

# **Ex-Post Project Evaluation 2013: Package III-7 (Indonesia)**

**March 2015**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

---

**OPMAC Corporation**

EV
JR
14-45

## Preface

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

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2011, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2010. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

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

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

March 2015  
Toshitsugu Uesawa  
Vice President  
Japan International Cooperation Agency (JICA)

## Disclaimer

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

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

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

No part of this report may be copied or reprinted without the consent of JICA.

Indonesia

Ex-Post Evaluation of Japanese ODA Loan

“Project Type Sector Loan for Water Resources Development (II)”

External Evaluator: Junko Fujiwara, OPMAC Corporation

**0. Summary**

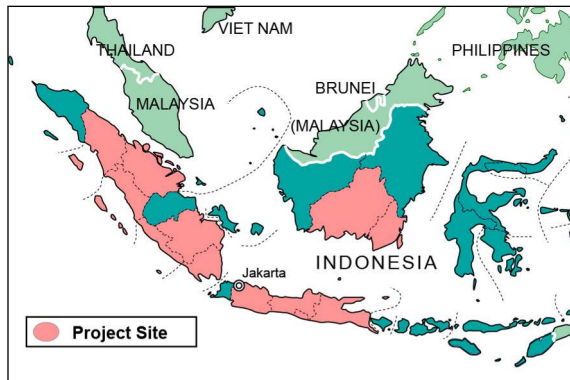
The objective of this project was to enhance food production, particularly in rice, to achieve the nation’s self-sufficiency in food supply through the construction and rehabilitation of moderate scale irrigation facilities in Western and Central Indonesia thereby contributing to the reinforcement of the agricultural production infrastructure and poverty reduction in rural Indonesia. This objective was well in line with Indonesia’s development policy and the nation’s developmental needs for increased food production as well as with Japan’s ODA policy. However, it was assessed that some problems were evident in the project planning. The project relevance is evaluated as fair.

With regard to the effectiveness of this project, it was confirmed qualitatively that the farming water supply and rice production improved and that the crop intensity of rice increased through this project by the interview surveys. Although some target figures in the Operation and Effects indicators were not achieved, the objective “to enhance food production particularly in rice to achieve self-sufficiency in food supply” was almost accomplished as a whole, as the unit yield and crop intensity of rice improved steadily. Accordingly, the effectiveness of utilizing irrigation facilities constructed under this project was confirmed as they contributed to the improvement of whole farming gross income and average annual income. Moreover, the intended project impact, “contribution to the enhancement of the farming production infrastructure and to poverty reduction in rural Indonesia” was confirmed, no issues were recognized in the areas of the natural environment, land acquisition and resettlement, and there were no other negative impacts. Therefore it is concluded that the project demonstrated effectiveness almost as planned, and the effectiveness and impacts of the project are evaluated as high.

The efficiency of the project is fair as the project cost did not exceed the planned budget, but the project period was significantly longer than planned. In terms of operation and maintenance, there were no issues with the institutional aspects and the present condition of the irrigation facilities covered under the project. However, there have been some minor problems with the technical and financial aspects, which may give a negative impact on the operation and maintenance systems and the physical condition of each subproject in the future. The sustainability of the effects realized by this project is therefore fair.

In light of the above, the project is overall evaluated as partially satisfactory.

## 1. Project Description



Project Location



Dam Constructed under the Project  
(Batang Tongar)

### 1.1 Background

The Government of Indonesia identified self-sufficiency of the rice supply as the nation's main goal to ensure national food security and deployed various policies to increase rice production such as the introduction of high-yield varieties and the expansion of irrigated farmland.

These policies were effective, resulting in increased rice production in the 1980s, with the nation's self-sufficiency rate in rice reaching 100% in 1984. However, the demand-supply balance of rice remained unstable as the population increased at 1.6% annually and rice consumption increased at 3.1% annually. Combined with the slow growth in cultivated areas due to the decrease in farmland on Java Island and so on, rice production was finally not able to catch up with demand.

In 1996, Japan signed a loan agreement for "Project Type Sector Loan for Water Resources Development (I)" with the Government of Indonesia and provided assistance for the new construction and rehabilitation of small-scale irrigation facilities, ponds and flood control facilities in 24 provinces throughout the country. However, the nation's agricultural production capacity was reduced due to a series of severe weather events such as the droughts of 1994 and 1997 as well as with the high prices of agricultural chemicals and materials caused by the depreciation of the Rupiah in 1998. As a result, the nation's self-sufficiency rate in rice supply dropped to 84.2% in 1999. It was increasingly difficult to maintain self-sufficiency in rice, and the country came to rely on imported rice constantly.

The Indonesian government was facing difficulties in securing sufficient funding for new public works. Under these circumstances, this project was expected to widely contribute to increased rice production in Indonesia and to revitalize local economies through the construction and rehabilitation of moderate-scale irrigation facilities in Western Indonesia (Sumatra Island) and Central Indonesia (Java Island and Kalimantan Island).

## 1.2 Project Outline

The objective of this project was to enhance food production mainly in the rice crop for the accomplishment of self-sufficiency in the food supply by building and rehabilitating moderate-scale irrigation facilities at 19 sites in 12 provinces in Western and Central Indonesia, thereby contributing to reinforcement of the rural agricultural production infrastructure and poverty reduction:

Loan Approved Amount / Disbursed Amount	18,676 million yen / 18,473 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 30, 2001 / July 5, 2001
Terms and Conditions	<p>[Main portion]</p> <p>Interest rate: 1.80%</p> <p>Repayment period: 30 years (Grace period) (10 years)</p> <p>Conditions for procurement: general untied</p> <p>[Consulting portion]</p> <p>Interest rate: 0.75%</p> <p>Repayment period: 40 years (Grace period) (10 years)</p> <p>Conditions for procurement: bilateral tied</p>
Borrower/Executing Agency	Government of Indonesia / Director General of Water Resources, Ministry of Public Works
Final Disbursement Date	December, 2011
Related Studies (Feasibility Studies, etc.)	N/A
Related Projects	<p>Related Japanese ODA loans</p> <ul style="list-style-type: none"> <li>· “Project Type Sector Loan for Water Resources Development” (L/A Signing: FY1996, approved amount: 11,797 million yen)<sup>1</sup></li> <li>· “Participatory Irrigation Rehabilitation and Improvement Management Project” (L/A Signing: FY2007, approved amount: 12,310 million yen)<sup>2</sup></li> <li>· Way Rarem Irrigation Project (Phase 1-4) (L/A Signing: FY1978, FY1980, FY1987, FY1991, approved amount: Total 22,260 million yen)<sup>3</sup></li> <li>· “Way Curup Irrigation Project” (L/A Signing: FY1991, approved amount: 1,422 million yen)<sup>4</sup></li> </ul>

<sup>1</sup> This project was implemented as the phase 1 of Project Type Sector Loan for Water Resources Development (PTSL-II).

<sup>2</sup> This project was processed following PTSL-II. Some subprojects of PTSL-II were taken over to Participatory Irrigation Rehabilitation and Improvement Management Project (PIRIMP).

<sup>3</sup> Rehabilitation of the irrigation facilities which were constructed under this project was included in PTSL-II.

<sup>4</sup> Ditto.

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Junko Fujiwara (OPMAC Corporation)

### 2.2 Duration of Evaluation Study

Ex-post evaluation of the project was conducted as below:

Evaluation period: January 2014 – April 2015

Site survey: April 6 - May 9, 2014, and August 6 - 16, 2014

### 2.3 Constraints during the Evaluation Study

#### 2.3.1 Limitations in Site Surveys and Beneficiary Surveys

In order to evaluate the project efficiently in a limited timeframe for this ex-post evaluation, 5 subprojects out of the total 19 subprojects were chosen for site surveys to study how the facilities are currently managed (Table 1). Four out of these 5 subprojects were selected for the beneficiary survey in order to evaluate how effective the project has been and what kind of impacts were realized (same table).

The 5 subprojects were chosen carefully to ensure balanced evaluation including different design elements such as new construction or the rehabilitation of existing facilities, weirs or dam irrigation. Also, among the 12 provinces located in Sumatra Island, Java Island, and Kalimantan Island, 5 provinces were selected from each island to ensure balanced sampling from the provinces and islands. These 5 locations have different climates and their annual precipitations differ significantly.

Table 1: Subprojects Selected for Site Survey and Beneficiary Survey

Subproject	Island	Province	Site Survey	Beneficiary Survey
Batang Tongar Irrigation Improvement Project	Sumatra Island	West Sumatra	○	○
Way Curup Irrigation Improvement Project		Lampung	○	○
Lanang Irrigation Improvement Project	Java Island	Central Java	○	○
Bajulmati Dam Irrigation Improvement Project		East Java	○	○
Amandit Irrigation Project	Kalimantan Island	South Kalimantan	○	-

Source: Developed by Evaluator

Note 1: Among 5 subprojects, Batang Tongar, Lanang and Bajulmati have both facilities which were newly constructed and rehabilitated, while Way Curup has only rehabilitated facilities and Amandit has newly constructed facilities under the Project.

Note 2: An outline of all the 19 projects is shown in the Table 18.

### 2.3.2 Limitations in Data/Information Collection

Due to the decentralization of government authorities in Indonesia, local government and central government do not always communicate successfully with regard to grasping the current status of the 19 subprojects and how their Operation and Effect indicators are performing. As a result, it was difficult to collect and study survey results except for the 5 subprojects where site surveys were conducted.

Given the limitations in site surveys and beneficiaries' survey, as well as in data / information collection, analyses of the effectiveness, impacts and sustainability of the project will be based on the 5 subprojects where the Evaluator was able to study the current status of the project and to analyze the survey results in detail. This will constitute the overall evaluation of this project.

## **3. Evaluation Results (Rating: C<sup>5</sup>)**

### 3.1 Relevance (Rating: ②<sup>6</sup>)

#### 3.1.1 Relevance to the Development Plan of Indonesia

##### (1) National development plan level

Indonesia's 6th 5-year plan (Repelita VI: 1994/95 - 1998/99), on which the appraisal of the project was based in 2001, identified "improvements in agricultural produce in both quality and quantity" and "improvements in the living standard of farmers and rural society through diversification and increased efficiency in agriculture" as national goals. In addition, the subsequent 5-year national development plan (Propenas 2000-2004) identified agricultural development as a focus area, with the goal of "overcoming poverty and satisfying the people's basic needs".

At the time of the ex-post evaluation of this project, the National Long Term Development Plan (RPJPN) (2005-2025) and the second term National Medium Term Development Plan (PRJMN2) (2010-2014) were underway. These plans identified "food security" (competitive agriculture products, increased income for farmers, securing of natural resources and the environment, the building and maintaining of irrigation infrastructure and facilities) as a priority development agenda.

##### (2) Sector development plan level

At the time of appraisal (2001), the national development 5-year plan (2000 - 2004) had focus strategies which included the expansion of agricultural production particularly in rice (the nation's main staple), the diversification of produce to satisfy agroindustry needs and to increase income for farmers.

---

<sup>5</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>6</sup> ③: High, ②: Fair, ①: Low



At the time of the ex-post evaluation, the 5-year Agriculture Development Plan (2009 - 2014) laid out by the Ministry of Agriculture (MOA) (2010) was under way. This plan listed four main goals: 1) enhancement of food security with improved self-sufficiency in the main staples; 2) diversification of agricultural production to correct the heavy reliance on rice; 3) value-added and internationally competitive agricultural products to promote exports; 4) improvement of welfare for farmers.

### 3.1.2 Relevance to the Development Needs of Indonesia

The self-sufficiency rate of the food supply reached 100% in 1984 in Indonesia. In the years that followed, however, growth in population and income standards led to an increased consumption of rice. Combined with the decrease in farmland particularly on Java Island, the nation's structural shortage of rice was evident at the time of project appraisal. Self-sufficiency in food, particularly rice, is one of the pillars of Indonesia's national policy. To achieve this goal, the development of irrigation facilities was given the highest priority.

At the time of the ex-post evaluation, Indonesia's consumption of grains other than rice, such as wheat, was increasing along with rice, indicating a more diverse diet. However, demand for rice, as well as the need for increased rice production, was still high. In 2011, the country imported 2 million tons of rice.

The Western region of Indonesia (the area combining Sumatra Island, Java Island and Kalimantan Island), which was the target area of this project, has 85% of the nation's population (2010). The demand for rice in this region is proportionate to its population (86% of the national figure). Particularly on Java Island, where the population is dense, the demand for rice is at its highest (approximately 18.2 million tons) reaching approximately 68% of the demand for the entire Western region (approximately 26.7 million tons). The project area has an important role as the prime supply source for Java Island, where rice demand is highest in the nation. As for annual growth in rice production, the required growth rate was 1.5% both in the Western region and nationwide (Table 2).

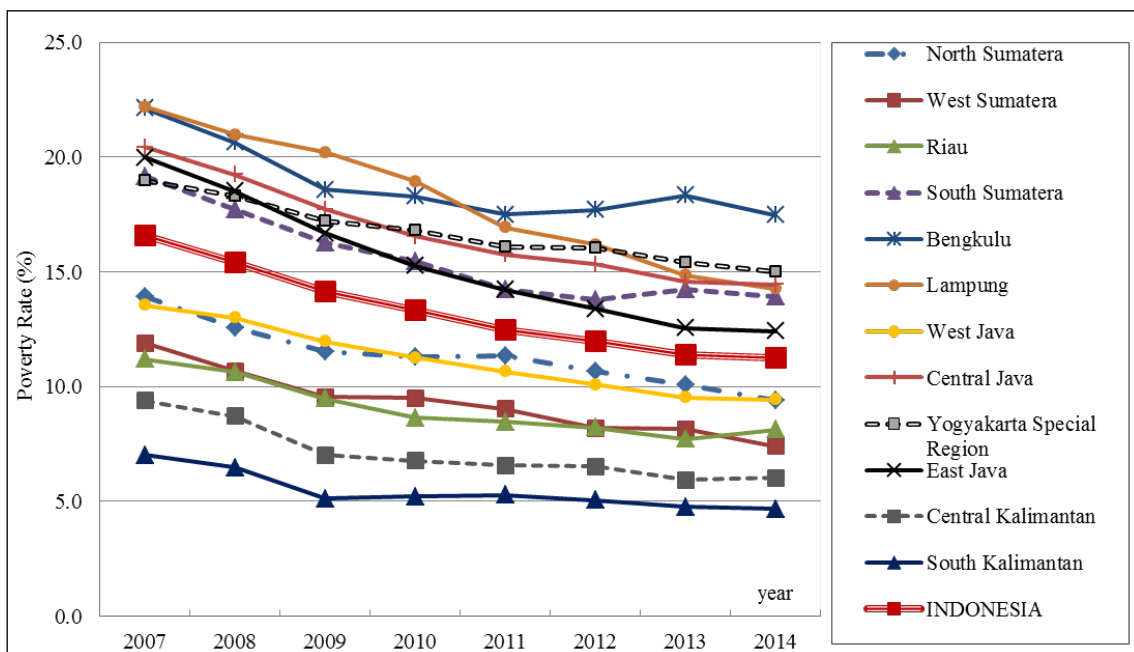
Table 2: Population, Demand for Rice and Production Growth

Item	Unit	Nationwide	Western Region			
			Sumatra Island	Java Island	Kalimantan Island	
Population (2010)	person	237,641,326	201,029,352	56,632,931	136,610,590	13,787,831
Demand for Rice (2013)	Million tons	31.1	26.7	6.7	18.2	1.8
Annual Demand for Rice Production Increase (2013)	%	1.5%	1.5%	1.5%	1.5%	1.5%

Source: Statistics Indonesia, survey results

While the demand in food is increasing along with population growth, cultivated areas for rice farming in North Sumatra province and Riau province on Sumatra Island are decreasing. In West Java province and Central Java province on Java Island, rice farming areas repeatedly increase and decrease resulting in little expansion. In Sumatra Island, it was confirmed that some farmland was converted for higher profit farming such as oil palm and rubber plantation, and in Java Island, industrialization and modernization are affecting the usage of farmland. Under these circumstances, any significant increase in rice planting cannot be expected. Given the limitation of cultivated areas, more efficient production of main staples is desired.

Looking at the shift in population living below the poverty line (2007 - 2014: Figure 1), the poverty rate is improving steadily in each province covered by this project. However, in the southern part of Sumatra Island (South Sumatra province, Bengkulu province, and Lampung province) and the middle-eastern part of Java Island (Central Java province, Special Region of Yogyakarta, and East Java province) the poverty rate is still over the national average. The need for poverty reduction in the project area is remaining, especially in these provinces.



Source: Developed by Evaluator based on figures published by Statistics Indonesia

Figure 1: Shift in the Poverty Rate in Provinces under the Project (2007 - 2014)

To summarize, the need for continued support for the development of irrigation facilities in order to increase unit yields and to enhance production capabilities for rice and other produce is still recognized.

### 3.1.3 Relevance to Japan's ODA Policy

At the time of appraisal (2001), Japan's ODA policy for Indonesia (2001) recognized the following priority areas: 1) securing equality 2) human resources and education 3) conservation of the natural environment 4) support for the reorganization of the industry structure 5) building an industrial foundation (economic infrastructure). This project is relevant to 5) of the above. In addition, Japan International Cooperation Agency (JICA)'s Medium-Term Strategy for Overseas Economic Cooperation Operations identified "development of the economic/social infrastructure" as one of the priority areas for Indonesia, and "agriculture" was positioned as an important pillar for the development of the economic infrastructure. The project is in line with this policy.

### 3.1.4 Validity of Project Planning and Project Implementation Approach

This project consolidates multiple subprojects. At the time of project designing, 180 candidate subprojects in the areas of irrigation, pond, swamp development and flood control were reviewed for consideration. These candidates were narrowed down to a shortlist of 22 which met the following conditions: 1) where the subproject would contribute to an increase in rice production; 2) where an early realization of project effects could be expected; 3) where the project is a mature case with no significant technical challenges 4) (in the case of rehabilitation projects) where the project is currently under appropriate operation and maintenance 5) where the project has had an Environmental Impact Assessment (EIA) completed if the subproject is classified as Category A under "JBIC Environmental Guidelines for ODA Loans (October, 1999)"; 6) where the project is not in an area of political unrest at the time of appraisal which would make project supervision difficult.

These 22 subprojects were prioritized based on their economic internal rate of return (EIRR), and the final 19 were selected to be included in this project. However, after the project went underway, many flaws were discovered in the geological and topographical data that formed the basis for the engineering details as well as in the engineering design elements themselves. As a result, each subproject had to go through re-survey, and the design elements also had to be reviewed thoroughly. For example, it had been expected since the time of project formulation that land acquisition would be required for 8 subprojects, and irrigation systems were being designed and scaled based on this assumption. However, after the design review, it turned out that the number of subprojects that required land acquisition was actually 12, increasing the scope for land acquisition and relocation significantly. In addition, land acquisition negotiations with residents proceeded with difficulty at the project implementation stage, and consequently additional changes in canal routes and design (scaling down) were unavoidable.

Meanwhile, the mid-term review (2009) proposed the addition of new Operation and Effects indicators to those defined at project appraisal (2001) to include unit yields of rice,

annual rice cropping intensity, average annual income per household, average agricultural gross income per household, and Water User Association (WUA) coverage ratio. Also, it was proposed that the unit yield of maize should be removed from all indicators as maize is not planted in some of the subproject areas. It was also proposed that the target figures be revised, given the design changes mentioned above, and the decrease in the planned irrigated area expected from the changes made.

Due to these unexpected circumstances, additional services were incurred such as repeating the geological and topographical surveys, re-designing facilities and re-calculating the project cost. The project budget and expenditure was managed tightly during the implementation period with a possible budget over-run in mind. For example, when it became apparent that not all subprojects could be implemented due to the significant increase in cost and escalation in prices, the 3 subprojects proceeding at the slowest pace were canceled<sup>7</sup>. As a result, as described in the “Efficiency” section below, the project cost came in within the planned budget although the project period was significantly longer than planned.

It is considered that the project supervision of the Project Management Unit, solutions applied to the problems as well as their approach were all valid. However, it is not possible to overlook the fact that inadequate quality in project planning led to various problems including design changes, revisions of indicator target figures for measuring project effects and the prolonged project period.

In summary, it can be said that the project has been highly relevant to Indonesia’s development plan and development needs, as well as to Japan’s ODA policy. However, there were problems at the time of project planning. Therefore, its relevance is evaluated as fair.

### 3.2 Effectiveness<sup>8</sup> (Rating: ③)

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

The Operation and Effect indicators of the project were analyzed comparing the base figures (set in 2000), target figures at the timing of project appraisal, target figures revised at mid-term review, actual figures at mid-term review (2009), project completion (2011) and ex-post evaluation (2013) (Table 3 - Table 7) for the 5 subprojects (Batang Tongar Irrigation Improvement Project, Way Curup Irrigation Improvement Project, Lanang Irrigation Improvement Project, Bajulmati Dam Irrigation Improvement Project, and Amandit Irrigation Project - See Table 1.) As mentioned above, the Operation and Effects indicators were revised at the time of the mid-term review to reflect a more realistic project scale after the design changes were made. Since these revised figures were used by the JICA Indonesia Office and the

---

<sup>7</sup> Two out of the remaining 16 were not completed as part of this project as their contracts were terminated and continued by the national budget of the Government of Indonesia or under the following project.

<sup>8</sup> Project impacts will also be taken into consideration when rating effectiveness.

executing agency when monitoring the project<sup>9</sup>, this ex-post evaluation uses the revised target figures to compare against the actuals in order to study the degree of accomplishments in quantitative effects of the project. (The original target figures defined before project implementation are also listed for reference.)

The intended outcome of the project is “enhanced agricultural production mainly in rice to achieve self-sufficiency of the nation’s food supply”. The project effectiveness will be analyzed mainly from such indicators as irrigated area, production volume and yield per unit area, and the annual cropping intensity of rice. Gross annual average income and farm income per household will also be taken into consideration as reference indicators for a comprehensive evaluation.

Although the WUA formulation rate was also listed as an Operation and Effects indicator, this indicator shows a project output rather than the effectiveness of the project and can be better used to measure the institutional capabilities of maintenance and management. Therefore this aspect will be analyzed in detail under “3.5 Sustainability”.

Analysis results for the 5 subprojects are described separately below:

(1) Batang Tongar Irrigation Improvement Project (Table 3)

the irrigated area at the time of the ex-post evaluation is above the revised target, and compared against the actual at project completion it can be seen to have increased by around 100 ha. Rice production volume at the time of this ex-post evaluation had increased by over 1,000 tonnages comparing against that at the time of project completion. However, it was almost same as the actual figure at the time of mid-term review and was below the revised target. The reasons for this comparatively low level of rice production are the relative decline in the price of rice causing the shift to oil palm and rubber plantations, wider areas of farmland per household causing shortages in the labor force, and so on. In addition, in some areas where the development of secondary and tertiary canals was delayed, water was not distributed sufficiently to the tail end of the irrigation system, where some farmers switched from rice to maize, which can be grown with less water.

The yield of rice per unit area was above the target. The slow growth in the unit yield compared to the time of project completion is largely due to shortages in the labor force. The annual cropping intensity of rice had improved compared to the time of project completion, but it was below the revised target and the actual figure at the time of mid-term review<sup>10</sup>. The prime reason for this is that the cropping pattern changed by recent shifts in farmland to other uses.

---

<sup>9</sup> It was confirmed at the time of the ex-post evaluation that the JICA Indonesia Office and the executing agency had agreed on these revisions (note that no official written agreement was confirmed).

<sup>10</sup> No information was obtained as a result of the survey regarding the background reasons for low cropping intensity at the time of project completion.

Household gross annual average income was almost the same as the time of project completion, but it highly exceeded the target. The gross annual average farm income per household also highly exceeded the target.

Table 3: Shift in Operation and Effect Indicators  
(Batang Tongar Irrigation Improvement Project)

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	0	4,391	1,566	1,207	2,469	2,599
Crop Production of Paddy (ton / season)	15,369	29,508	12,528	9,526	8,208	9,551
Unit Yield of Rice (average) (ton/ha/crop)	3.5	4.2	4	3.3	4.8	4.6
Rice Cropping Intensity (average) (%/year)	100	160	200	177	69	148
WUA Formulation Rate (%)	-	100	No change	11.3	30	39
Gross Annual Average Income (million rupiah/year)	-	-	16.1	6.96	43.42	43
Gross Annual Average Farm Income (million rupiah/year)	-	-	13.57	4.43	33.38	27.1

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note 1: The definitions of each indicator are as follows. Irrigated area indicates an area irrigated within a cultivated area. Crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times a crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

Note 2: Through the revisions during the survey, investigation and design (SID), the new construction of the secondary canal was downsized from a planned 77 km to 62.4 km, and that of the tertiary canal from 4,391 ha to 603 ha. Although additional rehabilitation work was carried out for 6.1 km of primary canal, 20.3 km of secondary canal and 60.0 ha of tertiary canal, the target irrigated area shrank to 1,566 ha. The target figure of the rice production volume was revised from 29,508 tonnages at the time of project appraisal to a lower 12,528 tonnage accordingly.

Note 3: The revised target of rice production volume (12,528 tonnages) is in fact lower than the base figure (15,369 tonnage). Information attached to the internal document of September 2000 provided by JICA describes the base figure of the irrigated area as being 2,100 ha, not 0 ha, which does not cause a contradiction.

## (2) Way Curup Irrigation Improvement Project (Table 4)

The actual for the irrigated area at the time of the ex-post evaluation was approximately 10% below the revised target, the actual at the mid-term review and the actual at project completion. The decrease in irrigation coverage can be explained by the relative decline in the price of rice causing a shift to oil palm/rubber plantations and cotton growing, by shortages in the labor force and by more farmland being converted into residential space due to population growth. On the other hand, the rice production amount at the time of the ex-post evaluation

exceeded the revised target as well as the actual at project completion. Despite the recent decrease in farmland and irrigated areas as well as the situation where a better rice variety and soil improvements are desired, it is apparent that a sufficient water supply is secured through the irrigation system contributing to the steady growth in the yield per unit area and the rice cropping intensity, resulting in good performance exceeding the target. The average income per household as well as farming income per household are growing steadily exceeding the target in both. It is conceivable that the steady growth in rice production and the partial conversion of farmland to high-profit produce are working well.

The WUA formulation rate has gone up since the time of project completion (2011) reaching the target of 100%.

Table 4: Shift in Operation and Effects indicators (Way Curup Irrigation Improvement Project)

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	2,176	4,307	4,073	1,961	3,913	3,629
Crop Production of Paddy (ton / season)	15,232	27,405	27,473	27,473	32,301	38,280
Unit Yield of Rice (average) (ton/ha/crop)	3.5	3.5	4.5	3.5	4.71	5.5
Rice Cropping Intensity (average) (%/year)	101	182	150	112	175	192
WUA Formulation Rate (%)		100	No change	0	100	100
Gross Annual Average Income (million rupiah/year)			9.25	4.51	28.97	43.8
Gross Annual Average Farm Income (million rupiah/year)			6.74	2.00	23.82	36.3

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

### (3) Lanang Irrigation Improvement Project (Table 5)

The irrigated area mostly reached the target. Rice production increased steadily throughout the project implementation period and exceeded the target at the time of ex-post evaluation. Cropping intensity and unit yield of rice exceeded the target. WUA formulation rate had grown since the time of mid-term review (2009) reaching the target of 100%. The gross average annual income per household and farm income both exceeded the target.

Table 5: Shift in Operation and Effect indicators (Lanang Irrigation Improvement Project)

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	1,871	1,871	1,900	0	1,410	1,817
Crop Production of Paddy (ton / season)	7,578	12,349	19,000	7,650	14,100	24,844
Unit Yield of Rice (average) (ton/ha/crop)	4.5	5.5	5.0	3	5.0	8
Rice Cropping Intensity (average) (%/year)	90	120	200	134	-	250
WUA Formulation Rate (%)	-	100	No change	40	-	100
Gross Annual Average Income (million rupiah/year)	-	-	8.84	6.19	-	19
Gross Annual Average Farm Income (million rupiah/year)	-	-	3.71	2.37	-	7.5

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

#### (4) Bajulmati Dam Irrigation Improvement Project (Table 6)

Irrigation coverage increased steadily throughout the project implementation period and exceeded the revised target significantly at the time of the ex-post evaluation. Rice production also increased steadily and exceeded the target at the time of the ex-post evaluation. The unit yield of rice yield has shown a steady increase since the time of project execution although the actual came in just under the revised target. Similarly, the rice cropping intensity showed a steady performance, exceeding the target at the time of ex-post evaluation. Gross income and the farm income per household both exceeded the target. The WUA formulation rate reached the target of 100%.



Table 6: Shift in Operation and Effect indicators  
(Bajulmati Dam Irrigation Improvement Project)

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	1,004	1,980	779	779	779	1,417
Crop Production of Paddy (ton / season)	5,544	19,800	11,038	6,501	7,493	13,533
Unit Yield of Rice (average) (ton/ha/crop)	3.5	5.0	5.8	4.1	5.26	5.5
Rice Cropping Intensity (average) (%/year)	80	200	238	204	180	250
WUA Formulation Rate (%)	-	100	No change	100	53	100
Gross Annual Average Income (million rupiah/year)	-	-	26.81	25.44	23.86	42.5
Gross Annual Average Farm Income (million rupiah/year)	-	-	23.73	22.35	17	30

Source: Information provided by JICA (disclosed / internal), ex-post evaluation survey results

Note 1: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

Note 2: The target figure for the irrigated area (779 ha) revised at the time of the mid-term review is in fact below the base figure (1,004 ha) due to the scaling down of the facility design with less irrigated area than the planned at the time of project appraisal. As the result of revisions during SID and the re-estimation of the project cost, new construction of dams, weirs, primary canals and secondary canals, and both new construction and rehabilitation of tertiary canals were excluded. Instead, tunnel construction and rehabilitation of weirs and primary canals was newly implemented.

#### (5) Amandit Irrigation Project (Table 7)

Irrigation coverage increased steadily through the project implementation period and exceeded the revised target significantly at the time of the ex-post evaluation. Both the rice production amount and the yield per unit area increased steadily and exceeded the target significantly. On the other hand, the actual for the rice cropping intensity came in below the target, and lower than the actual recorded at the time of project completion<sup>11</sup>. Both household income and farming gross income exceeded the target as well as the actual at project completion reflecting the growth in rice production and yield per unit area. The WUA formulation rate remained at 20%. Among the entire irrigation system of Amandit, some tertiary canals have not

<sup>11</sup> No information was obtained as a result of any survey on the backgrounds and their reasons.

been completed where they were not included in the scope of assistance of the project<sup>12</sup>.

Table 7: Shift in Operation and Effect indicators (Amandit Irrigation Project)

Indicator	Base Year (2000)	Target set at Project Appraisal (4 years after project completion)	Target revised at Mid-term Review (2 years after project completion)	Actual at Mid-term Review (2009)	Actual at Project Completion (2011)	Actual at Ex-post Evaluation (2013: 2 years after project completion)
Irrigated Area (ha)	0	7,399	2,341	0	2,700	4,089
Crop Production of Paddy (ton / season)	14,798	33,665	9,387	4,023	23,244	29,981
Unit Yield of Rice (average) (ton/ha/crop)	2.5	3.5	No change	3	4.39	5.2
Rice Cropping Intensity (average) (%/year)	80	130	200	100	196	141
WUA Formulation Rate (%)	-	100	No change	0	48	20
Gross Annual Average Income (million rupiah/year)	-	-	11.86	7.5	28.36	33.6
Gross Annual Average Farm Income (million rupiah/year)	-	-	5.53	1.17	17.47	23.2

Source: Information provided by JICA (disclosed / internal, as of July 2001), ex-post evaluation survey results

Note 1: The definitions of each indicator are as follows. Irrigated area indicates the area irrigated within a cultivated area. The crop production volume indicates the annual production amount by crop in the area benefited by the project. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. The WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks, assuming that one WUA is formed per one block of tertiary canal. The gross annual average farm income is the crop production volume multiplied by crop price.

Note 2: Through the revisions during SID, the new construction of secondary canals was downsized from the planned 49 km to 4.2 km, and that of tertiary canals from 7,399 ha to zero. The target irrigated area shrank from 7,399 ha to 2,341 ha accordingly. The target figure for the rice production volume was revised from 33,665 tonnages at the time of project appraisal to the lower 9,387.

Note 3: The revised target of rice production volume (9,387 tonnages) is in fact lower than the base figure (14,798 tonnages). The information as of September 2000 describes the base figure of the irrigated area as being 3,358 ha and the target figure as being 7,399. The base figure of the rice production amount was 6,716 tonnages and the target figure was 33,665, which does not cause a contradiction.

To summarize the quantitative effects observed at each site, the unit yield of rice and the rice crop intensity rate have improved steadily indicating that the irrigation facilities developed through the project have been effective. The gross farm income earned from the agricultural activities as a whole and the average annual income show good figures at each subproject.

<sup>12</sup> The WUA formulation rate at the time of ex-post evaluation was lower than that at the time of project completion (48%). According to the executing agency, the 48% figure is a result of excessive recording, but that the reliability of data collected at project completion was unable to verify.

### 3.2.2 Qualitative Effects

As part of this evaluation, beneficiary surveys were conducted at 4 sites in 4 provinces in the project area with a total of 239 households<sup>13</sup>. In order to study how rice planting may be done differently in upper / middle / lower stream areas, survey targets were selected from each stream area through the Ministry of Public Works (MOPW)'s River Basin Management Office (Balai Office). The selected farmers were mainly WUA participants.

Almost all the survey respondents were heads of households, and their average age was 48.7. The breakdown by area is 53, 78, 108 from upper stream, middle steam, lower stream respectively. 237 of 239 farmers were WUA members, and 216 of them participate in WUA activities (Table 8).

Table 8: Overview of Beneficiary Survey Respondents

Unit: person

Subproject	Number of Respondents (households)	Average Age of Household Head	Farming Location			Memberships of WUA	
			Upper-stream	Mid-stream	Lower-stream	No of members (members / total respondents)	No of active members (active members / total members)
Batang Tongar Irrigation Improvement Project	51	42.6	6	17	28	49 (96.1%)	46 (93.9%)
Way Curup Irrigation Improvement Project	67	50.3	12	0	55	67 (100.0%)	63 (94.0%)
Lanang Irrigation Improvement Project	60	51.1	24	14	22	60 (100.0%)	51 (85.0%)
Bajulmati Dam Irrigation Improvement Project	61	46.1	11	47	3	61 (100.0%)	56 (91.8%)
Total	239	48.7	53	78	108	237 (99.2%)	216 (91.1%)

Source: Beneficiary survey results

#### (1) Improvement in farming water supply

Over 70% of all respondents (174) answered that the water supply to farmland had increased / been improved by the development of irrigation facilities (Table 9). By subproject, this tendency was high in Lanang (85.0%) and in the upper steam area (84.9%) by river area. Just under 70% of the beneficiary farmers who plant rice in the lower stream area answered that the water supply “increased / improved”. However, the score for “aggravated / decreased” was also high in the lower stream area (22.2%). Water gate operations and water distribution monitoring are done mainly by local farmers under the supervision of the Balai Office or the

<sup>13</sup> Survey target: Beneficiary farmers. Survey method: Structured questionnaire (face-to-face interview). Locations and dates are as follows: Batang Tongar: Pasaman Sub-district of West Pasaman District, West Sumatra Province (15 and 16 April 2014), Way Curup: Labuhan Maringgai Sub-district, Way Jepar Sub-district, Mataram Baru Sub-district of East Lampung District, Lampung Province (18 April 2014), Lanang: Penawangan Sub-district of Grobogan District, Central Java Province (21 and 22 April 2014), Bajulmati: Banyuputih Sub-district and Wongsorejo Sub-district of Banyuwangi District, East Java Province (24 and 25 April 2014).

local government's department of water resources (DOWR). It is apparent that there is a room for improvement in maintenance activities and operation skills in order to distribute water sufficiently to the lower stream areas.

Table 9: Changes in Water Supply to Farmland

Unit: person

By Subproject / by Farming Location	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Total	174 (72.8%)	30 (12.6%)	28 (11.7%)	7 (2.9%)	239
Breakdown by Subproject					
Batang Tongar Irrigation Improvement Project	28 (54.9%)	9 (17.6%)	12 (23.5%)	2 (3.9%)	51
Way Curup Irrigation Improvement Project	54 (80.6%)	3 (4.5%)	7 (10.4%)	3 (4.5%)	67
Lanang Irrigation Improvement Project	51 (85.0%)	0 (0.0%)	7 (11.7%)	2 (3.3%)	60
Bajulmati Dam Irrigation Improvement Project	41 (67.2%)	18 (29.5%)	2 (3.3%)	0 (0.0%)	61
Breakdown by Farming Location					
Upper-stream	45 (84.9%)	5 (9.4%)	1 (1.9%)	2 (3.8%)	53
Mid-stream	57 (73.1%)	17 (21.8%)	3 (3.85%)	1 (1.3%)	78
Lower-stream	72 (66.7%)	8 (7.4%)	24 (22.2%)	4 (3.7%)	108

Source: Beneficiary survey results

## (2) Increase in rice yield

176 respondents (over 70%) answered that unit yield of rice increased / improved from ex-ante project implementation. By subproject, Lanang showed the highest score (56 respondents: 93.3%) (Table 10). This is closely related to the result that almost 80% (47 beneficiaries) answered that the farming water supply had been improved / had increased. By river area, the upper stream area shows the highest score in "increased / improved" at 86.8%. Although in the upper stream area, the water supply was sufficient even before project implementation, especially in the rainy season, the updated irrigation facilities provided by the project allocated an adequate water supply at appropriate times annually and, hence, the rice yield was improved / increased.

147 farmers out of 239 checked both the answers "improved / increased rice yield" and "improved / increased farming water supply" indicating a strong correlation between these two, as shown in the case of Lanang. It is possible that the project allowed farmers to secure sufficient water when required, such as at the time of planting and during the dry season, realizing a significant effect in rice farming. Improvements in water distribution in the lower stream area may lead to further improvements in rice production in the future.

Table 10: Changes in the Unit Yield of Rice

Unit: person

By Subproject / by Farming Location	Answer				Total
	Increased / Improved from ex-ante Project	Same as before Project	Decreased / Aggravated from ex-ante Project	Others / N/A	
Total	176 (73.6%)	39 (16.3%)	8 (3.3%)	16 (6.7%)	239
Of whom the number of beneficiaries who also stated their farm water supply increased:	147	21	1	5	174
Breakdown by Subproject					
Batang Tongar Irrigation Improvement Project	28 (54.9%)	13 (25.5%)	6 (11.8%)	4 (7.8%)	51
Way Curup Irrigation Improvement Project	53 (79.1%)	11 (16.4%)	1 (1.5%)	2 (3.0%)	67
Lanang Irrigation Improvement Project	56 (93.3%)	4 (6.7%)	0 (0.0%)	0 (0.0%)	60
Bajulmati Dam Irrigation Improvement Project	39 (63.9%)	11 (18.0%)	1 (1.6%)	10 (16.4%)	61
Breakdown by Farming Location					
Upper-stream	46 (86.8%)	5 (9.4%)	0 (0.0%)	2 (3.8%)	53
Mid-stream	53 (67.9%)	12 (15.4%)	2 (2.6%)	11 (14.1%)	78
Lower-stream	77 (71.3%)	22 (20.4%)	6 (5.6%)	3 (2.8%)	108

Source: Beneficiary survey results

## (3) Increase in rice plantings

Table 11 shows the current status of rice farming with the 239 beneficiary farmers by season and river area. About 80% of all beneficiaries planted rice either twice or three times a year, and 129 out of 156 farmers who planted twice a year and 30 of 36 farmers who planted three times a year answered that their rice production increased.

Table 11: Changes in the Number of Rice Plantings

Unit: person

By Subproject / by Farming Location	No of Crop: 0 time	No of Crop: 1 time	No of Crops: 2 times		No of Crops: 3 times		Total
	rainy season: 0 dry season: 0	rainy season: 1 dry season: 0	rainy season: 2 dry season: 0	rainy season: 1 dry season: 1	rainy season: 2 dry season: 1	rainy season: 1 dry season: 2	
	Total	25 (10.5%)	22 (9.2%)	44 (18.4%)	112 (46.9%)	25 (10.5%)	
Of whom the number of beneficiaries who also stated their unit yield of rice increased:	5	12	41	88	21	9	176
Breakdown by Subproject							
Batang Tongar Irrigation Improvement Project	13 (25.5%)	1 (2.0%)	0 (0.0%)	29 (56.9%)	8 (15.7%)	0 (0.0%)	51

By Subproject / by Farming Location	No of Crop: 0 time	No of Crop: 1 time	No of Crops: 2 times		No of Crops: 3 times		Total
	rainy season: 0 dry season: 0	rainy season: 1 dry season: 0	rainy season: 2 dry season: 0	rainy season: 1 dry season: 1	rainy season: 2 dry season: 1	rainy season: 1 dry season: 2	
Way Curup Irrigation Improvement Project	0 (0.0%)	2 (3.0%)	0 (0.0%)	64 (95.5%)	1 (1.5%)	0 (0.0%)	67
Lanang Irrigation Improvement Project	0 (0.0%)	3 (5.0%)	41 (68.3%)	16 (26.7%)	0 (0.0%)	0 (0.0%)	60
Bajulmati Dam Irrigation Improvement Project	12 (19.7%)	16 (26.2%)	3 (4.9%)	3 (4.9%)	16 (26.2%)	11 (18.0%)	61
Breakdown by Farming Location							
Upper-stream	3 (5.7%)	4 (75%)	24 (45.3%)	17 (32.1%)	5 (9.4%)	0 (0.0%)	53
Mid-stream	12 (15.4%)	16 (20.5%)	7 (9.0%)	22 (28.2%)	10 (12.8%)	11 (14.1%)	78
Lower-stream	10 (9.3%)	2 (1.9%)	13 (12.0%)	73 (67.6%)	10 (9.3%)	0 (0.0%)	108

Source: Beneficiary survey results

Note 1: Those respondents who grow rice during dry season also grow rice during rainy season.

Note 2: Beneficiary farmers who grow rice in dry seasons also grow rice in rainy seasons. Of the 5 farmers who answered “rice yield increased” with no rice planting, 2 were in Batang Tongar, and 3 were in Bajulmati. These farmers had either converted their farmland into higher profit produce such as oil palm, despite its increased rice yield, or had an increased yield in produce other than rice.

As seen in the results by subproject, 95.5% of the Way Curup beneficiaries and 95.0% of Lanang beneficiaries planted rice twice a year. Bajulmati has the highest score for triple rice-planting at 44.2%. The score for double-planting is high in the upper and middle stream areas (77.4% and 79.6% respectively), and the triple-planting score is high in the middle stream area (26.9%). In Batang Tongar, for over 25% of beneficiaries, rice is not the main crop in the lower stream area. According to beneficiary interviews, this is because farmers “can’t secure enough labor force required for rice farming”, “switched to secondary crops such as maize, which does not require as much work” and “converted farmland for higher profit farming like oil palm”. In Way Curup, many residents moved into the area in the 1970’s. They have an established and tight-knit community, and WUA members work closely together (Photo 1). They have used irrigation systems for over 15 years, and rehabilitation completed through this project made it possible to plant rice twice a year in a stable manner. In Lanang, where precipitation is low in the dry season, a stable water supply was secured throughout the year thanks to this project (Photo 2).



Photo 1: WUA Organizational Chart (Way Curup)



Photo 2: Weir constructed under the Project (Lanang)

In Bajulmati, it was confirmed that about 20% of the beneficiaries didn't grow rice, mainly in the middle stream area. This is because some farmers grew secondary crops with less water requirement such as maize, as the dam was not complete as of April 2014, and the water supply was short, mainly in the highlands.

From the beneficiary survey, it was confirmed that the farming water supply, rice production and planting frequency all improved and that there was qualitative effectiveness.

Therefore, in terms of qualitative and quantitative effectiveness as mentioned in the above, the objective "to enhance agricultural production particularly in rice to achieve self-sufficiency of food supply" has almost been achieved.

### 3.3 Impacts

The irrigation facilities developed through this project are used well, and the intended effects of the project such as improvements in the farming water supply, unit yield of rice and cropping intensity were confirmed from the beneficiary survey results. In addition, certain positive impacts were observed such as improvements in farming income, the production infrastructure, the living environment and the standard of living. Environmental considerations were properly addressed. The scope of land acquisition and resettlement expanded due to the project design review, but this was only after thorough discussions with the residents. The plan was executed appropriately in accordance with Indonesian law and no problems have been reported.

Details will be described below.

#### 3.3.1 Intended Impacts

##### (1) Household finances

144 beneficiary farmers (60.3%) answered that their farming income increased, and 124

(51.9%) answered that their farming expenses increased. A part of these expenses was for securing a stronger labor force and purchasing seedlings and chemicals. 77 farmers (32.2%) indicated that a stronger labor force was required after project implementation. With regard to employment opportunities for family members, the number of farmers who indicated “increased after project” went up to 88 (36.8%). Farmers whose “non-farming income increased” were up to 84 (35.1%), and farmers whose “non-farming expenses increased” were also up to 73 (30.5%). As for savings, 78 (32.6%) indicated that they had “increased”, but 20 (8.4%) answered that they were the “same as before project”. Also, livestock such as farm animals and other non-cash savings raised the number for “Other/Not Applicable” (138, 57.7%).

Table 12: Household Finances

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Household Farm Income	144 (60.3%)	81 (33.9%)	11 (4.6%)	3 (1.3%)	239
Farm Labor	77 (32.2%)	119 (49.8%)	26 (10.9%)	17 (7.1%)	239
Farm Expenses	124 (51.9%)	83 (34.7%)	29 (12.1%)	3 (1.3%)	239
Job opportunities for family members	88 (36.8%)	41 (17.2%)	2 (0.8%)	108 (45.2%)	239
Household Non-farm Income	84 (35.1%)	39 (16.3%)	3 (1.3%)	113 (47.3%)	239
Non-farm Expenditure	73 (30.5%)	52 (21.8%)	4 (1.7%)	110 (46.0%)	239
Savings	78 (32.6%)	20 (8.4%)	3 (1.3%)	138 (57.7%)	239

Source: Beneficiary survey results

Note: For “Job opportunities for family members”, “non-farming household income” and “non-farming expenses”, almost half of all respondents indicated “Other/Not applicable”. This is because few beneficiaries engage in occupations other than farming.

## (2) Improvement in life infrastructure

The number of beneficiaries who answered that “farming / residential water quality improved” reached 206 (86.2%). The water distributed through the canals is intended for farming, but the residents also use it for other general purposes such as laundry, bathing and swimming. With the rehabilitation and new construction of canals, the water became cleaner as wood debris, sand and other impurities were removed regularly. Farmers seem to feel the effect of well-maintained irrigation systems and the outcome of their maintenance activities. Asked about the water supply to households, 51.9% answered “same as before project”, but 109 beneficiaries (45.6%) answered “Increased / Improved”. This may be because water is available for residents’ daily use if they go to a canal, to a certain degree, satisfying their need for water for general purposes.



Table 13: Improvement in Life Infrastructure

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Water Quality	206 (86.2%)	16 (6.7%)	12 (5.0%)	5 (2.1%)	239
Water Supply to Household	109 (45.6%)	124 (51.9%)	2 (0.8%)	4 (1.7%)	239
Road Access	145 (60.7%)	28 (11.7%)	57 (23.8%)	9 (3.8%)	239

Source: Beneficiary survey results

Note: Beneficiaries' answers to the condition of the water supply to households implies mainly water for general purposes water (laundry, swimming and such).

Similarly, 145 farmers (60.7%) answered that road access near irrigation facilities “improved”, indicating that road works around canal development contributed to improvements in the living environment of beneficiaries (Photo 3).



Photo 3: Road improved along the tertiary canal (Bajulmati)

(3) Improvements in health, hygiene and education

167 farmers (69.9%) answered that “health and hygiene improved”. Also, 164 farmers (68.6%) answered that “children’s education opportunities improved”. Expenses for health and education add up as they include medical supplies, clothing, transportation costs for getting to schools and healthcare facilities. Increased farming income achieved through the project appears to have made these non-farming expenses more affordable indicating a correlation with the responses observed above, in 1) Household finances. Improvements in health and education are an essential factor for getting out of poverty. It is likely that cash surplus invested in these areas will further increase in the future.

Table 14: Improvements in Health, Hygiene and the Education Environment

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Health and Hygiene of Household	167 (69.9%)	67 (28.0%)	2 (0.8%)	3 (1.3%)	239
Education Level for Children	164 (68.6%)	41 (17.2%)	1 (0.4%)	33 (13.8%)	239

Source: Beneficiary survey results

(4) Diversity in local markets and business

165 farmers (69.0%) out of the total 239 answered that “the local market became more active after the project”. It is conceivable that the project contributed to increased yields in rice and other crops and that farmers started selling their surpluses at the local market.

As for “diversity in local businesses”, on the other hand, only 68 farmers (28.5%) answered that they “diversified”, and 140 farmers (58.9%) answered “same as before project”. It is not confirmed yet that there is any trend where surplus in crops is invested to manufacture processed agricultural products for new business development. It is advisable that future trends are monitored on an ongoing basis.

Table 15: Diversity in Local Markets and Businesses

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Local Markets	165 (69.0%)	53 (22.2%)	6 (2.5%)	15 (6.3%)	239
Diversity of Local Businesses	68 (28.5%)	140 (58.6%)	0 (0.0%)	31 (13.0%)	239

Source: Beneficiary survey results

In summary, post-project improvements are recognized in farming income, which suggests effectiveness of the project. Savings and other ways to secure surpluses from increased income also improved. On the other hand, securing the required labor force proved difficult, and farming expenses are on the rise. As for life infrastructure, the farming water supply provided through the project contributed to better water quality and more convenience in residents’ daily water use. In addition, the living environment of beneficiaries improved as seen in better road conditions. Farmers’ standard of life, measured by health, hygiene and education is mostly improving. Although local markets are becoming more active, signs of business investment and new business development, which would require specific technology and skills, are yet to be seen. Short-term, rapid income increase is not expected, but it is still apparent that the quality of life of beneficiaries is improving steadily.

Thus, the impact of this project, “contribution to the enhancement of the rural production infrastructure and poverty reduction” is confirmed.

### 3.3.2 Other Impacts

#### (1) Impact on the natural environment

In accordance with the “JBIC Environmental Guidelines for ODA Loans (October 1999)”, two subprojects (Air Lakitan, Bajulmati) were classified as Category A and it was required that an Environmental Impact Assessments (EIA) report be submitted. In this ex-post evaluation, it was confirmed that these two subprojects did have EIAs completed and approved based on the

initial plan.

Table 16 summarizes environmental approvals and how environmental monitoring is conducted for the 5 subprojects where the site survey was conducted. Some subprojects were required to have EIAs completed by Indonesian environmental laws<sup>14</sup> even though they were not classified as Category A under the guidelines above mentioned. The executing agency took one of the measures required by domestic law (either the implementation of EIA or the elaboration of an environmental management plan and an environmental monitoring plan). Environmental monitoring was taken over either by the Balai Office or the provincial government DOWR. Monitoring is still continuing and no negative impacts on the environment have been confirmed.

Table 16: Environmental Assessments and Monitoring Status

Subproject	Assessment Conducted	Time Approved	Monitoring Status
Batang Tongar Irrigation Improvement Project	Environmental Impact Assessment	Approved in April, 2000	Monitored by the DOWR, Provincial Government
Way Curup Irrigation Improvement Project	Environmental Assessment	Conducted in 1993	Monitored by the Balai Office as of the time of ex-post evaluation
Lanang Irrigation Improvement Project	Environmental management plan/environmental monitoring plan	Approved in December, 2003	Monitored by the DOWR, Provincial Government
Bajulmati Dam Irrigation Improvement Project	Environmental Impact Assessment	Approved in October, 2002	Monitored by the Balai Office from 2008 up until the time of ex-post evaluation
Amandit Irrigation Project	Environmental Impact Assessment	Approved in November, 2002	As of the time of ex-post evaluation monitored by the Balai Office as part of maintenance and operation activities

Source: Beneficiary survey results

## (2) Land acquisition and resettlement

Table 17 shows the original plan and actuals for land acquisition and resettlements for this project.

Out of 8 subprojects where land acquisition was originally planned, 6 subprojects required more land area for acquisition. Furthermore, it turned out that 4 other subprojects needed land acquisition. As a result, the total land acquired for the project was 1,981.07 ha, larger than originally planned. In order to minimize land acquisition and relocation of residents, canal routes and other designs were changed and scaled down after consulting with the residents. Various measures were taken including the construction of temporary facilities and access pathways in order to avoid cutting down teakwood. Since land acquisition was scaled down, the relocation of residents that was expected in Air Lakitan was cancelled, and relocation in

<sup>14</sup> The Decree of the State Minister of the Environment No.17/2001 and the Decree of the State Minister of the Environment No.11/2006

Amandit was scaled down. However, additional households in Karau needed to be relocated.

These changes caused a delay in the project implementation, but it was all executed appropriately in accordance with Indonesian law. According to interviews with the Balai Offices in each area, conducted in this ex-post evaluation, no additional land acquisition or resettlement was required after project completion, and there were no specific long-term issues with land acquisition and relocation during the project implementation period.

Table 17: Status of Land Acquisition and Resettlement

	Plan		Actual	
	Scale	Subproject	Scale	Subproject
Land Acquisition	1,334.5 ha (8 sites)	<ul style="list-style-type: none"> <li>· Batang Angkola Irrigation Improvement Project (198 ha)</li> <li>· Panti Rao Irrigation Improvement Project (118 ha)</li> <li>· Batang Tongar Irrigation Improvement Project (65 ha)</li> <li>· Okak Irrigation Project (30 ha)</li> <li>· Air Lakitan Irrigation Project (353 ha)</li> <li>· Muko-Muko Kanan Irrigation Improvement Project (100.5 ha)</li> <li>· Karau Irrigation Project (300 ha)</li> <li>· Amandit Irrigation Project (170 ha)</li> </ul>	1,981.1 ha (12 sites)	<ul style="list-style-type: none"> <li>· Batang Angkola Irrigation Improvement Project (241.36 ha)</li> <li>· Panti Rao Irrigation Improvement Project (282.62 ha)</li> <li>· Batang Tongar Irrigation Improvement Project (119.72 ha)</li> <li>· Okak Irrigation Project (103.52 ha)</li> <li>· Air Lakitan Irrigation Project (228.61 ha)</li> <li>· Muko-Muko Kanan Irrigation Improvement Project (196 ha)</li> <li>· Karau Irrigation Project (518 ha)</li> <li>· Amandit Irrigation Project (126.44 ha)</li> <li>· Lodan Dam Irrigation Improvement Project (11.1 ha)</li> <li>· Lanang Irrigation Improvement Project (2.01 ha)</li> <li>· Sapon Irrigation Improvement Project (2.93 ha)</li> <li>· Bajulmati Dam Irrigation Improvement Project (148.76 ha)</li> </ul>
Resettlement	27 households (2 sites)	<ul style="list-style-type: none"> <li>· Air Lakitan Irrigation Project (16 households)</li> <li>· Amandit Irrigation Project (11 households)</li> </ul>	51 households (2 sites)	<ul style="list-style-type: none"> <li>· Amandit Irrigation Project (6 households)</li> <li>· Karau Irrigation Project (45 households)</li> </ul>

Source: Project Completion Report (June 2012)

(3) Unintended positive/negative impacts

None.

To summarize, improvements in the farming water supply, the unit yield of rice and cropping intensity were confirmed qualitatively. The effectiveness of the project impact, “contribution to the enhancement of the rural production infrastructure and poverty reduction” was also confirmed. There were no problems with the natural environment, relocation of residents and land acquisition and were no other positive or negative impacts.

It was confirmed that effects were realized almost as planned through this project. Overall, the effectiveness and impacts of the project are evaluated as high.

### 3.4 Efficiency (Rating: ②)

#### 3.4.1 Project Output

##### (1) Survey, Investigation and Design (SID)

SID was originally planned for all 19 subprojects. However, due to an expected budget over-run, it was carried out for 12 subprojects only (Table 18).

##### (2) Number of subprojects

At the time of project appraisal, the construction and rehabilitation of irrigation facilities were planned for 19 subprojects. However, during the project implementation period, limitations in budget and the construction period became apparent, resulting in the cancellation of 3 subprojects including Batang Batahan, Jabung, and Leuwi Goong was implemented under a Japanese ODA loan project “Participatory Irrigation Rehabilitation and Improvement Management Project” (PIRIMP). The scope for the remaining 16 subprojects was also changed; some design elements were modified, and some part of the construction work was transferred to different projects. The quality of work undertaken by a local contractor for the Okak subproject was extremely poor, so the contract was terminated in 2011 before the construction was completed. The subproject was removed from this project and implemented using the Indonesian government national budget. Having been partly conducted under this project, the Air Lakitan subproject is now placed under PIRIMP.

Table 18: Subprojects Planned and Implemented in the Project

No.	Name of Subprojects	Province	Plan		Actual	
			SID	Components	SID	Components
1	Batang Angkola Irrigation Improvement Project	North Sumatera	Planned	New construction / rehabilitation	Implemented	New construction / rehabilitation
2	Simodong Irrigation Improvement Project		Planned	New construction / rehabilitation	Implemented	New construction / rehabilitation
3	Panti Rao Irrigation Improvement Project	West Sumatera	Planned	New construction / rehabilitation	Implemented	New construction / rehabilitation
4	Batang Batahan Irrigation Project		Planned	New construction / rehabilitation	Not implemented	Excluded out of scope
5	Batang Tongar Irrigation Improvement Project		Planned	New construction	Implemented	New construction / rehabilitation
6	Okak Irrigation Project	Riau	Planned	New construction	Implemented	New construction (contract terminated. Construction continued by national budget)
7	Air Lakitan Irrigation Project	South Sumatera	Planned	New construction	Implemented	New construction (Partly implemented under other project) <sup>15</sup>

<sup>15</sup> Implemented under the Participatory Irrigation Rehabilitation and Improvement Management Project (PIRIMP).

No.	Name of Subprojects	Province	Plan		Actual	
			SID	Components	SID	Components
8	Muko-Muko Kanan Irrigation Improvement Project	Bengkulu	Planned	New construction	Implemented	New construction / rehabilitation
9	Jabung Irrigation Improvement Project	Lampung	Planned	Rehabilitation	Not implemented	Excluded out of scope
10	Way Curup Irrigation Improvement Project <sup>16</sup>		Planned	Rehabilitation	Implemented	Rehabilitation
11	Way Rarem Irrigation Improvement Project <sup>17</sup>	Lampung	Planned	Rehabilitation	Implemented	Rehabilitation
12	Lemah Abang / Kedung Gede Irrigation Improvement Project	West Java	Planned	Rehabilitation	Implemented	Rehabilitation
13	Leuwi Goong Irrigation Project		Planned	New construction	Not implemented	Excluded out of scope <sup>18</sup>
14	Lanang Irrigation Improvement Project	Central Java	Planned	New construction	Implemented	New construction / rehabilitation
15	Lodan Dam Irrigation Improvement Project		Planned	New construction	Not implemented	New construction / rehabilitation
16	Sapon Irrigation Improvement Project	Yogyakarta Special Region	Planned	Rehabilitation	Not implemented	New construction / rehabilitation
17	Bajulmati Dam Irrigation Improvement Project	East Java	Planned	New construction	Not implemented	New construction / rehabilitation
18	Karau Irrigation Project	Central Kalimantan	Planned	New construction	Not implemented	New construction
19	Amandit Irrigation Project	South Kalimantan	Planned	New construction	implemented	New construction

Source: Developed by the Evaluator based on related documents.

### (3) Consulting services

Due to the additional work mentioned below, more consulting services (498.28 man months) were required. The total consulting services required were 3,517.45 man months (International: 452.89, Local 3,064.56).

### (4) Civil Works

New constructions for dams, weirs, primary / secondary / tertiary / drainage canals were reduced significantly. On the other hand, rehabilitations for weirs and primary / secondary / tertiary canals were increased significantly (See “Comparison of the original and actual scope of the project” at the end of this report). As mentioned previously, these changes were caused

<sup>16</sup> Constructed in the Way Curup Irrigation Project.

<sup>17</sup> Constructed in the Way Rarem Irrigation Project (Phase 1 to 4).

<sup>18</sup> Implemented under PIRIMP.

while re-implementing the geographical and topographical survey, re-estimating project cost, and when faced with difficulties in land acquisition where new constructions of facilities were planned. These changes were deemed appropriate in order to cope with the current situation.

Although all of the construction works for the 16 subprojects were to be procured through local competitive bidding (LCB), some were procured through international competitive bidding (ICB) in order to secure competition and the quality of the works. In the end, 13 subprojects were procured through ICB, and 9 were procured through LCB.

The project required considerable design changes resulting in significant differences between the original plans and the actuals. However, since the solutions and the problem-solving approach taken by the project management teams during the implementation period were suitable, the output actuals are evaluated as appropriate.

### 3.4.2 Project Input

#### 3.4.2.1 Project Cost

The actual cost of the project was 21,795 million yen. The project was completed within the planned budget of 21,972 million yen (99% of the budget).

Table 19: Plan and Actual of Project Cost

Unit: million yen

Budget Item	Plan						Actual					
	Foreign Currency		Local Currency		Total		Foreign Currency		Local Currency		Total	
	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan
Construction	0	0	15,038	15,038	15,038	15,038	15	15	15,369	15,369	15,384	15,384
SID	0	0	103	103	103	103	0	0	93	93	93	93
C/S	1,027	1,027	1,886	1,886	2,913	2,913	1,115	1,115	1,879	1,879	2,995	2,995
Contingency	0	0	757	622	757	622	0	0	0	0	0	0
Land Acquisition	0	0	670	0	670	0	0	0	1,113	0	1,113	0
Administration	0	0	1,203	0	1,203	0	0	0	973	0	973	0
Tax	0	0	1,288	0	1,288	0	0	0	1,237	0	1,237	0
Total	1,027	1,027	20,945	17,649	21,972	18,676	1,131	1,131	20,664	17,342	21,795	18,473

Source: Survey response from executing agency

Note 1: Numbers are rounded to the millions, so there is some discrepancy between the total amount and sum of items

Note 2: C/S: Consulting Services, SID: Survey, Investigation and Design.

Some unexpected additional works were incurred during the project implementation period, such as geological and topographical surveys, engineering designs and calculations of project cost, which had to be redone for each subproject. However, the project cost was managed tightly with a possible budget run-over in mind. Some subprojects were cancelled, and others had their design scope reduced. Consequently, the project was completed within the original budget, which was appropriate against the project output.

### 3.4.2.2 Project Period

The planned project period was 68 months from July 2001 (L/A signed) to February 2007 (expected completion of consulting services contract), but the actual project duration was 124 months from July 2001 to November 2011, exceeding the original plan significantly (182% of the plan). The main reasons for the extended project period are listed below. The extension was unavoidable to achieve an appropriate project outcome given the reasons below:

#### (1) Delays in signing consulting services contracts

The project plan assumed that consulting services contracts would be signed within two months of L/A signing. In reality, it took 9 months (3.5 months for developing the terms of reference and sending invitations for bidding, and 5.5 months for tender evaluations and contract negotiation) to complete the process.

#### (2) Prolonged design reviews

Design details and geological information prepared by local consultants had to be re-evaluated. Additional geological and topographical surveys, hydraulic model tests and modifications to design plans were required. As a result, design reviews took longer than planned. The start for each subproject was planned for 2002, which was a delay of 2 to 4 years in most cases.

#### (3) Reconsideration of construction plans

Modification of the entire plan up to the loan amount was required due to cost increases derived from rapid inflation in the local currency portion, to design modifications and to design changes that reflected the intention of residents. Therefore, the procurement of construction work for each subproject was carried out gradually, and the commencement of construction was from 2003 to 2009 (in most cases from 2004 to 2006).

#### (4) Delay in project budget execution

Delays occurred in budget approval by the Directorate General of Water Resources (DGWR) of the MOPW, in local currency budget arrangements, and in budget transfers from central to local government.

#### (5) Delay in the land acquisition process

Consultation with the beneficiary was carefully carried out in order to minimize the scale of land acquisition and resettlement. Also, there was downsizing of design in accordance with the wishes of residents, and changes were also made to canal routes and designs. These measures led to the delay in the project implementation.



(6) Performance of the local contractor

Progress was delayed in the subprojects of Muko-Muko Kanan, Okak, Lanang and Karau due to financial incapability of the local contractor. The original construction plan was 3 years in each subproject, and this was extended to 4 to 6 years.

(7) Additional works

Works such as the emergency response to the earthquake which occurred in Yogyakarta<sup>19</sup> and assistance for a succeeding project were added to the consulting service.

3.4.3 Results of Calculations of Internal Rates of Return (Reference only)

FIRR was not calculated while EIRR was 13.6% at the time of appraisal. The calculation basis for the EIRR is as follows:

Cost:	Cost required for the project (civil work and administration cost) and maintenance cost to be increased as a result of the project implementation
Benefit:	Net farm income increase
Project Life:	30 years after commencement of operation

In this ex-post evaluation, FIRR is not calculated as in the appraisal. Since the output content is very different from what was planned initially, a comparison of before and after the project cannot be done appropriately. Therefore, it is not possible to analyze EIRR in this ex-post evaluation.

To summarize, the project cost was lower than planned, but the project period was significantly longer than planned. Therefore, the efficiency of this project is fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

The domestic law and government regulations stipulated in 2004 and 2006<sup>20</sup> define the operation and management frameworks based on the difference in irrigation area. When the area becomes smaller-scale, subordinate organizations become responsible for the operation and maintenance of primary and secondary canals. These range from the MOPW and provincial governments, to district governments. The WUAs also take major roles in the operation and

<sup>19</sup> This was to rehabilitate the irrigation facilities located in Yogyakarta Special Region which were severely damaged in the earthquake which occurred in Central Java in May 2006 in order to mitigate the crop loss of the upcoming cropping season in the affected area. Sapon, one of the subprojects under the Project, was located in the lower-stream of the recovery target area, and it was decided that assistance would be provided to the recovery target area as part of this Project since, to a certain extent, an impact was anticipated in Sapon.

<sup>20</sup> The Water Resources Law No.7 of 2004 (UUSDA 7/2004), the Government Regulation No.20 of 2006 (PP 20/2006). Since 2006, there has been no revision of existing regulations regarding canal management, nor stipulation of new regulations.

maintenance of tertiary canals no matter how big the irrigated area is. The above government regulation stipulates an exception that “when a subordinate organization does not have financial / managing abilities, its supervising organization shall be accountable”.

Table 20: Responsible Organizations for O&M under Law

Irrigation Schemes	Primary Canal		Secondary Canal		Tertiary Canal	
	Source	Agency Responsible	Source	Agency Responsible	Source	Agency Responsible
Over 3000 ha and overlaps multiple provinces	MOPW	DGWR, MOPW	MOPW	DGWR, MOPW	Determined by WUA	WUA
Over 1000 ha and less than 3000 ha; overlaps multiple districts	Provincial government	DOWR, Provincial government	Provincial government	DOWR, Provincial government	Determined by WUA	WUA
Less than 1000 ha	District government	Department of Irrigation, District government	District government	Department of Irrigation, District government	Determined by WUA	WUA

Source: The Water Resources Law No.7 of 2004 (UUSDA 7/2004), the Government Regulation No.20 of 2006 (PP 20/2006)

Table 21 shows the present operation and maintenance organizations of the five subprojects where the site surveys were conducted. On-site level coordination and cooperation with the local government’s department of agriculture (DOA) is one of the important factors for proper facility operation and maintenance. On the ground level, efforts have been made such as establishing an official collaboration between the DOWR and the DOA of local governments by exchanging a memorandum for their roles and responsibilities. For the O&M of tertiary canals, operation and maintenance by the WUA has been carried out as stipulated in the rules and regulations except in Lanang. The rates of WUA formulation at the rest of the four subprojects are 40%, 100%, 100% and 20% respectively. The whole length of the tertiary canal has not yet been covered in Batang Tongar and Amandit, as the construction schedule of secondary canals at Batang Tongar has been delayed due to the delay in land acquisition, which has caused another delay in the construction of tertiary canals and the establishment of WUA, which is still progressing. District DOA has been giving support for the time being. In Amandit, WUA has not been organized yet where tertiary canals, not under the Project, are planned for the provision of water in the surrounding area. On the other hand WUA is functioning as management in areas covered by the Project.

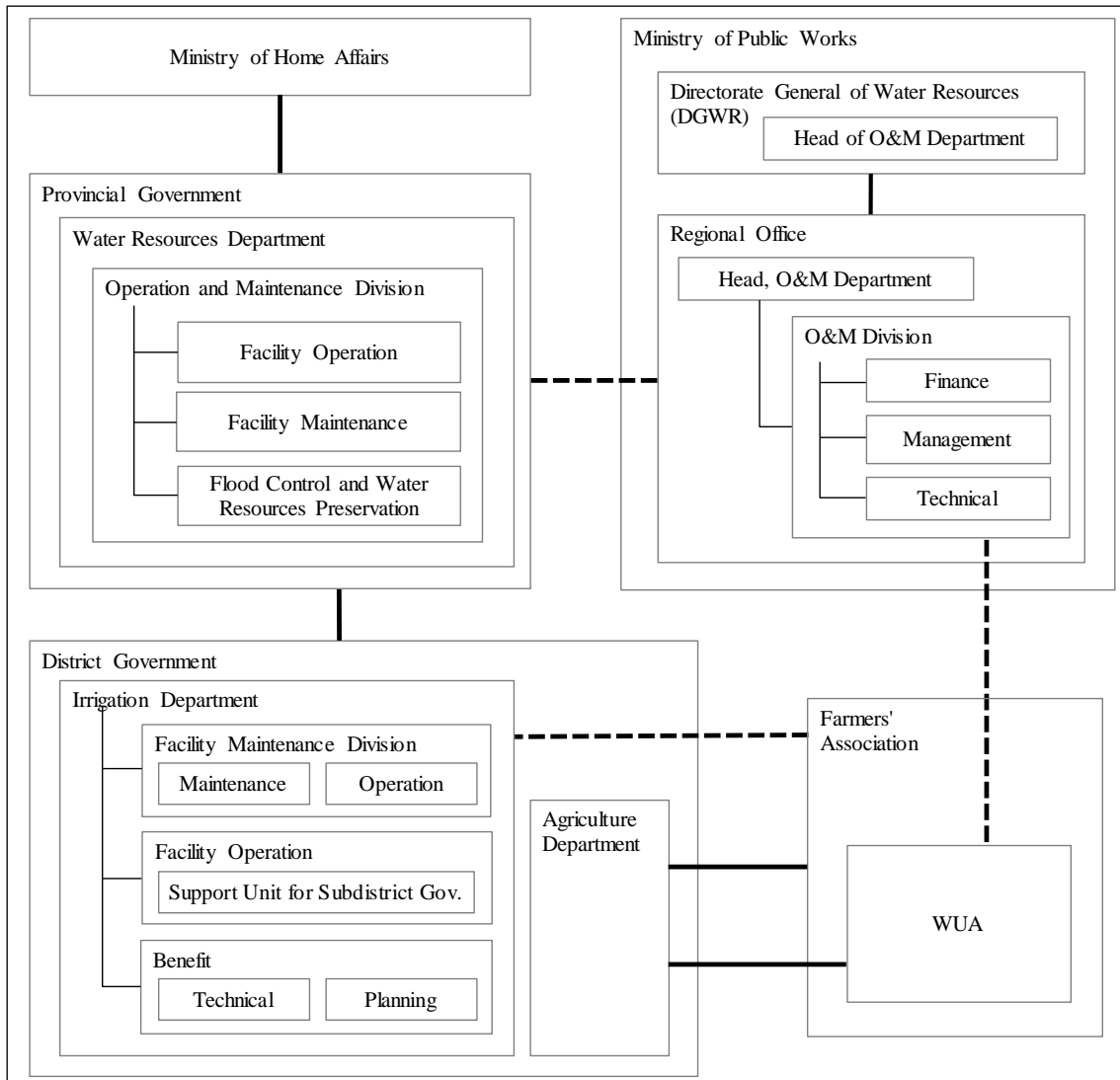
Table 21: Organizations Responsible for O&M at Each Site

Subproject	Irrigated Area (ha)	Primary Canal		Secondary Canal		Tertiary Canal		WUA Formulation Rate
		Source	Agency Responsible	Source	Agency Responsible	Source	Agency Responsible	
Batang Tongar	2,599	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Collected from WUA members	Guided by DOA, District Government	40%
Way Curup	3,629	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Collected from WUA members	WUA	100%
Lanang	1,817	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Local Government	DOWR, District Government	100%
Bajulmati	1,417	MOPW	DOWR, Provincial Government	MOPW	Dept of Irrigation, District Government	-	WUA	100%
Amandit	4,089	MOPW	DOWR, Provincial Government	MOPW	DOWR, Provincial Government	Collected from WUA members	WUA	20%

Source: Survey response from executing agency

Figure 2 shows an example of operation and maintenance conducted among the related organizations in the irrigation system of Bajulmati covered under the Project. The Balay Office under the MOPW conducts O&M by coordinating and working together with the provincial and district government which belongs to the Ministry of Home Affairs. The role and responsibility for enforcing the capacity of WUA is given to the MOA as stipulated in the government regulation<sup>21</sup>. Farmers' Associations, which are also under the MOA, are taking over WUA members and activities as part of their roles and responsibility. Local government DOA conducts the management of WUA and also carry out supporting activities on behalf of the MOA in Amandit. The same is also true in Bajulmati.

<sup>21</sup> The Government Regulation No.38 of 2007 (PP 38/2007)



Source: Developed by the Evaluator based on the survey response from the executing agency

Note1: It depends on each province and district as to how the local government is involved in the management of the irrigation systems. This figure shows the institutional arrangements of Banyuwangi District of East Java Province for the management of the irrigation system of Bajulmati as one example.

Note2: The solid lines in the figure shows the direct relations for jurisdiction and chain of command in-between. The dashed lines show indirect and relevant conditions among organizations. For instance, WUA is under the jurisdiction of the MOA, and the solid line between the District DOA and the WUA shows the DOA leading role vis-à-vis WUA in Bajulmati. On the other hand, the dashed line between WUA and the MOPW shows indirect relations.

Figure 2: Organizational Structure for O&M at the Bajulmati Irrigation Improvement Subproject

To summarize, legislative arrangements have been well developed in terms of irrigation facilities management, and the roles and responsibilities of relevant organizations for operation and maintenance have become tangible. They cooperate and support each other based on the established framework as described above. Where the rate of WUA formulation remains low, the DOA of local governments supports tertiary canal management on their behalf, which is one proof of the enforcement of operation and maintenance at ground level. In conclusion, there are no specific problems found in the institutional aspect.

### 3.5.2 Technical Aspects of Operation and Maintenance

Table 22 describes the jurisdiction of responsibilities and the frequency of maintenance activities of the 5 subprojects in detail. According to the responses to the questionnaires by the executing agencies and local government authorities and the site survey, various efforts were made for O&M through the mutual support of local residents, and WUAs have greatly contributed to the sustainable management of facilities and activities since project completion. They periodically conduct dialog among themselves to solve technical problems in tertiary canal management and soil improvement, to conduct monitoring of the irrigation water level, and to take action for emergency response in the case of landslides.

In Lanang, for instance, WUAs check if water is distributed towards the tail farm land by supporting weir operation and by monitoring water management. They often remove garbage from the canals, hold discussions among farmers' groups on water management, state their view from the ground on which crops should be chosen according to the water budget. They support the DOWR in cases of emergency such as landslides. In Bajulmati, they employ retired staffs to meet the demand for human resources, and they provide technical advice and information on agriculture productivity twice a year. However, there are some cases, as seen in Amandit, where the shortage of WUA members makes it impossible to fully manage tertiary canals. There are also some other cases where technical guidance and organizational enforcement cannot be expected, or where landless farmers cannot participate.

Table 22: Agencies Responsible for Maintenance Works, Frequency and Contents

Subproject	Item	Daily Inspection	Periodic Inspection	Large-scale Works
Batang Tongar	Agency Responsible	DOWR, Provincial Government	DOWR, Provincial Government / Balai Office, MOPW	Balai Office, MOPW
	Frequency	Twice a year	Once a year	Once a year
	Contents	-	-	Weir, primary and secondary canals
Way Curup	Agency Responsible	DOWR, Provincial Government	DOWR, Provincial Government / Balai Office, MOPW	Balai Office, MOPW
	Frequency	Every two months (voluntary)	Once a year (voluntary)	Once a year
	Contents	Grass removal	Removal of mud	Weir
Lanang	Agency Responsible	Balai Office, MOPW	Balai Office, MOPW	Balai Office, MOPW
	Frequency	Four times a year	Twice a year (voluntary)	Once a year
	Contents	Garbage removal, gate maintenance	Grass removal and gate maintenance	Facility rehabilitation
Bajulmati	Agency Responsible	WUA	Irrigation Dept, District Government	Balai Office, MOPW
	Frequency	Twice a month	Once a year	Upon requirement
	Contents	-	Canal maintenance	Repair of major damages

Subproject	Item	Daily Inspection	Periodic Inspection	Large-scale Works
Amandit	Agency Responsible	Balai Office, MOPW / WUA	Balai Office, MOPW	Balai Office, MOPW
	Frequency	Twice a year	Once a year	Once every two years
	Contents	Maintenance of weir and canals / grass removal and garbage removal	Weir and canal maintenance	Weir maintenance

Source: Survey response from executing agency

Human resource development conducted in the five subprojects varies, as seen in Table 23. Provision of appropriate training opportunities and upgrades of the irrigation facility management techniques are further expected based upon the present quality of human resources at each site. For instance, at the timing of this ex-post evaluation, in Batang Tongar, a committee had been established among relevant stakeholders, while WUA was still under formulation and the maintenance works of canals were left to individuals under leadership of village heads. The maintenance and management capacity of staff members is not sufficient in terms of water management of the irrigation facilities and canals at each level, and capacity development is expected. No information was obtained at Way Curup as a result of any survey. In Lanang and Amandit, there are training opportunities provided, including for WUA members, as shown by the survey. In Bajulmati training opportunities are provided only one time per three years for two people.

As for the capacity enforcement of WUA, the Government Regulation No.38 promulgated in 2007 introduced a training framework in which the MOA provides training opportunities for organizational support and capacity development through NGO, agriculture activities and water management, and operation and maintenance techniques for the existing irrigation facilities. However, no guidance was confirmed in this survey to have been given to WUA by the MOA, or by the DOA of local governments.

Table 23: Training Opportunities for O&M Staff of 5 Subprojects

Subproject	Program	Contents / Purposes	Target	Frequency
Batang Tongar Irrigation Improvement Project	Staff training on irrigation operation	Improvement of irrigation facilities operation skills	4 people from each irrigation area (2 in charge of weir flushing, 2 in charge of water gate management)	Once a year
Way Curup Irrigation Improvement Project	-	-	-	-
Lanang Irrigation Improvement Project	Training on irrigation operation and management	Improvement of operation management skills	<ul style="list-style-type: none"> <li>• Department of Technical Service</li> <li>• Irrigation Assistant</li> <li>• Weir management</li> <li>• Weir flushing</li> </ul>	Once a year
	Operation of measurement devices	Improvement of operation skills of measurement devices	<ul style="list-style-type: none"> <li>• O&amp;M staff</li> <li>• Irrigation Assistant</li> <li>• Weir management</li> <li>• Weir flushing</li> <li>• WUA</li> </ul>	Once a year
	Management of irrigation facilities	Improvement of irrigation facility management skills	<ul style="list-style-type: none"> <li>• Department of Technical Service</li> <li>• O&amp;M staff</li> <li>• Irrigation Assistant</li> <li>• Weir management</li> <li>• Weir flushing</li> <li>• WUA</li> </ul>	Once a year
	Agriculture improvement by using SRI method	Improvement of agriculture management and water management skills	<ul style="list-style-type: none"> <li>• Irrigation Assistant</li> <li>• Weir management</li> <li>• Weir flushing</li> <li>• WUA</li> </ul>	Once a year
Bajulmati Dam Irrigation Improvement Project	Quality control	Improvement of construction work progress management skills	Two persons	Once every three years
Amandit Irrigation Project	Human resources development	Technical operation and management	30 staff members	Twice a year
	Human resources development	Enforcement of WUA	30 WUA members	Three times a year

Source: Survey response from executing agency

Note: SRI stands for System of Rice Intensification. It indicates the technology of increasing unit yield of rice while saving resources.

To summarize, in terms of the technical aspects of operation and maintenance, further efforts are found to be necessary, such as employing more human resources, improving the quality of existing human resources, and enforcing the technical capacity of organizations.

### 3.5.3 Financial Aspects of Operation and Maintenance

In the 5 subprojects where the site survey was conducted, it was the MOPW who should provide the budget of primary and secondary canal operation and management. Local governments or WUA should provide the budget for tertiary canal management. The budget for regular checkups and repairs was the responsibility of local governments or the Balai offices.

The transition of budget allocation by the MOPW on the maintenance of the irrigation facilities is shown in the following Table 24. The O&M Department of the MOPW, which was recently established, has not completed institutional arrangements yet for timely budget allocation to each Balai office when requests for budget are made.

Table 24: O&M Cost for Each Subproject allocated by the MOPW

Unit: 1,000 Rupiah

Subproject	2009	2010	2011	2012	2013
Batang Tongar Irrigation Improvement Project	996,600	1,063,040	1,063,040	1,195,920	1,328,800
Way Curup Irrigation Improvement Project	540,000	540,000	750,240	844,020	937,800
Lanang Irrigation Improvement Project	-	-	-	-	100,000,000
Bajulmati Dam Irrigation Improvement Project	810,000	862,000	865,000	970,000	1,072,000
Amandit Irrigation Project	-	-	-	-	50,000,000

Source: Survey responses from the executing agency

Note: Lanang was under construction up to 2011, and 2012 was under the warranty period covered by the contractor. Amandit was under construction up to 2009, before when there was no O&M cost allocation.

Information on budget and expenditure data from local governments was not confirmed during this study. In 3 out of 5 sites where WUA members pay for the maintenance costs of the tertiary canals, the comment was made that it was “not sufficient”, but the exact amount collected at the end of the survey was not shared.

To summarize, the financial aspect of operation and maintenance has some problems. It is necessary to promote the institutional capacity development of the O&M Department of the MOPW, and to enforce budget allocation. Although it is not known to what extent the local governments provide the budget for maintenance, their roles on the ground for prompt action are important and it is expected that their budget allocation should reach a sufficient level. Securing financial contributions from the WUA members is an urgent task that needs to be tackled and confirmed.

#### 3.5.4 Current Status of Operation and Maintenance

Although there were some subprojects where the construction of the irrigation facilities continued to be paid for by the national budget, and where malfunction of canals occurred caused by landslides following deluges, the site survey conducted in this ex-post evaluation (2014) confirmed that the facilities of the 5 subprojects were more or less appropriately maintained. Out of 5 subprojects, 3 (Batang Tongar, Way Curup and Bajulmati) were the rehabilitation of existing facilities and partly new construction. The O&M framework seemed stable as seen in Way Curup where the local community has existed for a long-time and is stable, which helps smooth cooperation among stakeholders. The remaining two are new projects and no major problems have been admitted yet. Some facilities were partly damaged because of



deluges and slope failures, but the staff members responded well and within regular maintenance work.

The results of site survey are shown as follows:

Table 25: Physical Condition of 5 Subprojects at the Time of Site Survey

Subproject	Physical Condition of Project Facilities
Batang Tongar Irrigation Improvement Project	The design of the irrigation network was partly altered as it was decided not to construct some secondary canals when part of the land was converted into oil palm plantation. Primary and secondary canals were properly managed by the Balai Office of the MOPW.
Way Curup Irrigation Improvement Project	Facilities were well managed. Communication and coordination among WUAs, Farmers' Associations and the DOWR were good. However, linings of tertiary canals were not all completed, and they were waiting for the budget allocation for continuance of construction. There were conversions of land use from agriculture to other purposes observed.
Lanang Irrigation Improvement Project	Only two years had passed since project completion, which kept meant there was a lack of experience in coordination among the relevant organizations for the water supply. More time was needed for the establishment of a better operation and management structure although the facilities were well managed.
Bajulmati Dam Irrigation Improvement Project	Facilities were well managed. Communication and coordination among WUAs, Farmers' Associations and the DOWR were good and quality service was provided as a result. However, The water quantity at the secondary canals downstream was insufficient, which meant that farmers changed crops to maize and chilies.
Amandit Irrigation Project	Facilities were well managed and there was no specific problem found.

Source: Site survey results

To summarize, no issues are recognized with the institutional aspect and present condition of the irrigation facilities covered under the project. However, there are some minor problems with the technical and financial aspects, which may have a negative impact on the operation and maintenance systems and physical condition of each subproject in the future. The sustainability of the effects realized by this project is therefore fair.

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

##### 4.1 Conclusion

The objective of this project was to enhance food production, particularly in rice, to achieve the nation's self-sufficiency in food supply through the construction and rehabilitation of moderate scale irrigation facilities in Western and Central Indonesia thereby contributing to the reinforcement of the agricultural production infrastructure and poverty reduction in rural Indonesia. This objective was well in line with Indonesia's development policy and the nation's developmental needs for increased food production as well as with Japan's ODA policy. However, it was assessed that some problems were evident in the project planning. The project relevance is evaluated as fair.

With regard to the effectiveness of this project, it was confirmed qualitatively that the farming water supply and unit yields of rice improved and that the crop intensity of rice increased through this project as was seen through the interview surveys. Although some target

figures in the Operation and Effects indicators were not achieved, the objective “to enhance food production particularly in rice to achieve self-sufficiency in food supply” was almost accomplished as a whole, as the unit yield and crop intensity of rice improved steadily. Accordingly, the effectiveness of utilizing irrigation facilities constructed under this project was confirmed as they contributed to the improvement of whole farming gross income and average annual income. Moreover, the effectiveness of the intended project impact, “contribution to the enhancement of the farming production infrastructure and to poverty reduction in rural Indonesia” was confirmed, and no issues were recognized in the areas of the natural environment, land acquisition and resettlement, and there were no other negative impacts. Therefore it is concluded that the project demonstrated effectiveness almost as planned, and the effectiveness and impacts of the project are evaluated as high.

The efficiency of the project is fair as the project cost did not exceed the planned budget, but the project period was significantly longer than planned. In terms of operation and maintenance, there were no issues with the institutional aspects and the present condition of the irrigation facilities covered under the project. However, there have been some minor problems with the technical and financial aspects, which may give a negative impact on the operation and maintenance systems and the physical condition of each subproject in the future. The sustainability of the effects realized by this project is therefore fair.

In light of the above, the project is overall evaluated as partially satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

#### (1) Establishment of an official collaboration framework with relevant organizations

While government bodies were reorganized and their roles and functions were reshuffled after the project designing, the MOPW and its Balai Offices, DOWR, and DOA of local government (province and district) coordinate and cooperate well for the maintenance of the irrigation facilities developed under the project. Ground level coordination and cooperation with the DOA is the vital key. In order to respond to changes in the preconditions while dealing with various stakeholders it is anticipated that inter-coordination beyond the mandated roles and responsibilities stipulated in the existing rules will be necessary. It is recommended that official agreements be left as written consent, not verbal, through concluding memorandums and so on between the MOPW, the MOA, and local government departments, for securing the project sustainability.

#### (2) Support for residents’ maintenance activities and their skill development

At ground level, members of WUAs and Farmers’ Associations have carried out periodic meetings and discussions on tertiary canal management and emergency responses. Although residents’ solidarity and group efforts have been found effective, they have less opportunity to

learn about water management or to develop technical skills. It is also difficult for residents to recognize where they stand vis-à-vis the whole irrigation system. There are cases in which organization enforcement is not conducted effectively.

It is strongly recommended that the executing agency, in collaboration with relevant organizations such as the MOA, extend long-term and continuous support to residents and their groups to promote role-sharing and transfer of their roles to others.

#### 4.2.2 Recommendations to JICA

None.

### 4.3 Lessons Learned

#### 4.3.1 Further Consideration and investigation for data collection and design content in the project planning stage

It became difficult to implement the 19 subprojects originally planned due to a significant increase in cost associated with the fundamental amendment of the design contents of each subproject. This is because surveys needed to be conducted again during the project implementation period as deficiencies were found in the geographical and topographical data that had been relied on in the design at the time of the project formulation stage, as well as in the design content which was based on the above data. The scale of land acquisition and resettlement increased as a result of the re-examination after the project start, even though the irrigation areas had been set with land acquisition as a precondition, as the necessity for land acquisition was raised from the project formulation stage. (As the result of negotiations with local residents, various countermeasures were taken such as the alteration of canal routes and the reconsideration of design (downsizing of the irrigation systems, etc.). These actions were one of the causes of the longer project period, but the increase in land acquisition was kept to a minimum and the acquisition process was careful and respectful, based on the laws and rules stipulated in Indonesia. No problems have been observed since project completion.)

For an examination of whether the project plan is appropriate, it would be necessary to secure ample time for thorough technical assessment with qualified experts for analyzing data and estimating the project cost, which are the basis of the project planning, when formulating similar projects near future. Whether or not land acquisition is possible greatly affects the project scale and design, and it is recommended that the scale and area of land to be acquired should be accurately identified based on an accurate design at the project planning stage, and that acquisition of land takes place as early possible in order not to harm project implementation.

#### 4.3.2 Thorough Implementation of Project Monitoring and Review

The planned project design was largely reviewed and revised prior to the Mid-term Review of 2009. The Mid-term review report became public and a third party evaluator was proposed on the occasion of the Mid-term Review to review and change the target figures of the operation and effect indicators

This project is a project-type sector loan in which subprojects were well formulated and collected as a project package for implementation. Although the project-type loan requires a certain level of design quality at the planning stage, projects with a long implementation period may need, in some cases, reexamination of the operation and effect indicators due to the change of project scope when the situation changes during project implementation. When processing future project-type projects in the irrigation sector in similar conditions, though the design should be as accurate as possible at the planning stage, it is strongly recommended that the project progress and related problems and tasks be worked out and understood through regular monitoring and data collection in the project implementation stage. When the causes of the problems and tasks to be tackled become tangible, it is strongly recommended that JICA and the executing agency conduct a joint project review in a timely manner and make an official agreement for revisions for smooth project monitoring in due course of time and by the ex-post evaluation.

#### 4.3.3 Feedback on Similar Cooperation Projects

JICA has greatly supported the irrigation sector in Indonesia by extending ODA loans along with technical cooperation and grant aid. This project was processed and formulated following the phase I in Central and Western Indonesia, and there is another project under implementation following this project. A cross-scheme evaluation among irrigation sector projects can examine and draw lessons, from a universal and long-term perspective, regarding holistic poverty reduction among farmers in the target area (including cooperation in other sectors), and progress of the skills improvement of government officials of Indonesia

When conducting irrigation projects which are long-term and have a broad area coverage, it is recommended that, by implementing a cross-scheme evaluation and by an examination of project direction, an effective outcome of the examination is sought and lessons drawn for the formulation of similar projects in other countries

End

### Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs a. Civil Works	<ul style="list-style-type: none"> <li>- Dam: 2 (newly constructed)</li> <li>- Weir and intake: 8 (new) and 2 (rehabilitated)</li> <li>- Main canal: Approx. 196km (new) and 76km (rehabilitated)</li> <li>- Primary canal: 34km (new) and 3km (rehabilitated)</li> <li>- Secondary canal: 548km (new) and 156km (rehabilitated)</li> <li>- Tertiary canal: 52,230km (new) and 6,633km (rehabilitated)</li> <li>- Land development: 7,490 ha (new)</li> <li>- Drainage canal: 273 km (new)</li> <li>- Supply canal: 9 km (new)</li> <li>- Flood control dyke: 5 km (new)</li> <li>- Covering dyke: 0.4 km (new)</li> <li>- Tunnel: 0.6 km (new)</li> <li>- Main drain: 3 km (rehabilitated)</li> <li>- Secondary drain: 49 km (rehabilitated)</li> <li>- Floodway: 2 km (rehabilitated)</li> <li>- Siphon: 2 (rehabilitated)</li> <li>- Crump de Gruyter diversion: 189 (rehabilitated)</li> <li>- State road: 0.2km (rehabilitated)</li> </ul>	<ul style="list-style-type: none"> <li>- Dam: 1 (newly constructed)</li> <li>- Weir and intake: 6 (new) and 5 (rehabilitated)</li> <li>- Main canal: 115km (new) and 58km (rehabilitated)</li> <li>- Primary canal: Approx. 12km (new) and 4km (rehabilitated)</li> <li>- Secondary canal: Approx. 187km (new) and 183km (rehabilitated)</li> <li>- Tertiary canal: 14,697km (new) and 2,898km (rehabilitated)</li> <li>- Land development: 604 ha (new)</li> <li>- Drainage canal: approx. 137 km (new)</li> <li>- Supply canal: 2.5 km (new)</li> <li>- Covering dyke: 0.1 km (new)</li> <li>- Tunnel: 174.6 km (new)</li> <li>- Secondary drain: 22 km (rehabilitated)</li> <li>- Floodway: Approx. 5 km (rehabilitated)</li> <li>- Siphon: 1 (rehabilitated)</li> <li>- Crump de Gruyter diversion: 42 (rehabilitated)</li> <li>- Spillway for weir: 1 (new)</li> </ul>
b. Consulting Services	3,019.17 man / months	3,517.45 man / months
2. Project Period	July 2001 to February 2007 (68 months)	July 2001 to November 2011 (124 months)
3. Project Cost		
Amount paid in Foreign Currency	1,027 million yen	1,131 million yen
Amount paid in Local Currency	20,945 million yen (1,611,154 million rupiah)	21,299 million yen (1,905,605 million rupiah)
Total	21,972 million yen	22,430 million yen
Japanese ODA loan portion	18,676 million yen	18,473 million yen
Exchange Rate	1 rupiah = 0.013 yen (as of July 2001)	1 rupiah = 0.011 yen (average between 2001 and 2011)

Republic of Indonesia

Ex-Post Evaluation of Japanese ODA Loan  
“Maritime Education and Training Improvement Project”

External Evaluator: Keishi Miyazaki, OPMAC Corporation

## 0. Summary

The objective of this project was to improve the capacity of Indonesian seafarers to meet the requirements of STCW95<sup>1</sup> in their qualifications by the construction and installation of necessary facilities and equipment for training and education based on STCW95, together with capacity development of trainers in six government Maritime Education and Training Institutions (METIs). This project has been highly relevant to Indonesia’s development plan and development needs, as well as to Japan’s ODA policy. Therefore its relevance is high. Both the number of fulltime students on STCW95 compliant training to obtain certificates of competency and the number of graduates who passed the STCW95 compliant national examination fully achieved their respective targets. It was confirmed that the project contributed to improvements in the educational levels of the six METIs to some extent through the realization of the provision of seafarers’ education and training in compliance with STCW95. However, the annual operation hours of major simulators of the project have not yet met the target as the operation of some simulators has been suspended due to breakdown and malfunction. Each school has made efforts to fulfill the required hours for practical training based on the annual training curriculum by utilizing a combination of the project equipment and similar types of other equipment introduced with the assistance of other donors. It was confirmed that the project had positive impacts to some extent on securing employment opportunities for Indonesian seafarers, improving the safety of marine transport, and promoting opportunities for foreign currency earning. Therefore, the effectiveness and impact of the project are fair. Although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the project is fair. Problems were observed in the current status of operation and maintenance of a part of the project equipment, and there have been constraints in the budget for operation, maintenance and management because of the delay in ownership transfer of the project equipment from the executing agency to the six target METIs. Therefore the sustainability of the project effects is fair.

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

---

<sup>1</sup> Regarding STCW95, please see “1.2 Project Outline”.

## 1. Project Description



Project Locations



The Ship Maneuvering Simulator introduced by the Project (PIP Makassar)

### 1.1 Background

In Indonesia, the world's largest archipelagic nation, marine transport including domestic and foreign shipping is a major industry. In 1995, Indonesia was the second largest country after the Philippines in this respect having more than 80 thousand qualified seafarers, which counted 7% of the total of seafarers in the world.

The education of Indonesian seafarers<sup>2</sup> has been provided in compliance with the International Convention on Standards of Training Certification and Watchkeeping for Seafarers (STCW) established in 1978. The STCW Convention was revised in 1995 (STCW95) and became effective in 1997, then it was scheduled to be fully implemented in February 2002 after a five-years transition period. As a result of the enforcement of STCW95, seafarers who had obtained their certificates in the countries judged as non-compliant with STCW95 in the training of seafarers and the examination of certificates were obliged to lose their seafarers certificates after February 2002.

In order to maintain the effectiveness of Indonesian seafarers certificates, Indonesia had been working towards the improvement of seafarers education and the establishment of a seafarers certificate system in compliance with STCW95 through the development of a related legal framework and the establishment of manuals meeting the requirement of STCW in related organizations. However, the improvement of training in the Maritime Education and Training Institutions (METIs), including improvements in training equipment, did not progress. Therefore, the improvement of training equipment, curricula, and the capacity deployment of instructors in METIs was an urgent issue.

---

<sup>2</sup> Seafarers are classified into two groups: Officer and Rating. Officers are referred to as "Marine Officers (Nautical, Technical)" and ratings are referred to as "Ratings (Nautical, Technical)". Maritime Officers have certificates ranging from First Grade (DOC/EOC-I) to Fifth (DOC/EOC-V).

## 1.2 Project Outline

The objective of the project is to train Indonesian seafarers to meet the requirements of STCW95 (Remarks 1) by the construction and installation of necessary facilities and equipment for training and education based on STCW95 and the capacity development of trainers in the six government Maritime Education and Training Institutions (METIs) (Remarks 2), thereby securing employment opportunities for seafarers and promoting opportunities for foreign currency earning.

(Remarks 1) The STCW (Standards of Training and Certification of Watchkeeping for Seafarer) is an international convention adopted in 1978 by the International Maritime Organization (IMO). The STCW defines the requirements for the minimum skills and capacity of seafarers to prevent accidents at sea, as well as the international standards regarding supervision and monitoring for seafarers' education agencies and the issuance of seafarers' certificates in the signatory countries (STCW came into effect in 1984). The STCW Convention has been amended several times, but a comprehensive reexamination was carried out in amendments of 1995 (STCW95) including a revision of requirements for seafarers' training and qualification (STCW95 came into effect in 1997). Since then, STCW has been amended continuously<sup>3</sup>, and the latest version at the time of ex-post evaluation was STCW2010 which had been amended in 2010. As of end of July 2013, there are total 157 signatory countries of the STCW Convention, including Indonesia.

(Remarks 2) The six METIs are (i) Merchant Marine College (BP3IP), (ii) Maritime Higher Education and Training Institute Jakarta (STIP Jakarta), (iii) Merchant Marine Polytechnics Semarang (PIP Semarang), (iv) Merchant Marine Polytechnics Makassar (PIP Makassar), (v) Merchant Marine Polytechnics Surabaya (PIP Surabaya) (PIP Surabaya was upgraded from Merchant Marine School in 2013), (vi) Merchant Marine School, Barombong (BP2IP Barombong).

Loan Approved Amount/ Disbursed Amount	7,669 million yen / 5,705 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2001 / December 2001
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40 years (Grace period: 10 year) Condition of Procurement: Bilateral tied
Borrower / Executing Agency	The Republic of Indonesia / Transportation Human Resources Development Agencies (THRDA), Ministry of Transportation (MOT)

<sup>3</sup> There were minor modifications after the establishment of STCW95 in amendments in 1997, 1998, 2003, 2004, 2005 and 2006.



Final Disbursement Date	June 2011
Related Projects	<p><u>ODA Loan</u></p> <ul style="list-style-type: none"> <li>• Equipment Supply For Maritime Sector Training Program (1985)</li> <li>• Rating Schools Establishment Project (1995)</li> </ul> <p><u>Grant Aid</u></p> <ul style="list-style-type: none"> <li>• Project for Improvement of the Ujung Pandang Rating School (1986)</li> <li>• Project for Improvement of the Barombong Rating School (1994)</li> </ul> <p><u>Technical Cooperation</u></p> <ul style="list-style-type: none"> <li>• Seafarers' Education Improvement Project (2003-2006)</li> <li>• Dispatch of long-term JICA experts (2003-2006)</li> <li>• Dispatch of short-term JICA experts (2003)</li> </ul>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Keishi Miyazaki, OPMAC Corporation

### 2.2 Duration of Evaluation Study

Duration of the Study: January 2014 – April 2015

Duration of the Field Study: April 6 – May 2, 2014, July 9 – 19, 2014

## 3. Results of the Evaluation (Overall Rating: C<sup>4</sup>)

### 3.1 Relevance (Rating: ③<sup>5</sup>)

#### 3.1.1 Relevance to the Development Plan of Indonesia

At the time of appraisal of this project in 2001, the Indonesian National Development Plan (PROPENAS) (2000-2004) indicated the cross-sectoral five development priorities as being (i) developing a democratic political system and maintaining national unity and cohesion, (ii) realization of the supremacy of law and good governance, (iii) accelerating economic recovery and strengthening the foundation of sustainable and fair development on the basis of the people's economic system, (iv) developing social warfare, increasing the quality of religious life and cultural resilience, and (v) increasing regional development, as well as national development programs covering nine sectors<sup>6</sup> to deal with the development priorities of PROPENAS. In the national development programs for the education sector, reform of the education system was stipulated, including review and improvement of curricula in conformity with development needs at the local, national and global levels. As this project was aimed at

<sup>4</sup> A: Highly Satisfactory, B: Satisfactory, C: Partially Satisfactory, D: Unsatisfactory.

<sup>5</sup> ③:High, ②: Fair, ①: Low.

<sup>6</sup> The nine sectors are (1) law, (2) economy, (3) politics, (4) religious affairs, (5) education, (6) society and culture, (7) regional development, (8) natural resources and environmental management, and (9) defense and security.

improving Indonesian seafarers' education and training to meet the requirements of the STCW Convention defining the minimum skills and capacities of seafarers to prevent accidents at sea, the project was consistent with PROPENAS. Also the Ministry of Transport set the development of Indonesian seafarers in compliance with STCW95 as one of the most important priority issues in transport sector policy. The Education and Training Agency (ETA) (currently the Transportation Human Resources Development Agencies (THRDA)) and the Directorate General of Sea Transportation setup a taskforce and worked for the development of a related legal framework and the establishment of manuals that met the requirement of STCW95 in the related organizations and METIs.

At the time of the ex-post evaluation, the National Medium Term Development Plan of Indonesia (RPJMN) (2010-2014), which was the Five-Year National Development Plan of Indonesia, set eleven national priorities. These were (i) bureaucracy and government reform, (ii) education, (iii) health, (iv) poverty reduction, (v) food resilience, (vi) infrastructure, (vii) investment and business climates, (viii) energy, (ix) environment and disaster management, (x) least developed, frontier, outer and post-conflict areas, and (xi) culture, creativity, and technological innovation. Since this project is aimed at educating qualified seafarers to satisfy international conventions through the upgrading of maritime education in Indonesia, the project objective is still consistent with the development priority of RPJMN "(ii) education".

At the time of the ex-post evaluation, Indonesia was continuously authorized by IMO as a country that satisfies international standards in line with STCW, and Indonesia fully met the requirements of STCW95. Currently, the Indonesian government has been working on the establishment of a related legal framework and manuals in related organizations and METIs that respond to the requirement of STCW2010 amended in 2010.

### 3.1.2 Relevance to the Development Needs of Indonesia

In Indonesia, which is the world's largest archipelagic nation, marine transport is a major industry and plays an important role in supporting employment opportunities and foreign currency earning. Therefore, strengthening the capacities of METIs which provided seafarers' education was expected.

At the time of appraisal of this project, seven government METIs: three merchant marine polytechnics, one merchant marine college and three merchant marine schools (rating school), existed under the Education and Training Agency (ETA) (currently the Transport Human Resource Development Agency (THRDA)), which was in charge of public seafarers' education. An additional three merchant marine schools were in preparation. In order to meet the requirements of STCW95, it was necessary for Indonesia to respond to the following issues: (i) the establishment of related laws, regulations and manuals, (ii) the introduction of advanced training equipment in METIs such as radar/ARPA simulators, ship maneuvering simulators and engine room simulators as well as reinforcement of existing training equipment, (iii)

development of new education and training programs by utilizing simulators in compliance with IMO model courses, and (iv) training for instructors/trainers who use simulators and for technicians who take care of the maintenance of training equipment in METIs. Regarding (i), the necessary actions had been already taken by ETA and the respective agencies. Regarding (ii), (iii) and (iv), however, the appropriate actions had not been fully taken in the six target METIs. Particularly, the Merchant Marine College (BP3IP) in Jakarta, which specializes in upgrading education for seafarers had only a small amount of advanced training equipment, and the installation of new advanced training equipment in BP3IP was an urgent issue.

At the time of the ex-post evaluation, Indonesia held 77,727 seafarers (in 2010) which was the fourth largest number of seafarers after China, Turkey, the Philippines, and which counted for 5.9% of the total number of seafarers in the world<sup>7</sup>. This contributed to the creation of employment opportunities and foreign currency earning, and the importance of supporting the Indonesian marine transport sector and maritime education and training institutions has remained high.

At the time of ex-post evaluation, the six target METIs of this project had already provided the relevant seafarers' education and training in compliance with STCW95 after the introduction of training equipment and the reform of curricula by implementing various measures, including this project. Since January 2012, the six target METIs have been conducting necessary preparations such as reviewing and updating the existing education curricula<sup>8</sup> and the procurement of additional training equipment in order to satisfy the requirements of STCW2010, such as additional and modified qualifications for seafarers. It is expected that the six target METIs will complete the necessary actions by the end of 2014.

### 3.1.3 Relevance to Japan's ODA Policy

At the time of appraisal of this project, the Japanese Government Country Assistance Policies for Indonesia (2001) had the following five priority areas: (i) fairness, (ii) human resource development and education, (iii) environmental protection, (iv) reform of industrial structure, and (v) economic infrastructure. The objective of this project was consistent with the priority area of "(ii) human resource development and education". Also JICA's Country Assistance Strategy for Indonesia, established in September 2000, mentioned the necessity of assistance for school infrastructure development for seafarers' education that was requested by the international conventions. Therefore, the objective of this project was in line with the above JICA strategy.

---

<sup>7</sup> According to the latest IMO statistics in 2010, the total number of seafarers in the world was 1,316,606. The major nationalities were: China (141,807), Turkey (87,743), the Philippines (81,180), Indonesia (77,727), Russia (65,000), and India (62,672).

<sup>8</sup> The new curricula of METIs in compliance with STCW2010 are defined by the Regulations of Transport Human Resource Development Agency, the Ministry of Transport (Regulations of the Head Transport Human Resources Development Agencies No. SK 2126/HK.208/XI/DIKLAT-2010 regarding Guidance of Maritime Education and Training Implementation).

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

### 3.2 Effectiveness<sup>9</sup> (Rating: ②)

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

The aim of the project was to enable the six target METIs to conduct the relevant seafarers' education and training to satisfy the requirements of STCW95 by reviewing and improving the existing education and training curricula, developing instructors' capacity, installing simulation-type training equipment, and constructing training facilities. In addition, it was expected that the project would contribute to securing employment opportunities for Indonesian seafarers at shipping companies including foreign shipping companies, to improving the safety of marine transport, and to increasing the opportunities for foreign currency earning by educating and producing qualified seafarers who satisfy the requirements of STCW95.

Table 1 shows the list of training equipment installed by the project and the allocation for the six target METIs. BP3IP where little training equipment had been available received the most equipment. The remaining five METIs received necessary equipment after an examination of overlaps with existing equipment.

Table 1: Allocation of Training Equipment for each METI by the Project

Equipment	BP3IP	STIP Jakarta	PIP Semarang	PIP Surabaya	PIP Makassar	BP2IP Barombong
Radar/ARPA Simulator <sup>(Note 1)</sup>	X			X		X
Ship Maneuvering Simulator			X		X	
Engine Room Simulator	X		X		X	
Diesel Engine Plant Simulator	X					
GMDSS Simulator (incl. PC base) <sup>(Note 2)</sup>	X	X	X	X		X
Navigation Aids Simulator	X					
Engine Workshop Equipment	X					
PC based Cargo Handling Simulator					X	X
Cargo Oil Handling Simulator	X		X		X	
LNG Cargo Handling Simulator	X					
Inner Gas System			X	X		X
Automatic/Control Equipment	X					
Basic Safety Equipment	X	X	X	X	X	X
Tanker Cleaning Machine Trainer		X	X	X	X	X
Solid Flootation Oil Booms						X
Oil Recovery Devices						X
Physics and Chemistry Laboratory Equipment	X	X	X		X	
Language Laboratory	X	X			X	X

Source: Project Completion Report.

Note 1: ARPA: Automatic Radar Plotting Aids

Note 2: GMDSS: Global Maritime Distress and Safety System

<sup>9</sup> Sub-rating of Effectiveness is to be put with consideration of Impact.

Table 2 shows the proportion of the project equipment to the total training equipment in the six target METIs. Seventy percent of the major training equipment in BP3IP was introduced by the project. Meanwhile, the proportions of the project equipment in STIP Jakarta and PIP Surabaya were less than 10% of the total of the major training equipment.

Table 2: Proportion of the Project Equipment to the Total Training Equipment

School	Proportion of the Project Equipment to the Total Training Equipment
BP3IP	70%
STIP Jakarta	9%
PIP Semarang	20%
PIP Surabaya	7%
PIP Makassar	30%
NP2IP Barombong	19%

Source: Response to the questionnaire.

Differences in the utilization of project equipment were observed at the time of the ex-post evaluation. On one hand, no major problems were seen in the utilization of project equipment in BP3IP and STIP Jakarta, on the other hand, some equipment was not fully utilized in PIP Semarang, PIP Surabaya, PIP Makassar, and BP2IP Barombong due to breakdowns and malfunctions of the machinery and systems (See **“3.5.4 Current Status of Operation and Maintenance”** for detailed information on the status of the equipment with problems).

#### (1) Annual Operation Hours of Training Equipment

At the time of the appraisal of this project, targets had been set for the annual operation hours of major training equipment after project completion including those for GMDSS simulators, radar/ARPA simulators, ship maneuvering simulators, and engine room simulators. Table 3 indicates the annual operation hours of these four types of simulators at each school. The annual operating hours per one set of equipment of each simulator in 2010-2013 have not yet achieved their respective targets. The main reasons are: (i) the operation of some equipment was suspended or frequency of utilization reduced due to breakdowns and malfunctions of the equipment, (ii) there were changes in the operation hours of equipment according to modifications of training curricula and increases/ decreases in the number of students, (iii) some schools reduced the utilization of project equipment because the transfer of ownership of the project equipment had not been completed.

Table 3: Annual Operation Hours of the Project Equipment

Unit: Annual operating hours per one set of equipment

Type of Equipment / School	Target (Project Completion)	Actual		
		2011 (Project Completion)	2012 (1 year after Project Completion)	2013 (1 year after Project Completion)
(1) GMSDD Simulator				
BP3IP	887	148	158	211
STIP Jakarta		205	273	702
PIP Semarang		9	24	14
PIP Surabaya		364	364	364
BP2IP Barombong		Operation has been suspended due to breakdown		
(2) Radar/ARPA Simulator				
BP3IP	1,040	386	75	166
PIP Surabaya		110	116	118
BP2IP Barombong		Operation has been suspended due to breakdown		
(3) Ship Maneuvering Simulator				
PIP Semarang	879	173	58	535
PIP Makassar		352	240	620
(3) Engine Room Simulator				
BP3IP	1,364	260	570	630
PIP Semarang		239	100	904
PIP Makassar		92	92	505
BP2IP Barombong		86	180	280

Source: JICA appraisal documents, Project Completion Report, and Response to the questionnaire.

Note: Regarding GMDSS Simulator and Radar/ARPA simulator, usually one set of equipment for instructors and 2-3 sets of equipment for students are installed as one system.

Regarding (i), for example, BP2IP Barombong has suspended the operation of the GMDSS simulator and the radar/ARPA simulator since 2011 due to problems with the software. PIP Semarang restricted the use of the GMDSS simulator due to problems with instructor's monitor.

Regarding (ii), for example, BP3IP and STIP Jakarta set the planned training hours for the GMDSS simulator as 529 hours<sup>10</sup> based on their annual training curriculum. Compared with this figure, at least the actual operation hours of GMSDD simulator in 2013 in STIP Jakarta, which were 702 hours, fully met the above planned training hours. It was found that there were differences between the target operation hours of each piece of equipment estimated at the time of appraisal and the planned training hours at each school based on their annual training curricula. However, it was difficult to verify detailed information on the assumptions and preconditions of how to calculate the target annual operation hours for each piece of equipment at the time of appraisal. Therefore, this ex-post evaluation could not conduct detailed analysis on the differences between the planned and actual figures.

Regarding (iii), none of the target schools were able to execute the operation and

<sup>10</sup> 74 hours (planned training hours for a one unit of GMDSS simulator training course) x 8 hours x 8 courses/year= 592 hours/year.

maintenance budget for the project equipment because the ownership of the project equipment still belonged to THRDA and had not been transferred to each school at the time of ex-post evaluation. For this reason, PIP Semarang and PIP Surabaya regulated the utilization of the project equipment. Furthermore, the delay in the transferring of ownership negatively influenced the operation, maintenance and management of the training equipment (See **“3.5.3 Financial Aspects of Operation and Maintenance”** for detailed information). According to THRDA, there are plans to complete the procedure for transferring ownership of the project equipment from THRDA to the six target METIs by the end of 2014 <sup>11</sup>.

In addition to the training equipment provided by this project, each school has similar types of simulators introduced with the assistance of the Indonesian government and other donors, and classes have been conducted utilizing both project equipment and similar types of other equipment as supplements to each other. These similar types of training equipment are mostly computer-based simulators. For example, when it is difficult to utilize the real type of GMDSS simulator introduced by the project due to mechanical problems, the instructors have taught the theory of the GMDSS simulator to students utilizing the computer-based GMDSS simulator first<sup>12</sup>, going on to explain how to practically use the simulator by showing and demonstrating with the real type of GMDSS simulator. For this reason, even if the annual operation hours of the training equipment do not reach the targets shown in Table 3, each school has made efforts to fulfill the required hours for practical training based on the annual training curriculum by utilizing a combination of the project equipment and similar types of other equipment.

- (2) Number of Fulltime Students who received STCW95 Compliant Training and have obtained a Certificate of Competency in compliance with STCW95

The seafarers’ education and training program in Indonesia consists of two programs: (i) seafarers’ competency education and training program for the specialized subjects<sup>13</sup> necessary

---

<sup>11</sup> In 2012, THRDA submitted a proposal to the Ministry of Transport (MOT) for transferring the property rights of training equipment from THRDA to METIs. The response to the proposal by MOT was that the transfer of property was allowed only after THRDA had made the appropriate repairs of broken and damaged equipment. Therefore, THRDA made an effort to secure and execute the necessary maintenance budget for the repair works. However, THRDA could not obtain the necessary budget due to the prolonged and complicated budget application procedures in MOT, e.g. the detailed examination and comments made on the cost estimation of maintenance by the inspector general. In 2014, THRDA submitted a proposal to MOT again for transferring the property rights of training equipment, and this was in process in MOT at the time of ex-post evaluation.

<sup>12</sup> When utilizing the real type of GMDSS simulators for classes, usually one set of equipment for instructors and 3 sets of equipment for students are utilized simultaneously as one simulation system. Therefore, the number of students who can practice on-hands training of real type of GMDSS simulators for one class is limited. Meanwhile, when utilizing computer-based GMDSS simulators, the number of students who can study the GMDSS simulator for one class is the same as the number of computer terminals, which is usually 20-30.

<sup>13</sup> For example, the specialized subjects are navigation, ship operation, and maritime law for the deck department, and marine meteorology, marine engines, electrical and electronics engineering, machine work, and measurement control for the engine department.

for obtaining seafarers certificates<sup>14</sup>, and (ii) seafarers' proficiency education and training program for the certificates of the technical skills and qualifications required for each type of duty. The seafarers' competency education and training program includes one year on-board training. The seafarers' proficiency education and training program includes the following practical training which conducted utilizing simulators: on ship security, GMDSS, radar simulation, tanker familiarization, engine room, firefighting training, medical care and maritime English.

Table 4 indicates the number of fulltime students on STCW95 compliance training to obtain certificates of competency. Looking at the actual figures in 2010-2013, the actual total figure in 2013 was 20,931 against the target total figure of 9,333, which fully met the target as it was more than twice the target figure. While the largest factor contributing to this achievement was that each school expanded its number of students, it is also considered that the project has also contributed to the above achievement to some extent, since the project equipment as well as school buildings constructed by the project at each school were utilized for the seafarers' competency education and training program.. At the same time, considering that other training equipment was utilized for this program and that the proportion of project equipment among the total equipment used in STIP Jakarta and PIP Surabaya was less than 10 percent, there are also factors which contributed to the above achievement, other than the project. Regarding deck watch rating and engine watch rating, actual figures did not reach their respective targets in some years. This is because competency education and training courses for deck watch and engine watch rating are integrated into the competency education and training courses for deck and engine rating at the respective schools as a result of change of their educational program. Therefore, if the comparison is made between the actual and target figures in terms of sum number of "deck watch and engine watch rating" and "deck and engine rating", the actual figures fully meet the target figures.

---

<sup>14</sup> The seafarers' certificates of the deck and engine departments are classified into five grades (from first to fifth grade) according to the tonnage and engine power outputs. For deck officers, the first, second and third deck officers (DOC I, DOC II, DOC III) are able to go on unlimited voyages including international voyages, the fourth grade deck officers (DOC IV) can go on near coastal voyages, and the fifth deck officers (DOC V) are able to go on near costal and local voyages. For engine room officers, grades are categorized according to the engine power outputs of ships. In addition, there are certificates of ratings who work under deck and for engine room officers.



Table 4: Number of Fulltime Students on STCW95 Compliant Training to obtain Certificate of Competency

Unit: Number of persons

Type of Certificate	Base line (2000)	Target (Project Completion)	Actual		
			2011 (Project Completion)	2012 (1 year after Project Completion)	2013 (1 year after Project Completion)
<b>Deck Department</b>					
1. Deck Officer Class-I	62	240	393	544	542
2. Deck Officer Class-II	234	474	629	782	594
3. Deck Officer Class-III	1,141	1,462	1,215	1,612	1,696
4. Deck Officer Class-IV	164	330	678	874	704
5. Deck Officer Class-V	197	360	1,808	3,053	3,877
6. Deck Rating	60	540	2,219	3,904	4,084
7. Deck Watch Rating	240	1,380	1,519	1,074	731
<b>Engine Department</b>					
8. Engineer Officer Class-I	33	240	352	447	439
9. Engineer Officer Class-II	194	390	546	704	661
10. Engineer Officer Class-III	1,070	1,337	1,232	1,579	1,627
11. Engineer Officer Class-IV	150	300	616	747	682
12. Engineer Officer Class-V	155	360	1,267	1,987	2,592
13. Engine Rating	60	540	2,030	2,039	2,233
14. Engine Watch Rating	240	1,380	1,035	580	469
<b>Total</b>	<b>4,000</b>	<b>9,333</b>	<b>15,539</b>	<b>19,926</b>	<b>20,931</b>

Source: JICA appraisal documents and Response to the questionnaire.

Note: The competency education and training courses for deck watch rating and engine watch rating are integrated with competency education and training courses for deck and engine rating. METIs have not received applications from new students for the deck watch and engine watch rating courses since 2012. The deck watch and engine watch rating courses are scheduled to end in 2014 when the existing cadets (students) graduate these courses.

### (3) Number of Graduates who passed STCW95 Compliant National Examinations

Table 5 indicates the number of graduates who passed STCW95 compliant national examinations in the six target METIs. The actual total figure in 2013 was 20,895 against the total target figure of 9,323, which fully met the target as it was more than twice the target figure. It is considered that the project contributed to this achievement to some extent, but other factors also made notable contributions. The reason for this is as same as the reason that explained in the case of number of fulltime students on STCW95 compliant training to obtain certificate of competency.

Table 5: Number of Graduates who passed STCW95 Compliant National Examinations conducted by the Board of State Examination and Certificate for Seafarers (DPSK)

Unit: Number of person

Type of Certificate	Base line (2000)	Target (Project Completion)	Actual		
			2011 (Project Completion)	2012 (1 year after Project Completion)	2013 (1 year after Project Completion)
<b>Deck Department</b>					
1. Deck Officer Class-I	41	238	339	470	572
2. Deck Officer Class-II	223	473	574	710	659
3. Deck Officer Class-III	1,141	1,462	1,198	1,606	1,847
4. Deck Officer Class-IV	164	330	758	975	786
5. Deck Officer Class-V	192	359	1,385	2,920	3,571
6. Deck Rating	55	538	2,219	3,904	4,063
7. Deck Watch Rating	240	1,380	1,536	1,072	746
<b>Engine Department</b>					
8. Engineer Officer Class-I	26	239	320	416	466
9. Engineer Officer Class-II	194	390	471	776	702
10. Engineer Officer Class-III	1,070	1,337	1,226	1,587	1,609
11. Engineer Officer Class-IV	150	300	659	853	746
12. Engineer Officer Class-V	153	359	1,038	1,940	2,421
13. Engine Rating	59	538	1,206	2,039	2,233
14. Engine Watch Rating	240	1,380	939	565	474
<b>Total</b>	<b>3,948</b>	<b>9,323</b>	<b>13,868</b>	<b>19,833</b>	<b>20,895</b>

Source: JICA appraisal documents and Response to the questionnaire.

Note: The competency education and training courses for deck watch rating and engine watch rating are integrated with competency education and training courses for deck and engine rating, and METIs have not received applications from new students for the deck watch and engine watch rating courses since 2012. The deck watch and engine watch rating courses are scheduled to end in 2014 when the existing cadets (students) graduate these courses.

The national examinations for seafarers' certificates of competency are conducted four times a year, and the examination contains six subjects. The examinees are entitled to apply for the national examination four times consecutively, and those subjects which are passed can be carried over to the next examination until the fourth time. Generally most graduates from the six target METIs were able to pass the examination successfully within the four attempts.



National Examination of Seafarers conducted in PIP Makassar

### 3.2.2 Quantitative Effects

#### (1) Response to the requirements of STCW95

The aim of STCW95 was to improve the capacity of seafarers through improvements in institutional and personal aspects including the development of related laws and regulations,

clarification of the required seafarers' education curricula and seafarers' qualifications, and upgrading seafarers' quality in order to reduce accidents at sea which have been mainly caused by human error. The important characteristic of STCW95 was that a higher priority was given to the acquisition of practical skills and techniques backed by theoretical knowledge than the conventional seafarers' training focused on theoretical studies. The Indonesian government had been working on the improvement and reform of the legal and institutional aspects in line with STCW95 with the assistance of JICA experts<sup>15</sup>.

Based on the above initiatives, this project implemented the following hardware and software assistance to the six target METIs in order that they could provide the relevant seafarers' education and training in compliance with STCW95: (i) introduction of several IMO model courses for seafarers proficiency education and training programs which were missing in total 35 IMO model courses, (ii) training for instructors on the operation, maintenance and management of simulators, and (iii) the introduction of simulators, construction of new school buildings, and the rehabilitation of school facilities to be utilized for simulator classes (See **"3.4.1 Project Outputs"** for detailed information).

According to interview with THRDA and the six target METIs, it was confirmed that the capacities of the six target METIs in implementing the relevant seafarers education and training in compliance with STCW95 had been strengthened through the implementation of this project. In particular, it is considered that the project effects were more notable in BP3IP than the other schools, because it had only a small amount of advanced training equipment such as simulators available before project implementation, but now has received most types of simulators from the project. At the time of the ex-post evaluation, Indonesia was listed with the countries authorized by IMO for the fulfillment of international standards based on the STCW Convention. This means that Indonesia has satisfied the requirements of STCW95.

In addition, the education and training program, which was one of the project components, was intended to improve the levels of Indonesian seafarers' education to a higher standard than the requirements of STCW95 (so called "STCW95 plus Alpha"). Therefore, the project planned and implemented (i) the introduction of teaching methods for the skill improvement of instructors, (ii) the improvement of assessment methods for instructors, (iii) the development of teaching guidelines including manuals and teaching materials, and (iv) overseas training programs including training for Bridge Resource Management (BRM) and Engine Room Resource Management (ERM). The contents of the education and training program have helped the six target METIs to prepare for STCW2010. For example, STCW2010 added qualifications in communication ability, including communication skills and leadership, as a measure for

---

<sup>15</sup> For example, the technical cooperation project "Seafarers Education Improvement Project (2003-2006)" and the dispatch of JICA experts to THRDA, MOT (dispatch of long-term JICA experts (2003-2006), and dispatch of short-term JICA experts (2003)).

accident prevention. Bridge Resource Management (BRM) and Engine Room Resource Management (ERM) are one of the above qualifications, and training for BRM and ERM were already included in the subjects of the overseas training programs under the education and training program of this project. Also a qualification for GMDSS radio operators, which was not clearly defined in STCW95, was added by STCW2010. In response to this, PIP Surabaya established new training courses for electrical engineers and electrical technicians as one of seafarers' proficiency certificates for the engine department. As practical training with GMDSS and ARPA simulators are compulsory for the certificates of electrical engineers and electrical technicians, the simulators introduced by the project have been utilized for these training courses. Furthermore, STCW2010 demands the use of full mission type (real type) simulators for seafarers' proficiency education and training programs. However, it is not necessary for BP3IP to make additional investment for this requirement as BP3IP has already installed full mission type simulators through this project. According to BP3IP, they recognized that they were able to respond to the requirements of STCW2010 smoothly because they could successfully meet the requirements of STCW95 through the implementation of this project.

At the time of ex-post evaluation, there were ten government maritime education and training institutions (METIs) including five Merchant Marine Polytechnics, one Merchant Marine College, one Sea Transportation Education and Training College<sup>16</sup>, and three Merchant Marine Schools. There were also 93 private schools in the Indonesia seafarers' education sector. Generally the government METIs are superior to the private schools in terms of the quantity and variety of training equipment, the quantity and quality of instructors, and the sufficiency of their educational programs. Also the seafarers' competency education and training programs for the advanced level of officers, such as first and second officers, (DOC/EOC I and II) are only available at the government METIs. Furthermore, the government METIs have played a leading role in the Indonesian seafarers' education sector by providing technical assistances and lending advanced simulators to the private schools. In that sense, the project has had a positive influence on the entire seafarers' education sector in Indonesia as private schools were expected to indirectly enjoy the benefits of the project through capacity improvement of seafarers' education and training in the six target METIs.

## (2) Improvement of Educational Level in the Six Target METIs

This ex-post evaluation conducted a beneficiary survey<sup>17</sup> (sample size: 110) with

---

<sup>16</sup> Sea Transportation Education and Training College (BPPTL), Jakarta, specializes in education of policy issues for Indonesian government officers engaged in the marine transport sector, and it does not provide seafarers' education and training in general.

<sup>17</sup> The ex-post evaluation conducted the beneficiary survey targeting current students, graduates and instructors in the six target METIs, and shipping companies. The total number of interviewees were 110 and the breakdown was: 38 current students (5-7 person/school), 31 graduates (4-6 persons/school), 31 instructors (5-6 persons/school), and

instructors, current students, graduates and shipping companies in order to find out the project effects on the improvement of the educational level in the six target METIs. Normally, analysis of changes in education level should be made by comparing the situation before and after project implementation. However, there were few people who knew the education levels both in 2000 and before project implementation as well as those after project completion in 2011, except some instructors who had been working for the same school continuously for more than 15 years. Therefore, this beneficiary survey firstly examined the perceptions of interviewees about whether or not the educational level of the target schools, including the capacity of instructors and students and the contents of educational programs, were better than the other schools. If the result of this was positive, further analysis took place on whether or not this positive result could be attributed to the project.

In addition to this beneficiary survey, as a supplement, interview surveys were conducted with 18 instructors of BP3IP who had participated in the overseas training programs conducted by this project and who had been working for BP3IP continuously at the time of ex-post evaluation. Based on the results of these interview surveys, analysis was made on the effects on improvements of instructors' capacity as a result of the overseas training programs and on capacity improvements of students and graduates in comparison with the situations of pre and post project implementation.

#### Improvement in Capacity of Instructors

According to the results of beneficiary survey, 93% of respondents (84% of instructors, 97% of students, 100% of graduates, 90% of shipping companies) answered that the capacity of instructors in the six METIs were better than in other schools. The major reasons raised by the respondents were: (i) instructors had seafarers' certificates, (ii) instructors had knowledge and experience in the maritime field or as seafarers, (iii) instructors had already received training to implement the seafarers' education and training in compliance with the STCW Conventions, and (iv) some of the instructors taught in other maritime schools including private schools. Also, 81% of respondents except shipping companies were satisfied with the capacity of instructors (very much satisfied: 22%, satisfied to some extent: 59%).

When asking only instructors about the improved aspects of instructors' capacity, the major responses were as follows: (i) how to develop educational and training courses in line with STCW95 (74% of responses), (ii) skills and knowledge of the new subjects (58%), (iii) teaching skills (55%) and (iv) how to operate and maintain the new equipment (45%) (multiple answers allowed).

The interview survey results from 18 instructors of BP3IP indicated that all 18 respondents

---

10 shipping companies. Principally, the beneficiary survey was conducted with a face-to-face interview utilizing a structured interview sheet. However, some graduates were asked to complete the interview sheet by themselves and submit them through e-mail.

recognized the improvement in their capacity through participation in the overseas training programs. Their main responses about improved aspects of instructors' capacity were (i) skills and knowledge of the new subjects (67%), (ii) teaching skills (61%), (iii) how to develop the educational and training course in line with STCW95 (61%), (iv) operation skills of simulators (44%) and (v) how to operate and maintain the new equipment (39%) (multiple answers allowed). These results were almost same as the results of the beneficiary survey regarding the improved aspects of instructors' capacity in the six METIs. All 18 instructors of BP3IP answered that they utilized the skills and knowledge acquired in the overseas training programs for teaching. In the beneficiary survey results, "(iii) instructors already received training to implement the seafarers' education and training in compliance with the STCW Conventions", and "(iv) some of instructors taught in other maritime schools including private schools" were listed as reasons why the instructors of the six METIs were better than at other schools. It is assumed that the capacity development training for instructors by the project and its outcome may be the background to the above two responses.

#### Improvement in Capacity of Students and Graduates

According to the results of beneficiary survey, 92% of respondents (87% of instructors, 89% of students, 97% of graduates, 100% of shipping companies) answered that the capacity of current students and graduates in the six METIs were better than at other schools. The major reasons given by the respondents were: (i) student and graduates mastered theory and practice supported by an appropriate curriculum and complete training equipment, (ii) all skills and knowledge acquired from school could be implemented in the work place<sup>18</sup>, and (iii) plenty of shipping companies wanted to recruit graduates from the six METIs because of their high quality.

The interview survey results with 18 instructors of BP3IP indicated that they recognized that the capacity of students and graduates had improved comparing the situation before and after project implementation. Their main responses about the possible reasons for this improvement were: (i) improvement in the capacity of instructors (83%), (ii) improvement in education and training programs (61%), (iii) improvement of training equipment (56%), (iv) increase in the number of instructors against the number of students (33%), and (v) improvement of other educational facilities such as libraries (28%) (multiple answers allowed).

Needless to say, the capacity of students and graduates largely depends on their individual qualifications and their own efforts. At the same time, the improvement of the educational environment in the six METIs by the project through educational curriculum improvement, the

---

<sup>18</sup> Since the training equipment introduced by the project was designed in consideration of practicality, the project provided the full mission type simulators as same as the real equipment utilized on board. Therefore, many students and instructors commented that the seafarers' proficiency education and training program utilizing the real type of simulators was very useful for practical work place as the skills and knowledge learned in the school could be easily applied when working on board.

installation of training equipment, and the construction and rehabilitation of school buildings must have contributed to helping students to master the practical knowledge and skills necessary for seafarers to some extent. It is assumed that this may be the background to the responses to (i), (ii) and (iii) for reasons why the capacity of current students and graduates in the six METIs were better than at other schools.

From the viewpoint of shipping companies, 50% of shipping companies highly evaluated “adaptability” and “personality” of graduates, but the majority of shipping companies rated the “technical skills”, “knowledge” and “foreign language ability” of graduates as moderate. As employers of seafarers with a variety of nationalities, they thought that there was room for improvement in the capacity of Indonesian seafarers in comparison with seafarers of the Philippines, India and Eastern Europe. On the one hand, shipping companies evaluated the usefulness of the seafarers’ proficiency training program utilizing full mission type simulators. They did, however, request that the six METIs to increase the training hours for proficiency training courses that utilized simulators since the existing average training hours per student are very limited. In addition, the demand of shipping companies for improving foreign language ability of students satisfying the international standards was high.

#### Improvement of the Education and Training Programs

According to the results of beneficiary survey, 100% of respondents answered that the education and training programs in the six METIs were better than at other schools. The main reason raised by the respondents was that the contents of the curricula and certificates provided by the six METIs were compliant with IMO conventions and international standards including STCW. 87% of respondents, except shipping companies, were satisfied with the education and training programs of the six METIs (very much satisfied: 24%, satisfied to some extent: 63%). This project supported improvement of curricula corresponding to STCW95 including the development of proficiency education and training courses based on IMO model courses. It is assumed that this may be the background to the responses that education and training program in the six METIs were better than other schools.

Based on the results of beneficiary survey and the interview survey with instructors of BP3IP participating in the overseas training programs, it can be concluded that the project has contributed to improvements in the capacity of instructors, the capacity of students and graduates, and education and training programs in the six METIs to some extent. Therefore, it is considered that the project has contributed to the improvement of educational levels of the six METIs to some extent.

### 3.3 Impact

#### 3.3.1 Intended Impacts

##### (1) Securing Employment Opportunities for Indonesian Seafarers

Every year, the six target METIs have accepted recruitment missions from shipping companies including domestic and foreign companies, and shipping companies have been active in employing excellent students as well as accepting students for on-board training<sup>19</sup> from the six METIs.

According to the results of beneficiary survey, instructors, students, and graduates gave the following answers about the most necessary qualifications and capacity for employment by foreign shipping companies: seafarers' certificates (44%), academic qualification (25%), and foreign language ability (23%). Shipping companies answered the same question with seafarers' certificates (44%), adaptability (44%), and foreign language ability (11%). As the graduates of the six METIs hold the appropriate seafarers' certificates in compliance with STCW95, and, according to the schools, most of them are employed by the domestic and foreign shipping companies. It is assumed, therefore, that the project has contributed to securing employment opportunities for Indonesia seafarers to some extent.

However, job hunting activities of graduates are basically carried out on an individual basis, and schools do not have enough information on the employment situation of their graduates as they have not conducted any follow-up survey. Therefore, it was difficult to verify the project impact on securing employment opportunities for graduates from the six METIs based on the quantitative data.

##### (2) Improvement in the Safety of Marine Transport

According to the results of the beneficiary survey, all instructors, students, graduates and shipping companies replied that the education and training program of the six METIs contributed to improvements in the safety of marine transport. The main reason given by the respondents was that contents of the curricula and certificates provided by the six METIs were compliant with IMO conventions and international standards including STCW<sup>20</sup>. THRDA, the executing agency of the project, also recognized that graduates were on board as seafarers and were actually working for the prevention of marine accidents at their respective work places

---

<sup>19</sup> It is compulsory for the third grade students to practice one year on-board training in the target METIs. However, since none of six target METIs have their own training ships, the one year on-board training has been conducted in cooperation with shipping companies. Since accepting trainees is an opportunity for shipping companies to find good students through on-board training and to recruit them before graduation, the shipping companies accept the trainees from the government METIs including the six target schools preferentially. For example, in many cases the shipping companies pay the tuition fees of good students for their fourth academic year under the condition that those students must be employed by the sponsoring shipping companies after graduation. However, the number of trainees accepted by the shipping companies is still less than the number of trainees who should receive on-board training, and some students are obliged to wait for a few months to one year for on-board training..

<sup>20</sup> For example, the practical training and proficiency certificates for ship maneuvering skills, operation skills of ARPA, GMDSS, oil and LNG tankers utilizing simulators defined by STCW are necessary for the safety of navigation and marine transport.



after having received practical education and training and acquired the relevant knowledge and skills for the prevention of marine accidents through learning with the training equipment and school facilities provided by the project. THRDA thought that this contributed to the improvement of safety in marine transport. In the light of above, it is assumed that this project has contributed to improvement in the safety of marine transport to some extent.

### (3) Promotion of Opportunities for Foreign Currency Earning.

This project anticipated the economic impact of foreign currency earning by securing the employment of graduates from the six METIs at foreign shipping companies. The ex-post evaluation examined a trial calculation of the expected total salaries of graduates from the six METIs in 2001-2013 by utilizing the following information and data: the number of graduates who passed the STCW95 compliant national examination (2001-2013) as shown in Table 5; the interview results with graduates; and the recommended minimum wage for seafarers by the International Transport Worker's Federation (ITF)<sup>21</sup> based on the recommended minimum wage for seafarers by IMO. The result of this trial calculation was 487 million US dollars in total<sup>22</sup>. Provided that graduates remitted a half of their salaries in foreign currency to Indonesia, it was also calculated that Indonesia received 243 million US dollars in total in three years from 2011 to 2013. However, these trial calculations did not include the expected foreign currency earning by graduates who worked for foreign shipping companies after they attended the seafarers' proficiency education and training program only<sup>23</sup>.

In the light of above, it is assumed that this project has contributed to the promotion of opportunities for foreign currency earning to some extent.

## 3.3.2 Other Impacts

### (1) Impacts on the Natural Environment

At the time of appraisal of the project, this project was categorized as type B in the JBIC Guidelines for the Confirmation of Environmental and Social Considerations (1999) since it was planned that the construction and rehabilitation works would be conducted within the existing school building and areas, and no major negative impacts on the natural environment

---

<sup>21</sup> The minimum monthly wages including the overtime premium utilized for this circulation were USD 2,235 for DOC/EOC I, USD 1,790 for DOC/EOC II, USD 1,725 for DOC/EOC III, IV, V and USD 1,028 for rating.

<sup>22</sup> According to the trial calculation of the foreign currency impact conducted by the ex-post evaluation of the Japanese ODA loan project "Equipment Supply For Maritime Sector Training Program" in 2000, it applied the assumption that 50% of graduates would work for the foreign shipping companies. Also, according to the results of the beneficiary survey conducted by this ex-post evaluation, 15 out of 31 graduates interviewed were currently working for foreign shipping companies. Based on this information, the trial calculation made by this ex-post evaluation adopted the assumption that 50% of the graduates from the six target METIs are working for the foreign shipping companies. However, the actual wage of seafarers differs according to the individual shipping companies.

<sup>23</sup> Many students who only attend the seafarers' proficiency education and training courses already hold the respective seafarers' certificates, and some of them who participated in courses are employed by the shipping companies. Therefore, it was difficult to estimate how many of students who only attend seafarers' proficiency education and training courses were able to get a new jobs at foreign shipping companies after finishing the courses.

were foreseen. Also implementation of an Environmental Impact Assessment (EIA) was not compulsory under Indonesian domestic law. The ex-post evaluation confirmed that no negative impacts on the natural environment by the project were observed.

## (2) Land Acquisition and Resettlement

The project conducted the new construction of school buildings as well as the rehabilitation of school facilities to install training equipment. However, these works were completed within the existing school compounds and there was no land acquisition associated with this project.

The project conducted a temporary resettlement of ten households<sup>24</sup> living adjacent to BP3IP's compound because the project needed to use 250m<sup>2</sup> of land near BP3IP temporarily for transporting the construction materials for the new buildings and installation of training equipment. The temporary resettlement process was handled by the contractor in the way of individual compensation between the contractor and the households, and neither THRDA nor the Indonesian government were involved in this process. A possible reason for this was that the contractor decided to settle the resettlement process by individual compensation with households in order to avoid the risk of delay in the construction works due to delays in the of resettlement process. It was common that the resettlement process by the government organizations took longer. In addition, it is assumed that there was an advantage for resettled households to accept individual compensation with contractors because the compensation money proposed by the contractors was usually higher than that of the Indonesian government who applied the conditions for illegal occupants. According to the representative of the contractor who used to be in charge of resentment affairs, the compensation process with households was conducted based on communication and consensus with households through organizing meetings with households to explain the project objective and project outlines and the reasons and necessity for temporary resettlement, and achieving the understanding and consensus of households. This process was similar process to that required by Indonesian domestic law.

According to BP3IP, the resettled households used to be vendors who sold food and drinks to the students of BP3IP. However, after project completion, those households never came back to their original place, and currently other people live in simple apartments in their place. For this reason, it was difficult to verify the current living condition of the resettled ten households in the ex-post evaluation.

## (3) Unintended Positive/Negative Impact

None.

---

<sup>24</sup> The resettled people lived in the place without the permission of the Jakarta city government (DKI Jakarta) who was the legal land owner. Therefore, the resettled people were so called illegal occupants.

Both the number of fulltime students on STCW95 compliant training to obtain certificates of competency and the number of graduates who passed the STCW95 compliant national examinations fully exceeded the respective targets. It was confirmed that the project contributed to the improvement of educational levels at the six METIs to some extent through the realization of the provision of seafarers' education and training in compliance with STCW95 by the six METIs. However, it is considered that not only this project but also other factors such as improvements in training equipment supported by the Indonesian government and other donors had a significant contribution to the above achievements. Meanwhile, the annual operation hours of major simulators of the project have not yet met the target because the operation of some simulators was suspended due to breakdown and malfunctions. The six METIs have made efforts to complete the required practical training based on the annual training curricula by utilizing a combination of the project equipment and similar types of other equipment. However, it is expected that the six METIs should conduct appropriate repair and maintenance of the equipment and fully utilize the training equipment of the project. It was confirmed that the project had positive impacts to some extent on securing employment opportunities for Indonesian seafarers, improving the safety of marine transport, and promoting opportunities for foreign currency earning as initially envisaged.

This project has somewhat achieved its objectives. Therefore, its effectiveness and impact is fair.

### 3.4 Efficiency (Rating:②)

#### 3.4.1 Project Outputs

The project outputs were composed of the following three components: (i) education and training program, (ii) procurement of training equipment, and (iii) civil works.

##### (i) Education and Training Program

##### Improvement of Seafarers' Education and Training Curricula in Compliance with STCW95

The education and training program was implemented during the final phase of the project for one year from July 2010 to June 2011. In this program, firstly a gap analysis was made on whether the existing training program and curricula of each METI satisfied STCW95 standards<sup>25</sup> (including the minor amendments of STCW in 1997, 1998, 2003, 2004, 2005, 2006) or not in terms of lectures, teaching subjects, and on-board training, etc. defined by the Decrees and Regulations of MOT. . Based on the results of the gap analysis, it was confirmed that the curricula for seafarers' competence education and training programs at the six METIs generally satisfied the requirements of STCW95. However, it was revealed that seafarers'

---

<sup>25</sup> Chapter II: Master and deck department and Chapter III: Engine department in STCW95.

proficiency education and training programs at the six METIs only contained 16 IMO model courses out of 35 model courses stipulated by IMO, and that there was no maximizing use of the existing education and training equipment in the six METIs. For this, the project proposed that the executing agency to develop an additional 19 proficiency training courses which conformed to the IMO model courses as well as to improve existing 16 proficiency training courses. This proposal was accepted by the executing agency. At the time of ex-post evaluation, 35 proficiency training courses that meet the requirements of STCW95 have been conducted in the government maritime education and training institutions including the six METIs.

#### Response to STCW95 plus Alpha<sup>26</sup>

Indonesia targeted a goal to supply high qualified seafarers who had received good seafarers' education and training and to enjoy a leading position in the international seafarers market. For realizing the above goal, Indonesia wanted to improve seafarers' education in Indonesia to more than the required level by STCW95 which defined requirements for minimum skills and capacities of seafarers in order to prevent accidents at sea (so called "STCW 95 plus Alpha). Therefore, the project supported the improvement of teaching methods as a response to STCW95 plus Alpha in addition to the response to STCW95.

For example, the education and training program contained (i) the introduction of teaching methods for improving instructors' skills and knowledge, (ii) the improvement of methods of assessment of instructors' capacity, (iii) development of a variety of teaching guidelines such as manuals and teaching materials including a translation of the Japanese textbook "Theory and Practice of Ship Handling"<sup>27</sup> into Indonesian, and the development of a textbook for engine departments, the "Lesson Plan for Engine Workshop". The above activities were undertaken in Indonesia as well as in Japan through overseas training programs.

#### Overseas Training Programs

The overseas training programs were implemented targeting instructors and technicians at the six METIs who were responsible for the operation and maintenance of the project equipment. As overseas training programs were designed to respond to "STCW95 plus Alpha", they cover the following subjects and topics; skills improvement for ship maneuvering simulators and engine room simulators, Bridge Resource Management (BRM) and Engine Room Resource Management (ERM)<sup>28</sup>, and teaching methods and assessment methods for improving

---

<sup>26</sup> "STCW95 plus Alpha" is a concept advocated by the Japanese government on the occasion of the International Maritime Conference organized in Japan in 2007. After this, this concept were disseminated to ASEAN countries and "STCW95 plus Alpha" became an indicator for improvement of seafarers' education (Project Completion report).

<sup>27</sup> "Emeritus Professor Kinzo Inoue (2011), Theory and Practice of Ship Handling", Seizando-Shoten Publication Co., Ltd.

<sup>28</sup> BRM and ERM were the risk management methods to secure ship security and safety of navigation through appropriate management and utilization of various resources in deck and engine room areas such as crew, equipment and information.

instructors' skills and knowledge in addition to operation and maintenance of simulators<sup>29</sup>. The actual total number of trainees who participated in the overseas training programs was 176, which was same as the planed (Table 6).

Table 6: Outputs of the Overseas Training Programs

Training Course		Person	Week	Batch	No. of Trainee	
					Deck	Engine
1	Ship Handling Simulator Training for Skills Improvement and Bridge Resource Management (BRM) (Simulator Course)	9	2	4	36	-
2	Engine Room Simulator Training for Skills Improvement and Engine Room Resource Management (ERM) (Simulator Course)	9	2	4	-	36
3	Assessment Method for Skills Improvement, and Introduction of Teaching Method for Skills Improvement (Non-Simulator Course)	20	2	4	40	40
4	Reinforcement of Operation and Maintenance Capability for Ship Handling and Engine Room Simulators (Non-Simulator Course)	6	2	4	12	12
Total					88	88
					176	

Source: Project Completion Report.

## (2) Procurement of Training Equipment

This project procured a variety of training equipment and simulators in line with STCW standards and installed them in the six METIs. Particularly, almost all types of training equipment were installed in BP3IP where little training equipment had been available. Necessary types of equipment were installed in other five METIs selectively considering the existing types and amount of equipment at each school. Table 7 indicates the planned and actual procured equipment, and there was a change in the amount of equipment as well as additional procurement of new types of equipment such as cargo oil handling simulators and LNG cargo handling simulators which were not planned in the original design. The reasons for the above modifications were: (i) review and updating of detailed design made in order to respond to the change of requirements associated with the amendment of STCW95 (as it took three years from completion of detailed design to procurement of equipment), and (ii) review and reexamination of the amount of equipment and target schools to avoid overlap with equipment already introduced by other projects. Since the above modifications were made in order to respond to environmental changes during the project implementation period and to avoid overlapping of

<sup>29</sup> In addition to the training courses for the operation and management of simulators under the overseas training programs, the manufacturers of simulators provided technical training and guidance for operation and maintenance of equipment in Indonesia as well as in Japan.

training equipment, the modification was justifiable.

Table 7: Planned and Actual Project Outputs (Procurement of Equipment)

Unit: Set

Item	Plan	Actual	Difference
Radar/ARPA Simulator (Note 1)	3	3	0
Ship Maneuvering Simulator	2	2	0
Engine Room Simulator	2	3	+1
Diesel Engine Plant Simulator	2	1	-1
GMDSS Simulator (incl. PC base) (Note 2)	4	5	+1
Navigation Aids Simulator	1	1	0
Engine Workshop Equipment (Lathe Machine, Milling Machine, Drilling Machine, Hack Sawing Machine, etc.)	1	1	0
PC based Cargo Handling Simulator	6	2	-4
Inner Gas System	6	3	-3
Automatic/Control Equipment	1	1	0
Basic Safety Equipment (Rescue Boat, Fire Detecting Systems, Fire Extinguishing Systems, Survival Suit, etc.)	6	6	0
Tanker Cleaning Machine Trainer	6	5	-1
Physics and Chemistry Laboratory Equipment	4	4	0
Language Laboratory	4	4	0
<Additional Outputs>			
Cargo Oil Handling Simulator	0	3	+3
LNG Cargo Handling Simulator	0	1	+1
Solid Flootation Oil Booms	0	1	+1
Oil Recovery Devices	0	1	+1

Source: Project Completion Report.

Note 1: ARPA: Automatic Radar Plotting Aids

Note 2: GMDSS: Global Maritime Distress and Safety System

### (3) Civil Works

The project constructed new school buildings for teaching of classes using training equipment as well as renovated facilities for the installation of training equipment. Table 8 shows the planned and actual project outputs for civil works. Regarding the construction of new school buildings, the actual number of buildings constructed was four against the planned one building. The reasons for this modification were that there was the necessity to construct additional three new buildings in the three METIs of PIP Semarang, PIP Makassar and BP2IP Barombong as a result of modifications in the types of training equipment introduced and layout changes where equipment was to be installed. Because of the above modifications, the number of schools that conducted school facility renovation changed from five to four schools. Since the above modifications were made in response to the modification of project outputs for the procurement of equipment, the modification of project outputs for civil works was justifiable.

Table 8: Planned and Actual Project Outputs (Civil Works)

Item	Plan	Actual
Construction of new buildings	Total: 1 building (Location) BP3IP	Total: 4 building (Location) BP3IP, PIP Semarang, PIP Makassar, BP2IP Barombong
Renovation Works of School Facilities for the installation of training equipment	Total: 5 schools (Location) STIP Jakarta, PIP Semarang, PIP Makassar, PIP Surabaya, BP2IP Barombong.	Total: 4 schools (Location) BP3IP, STIP Jakarta, PIP Semarang, PIP Makassar

Source: Response to the questionnaire.

Training Equipment introduced by the Project (Examples)



Radar/ARPA Simulator  
(PIP Surabaya)



Full Mission Engine Room  
Simulator (PIP Makassar)



GMDSS Simulator (Real Type)  
(PIP Semarang)



Diesel Engine Plant Simulator  
(BP3IP)



Full Mission Cargo Oil Handling  
Simulator (BP3IP)



Computer-based GMDSS Simulator  
(PIP Semarang)



Computer-based Cargo Handling  
Simulator (PIP Makassar)



Tank Cleaning Machine Trainer  
(BP2IP Barombong)



Solid Flootation Oil Booms  
(BP2IP Barombong)



Rescue Boat  
(PIP Semarang)



Language Laboratory  
(STIP Jakarta)



Chemistry Laboratory Equipment  
(STIP Jakarta)

### School Buildings Newly Constructed by the Project



BP3IP



PIP Makassar



PIP Semarang



BP2IP Barombong

### 3.4.2 Project Inputs

#### 3.4.2.1 Project Cost

The actual project cost was 6,410 million yen against 9,024 million yen planned cost, which was 89% of the planned cost (Table 9). Because there were modifications of the project outputs for civil works and the procurement of equipment, for reference, the ex-post evaluation conducted a trial calculation of the planned project cost based on the actual project outputs<sup>30</sup> and made a comparison between the estimated planned project cost modified by the trial calculation and the actual project cost. Based on the above, the estimated planned cost was 9,692 million yen, which was 66% of the planned cost.

The cost items exceeding the plan were the cost for education and training program (23 million yen overrun), the cost for civil works (848 million yen overrun), and the cost for consulting services (17 million yen overrun). The cost overrun of civil works was due to the expansion of the number of school buildings newly constructed from one to four. The cost for procurement of equipment was 2,547 million yen less than the plan (reduction of 38% against the plan) as a result of competitive bidding that enabled to sign the contract for the equipment-procurement package at a less price than the planned price, despite there being scope changes in the amount of procured equipment including additional equipment. Consequently, the cost overrun was compensated by cost savings in the procurement of equipment and the total project cost was within the planned cost.

<sup>30</sup> In this trial calculation, the planned costs for the procurement of equipment and civil works were recalculated based on actual project outputs by utilizing the same unit costs for equipment and civil works estimated at the time of appraisal of this project.



Table 9: Planned and Actual Project Cost

Item	Plan			Actual		
	Foreign Currency (mill. Yen)	Local Currency (mill. Yen)	Total (mill. Yen)	Foreign Currency (mill. Yen)	Local Currency (mill. Yen)	Total (mill. Yen)
Education and Training Program	383	15	398	256	165	421
Equipment and Civil Works	6,359	725	7,084	4,035	1,350	5,385
a) Procurement of Equipment	N.A.	N.A.	6,694	N.A.	N.A.	4,147
b) Civil Works	N.A.	N.A.	390	N.A.	N.A.	1,238
Consulting Service	465	122	587	388	216	604
Contingency	337	60	397	0	0	0
Tax/Duties, and Administration Cost	0	558	558	0	0	0
Total	7,544	1,480	9,024	4,679	1,731	6,410

Source: JICA appraisal documents and Project Completion Report.

Note: Exchange rate used for planned cost: IDR 1 = JPY 0.013 (As of September 2000)

Exchange rate used for actual cost: IDR 1 = JPY 0.0131 (consulting service), IDR 1 = JPY 0.0133 (main contracts) (Average between 2001 and 2010)

#### 3.4.2.2 Project Period

The actual project period was 115 months from December 2001 (signing of the loan agreement) to June 2011 (project completion) against planned 85 months from December 2001 to December 2007. This was longer than planned, at 134% of planned project period (Table 10).

The reasons for the delay were that (i) internal procedures of the executing agency took a long time at each step of the selection of consultants from the preparation of bidding documents to the signing of contracts, which resulted in about 16 months' delay, (ii) delay was caused by the preparation of detailed design with modifications of project scope that reflected the opinions of the executing agency, and (iii) the procurement procedure took a long time since the project was obliged to retender the contract package of civil works due to a single bid for the first tender, which resulted in about a 17 month' delay. In order to cope with the above delay, the expiry date of the loan agreement was extended for two years from June 10, 2009 to June 10, 2011.

Table 10: Planned and Actual Project Period

Item	Plan	Actual
1. Signing of Loan Agreement IP-507	December 2001	December 2001
2. Selection of Consultants	January 2002 – June 2002 (6 months)	November 2002 – April 2004 (18 months)
3. Consulting Service	July 2002 – December 2007 (66 months)	April 2004 – April 2011 (85 months)
4. Site Survey and Basic Design	July 2002 – December 2002 (6 months)	April 2004 – November 2005 (20 months)
5. Tender (from P/Q to Contract)	January 2003 – October 2004 (22 months)	November 2005 – February 2008 (28 months)

Item	Plan	Actual
6. Construction, Manufacture, and Installation	December 2004 – September 2006 (22 months)	February 2008 – November 2010 (34 months)
7. Education and Training Program	April 2006 – December 2007 (21 months)	July 2010 – June 2011 (12 months)
8. Project Completion	December 2007	June 2011

Source: JICA appraisal documents and Project Completion Report.

### 3.4.3 Results of Calculations of Internal Rates of Returns (Reference only)

Since this project is an education sector project for improvement of training equipment and education and training programs of maritime education and training schools, a quantitative analysis of the Internal Rate of Return (IRR) was not conducted at the time of the appraisal of this project in 2001. Therefore, the ex-post evaluation does not exercise a recalculation of IRR.

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

## 3.5 Sustainability (Rating: ②)

### 3.5.1 Institutional Aspects of Operation and Maintenance

The six target METIs are in charge of operation and maintenance (O&M) of the project equipment and facilities. The Transport Human Resource Development Agency (THRDA) is responsible for supervision of the O&M of the project equipment and facilities which is conducted by each school, and the securement and allocation of O&M budgets to each school. THRDA consists of three departments: the Education Department, the Training Department, and the General Department, and 20 staff out of the total 50 staff of THRDA have been working on supervision and budgeting. Instructors and technicians in the six METIs are assigned to take charge of O&M for each piece of equipment. Usually, technicians employed by each school are contracted employees who have mostly graduated from science and technological Polytechnics (i.e. same level as high school graduates in Japan). However, schools such as BP3IP and STIP Jakarta recruited several technicians who hold bachelor degrees from science and technological universities. The numbers of technicians of each school vary according to the size of school and scope of education, but from 8 to 25 technicians are employed per school. Regarding the O&M of the project equipment and facilities, instructors and technicians are assigned for each piece of equipment and to each facility, and the demarcation of their works is clearly

Table 11: Allocation of O&M staff in charge of the Project Equipment

School	Number of staff (instructors and technicians) in charge of O&M of the project equipment
BP3IP	57
STIP Jakarta	39
PIP Semarang	58
PIP Surabaya	7
PIP Makassar	93
BP2IP Barombong	34

Source: Response to the questionnaire.

defined (Table 11). The organization chart of the executing agency is shown in Figure 1.

No problems were observed in the institutional aspects of O&M of this project.

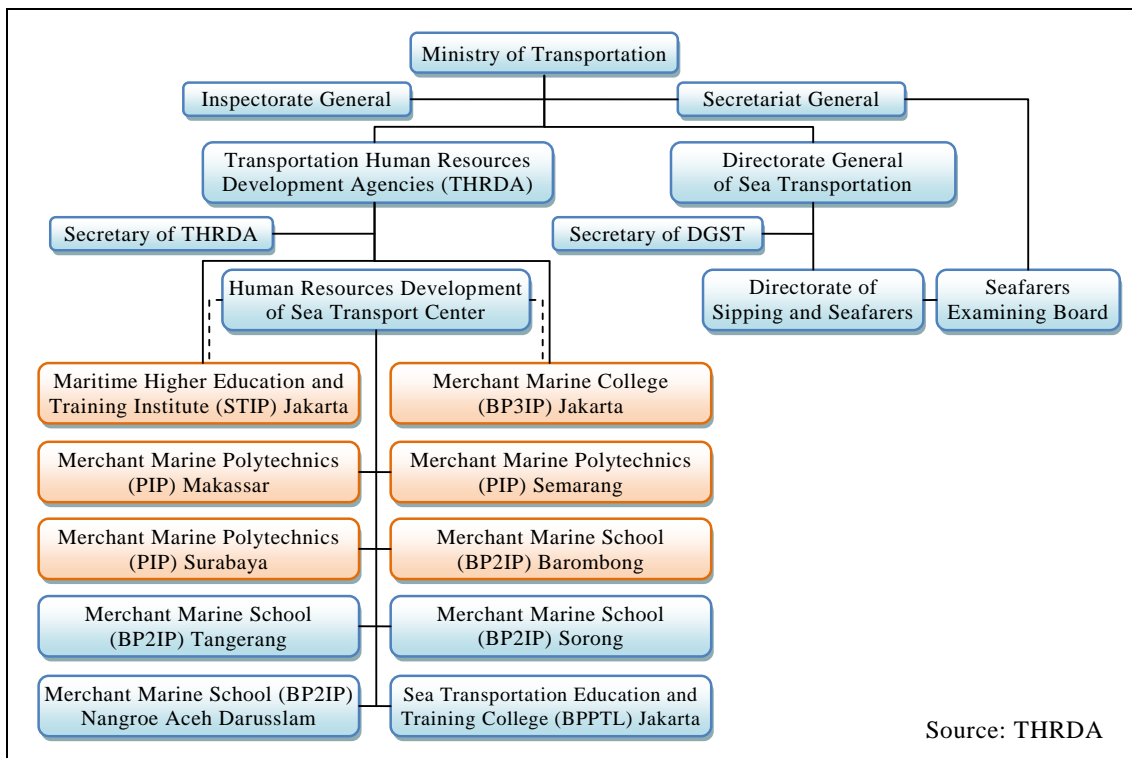


Figure 1: Organization Chart of Executing Agency

### 3.5.2 Technical Aspects of Operation and Maintenance

#### (1) Daily Maintenance by METIs and Maintenance Services of Contractors/ Manufacturers

In each school, technicians conduct the daily maintenance for each piece of training equipment and this includes: (i) starting up the system of each piece of equipment every day or every week, and checking problems, (ii) controlling the temperature of rooms where equipment is installed, and (iii) replacing batteries and making minor repairs to equipment according to the O&M plan.

The contract package of the project for equipment signed between THRADA and the contractors included a one year product warranty after the handing over of equipment and a three-year maintenance service package after the termination of the one year product warranty period. The contents of three-year maintenance service package were that a local service agent commissioned by the contractors visited each school once a year, undertook diagnostic evaluation on the condition of equipment, reported the causes of problems and recommended necessary countermeasures to each school. Based on the report and recommendations submitted by the local service agent, each school was expected to take the necessary actions and countermeasures for the repair of equipment as well as the replacement of spare parts. However,

due to differences in the technical and financial capacities of each school, the results of their responses were not same among the six METIs.

Meanwhile, the above three-year maintenance service package was terminated in April 2014. However, no concrete O&M plan was prepared, including the possibility of extension of the maintenance service package by the contractors, at the time of the ex-post evaluation.

## (2) Technical Knowledge of Instructors and Technicians

Since most of the project training equipment including simulators is of the full mission type (real type) and the advanced equipment is composed of specialized machines and a variety of application software, the repair and maintenance of the equipment require the knowledge of IT systems in addition to knowledge of electrical engineering. Although instructors in charge of O&M are familiar with how to operate the equipment, they have not necessarily acquired the relevant qualifications and technical knowledge for maintenance of the equipment as most of them have specialized in nautical and engineering subjects. Similarly, technicians have a certain level of knowledge of electrical engineering and the number of technicians who have specialized knowledge of IT systems was limited in the six METIs except for BP3IP and STPI Jakarta. The education and training program under this project provided a training course on “Reinforcement of Operation and Maintenance Capability for Ship Handling and Engine Room Simulators”. Aside from this, the manufacturers provided the O&M training for instructors through factory training in Japan, and technical guidance was given by engineers from the manufacturers during the installation of equipment at each school. However, the above training and technical guidance mainly focused on general O&M methods and basic trouble shooting using O&M manuals and they did not cover O&M methods and trouble shooting for IT systems and software of equipment that required special knowledge and skills. In this regard, the self-help efforts for updating special technical knowledge and skills on O&M by the six METIs continue to be necessary.

## (3) Training System and Utilization of O&M Manuals

Every year, THRDA conducts capacity development training on teaching skills (TOT 6.09 Certificates) and examination methods (TOE 3.12 Certificates) for instructors of the government METIs including the six METIs. BP3IP sent six instructors to the Netherlands to obtain certificates in simulator training (Certificate 6.10) through scholarships from the Dutch government. These six instructors have been conducting O&M training of simulators to other instructors and technicians in BP3IP and have tried to share their O&M knowledge and skills and improve the O&M capacities of



Operation and Maintenance  
Manuals in BP3IP

BP3IP institutionally. In addition, BP3IP has been practicing appropriate O&M activities in line with the procedures stipulated in the O&M manual such as the replacement of spare parts according to the given operation hours of equipment. Furthermore, BP3IP has been making efforts for trouble shooting by themselves referring to manuals and searching the information using internet. Therefore, all the project equipment in BP3IP has been operated without problems despite BP3IP receiving the largest amount of equipment among the six METIs. On the other hand, it has been observed that some METIs have not kept O&M manuals, backup CDs for application software of equipment, and passwords since these materials and information were not handed down from predecessor to successor. Such schools have some problems with equipment O&M.

In sum, the O&M capacity of each school varies. On the one hand, no major problems are observed in the technical capacity of BP3IP and STIP Jakarta. On the other hand, some problems are observed in the technical knowledge, training systems, and utilization of O&M manuals in the other four METIs.

### 3.5.3 Financial Aspects of Operation and Maintenance

The delay in transferring ownership of equipment from THRDA to each school affected the financial sustainability of this project negatively. Every year, each target school has been allocated an annual school budget including a budget for the O&M of school equipment and facilities. However, they are not allowed to execute the O&M budget for project equipment of which ownership has not been transferred to them because of regulations of the Indonesian government. Generally the financial resources of the target schools are: (i) government subsidies, and (ii) service revenues, which is an individual financial source for each school, earned from various school activities and businesses such as tuition fees and dormitory fees collected from students, and training fees paid by private companies and private schools when they receive training services from each school. In reality, however, each school is obliged to utilize a part of their service revenues to O&M of the project facilities and equipment because schools are not allowed to use government subsidies for the purpose of O&M of the project equipment. The scale of service revenues vary according to each school. For example, the proportion of service revenues among the total financial resources is 30-40% in the case of BP3IP and STIP Jakarta. However, that of PIP Surabaya is only 10% and total amount of service revenues is low. Due to the above differences, the schools whose service revenues are low have disadvantages in securing an O&M budget for the project facilities and equipment.

According to THRDA, the Ministry of Transport has already reserved the necessary O&M budget for the project facilities and equipment, and this will be executed by each school soon after the issue of transfer of ownership is formally settled. THRDA plans to complete the process of ownership transfer by the end of 2014.

Table 12 indicates the annual budget of the six target METIs in the last three years from

2011 to 2013. The actual O&M budgets for the project facilities and equipment only could not be identified due to lack of data<sup>31</sup>. According to interviews with the six METIs, it was recognized that the annual O&M budgets in the last three years, excluding the O&M budget for the project facilities and equipment, were mostly appropriate except in the case of PIP Semarang.

Table 12: Annual Budget of the Six Target METIs

(1) BP3IP

Unite: Million Rupiah

Budget Item	2011		2012		2013	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
1. Capital Expenditure	23,537	22,630	42,388	39,786	18,439	16,838
2. Operational Expenditure	58,969	40,823	68,488	52,793	73,934	60,680
3. Operation and Maintenance	N.A.	N.A.	813	N.A.	1,356	N.A.
Total	82,506	63,453	111,689	92,579	93,729	77,518

(2) STIP Jakarta

Budget Item	2011		2012		2013	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
1. Capital Expenditure	62,438	60,341	59,873	59,170	64,812	63,980
2. Operational Expenditure	95,589	81,017	106,722	90,696	129,908	104,196
3. Operation and Maintenance	553	431	404	340	201	195
Total	158,580	141,789	166,999	150,206	194,921	168,371

(3) PIP Semarang

Budget Item	2011		2012		2013	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
1. Capital Expenditure	10,710	9,324	45,948	43,900	6,057	4,901
2. Operational Expenditure	82,513	60,646	80,412	72,432	90,579	68,638
3. Operation and Maintenance	600	600	600	570	900	780
Total	93,823	70,570	126,960	116,902	97,536	74,319

(4) PIP Surabaya

Budget Item	2011		2012		2013	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
1. Capital Expenditure	106,508	104,962	20,242	13,627	12,941	10,007
2. Operational Expenditure	55,237	51,081	76,301	55,840	89,419	65,595
3. Operation and Maintenance	3,000	1,627	0	0	518	50
Total	164,745	157,670	96,543	69,467	102,878	75,652

<sup>31</sup> Since the target schools are not allowed to execute the budget for O&M of the project equipment because of regulations until the transfer of ownership is formally completed. Therefore, each school unofficially takes the O&M costs for the project equipment under the name of O&M costs for other equipment. For this reason, no official records and documents for the exact expenditures for O&M of the project equipment were produced.

(5) PIP Makassar

Budget Item	2011		2012		2013	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
1. Capital Expenditure	147,509	119,691	35,605	34,075	93,008	86,046
2. Operational Expenditure	70,448	50,139	68,319	51,141	84,374	64,364
3. Operation and Maintenance	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Total	217,957	169,830	103,924	85,216	177,382	150,410

(6) BP2IP Barombong

Budget Item	2011		2012		2013	
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure
1. Capital Expenditure	68,670	67,421	12,008	11,456	10,717	10,169
2. Operational Expenditure	29,144	21,540	39,730	28,915	46,793	36,685
3. Operation and Maintenance	N.A.	N.A.	N.A.	N.A.	300	N.A.
Total	97,814	88,961	51,738	40,371	57,810	46,854

Source: Response to the questionnaire.

Note 1: The expenditure of O&M in 2012 and 2013 of BP3IP included the operation expenditure of each year.

Note 2: The operation and maintenance cost for each METI includes operation and maintenance cost of all equipment and facilities of each METI.

### 3.5.4 Current Status of Operation and Maintenance

There were no problems observed in the current O&M status of the newly constructed school buildings and renovated facilities of the project. However, problems were identified in some equipment. Table 13 shows the summary of the O&M status of the project equipment, and Table 14 shows the list of training equipment confirmed as having problems at the time of ex-post evaluation. There were various reasons for malfunction of the equipment and the reasons for malfunction of some of the equipment could not be identified. The common reasons observed in each school were breakdown of UPS (Uninterruptible Power Supply System) and malfunction of software.

UPS is an appliance utilized for most of the simulators, but it needed to be replaced or repaired continuously because it frequently had trouble. It is considered that the unstable power supply with frequent voltage changes in Indonesia may relate to the above damage. Particularly, in South Sulawesi Province where PIP Makassar and BP2IP Barombong are located, the power supply is generally unstable and power failures occur very frequently. This may be one reason why UPS is damaged by excessive power loading. Regarding spare parts, each school has tried to procure spare parts in the local market as much as possible as it is costly to import genuine spare parts from Japanese manufacturers. However, those schools located in local regions face difficulties in accessing information and the markets for the procurement of spare parts in comparison with those schools in Jakarta such as BP3IP and STIP Jakarta where accessibility to information about spare parts and the availability of spare parts in the local market are better.

Regarding the issue of malfunction of software, it is difficult for the instructors and technicians of each school to solve the issue by themselves except for BP3IP and STIP Jakarta due to lack of specialized experts in IT systems. Non-updated software licenses and the lack of

periodical software updates may be other possible reasons for software problems. Effective countermeasures for the above issues have been under consideration in each school including the option of outsourcing of repair of training equipment with problems to private maintenance service providers.

Table 13: Summary of O&M Status of the Project Equipment

Type of Equipment	BP3IP	STIP Jakarta	PIP Semarang	PIP Surabaya	PIP Makassar	BP2IP Barombong
Radar/ARPA Simulator	○			●		●
Ship Maneuvering Simulator			●		●	
Engine Room Simulator	○		●		○	
Diesel Engine Plant Simulator	○					
GMDSS Simulator (incl. PC base)	○	●	●	○		●
Navigation Aids Simulator	○					
Engine Workshop Equipment	○					
PC based Cargo Handling Simulator					○	●
Cargo Oil Handling Simulator	○		○		●	
LNG Cargo Handling Simulator	○					
Inner Gas System			●	○		○
Automatic/Control Equipment	○					
Basic Safety Equipment	○	○	○	○	○	○
Tanker Cleaning Machine Trainer		○	●	○	○	○
Solid Floatation Oil Booms						○
Oil Recovery Devices						○
Physics and Chemistry Laboratory Equipment	○	○	○		○	
Language Laboratory	○	○			●	○

Source: Project Completion Report.

Note: ○: No problems or minor problems in O&M of equipment

●: Problems in O&M of equipment.

Table 14: Training Equipment confirmed with Problems at the Time of Ex-Post Evaluation

School	Equipment	Operation and Maintenance Status
STIP Jakarta	Computer-based GMDSS Simulator	One of VGA (Video Graphic Array) and UPS (Uninterruptible Power Supply System) are broken down. The necessary solutions have been under consideration.
PIP Semarang	Ship Maneuvering Simulator	Since June 2013, the monitor for the instructor has been out of use. The necessary solutions have been under consideration.
	Engine Room Simulator Inner Gas System	Since August 2013, the control PC for the instructor has been out of use. The necessary solutions have been under consideration.
	GMDSS Simulator	There are frequent defects of the monitor for the instructor. The necessary solutions have been under consideration.
	Tanker Cleaning Machine Trainer	Software problems. The necessary solutions have been under consideration.



School	Equipment	Operation and Maintenance Status
PIP Surabaya	Radar/ARPA Simulator	Since November 2013, one unit out of three units has been out of use due to software problems. The necessary solutions have been under consideration.
	GMDSS Simulator	Since 3013, software problems have occurred in the equipment for the instructor. The necessary solutions have been under consideration.
PIP Makassar	Ship Maneuvering Simulator	Some problems. The necessary solutions have been under consideration.
	Language Laboratory	Since 2010, the equipment has been out of use due to software problems.
	Cargo Oil Handling Simulator	Since 2012, the program has not been operated properly due to software problems. The necessary solutions have been under consideration.
BP2IP Barombong	Radar/ARPA Simulator	Operation has been suspended due to software problems. The necessary solutions have been under consideration.
	GMDSS Simulator	Since 2011, the simulator has been out of use due to software problems. The necessary solutions have been under consideration.
	Computer-based Cargo Handling Simulator	The operation of the ship maneuvering program has been suspended due to the breakdown of UPS and software problems. The necessary solutions have been under consideration.

Source: Response to the questionnaire and the results of project site visits by the external evaluator.

Some minor problems have been observed in the technical and financial aspects, and problems have been observed in the current status of the operation and maintenance of a part of the project equipment. Therefore the sustainability of the project effects is fair.

## 4. Conclusion, Recommendations and Lessons and Learned

### 4.1 Conclusion

The objective of this project was to improve the capacity of Indonesian seafarers to meet the requirements of STCW95 in their qualifications by the construction and installation of necessary facilities and equipment for training and education based on STCW95, together with capacity development of trainers in six government Maritime Education and Training Institutions (METIs). This project has been highly relevant to Indonesia's development plan and development needs, as well as to Japan's ODA policy. Therefore its relevance is high. Both the number of fulltime students on STCW95 compliant training to obtain certificates of competency and the number of graduates who passed the STCW95 compliant national examination fully achieved their respective targets. It was confirmed that the project contributed to improvements in the educational levels of the six METIs to some extent through the realization of the provision of seafarers' education and training in compliance with STCW95. However, the annual operation hours of major simulators of the project have not yet met the target as the operation of some simulators has been suspended due to breakdown and malfunction. Each school has made efforts to fulfill the required hours for practical training based on the annual training curriculum by utilizing a combination of the project equipment and similar types of

other equipment introduced with the assistance of other donors. It was confirmed that the project had positive impacts to some extent on securing employment opportunities for Indonesian seafarers, improving the safety of marine transport, and promoting opportunities for foreign currency earning. Therefore, the effectiveness and impact of the project are fair. Although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the project is fair. Problems were observed in the current status of operation and maintenance of a part of the project equipment, and there have been constraints in the O&M budget for operation, maintenance and management because of the delay in ownership transfer of the project equipment from the executing agency to the six target METIs. Therefore the sustainability of the project effects is fair.

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

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

#### (1) Issue of Ownership Transfer of the Project Equipment

- Due to the delay of ownership transfer of the project equipment from THRDA to the six target METIs, each school found it difficult to execute the O&M budget for the project equipment allocated from THRDA. It is recommended that THRDA should accelerate the process of ownership transfer and enable the target schools to execute the O&M budget for project equipment as soon as possible.

#### (2) Operating and Maintenance

- BP3IP is the most capable school among the six METIs in terms of operation and maintenance. The reasons for this are: (i) they are more blessed with human resources (Instructors and technicians) in terms of their number and their capacity, (ii) they exercise proper operation and maintenance according to the procedures stipulated in the O&M manuals, (iii) there are many opportunities for information sharing and mutual learning among the instructors and technicians in charge of O&M, and (iv) they have a relatively large amount of available funds for O&M. This will be a good practice for the improvement of the O&M capacity of other schools. It is, therefore, expected that the experience and know-how of BP3IP be shared among the six METIs so that they can actively learn from each other.
- The three-year maintenance service package by the local agents of manufacturers after the warranty period terminated in April 2014. However, as yet no new mid-term or long-term maintenance plan for the project equipment has been established. Therefore, it is recommended that THRDA, as well as the six METIs, should examine the next maintenance plan including the option for partial

outsourcing of repair of training equipment to private maintenance service providers as soon as possible.

- In order to secure a stable O&M budget in the future, it is recommended that the six METIs should examine the possibility of using the service revenues of each school as an alternative financial source to supplement any shortages in the O&M budget in addition to the O&M budget allocated from THRDA to each school. In order to secure stable service revenues, it is expected that each school will promote the provision of training services to seafarers of shipping companies, the dispatch of instructors to private schools and the lending of training equipment.

(3) Issue of Data Collection and Management for Recording of the Employment Status of Graduates

- It is important to monitor the employment status of graduates in the six METIs since this is useful in evaluating and improving the educational capacity and educational level of each school. For this reason, it is recommended that the six METIs should at least collect and manage the data and information on the employment status of students at the time of graduation.

4.2.2 Recommendation to JICA

None.

4.3 Lessons Learned

(1) Issue of Transfer of Ownership of the Project Facility and Equipment where the Executing Agency and the O&M Agency are Different

- Due to the delay in ownership transfer from THRDA, the exacting agency, to the six target METIs, the O&M agencies, each school faced difficulties in executing the O&M budget for the project equipment and facilities because it was restricted by the rules and procedures of Indonesian government. Therefore, for similar projects in the future, it is required that JICA should examine the necessary legal and institutional procedures associated with the ownership transfer of project facilities at the time of project appraisal in cases where the executing agency and the O&M agency are separate organizations. Also, JICA should help the executing agency and the O&M agency to complete the necessary procedures after project completion as soon as possible.

End

### Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs (1) Education and Training Program	<ul style="list-style-type: none"> <li>• Improvement of Seafarers' Education and Training Curricula</li> <li>• Overseas Training: 176 persons</li> </ul>	Same as planned
(2) Procurement of Education and Training Equipment	<ul style="list-style-type: none"> <li>• Radar/ARPA simulator: 3 sets</li> <li>• Ship maneuvering simulator: 2 sets</li> <li>• Engine room simulator: 2 sets</li> <li>• Diesel engine plant simulator: 2 sets</li> <li>• GMDSS simulator: 4 sets</li> <li>• Navigation aids simulator: 1 set</li> <li>• Engine workshop equipment: 1 set</li> <li>• Cargo handling simulator: 6 set</li> <li>• Inner gas system: 6 sets</li> <li>• Automatic/control equipment: 1 set</li> <li>• Basic safety equipment: 6 sets</li> <li>• Tanker cleaning machine trainer: 6 sets</li> <li>• Physical and chemistry laboratory equipment: 4 sets</li> <li>• Language laboratory: 4 sets</li> </ul>	<ul style="list-style-type: none"> <li>• Radar/ARPA simulator: 3 sets</li> <li>• Ship maneuvering simulator: 3 sets</li> <li>• Engine room simulator: 3 sets</li> <li>• Diesel engine plant simulator: 1 set</li> <li>• GMDSS simulator: 5 sets</li> <li>• Navigation aids simulator: 1 set</li> <li>• Engine workshop equipment: 1 set</li> <li>• Cargo handling simulator: 2 sets</li> <li>• Inner gas system: 3 sets</li> <li>• Automatic/control equipment: 1 set</li> <li>• Basic safety equipment: 6 sets</li> <li>• Tanker cleaning machine trainer: 5 sets</li> <li>• Physical and chemistry laboratory equipment: 4 sets</li> <li>• Language laboratory: 4 sets</li> </ul> <p>&lt;Additional outputs&gt;</p> <ul style="list-style-type: none"> <li>• Cargo oil handling simulator: 3 sets</li> <li>• LNG tanker simulator: 1 set</li> <li>• Solid floatation oil booms: 1 set</li> <li>• Oil recovery devices: 1 set</li> </ul>
(3) Civil Works	<ul style="list-style-type: none"> <li>• Construction of new building: 1</li> <li>• Renovation of facilities: 5</li> </ul>	Construction of new building: 4 Renovation of facilities: 4
(4) Consulting Services	<ul style="list-style-type: none"> <li>• Assistance of detailed design and tender</li> <li>• Monitoring of civil works for construction and installation of equipment</li> <li>• Logistic support for the education and training program</li> </ul>	Same as planned
2. Project Period	December 2001 – December 2007 (85 months)	December 2001 – June 2011 (115 months)
3. Project Cost		
Amount paid in Foreign currency	7,544 million yen	4,679 million yen
Amount paid in Local currency	1,480 million yen (113,860 million rupiah)	1,731 million yen (130,398 million rupiah)
Total	9,024 million yen	6,410 million yen
Japanese ODA loan portion	7,669 million yen	5,705 million yen
Exchange rate	1 rupiah = 0.013 yen (As of September 2000)	1 rupiah = 0.0131 yen (Consulting service) 1 rupiah = 0.0133 yen (Main contract) (Average between 2001 and 2010)

Indonesia

Ex-Post Evaluation of Japanese ODA Loan

“Decentralized Irrigation System Improvement Project in Eastern Region of Indonesia”

External Evaluator: Junko Fujiwara, OPMAC Corporation

**0. Summary**

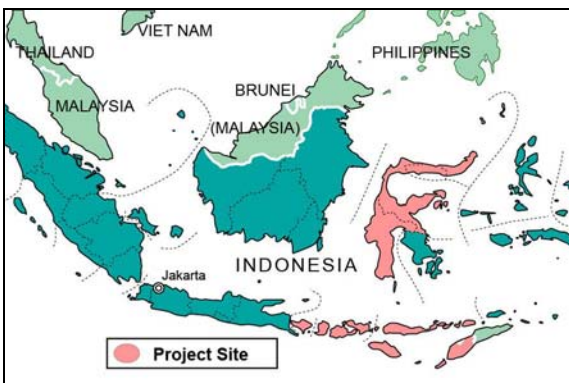
This project was intended to increase food production, mainly the rice crop, thereby contributing to poverty reduction in Eastern Indonesia through the new construction and rehabilitation of irrigation facilities and assistance for the institutional reinforcement of irrigation water management systems in the region.

This project was well in line with Japan’s ODA policy as well as with Indonesian development policy and the development needs in the country such as correcting regional disparities, increasing food production and securing water resources. Therefore the project relevance is high. The effectiveness of this project is considered to be high, as there were tangible effects and the importance of irrigation facilities improved under the project; dual rice cropping during rainy seasons and planting in dry seasons were made possible in the Eastern region where water resources were scarce and where development projects were needed. A positive impact of the project, “contribution to poverty reduction in the project area”, was confirmed and the high effectiveness of the project was apparent from the beneficiary survey. The effectiveness / impact of the project is deemed fair, as some information regarding environmental impacts and land acquisition was not available.

The efficiency of the project is fair as the project cost did not exceed the planned budget, but the project period was significantly longer than planned. In terms of maintenance and management of the project, there are minor problems in the technical and financial aspects and physical conditions of the facilities although there is no major issue with institutional aspect. Unless these problems are addressed comprehensively, it is likely that the current conditions of the facilities will worsen further. Therefore, sustainability of the project is fair.

In light of the above, the project is evaluated as partly satisfactory.

**1. Project Description**



Project Location



Constructed Weir of Malaka Weir Irrigation Project

## 1.1 Background

In 1989, Japan signed a loan agreement for the “Small Scale Irrigation Management Project (1)” with the Government of Indonesia. With subsequent agreements for the “Small Scale Irrigation Management Project (2)” and the “Small Scale Irrigation Management Project (3)” signed in 1994 and 1997 respectively, the Japanese Government provided continued and long-term support for the building of irrigation facilities in eleven provinces in the Eastern part of Indonesia with a total irrigation coverage of 83,886 ha (accumulated) and a total canal length of 510 km. A series of these projects supported the Indonesian Government with various agricultural schemes including the introduction of high-yield species and the expansion of irrigated farmland in order to increase food production and to achieve self-sufficiency of rice supply. They also promoted improvement of the irrigation system in Eastern Indonesia for the reduction of disparities with other regions and of poverty.

The above three projects contributed to increased food production, including in the rice crop, and the development of farming infrastructure in poor areas of Indonesia. They also enabled decentralized provincial / district governments to enhance their project implementation capabilities and organizational structures for managing irrigation facilities. However, the demand-supply balance of rice remained unstable as the population increased at 1.6% annually while rice consumption increased at 3.1% annually. Combined with the slow growth in cultivated areas due to the decrease in farmland on Java Island, rice production was not able to catch up with the demand. To address the situation, the project was extended for the new construction and rehabilitation of irrigation facilities and for the provision of assistance to refine irrigation water management in eight provinces in Eastern Indonesia (Bali province, West Nusa Tenggara province, East Nusa Tenggara province and five provinces in the Sulawesi Island).

## 1.2 Project Outline

The objective of this project was to increase food production, mainly in the rice crop, by building and rehabilitating irrigation facilities and providing assistance for better irrigation water management in eight provinces in Eastern Indonesia thereby contributing to poverty reduction in the region.

Load Approved Amount / Disbursed Amount	27,035 million yen / 25,541 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 28, 2002 / October 10, 2002

Terms and Conditions	<Main portion> Interest Rate: 1.80%, Repayment Period: 30 years (Grace Period 10 years) , Conditions for Procurement: General untied <Consulting portion> Interest Rate: 0.75%, Repayment Period: 40 years (Grace Period 10 years), Conditions for Procurement: Bilateral tied
Borrower / Executing Agency	Government of Indonesia/Director General of Water Resources, Ministry of Public Works
Final Disbursement Date	February, 2012
Related Projects	Related Japanese ODA loans: <ul style="list-style-type: none"> <li>· “Small Scale Irrigation Management Project (1)” (L/A Signing: FY1989, Approved Amount: 1,896 million yen)</li> <li>· “Small Scale Irrigation Management Project (2)” (L/A signing: FY1994, Approved Amount: 8,135 million yen)</li> <li>· “Small Scale Irrigation Management Project (3)” (L/A signing: FY1997, Approved Amount: 16,701 million yen)</li> <li>· “Decentralized Irrigation System Improvement Project in Eastern Region of Indonesia (II)” (L/A signing: FY2007, Approved Amount: 8,967 million yen)</li> </ul>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Junko Fujiwara (OPMAC Corporation)

### 2.2 Duration of Evaluation Study

Ex-post evaluation of the project was conducted as below:

Duration of the Study: January 2014 - April 2015

Duration of the Field Study: April 6 - May 9, 2014, and August 6 -16, 2014

### 2.3 Constraints during the Evaluation Study

The ex-post evaluation was conducted, securing “possibility of evaluation” and excluding “selection bias in its survey” due to limitations related to (i) data and information collection and (ii) site survey and beneficiary surveys as follows.

#### 2.3.1 Limitations related to data/information collection

The evaluation study could not cover the 40 out of 52 subprojects under the project for effective analysis as a comparison between the ex-ante and the ex-post status which secures the continuity of data for measuring effectiveness such as for irrigated areas predicted at the planning stage was difficult. This was because each of these subprojects, which had been supposed to be implemented as one subproject at the planning state, was eventually divided into several.

Among the 12 subprojects mentioned above, the questionnaires for Malaka Weir Irrigation, Ponre-Ponre Dam Irrigation and Paguyaman Weir Irrigation, which had been chosen for the mid-term review (conducted in FY 2007) and had been monitored as pilot projects for indicators in project effectiveness, were collected to ensure the possibility of evaluation. On the other hand, one subproject (Wae Dingin Irrigation: East Nusa Tenggara) for which questionnaire was collected, was not covered for the analysis due to the insufficiency of collected data. Questionnaires were not submitted in the remaining 8 subprojects.

### 2.3.2 Limitations in the Site Survey and Beneficiary Survey

In the evaluation study, site surveys and beneficiary surveys for all the 52 subprojects were not possible due to the limited timeframe, so some were selected from the total. In the course of selecting subprojects to be covered by the site survey and beneficiary survey, the following were included for the purpose of the exclusion of selection bias related to locational and climate factors as well as to the contents of subprojects: (i) the above 3 subprojects (Malaka, Ponre-Ponre and Paguyaman) which enabled effectiveness analysis, (ii) subprojects which contain various design elements such as new or rehabilitated, pond / weir / groundwater irrigations, and (iii) all the targeted 8 provinces as much as possible (including the major islands in East Nusa Tenggara province and West Nusa Tenggara province and a selection of locations which have different climates and different annual precipitations).

As a result, 6 provinces excluding Bali province and North Sulawesi province, namely East Nusa Tenggara province, South Sulawesi province, Gorontalo province, Southeast Sulawesi province, Central Sulawesi province and West Nusa Tenggara province were covered and 7 subprojects shown in Table 1 which includes those implemented on three major islands (Timor Island, Sumba Island, Sumbawa Island) in East and West Nusa Tenggara provinces were selected in the evaluation.

Table 1: Subprojects Selected for Site Surveys and Beneficiary Surveys

Subproject	Island	Province
Malaka Weir Irrigation Project	Timor	East Nusa Tenggara
Ponre-Ponre Dam Irrigation Project	Sulawesi	South Sulawesi
Paguyaman Weir Irrigation Project		Gorontalo
Benua Aporo Weir Irrigation Project		Southeast Sulawesi
Sausu Weir Irrigation Improvement Project		Central Sulawesi
Telaga Lebur Pond Irrigation Project		Lombok
Kempo Groundwater Irrigation Project	Sumbawa	

Source: Developed by Evaluator

Note: Site surveys studied the current status of facilities management. Beneficiary interviews were conducted to evaluate project impact.



Based on the above, project effectiveness in the evaluation will be analyzed based on the Operation and Effect indicators for the above three pilot subprojects, and project impacts and sustainability will be analyzed based on conditions at the seven subprojects mentioned above, where observations on facility status through site surveys and detailed evaluation of survey responses were possible. This will constitute the overall evaluation of this project.

#### 2.4 Remarks

The mid-term review was conducted in FY 2007 for this project. In the review, modification of the base / target figures at the time of appraisal was proposed for more realistic figures based on detailed design results conducted during the project implementation period (Table 2).

Table 2: Modified Operation and Effect Indicators

Subproject	Indicator	Figure	Original Figure	Modified Figure	Justification
Malaka Weir Irrigation	Rice cultivated area (rainy season)	Target Figure	10,000 ha	6,000 ha	At the time of project appraisal, the irrigated area was only a rough estimate. After the project started, more details on farmers' productivity and records on yield by crop per unit area became available.
Ponre-Ponre Dam Irrigation	Rice cultivated area (rainy season)	Base Figure	3,339 ha	2,400 ha	Based on re-evaluation of rain-fed area prior to the project
	Rice cultivated area (rainy season)	Target Figure	4,313 ha	3,749 ha	Reflecting detailed design results conducted upon the start of the project
	WUA formulation rate	Base Figure	41.67 %	N/A	According to the WUA formulation data approved by the district governor / court, officially organized Water Users Association (WUA) did not exist before the project. Therefore the base was modified to "Not Applicable".
Paguyaman Irrigation	Rice cultivated area (rainy season)	Base Figure	2,160 ha	2,090ha	Based on re-evaluation of rain-fed areas prior to the project
	Rice cultivated area (rainy season)	Target Figure	2,713 ha	6,880 ha	Reflecting the decision to expand the area through public consultation during the project implementation period
	Rice cultivated area (dry season)	Target Figure	2,713 ha	6,880 ha	
	WUA formulation rate	Base Figure	75 %	N/A	According to the WUA formulation data approved by the district governor / court, officially organized WUA did not exist before the project. Therefore the base was modified to "Not Applicable".

Source: Compiled by Evaluator based on periodical reports and mid-term review report

At the time of ex-post evaluation, however, official written agreement with the executing agency related to the modification was not found. It is not mentioned in progress reports nor in the project completion report. Except for the irrigated areas of each subproject, no indicator was monitored after mid-term review. Thus, the base / target figures modified at the time of the mid-term review are used as reference figures only, shown in project effectiveness in this ex-post evaluation report.

### **3. Results of the Evaluation (Overall Rating: C<sup>1</sup>)**

#### **3.1 Relevance (Rating: ③<sup>2</sup>)**

##### **3.1.1 Relevance to the Development Plan of Indonesia**

###### **(1) National development plan level**

At the time of appraisal (2002), “government decentralization and poverty reduction” was listed as one of the prioritized issues in the National 5-year Development Plan of Indonesia (Propenas 2000-2004). Also, under the “Development Program for Underdeveloped Regions”, regional imbalance was pointed out as being a challenge for the irrigation sector, and, in particular, the development of water resources and irrigation facilities in the Eastern region was identified as a goal.

At the time of ex-post evaluation of this project, the National Long Term Development Plan (RPJPN) (2005-2025) and the second term National Medium Term Development Plan (PRJMN2) (2010-2014) were underway, and contribution to public welfare through economic development and achieving fair and equal development were listed as objectives. Also, “food security” (enhancing the competitiveness of agriculture products, increasing farmers’ income levels, securing natural resources and the environment, building and maintaining irrigation infrastructure and facilities) was listed as a priority on the development agenda.

###### **(2) Sector development plan level**

At the time of project appraisal (2002), water resources and irrigation sector development plans (“food stability enhancement program”, “water resource development and management program”, etc.) were set forth responding to the National 5-year Development Plan (Propenas 2000-2004). The plan included improvement of the legal system for national policies for water resource development and management, the setting up of comprehensive organizations covering all the river basins together with financial system and regulations, the establishment of effective regulatory systems and implementation arrangements for better water quality and river basin water quality management.

At the time of ex-post evaluation, the 5-year Agriculture Development Plan (2009-2014), a sector development plan of the Ministry of Agriculture (MOA), listed four main goals: 1) Food

---

<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, and D: Unsatisfactory

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

security with improved self-sufficiency in main staples 2) Diverse agricultural production to correct heavy reliance on rice 3) Highly competitive, value-added agricultural products to promote exports, and 4) Improvements in welfare for farmers.

### 3.1.2 Relevance to the Development Needs of Indonesia

At the time of appraisal (2002), Eastern Indonesia was still the least developed region. Per capita GDP remained at 70% of the national average, and the population living under poverty line was at 29.8% (2000) which shows a worse figure than the national average of 24.1% (2000). Further development was desperately needed in order to correct the regional disparities.

Farmland on Java Island, which had been a major rice producing area, was expected to decrease by 20,000 ha annually due to urbanization and industrialization in the area. Under these circumstances, increasing rice production in Eastern Indonesia, where 60% of the population farmed, was considered important to increase the overall rice production in Indonesia and to secure a stable supply of food. Development in agriculture was also expected to contribute to the correction of regional disparities. Thus the project was considered important from the perspectives of both poverty reduction and economic development.

At the time of the ex-post evaluation (2010), the population in the project target provinces living below the poverty line had mostly shrunk, particularly in the provinces with major cities and tourism destination such as Bali province (4.88%), North Sulawesi province (9.1%) and South Sulawesi province (11.6%). In Southeast Sulawesi province the number was (17.05%), in Central Sulawesi province (18.07%), West Nusa Tenggara province (21.44%), East Nusa Tenggara province (23.03%) and Gorontalo province (23.19%) the numbers were very poor, exceeding the national average (13.3%: 31.02 million people).

The population growth rate in the project target area was over 2% in Bali, East Nusa Tenggara, Southeast Sulawesi and Gorontalo, which is higher than the national rate. (1.49%: 2000-2010). The demand for rice as of 2013 was 4.3 million tons (14% of the whole nation). The demand was expected to grow in proportion to population growth, therefore the need for increased rice production continues to be high.

At the same time, water resources in Eastern Indonesia are scarce - only 13.5% of the total resources in the country (Table 3). In particular, West Nusa Tenggara and East Nusa Tenggara are dry regions and still have a high demand for irrigation facilities to a secure sufficient and continuous water supply throughout a year. However, according to the project execution agency, the implementation of irrigation facilities is still not easy as they are faced with difficulties in land acquisition and financial constraints.

Table 3: Available Water Resource in the Eastern Region (2013)

					Unit: million m <sup>3</sup>
Nation-wide	Eastern region	Sulawesi Island	Lesser Sunda Islands	Bali Island	Maluku Islands
3,906,500	525,500	299,200		49,600	176,700

Source: Questionnaire survey results

Note: "Lesser Sunda Islands" is a generic term for islands scattered in a wide range from Lombok Island to Timor Island. The area combines West Nusa Tenggara and East Nusa Tenggara provinces.

Further enhancement to increase rice production systems and to secure water resource is still therefore deemed necessary in the project area.

### 3.1.3 Relevance to Japan's ODA Policy

At the time of appraisal (2002), Country Assistance Policy for Indonesia (1994 - 2001) and the 2001 additional ODA policy recognized following urgent priority areas: 1) securing fairness, 2) human resources development and education, 3) securing the environment, 4) support for reorganization of industry structure, 5) building industry foundation (economic infrastructure), 6) support for stability of the macro economy, 7) support to promote various reforms and 8) the elimination of economic bottlenecks. The objective of this project, development in Eastern Indonesian (correction of regional disparities) and its overall goal, poverty reduction, apply to "securing fairness" mentioned above as priority area 1).

In addition, JICA's Medium-Term Strategy for Overseas Economic Cooperation Operations (2002) recognized agriculture / irrigation as one of the priority areas for Indonesia. This policy also supported the "transfer of responsibility for irrigation facilities maintenance to Water Users Association (WUA)" which was a condition for the World Bank's structural adjustment loans to water resource sectors. The project was in line with this policy.

To summarize, the project has been highly relevant to Indonesia's development plan and development needs in its Eastern region, as well as Japan's ODA policy. Therefore its relevance is high.

## 3.2 Effectiveness<sup>3</sup> (Rating: ②)

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

Three subprojects (Malaka Irrigation Project, Ponre-Ponre Dam Irrigation Project, and Paguyaman Irrigation Project) were analyzed comparing the base figures (2001), target figures (2014) and actual figures at the mid-term review (2007) and ex-post evaluation (2013).

At the time of the ex-post evaluation, Operation and Effects indicators of the three subprojects either reached up to 80 to 90 % or exceeded the original target figures in rice cultivated area and yield by main crop per unit area. On the other hand, with all three

<sup>3</sup> Project impacts will also be taken into consideration when rating effectiveness

subprojects, the actual cultivated area used for produce other than rice did not reach the target. This may be due to the trend in the nine years of the project where rice became the main staple, causing a relative decrease in demand for produce other than rice.

As data on the net annual average farm income was not obtained<sup>4</sup>, only that on gross, the latter instead of the former was analyzed comparing the base figures at the time of appraisal and the target figures, and it was found that Malaka and Ponre-Ponre exceeded the original target figures.

Taking into consideration that the intended project outcome is to contribute to “increased food production mainly in rice”, the project effectiveness is judged in a comprehensive way which not only focuses on annual rice cultivated area and unit yield of major crops but also considers indicators such as the gross annual average farm income as reference.

Although the WUA formulation rate was also listed as an Operation and Effects indicator, this indicator shows a project output rather than effectiveness of the project. The effect of this indicator would be an improved management structure. Therefore this aspect will be analyzed in detail under “sustainability”.

Analysis results for the three subprojects are described separately below:

(1) Malaka Weir Irrigation Project (Table 4)

Looking at the shift in figures for Operation and Effect indicators, the steady increase in rice cultivated area and its unit yield is significant. The rice cultivated area remains less than 60% of the target for the rainy season, but for the dry season it increased significantly as a result of securing water resources. As a result, the total annual cultivated area at the time of the ex-post evaluation has reached over 80 % of the original target. According to the River Basin Management Office ("Balai Office"), before project implementation farmers planted rice, maize and peanuts only once in the rainy season and consumed maize and peanuts as daily staples. Rice consumption was limited to about once a week and special occasions such as weddings and funerals. After project implementation, rice planting was possible twice a year - one in the rainy season and again in the dry season. Also, they moved to wet-rice planting from dry planting, securing enough supply for the demand for rice as the main source of food.

On the other hand, actual figures for cultivated areas for maize, mung beans and peanuts ended up far from the targets. This can be largely attributed to a shift in food preference from maize to rice causing a relative decrease in demand for produce other than rice.

Looking at the unit yield by crop, all produce exceeded their targets. A significant improvement is also seen in the gross annual average farm income. It is likely that farmers benefited largely from the ability to plant rice in the dry season.

---

<sup>4</sup> It is considered difficult to obtain data on net annual average farm income as it is calculated by deducting farm management expenditure from gross farm income.

The WUA formulation rate remained at 45 % against the target of 100%. This is because the organization of WUA has taken longer than expected.

Table 4: Shift in Operation and Effect Indicators (Malaka Weir Irrigation Project)

Indicator	Base Year (2001)	Target set at Project Appraisal	Target modified at Mid-term Review (reference)		Actual at Mid-term Review (2007)	Actual at Ex-post Evaluation (2013: one year after project completion)
			Base Figure	Target Figure (2014: 2 years after project completion)		
Cultivated area by crop (ha)						
Rice (rainy season)	2,146	10,000	No change	6,000	2,300	5,716
Rice (dry season)	406	2,667	No change	No change	1,430	4,371
Maize	N/A	2,333	No change	No change	Rainy season 2,170 Dry season 1,180	672
Mung beans	N/A	2,000	No change	No change	768	285
Peanuts	N/A	2,500	No change	No change	N/A	60
WUA formulation rate (%)	33.33	100	No change	No change	83.9	45
Unit Yield by crop (ton/ha)						
Rice (rainy season)	2.3	2.5	No change	No change	3.0	4.3
Rice (dry season)	2.3	2.6	No change	No change	3.0	3.4
Maize	N/A	2.2	No change	No change	Rainy season 1.6 Dry season 1.2	2.6
Mung beans	N/A	0.84	No change	No change	0.87	1.2
Peanuts	N/A	1.3	No change	No change	N/A	1.6
Gross Annual Average Farm Income (1,000 Rp./year)	2,057	13,855	-	-	-	25,800
Net Annual Average Farm Income (1,000 Rp./year)	822	7,377	No change	No change	N/A	N/A

Source: Questionnaire survey results

Note: The definitions of each indicator are as follow. Cultivated area indicates total annual area of cultivation within the benefited area. WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks. Assuming that one WUA is formed per one block of tertiary canal. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times a crop is planted per year. For example, if rice is planted twice a year it is 200%. Gross annual average farm income indicates crop production volume multiplied by crop price. Net annual average farm income = gross annual average farm income – (total production cost – family labor cost – own land cost – equity interest).

## (2) Ponre-Ponre Dam Irrigation Project (Table 5)

Comparing the target figures to the actuals at the time of the ex-post evaluation, the area for rice cultivation exceeded the target in the rainy season but not in the dry season. Combined cultivated area for both seasons almost reached the total target figure. According to the Balai Office, farmers used to plant rice only once in the rainy season before project implementation, but after the project it became possible to plant in the dry season as well although it was only half of what was possible in the rainy season. The cultivated area of peanut reached 90% of the target. On the other hand, the actuals for the cultivated area for maize and mung beans, which

were consumed as alternative staples when rice planting was limited to the rainy season, were far below the targets. This may be explained by the fact that crops such as maize require less water and that they need water management / adjustment that is different from rice farming, as well as by the background fact that rice is becoming more important as the main source of food.

As for the yield per unit area, each product reached the target with rice and maize far exceeding their targets.

Although WUAs were more enhanced in Ponre-Ponre, the WUA formulation halted when the coverage exceeded 1,000 ha partly due to the regulation change that transferred the responsibility for supervision of WUA from the Ministry of Public Works (MOPW) to the MOA. In addition, Farmers' Associations (managed under the MOA as WUAs) were gaining higher positions relative to WUAs, which resulted in the low WUA formulation rate, at 23%.

Gross annual average farm income exceeded the target significantly. This can be mainly attributed to the fact that rice planting in the dry season was made possible and increased yield from each crop resulted in a larger volume of production.

Table 5: Shift in Operation and Effect Indicators (Ponre-Ponre Dam Irrigation Project)

Indicator	Base Year (2001)	Target set at Project Appraisal	Target modified at Mid-term Review (reference)		Actual at Mid-term Review (2007)	Actual at Ex-post Evaluation (2013: one year after project completion)
			Base Figure	Target Figure (2014: 2 years after project completion)		
Cultivated area by crop (ha)						
Rice (rainy season)	3,339	4,313	2,400	3,749	3,000	4,331
Rice (dry season)	N/A	2,157	No change	No change	N/A	1,500
Maize	N/A	2,157	No change	No change	500	600
Mung beans	266	1,294	No change	No change	N/A	70
Peanuts	381	2,157	No change	No change	1,000	2,000
WUA formulation rate (%)	41.67	100	N/A	No change	15.6	23
Unit Yield by crop (ton/ha)						
Rice (rainy season)	2.0	3.5	No change	No change	3.0	5.2
Rice (dry season)	3.2	3.5	No change	No change	N/A	4.8
Maize	N/A	2.0	No change	No change	1.0	5.0
Mung beans	0.25	1.2	No change	No change	N/A	1.4
Peanuts	0.35	1.4	No change	No change	1.0	1.4
Gross Annual Average Farm Income (1,000 Rp./ year)	1,624	9,157	-	-	-	15,500
Net Annual Average Farm Income (1,000 Rp./year)	871	5,193	No change	No change	3,326	N/A

Source: JICA internal information, mid-term review report, and questionnaire survey results

Note: The definitions of each indicator are as follows. Cultivated area indicates the total annual area of cultivation within the benefited area. WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks. Assuming that one WUA is formed per one block of tertiary canal. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. Gross annual average farm income indicates crop production volume multiplied by crop price. Net annual average farm income = gross annual average farm income – (total production cost – family labor cost – own land cost – equity interest).



Note: Photo taken on May, 2014

Photo 1: Ponre-Ponre Irrigation Dam



Note: Photo taken on May, 2014

Photo 2: Irrigated Farmland in Ponre-Ponre

### (3) Paguyaman Irrigation Project (Table 6)

Rice cultivated areas, particularly in the dry season, were increased significantly as a result of securing water resources, and the areas of both the dry and rainy seasons exceeded the actual figures at the time of the mid-term review as well as the target figures at the time of the appraisal. However, the expected amount of water did not reach marginal facilities in a stable manner and some farmers chose to grow sugar cane, renting their land to businesses.

On the other hand, the unit yield of rice exceeded the targets significantly. It is difficult to measure the effectiveness for maize, mung beans and peanuts as their target figures were not determined.

WUA activities remained at 40% at the time of ex-post evaluation, far from the target (100%). These existing associations showed active engagement such as hosting regular meetings, and farmers were showing improvement in performing planned tasks based on the rice planting calendar provided by the local Department of Agriculture (DOA). However, it has been only three years since the organization of WUA and more skills and accumulation of experience is necessary.

The gross annual average farm income was far below the target. A relation between the steady increase in cultivated areas as well as in the yield, mainly for rice, and the contribution of the project to poverty reduction was not found<sup>5</sup>.

---

<sup>5</sup> It can be assumed that the gross annual average farm income was supposed to be on an upward trend due to improvements in the rice cultivated area and unit yield, but it was not possible to confirm this from the answers of the executing agency. A possible reason may be the low reliability of data on the gross annual average farm income or the influence caused by the bad harvests of other crops (for the latter, judgment is difficult as no data related to each index of other crops was obtained from the time of project appraisal).



Table 6: Shift in Operation and Effect Indicators (Paguyaman Irrigation Project)

Indicator	Base Year (2001)	Target set at Project Appraisal	Target modified at Mid-term Review (reference)		Actual at Mid-term Review (2007)	Actual at Ex-post Evaluation (2013: one year after project completion)
			Base Figure	Target Figure (2014: 2 years after project completion)		
Cultivated area by crop (ha)						
Rice (rainy season)	2,160	2,713	2,090	6,880	3,529	5,774
Rice (dry season)	N/A	2,713	No change	6,880	512	5,774
Maize	188	N/A	No change	No change	1,942	1,105
Mung beans	N/A	N/A	No change	No change	N/A	N/A
Peanuts	N/A	N/A	No change	No change	N/A	N/A
WUA formulation rate (%)	75	100	N/A	No change	0	40
Unit Yield by crop (ton/ha)						
Rice (rainy season)	3.0	4.4	No change	No change	3.5-4.0	5.5
Rice (dry season)	N/A	4.6	No change	No change	N/A	5.7
Maize	1.0	N/A	No change	No change	3.0	4.2
Mung beans	N/A	N/A	No change	No change	N/A	0.9
Peanuts	N/A	N/A	No change	No change	N/A	1.1
Gross Annual Average Farm Income (1,000 Rp./year)	3,156	11,602	-	-	-	6,870
Net Annual Average Farm Income (1,000 Rp./year)	1,024	3,044	No change	No change	6,452	N/A

Source: JICA internal information, mid-term review report, and questionnaire survey results

Note: The definitions of each indicator are as follows. Cultivated area indicates the total annual area of cultivation within the benefited area. WUA formulation rate is calculated by dividing the number of WUA formed by the number of tertiary canal blocks. Assuming that one WUA is formed per one block of tertiary canal. Unit yield by crop indicates the yield per unit area by crop. Cropping intensity indicates how many times crop is planted per year. For example, if rice is planted twice a year it is 200%. Gross annual average farm income indicates crop production volume multiplied by crop price. Net annual average farm income = gross annual average farm income – (total production cost – family labor cost – own land cost – equity interest).

### 3.2.2 Qualitative Effects

Beneficiary surveys were conducted at seven sites in six provinces including the Malaka Weir Irrigation Project, Ponre-Ponre Dam Irrigation Project and Paguyaman Weir Irrigation Project. See Table 7 for the overview of survey respondents<sup>6</sup>. All of the respondents were the heads of households, and the average age was 41.3. A breakdown of respondents by upper

<sup>6</sup> Survey target: Beneficiary farmers extraction method: Through the MOPW Balai Office who executed each subproject, respondents were selected mainly from WUA members by river stream areas (upper, middle, lower streams). Survey method: Structural questionnaire (Face-to-face interview). Location and dates are as follows: Malaka: Central Malaka Sub-district, West Malaka Sub-district, Kobalima Sub-district and Weliman Sub-district of Malaka District, East Nusa Tenggara Province (3 May 2014), Ponre-ponre: Libureng Sub-district, Kahu Sub-district of Bone District, South Sulawesi Province (20 May 2014), Paguyaman: Tolango Hula Sub-district, Asparaga Sub-district, Wonosari Sub-district and Boliyohuto Sub-district of Gorontalo District, Gorontalo Province (28 and 29 April 2014), Benua Aporo: Basalah Sub-district of South Konawe District, Southeast Sulawesi Province (16 and 17 May 2014), Sausu: Balinggi Sub-district, Torue Sub-district of Parigi Moutong District, Central Sulawesi Province (14 May 2014), Telaga Lebur: Sekotong Sub-district of West Lombok District, West Nusa Tenggara Province (3 June 2014), Kempo: Kempo Sub-district, Manggilewa Sub-district of Dompu District, West Nusa Tenggara Province (30 May 2014).

stream, middle stream and lower stream cultivated areas is 75, 50 and 95 respectively. Of the 220 households, 139 were WUA members and 123 participate in WUA activities.

Table 7: Overview of Beneficiary Survey Respondents

Unit: person

Subproject	Number of Respondents (household)	Average Age of Household Head	Farming Location			Memberships of WUA	
			Upper stream	Mid-stream	Lower stream	No of members (members / total respondents)	No of active members (active members / total members)
Malaka Weir Irrigation	35	40.4	4	16	15	23 (65.7%)	13 (56.5%)
Ponre-Ponre Dam Irrigation	30	41.4	14	9	7	30 (100%)	30 (100%)
Paguyaman Weir Irrigation	33	46.1	11	13	9	32 (97.0%)	26 (81.3%)
(1) 3 pilot projects subtotal	98		29	38	31	85 (86.7%)	69 (81.2%)
Benua Aporo Weir Irrigation	31	40.0	0	2	29	0 (0%)	N/A
Sausu Weir Irrigation	29	43.0	8	10	11	23 (79.3%)	23 (100%)
Telaga Lebur Pond Irrigation	31	41.8	21	0	10	0 (0%)	N/A
Kempo Groundwater Irrigation	31	36.1	17	0	14	31 (100%)	31 (100%)
(2) Subtotal of remaining 4 (non-pilot)	152		46	12	64	54 (35.5%)	54 (100.0%)
(3) Total (1)+(2)	220	41.3	75	50	95	139 (63.2%)	123 (88.5%)

Source: Beneficiary survey results

The beneficiary survey results are summarized below in “changes in farming water supply”, “changes in rice yield” and “current status of rice farming”. The survey results from seven locations showed improvement in the farming water supply, improved rice yield and increased rice cultivations, thereby indicating the high effectiveness of the project was not limited to the three pilot projects.

#### (1) Changes in farming water supply

Approximately 70% of all respondents (152) answered that “rehabilitated / newly built irrigation facilities improved the water supply to farmland”. By subproject, the numbers were high at Malaka (85.7%), Kempo (80.6%), and Ponre-Ponre (76.7%) and in the mid-stream area (80.0%) by location.

On the other hand, the numbers of respondents who answered “Water supply is same as before project” were high at Benua Aporo (32.3%), Paguyaman (24.2%), Sausu (24.1%) and in the lower stream area (23.2%). Water gate operations and water distribution monitoring are mainly done by residents under the directions of the Balai Office or the local Department of

Water Resources (DOWR), and improvement in operation skills and maintenance activities is required in order to ensure sufficient water distribution to lower stream areas.

Table 8: Changes in Water Supply to Farmland

Unit: person

By Subproject / by Farming Location	Answer				Total
	Increased / improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Total	152 (69.1%)	40 (18.2%)	21 (9.5%)	7 (3.2%)	220
Breakdown by Subproject					
Malaka Weir Irrigation	30 (85.7%)	2 (5.7%)	3 (8.6%)	0 (0.0%)	35
Ponre-Ponre Dam Irrigation	23 (76.7%)	4 (13.3%)	2 (6.7%)	1 (3.3%)	30
Paguyaman Weir Irrigation	19 (57.6%)	8 (24.2%)	5 (15.2%)	1 (3.0%)	33
Benua Aporo Weir Irrigation	17 (54.8%)	10 (32.3%)	4 (12.9%)	0 (0.0%)	31
Sausu Weir Irrigation	19 (65.5%)	7 (24.1%)	2 (6.9%)	1 (3.4%)	29
Telaga Lebur Pond Irrigation	19 (61.3%)	4 (12.9%)	4 (12.9%)	4 (12.9%)	31
Kempo Groundwater Irrigation	25 (80.6%)	5 (16.1%)	1 (3.2%)	0 (0.0%)	31
Breakdown by Farming Location					
Upper stream	54 (72.0%)	13 (17.3%)	6 (8.0%)	2 (2.7%)	75
Mid stream	40 (80.0%)	5 (10.0%)	3 (6.0%)	2 (4.0%)	50
Lower stream	58 (61.1%)	22 (23.2%)	12 (12.6%)	3 (3.2%)	95

Source: Beneficiary survey results

## (2) Changes in rice yield

Looking at how farming may have improved (Table 9), over 70% of all respondents (157) indicated that “rice yield increased”. This tendency is significant at Ponre-Ponre Dam Irrigation Project (96.7%), Paguyaman Weir Irrigation Project (84.4%), Kempo Groundwater Irrigation Project (74.2%), Malaka Weir Irrigation Project (71.4%) and in the middle stream area (80.0%) and the upper stream area (78.7%). According to the Balai Office, in Kempo, farmers were able to plant in dry seasons after the project. In the Telaga Lebur Pond Irrigation Project area, dual cropping of rice was made possible, and the unit yield of rice as well as secondary produce increased. On the other hand, in the Benua Aporo and Sausu irrigation project areas, respondents who indicated “no change after project” or “decreased/aggravated after project” were approximately 20%, which is not low. This indicates that there is room for improvement in water supply management for more optimal timing and amounts.

121 farmers out of 220 checked both “increased rice yield” and “increased farming water supply” indicating that there is a strong correlation between these two. The project enabled farmers to secure sufficient water during the planting time and dry seasons, which appears to have been highly effective for rice farming.

Table 9: Changes in the Unit Yield of Rice

Unit: person

By Subproject / by Farming Location	Answer				Total
	Increased / improved after Project	Same as before Project	Decreased / Aggravated after Project	Others / N/A	
Total	157(71.4%)	40 (18.2%)	15 (6.8%)	8 (3.6%)	220
Of whom the number of beneficiaries who also stated their farm water supply increased	121	24	12	0	157
Breakdown by Subproject					
Malaka Weir Irrigation	25 (71.4%)	9 (25.7%)	0 (0.0%)	1 (2.9%)	35
Ponre-Ponre Dam Irrigation	29 (96.7%)	1 (3.3%)	0 (0.0%)	0 (0.0%)	30
Paguyaman Weir Irrigation	28 (84.8%)	2 (6.1%)	3 (9.1%)	0 (0.0%)	33
Benua Aporo Weir Irrigation	15 (48.4%)	6 (19.4%)	6 (19.4%)	4 (12.9%)	31
Sausu Weir Irrigation	16 (55.2%)	7 (24.1%)	6 (20.7%)	0 (0.0%)	29
Telaga Lebur Pond Irrigation	21 (67.7%)	7 (22.6%)	0 (0.0%)	3 (9.7%)	31
Kempo Groundwater Irrigation	23 (74.2%)	8 (25.8%)	0 (0.0%)	0 (0.0%)	31
Breakdown by Farming Location					
Upper stream	59 (78.7%)	12 (16.0%)	2 (2.7%)	2 (2.7%)	75
Mid stream	40 (80.0%)	6 (12.0%)	4 (8.0%)	0 (0.0%)	50
Lower stream	58 (61.1%)	22 (23.2%)	9 (9.5%)	6 (6.3%)	95

Source: Beneficiary survey results

### (3) Current status of rice farming

Table 10 shows the current status of rice farming with the 220 beneficiary farmers by season and stream area. About 70% farmers (161) plant rice twice a year, and especially Malaka Weir Irrigation Project, Ponre-Ponre Dam Irrigation Project, Benua Aporo Weir Irrigation Project and Sausu Weir Irrigation Project show high dual-cropping rates at approximately 90 to 100 %. Also, the dual cropping rate is high in the middle stream area (just under 90 %, 46 out of 50). Dual cropping at the Paguyaman Weir Project is just under 70% (22), but the remaining 30 % or so responded either “plant three times” or “plant four times” indicating that all of the respondents plant at least once in dry season and that the rice planting rate is going up as well. At Kempo Groundwater Irrigation Project, 28 farmers (over 90%) answered that they planted once (rainy season only), but 19 of them indicated that the rice yield increased after the project. That gives the implication that even when they only “planted once” there had been some improvement in place.

Looking at the correlation between the number of plantings and how the rice yield performed, farmers who planted either “three times a year” or “four times a year” all indicated that their “rice yield increased”, so the increase in the number of plantings including during dry seasons can be attributed to the project implementation. In addition, 71.4% of the farmers who “planted twice a year”, and 76.3% who “planted once a year” answered that their “rice yield increased” indicating that the project effectiveness is recognized by a large number of beneficiaries.

Table 10: Changes in the Number of Rice Plantings

Unit: person

By Subproject / by Farming Location	No of Crop: 0 time	No of Crop: 1 time	No of Crop: 2 times		No of Crop: 3 times		No of Crop: 4 times	Total
	rainy season: 0 dry season: 0	rainy season: 1 dry season: 0	rainy season: 2 dry season: 0	rainy season: 1 dry season: 1	rainy season: 2 dry season: 1	rainy season: 1 dry season: 2	rainy season: 2 dry season:2	
Total	8 (3.6%)	38 (17.3%)	25 (11.4%)	136 (61.8%)	4 (1.8%)	2 (0.9%)	7 (3.2%)	220
Of whom the number of beneficiaries who also stated their unit yield of rice increased	0	29	21	94	4	2	7	157
Breakdown by subproject								
Malaka Weir Irrigation	1 (2.9%)	0 (0.0%)	2 (5.7%)	32 (91.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	35
Ponre-Ponre Dam Irrigation	0 (0.0%)	3 (10.0%)	15 (50.0%)	12 (40.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	30
Paguyaman Weir Irrigation	0 (0.0%)	0 (0.0%)	0 (0.0%)	22 (66.7%)	4 (12.1%)	0 (0.0%)	7 (21.2%)	33
Benua Aporo Weir Irrigation	4 (12.9%)	0 (0.0%)	0 (0.0%)	27 (87.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	31
Sausu Weir Irrigation	0 (0.0%)	0 (0.0%)	0 (0.0%)	29 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	29
Telaga Lebur Pond Irrigation	3 (9.7%)	7 (22.6%)	5 (16.1%)	14 (45.2%)	0 (0.0%)	2 (6.5%)	0 (0.0%)	31
Kempo Groundwater Irrigation	0 (0.0%)	28 (90.3%)	3 (9.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	31
Breakdown by Farming Location								
Upper stream	2 (2.7%)	17 (22.7%)	12 (16.0%)	36 (48.0%)	3 (4.0%)	2 (2.7%)	3 (4.0%)	75
Mid stream	0 (0.0%)	0 (0.0%)	6 (12.0%)	40 (80.0%)	1 (2.0%)	0 (0.0%)	3 (6.0%)	50
Lower stream	6 (6.3%)	21 (22.1%)	7 (7.4%)	60 (63.2%)	0 (0.0%)	0 (0.0%)	1 (1.1%)	95

Source: Beneficiary survey results

Note: Beneficiary farmers who grow rice in dry seasons also grow rice in rainy seasons

In summary, irrigation facilities provided through the project enabled dual cropping and dry season planting in Eastern Indonesia where water resources were scarce and various development efforts are still required. The effect and importance of the project are mostly apparent in both qualitative and quantitative analyses. Therefore, it is determined that the objective of the project, “Increase food production mainly in rice” has been achieved. Thus the effectiveness of the project is high.

### 3.3 Impact

#### 3.3.1 Intended Impacts

##### (1) Household finances

In the beneficiary survey on farming income, 164 farmers (74.5%) answered that their income “increased after the project”. According to related information provided by the Balai

Office, in post-project Ponre-Ponre, the financial situation of beneficiary farmers improved due to the increased farming income; houses were renovated, and migrating workers to overseas (to countries like Malaysia) also decreased. Similarly, household income increased in the Paguyaman Irrigation Project area, where farmers were able to afford vehicles, improve children’s schooling and renovated their houses as well. In Kempo, planting in both seasons made farmers be more economically wealthy, and many households are now able to afford motorbikes.

As for farming expenses, 187 farmers (85.0%) answered that the expenses “increased after the project”. Some of these expenses were used to secure additional labor and to purchase seedlings and chemicals. 94 beneficiaries (42.7%) answered that they needed a larger labor force after the project indicating that they were responding to increased yield amount. On the other hand, 87 respondents (39.5%) maintained the “same labor force as before the project” indicating that they either 1) continued to use the same farming method regardless of the changes in yield per unit area or 2) achieved more efficient farming using agricultural machinery<sup>7</sup>.

100 farmers (45.5%) responded that their “non-farming expenses increased” showing a trend that expenses are on the rise regardless of their being farming or non-farming related. As for savings, 73 respondents (33.2%) answered that they “increased after the project”, but 47 respondents (21.4%) said that they remained the “same as before the project”. That implies that livestock such as farm animals are raising the number for “Other / Not Applicable” (91 respondents (41.4%)).

Table 11: Household Finances

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others/ N/A	
Household farm income	164 (74.5%)	36 (16.4%)	19 (8.6%)	1 (0.5%)	220
Farm labor	94 (42.7%)	87 (39.5%)	2 (0.9%)	37 (16.8%)	220
Farm expenses	187 (85.0%)	26 (11.8%)	6 (2.7%)	1 (0.5%)	220
Job opportunities for family members	66 (30.0%)	61 (27.7%)	10 (4.5%)	83 (37.7%)	220
Household Non-farm Income	45 (20.5%)	64 (29.1%)	11 (5.0%)	100 (45.5%)	220
Household Non-farming Expenditure	100 (45.5%)	33 (15.0%)	8 (3.6%)	79 (35.9%)	220
Savings	73 (33.2%)	47 (21.4%)	9 (4.1%)	91 (41.4%)	220

Source: Beneficiary survey results

Note: For “Job opportunities for family members” and “non-farming income”, 30% to 50% answered “Other / Not applicable”. This is because not many beneficiaries engage in occupations other than farming, so it is difficult to compare with the situation pre-project.

<sup>7</sup> For example, in Sausu, farmland per household is as large as 10 ha, so each household uses farm machines.

(2) Improvement in life infrastructure

In the beneficiary survey, 157 farmers (71.4%) answered that the quality of water used for farming and households was improved by the project irrigation facilities. The water supplied through the canals is used not only for farmland but also for people’s daily lives (such as laundry and bathing). With rehabilitations and new construction of canals, water became cleaner as impurities were removed from water regularly. Farmers seemed to feel the effect of well-maintained irrigation systems and the outcome of their maintenance activities.



Note: Photo taken in May, 2014

Photo 3: Tertiary Canal in Malaka Weir Irrigation Facilities

Water supply to residences was not an objective of this project. Combined with the fact that residents face serious conditions unique to dry regions where they need to rely largely on rain water, responses to “Water supply to household” were “same as before project” for 115 farmers (52.3%) and “Other / Not applicable” for 44 farmers (20.0%). On the other hand, 57 farmers (25.9%) answered that the water supply to household “increased after the project”. Since water is available for laundry and other daily necessities if a resident goes to a canal or another irrigation facility, the need for water for daily use is satisfied to some extent and people enjoy additional positive effects brought by the project as well.

A more significant contribution to residents’ living environment is seen in improved road conditions along the canal facilities. This contribution is indicated in the beneficiary responses where 115 beneficiaries (52.3%) answered that road access improved around the irrigation facilities. This implies that surrounding road improvement that comes with canal development has contributed to improvement in the living environment of beneficiaries.

Table 12: Improvement in Life Infrastructure

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others/ N/A	
Water Quality	157 (71.4%)	34 (15.5%)	24 (10.9%)	5 (2.3%)	220
Water Supply to Household	57 (25.9%)	115 (52.3%)	4 (1.8%)	44 (20.0%)	220
Road Access	115 (52.3%)	68 (30.9%)	32 (14.5%)	5 (2.3%)	220

Source: Beneficiary survey results

Note: Beneficiaries’ answers to the condition of the water supply to households implies mainly water for general purposes (laundry, swimming and such).

(3) Improvement in health, hygiene and education

In the beneficiary survey, 137 farmers (62.3%) answered that “health and hygiene improved”. Also, 128 farmers (58.2%) answered that “children’s education opportunities increased”. Expenses for health and education add up as they include medical supplies, clothing, transportation costs to go to school and healthcare facilities. Increased income achieved through the project appears to make these expenses more affordable contributing to a better quality of life.

Table 13: Improvement in Health, Hygiene and the Education Environment

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others/ N/A	
Health and Hygiene of Household	137 (62.3%)	58 (26.4%)	16 (7.3%)	9 (4.1%)	220
Education Level for Children	128 (58.2%)	49 (22.3%)	2 (0.9%)	41 (18.6%)	220

Source: Beneficiary survey results

(4) Diversity in local market and businesses

In the beneficiary survey, 131 farmers (59.5%) out of the total 220 answered that “the local market became more active after the project”. It is conceivable that the project contributed to increased yield in rice and other crops and that farmers started selling the surplus at the local market.

As for “diversity in local businesses”, 74 farmers (33.6%) answered that they “diversified”, and 123 farmers (55.9%) answered “same as before project”. Poverty rates in the project areas were high and it is possible that any increase in yield was directed to the farmers’ own consumption as they had been faced with challenges in rice production and consumption. It is not confirmed yet whether there is any trend where a surplus in crops is invested in the manufacture of processed agricultural products for new business development. A significant shift in farmers’ attitude and mindset toward businesses would be required. Therefore, it is advisable to monitor local trends at an ongoing basis.

Table 14: Diversity in Local Market and Businesses

Unit: person

Question Item	Answer				Total
	Increased / Improved after Project	Same as before Project	Decreased / Aggravated after Project	Others/ N/A	
Local Markets	131 (59.5%)	60 (27.3%)	25 (11.4%)	4 (1.8%)	220
Diversity of Local Businesses	74 (33.6%)	123 (55.9%)	17 (7.7%)	6 (2.7%)	220

Source: Beneficiary survey results



In summary, post-project improvement is recognized in farming income and farmers' savings to secure a cash surplus, which suggests effectiveness of the project. As for the life infrastructure, improvement in water quality and road access seems to contribute to an overall betterment of residents' living environment indicating indirect effectiveness of the project. In addition, the health, hygiene, and education of residents are mostly improving. While local markets are becoming more active, signs of business investment and new business development, which would require specific technology and skills, are yet to be seen. Although a short-term, rapid income increase is not expected, it is apparent that the beneficiaries' quality of life is improving steadily.

As a result of considering these comprehensively, the impact of this project, "contribution to poverty reduction in the project areas" is deemed to be confirmed.

### 3.3.2 Other Impacts

#### (1) Impact on the natural environment

According to Indonesian domestic law<sup>8</sup>, 19 of the subprojects were classified as Category A where the submission of an environmental impact assessment report was mandatory and 8 subprojects were classified as Category B. Since this project is a sector loan, it was expected that the Scope of Work for subprojects may be reviewed after project implementation and that the number of subprojects may change accordingly<sup>9</sup>. Therefore, it was agreed that construction would commence upon approval by JICA after the executing agency conducted environmental screening based on the "JBIC Environmental Guidelines for ODA Loans" (October, 1999).

At the time of the ex-post evaluation, the Evaluator attempted to verify if the process described above was completed. However, the project completion report did not contain any information on environmental appraisal, and it turned out that the executing agency was not aware of whether environmental impact assessments had been conducted, nor did they know the status of environmental monitoring, partly due to decentralization. Under these circumstances, it was not possible to verify whether environmental impact assessments were carried out or how things were monitored with the subprojects classified as A or B at appraisal. This is except for the seven subprojects where a site survey, survey and detailed analyses were conducted.

For the 7 subprojects where a site survey was conducted, environmental approvals and the monitoring status are indicated in Table 15. At the time of ex-post evaluation the sites are still monitored except for the Malaka and Sausu irrigation projects.

---

<sup>8</sup> The Decree of the State Minister of the Environment No.17/2001. This law was partially revised in 2006 (the Decree of the State Minister of the Environment No.11/2006).

<sup>9</sup> Nine out of 19 projects were divided into more than two projects after the project started.

Table 15: EIA and Monitoring at Subprojects Selected for Site Survey

Subproject	Environmental Category at Appraisal	Assessment Conducted	Time Approved	Notes: Monitoring Status
Malaka Weir Irrigation Project	A	Unknown	Before project implementation	Air pollution due to heavy machinery use and dust emission was confirmed in 2001- 2003. Need to confirm if inland fishing takes place in the reservoir. As of the time of ex-post evaluation, not monitored.
Ponre-Ponre Dam Irrigation Project	A	Environmental impact assessment (2001)	Before project implementation	Currently As of the time of ex-post evaluation, the Provincial DOWR conducts monitoring and reports to the MOPW.
Paguyaman Weir Irrigation Project	A	Environmental impact assessment	Before project implementation (2004)	Monitoring conducted by Provincial DOWR as of the time of ex-post evaluation. No major issues were confirmed.
Benua Aporo Weir Irrigation Project	A	Environmental impact assessment	Before project implementation	Monitoring conducted by Provincial DOWR as of the time of ex-post evaluation. No major issues were confirmed.
Sausu Weir Irrigation Project	A	Unknown	Unknown	As the Central Sulawesi Irrigation Project, classified as Category A at appraisal. Evaluated in detail after project commencement and divided into three subprojects including Sausu. Currently not monitored
Telaga Lebur Pond Irrigation Project	A	Environmental impact assessment (2006)	Before project implementation	As the West Nusa Tenggara Pond Improvement Project, classified as Category A at appraisal. Evaluated in detail after the project kicked off and divided into three subprojects including Telaga Lebur. Monitoring conducted by Provincial DOWR as of the time of ex-post evaluation. No major issues were confirmed.
Kempo Groundwater Irrigation Project	B	Environmental impact assessment	Before project implementation	As the West Nusa Tenggara Groundwater Irrigation Project, classified as Category B at appraisal. Evaluated in detail after the project kicked off and divided into three subprojects including Kempo. Monitoring conducted by Provincial DOWR as of the time of ex-post evaluation. No major issues were confirmed.

Source: Questionnaire survey results and JICA internal document

## (2) Land acquisition and resettlement

At the time of project appraisal, a total of 683 ha land acquisition and resettlement of 33 households were anticipated at nine sites.

Table 16 summarizes the original plan and actuals for land acquisition and resettlement. There is little information regarding land acquisition and resettlement in the project completion report. The Evaluator attempted to obtain related information, but the executing agency was not aware of details of these matters partly due to government decentralization.

Table 16: Status of Land Acquisition and Relocation of Residents

	Plan		Actual	
	Subproject	Scale	Scale	Notes
Land Acquisition	Nangkara/Dompu Irrigation	26 ha	Unknown	-
	Sumbawa Dam Additional Works	30 ha	45.82 ha	Evaluated in detail after the project kicked off. Divided into two subprojects (Pelaparado Dam Irrigation and Batu Bulan Dam Irrigation). For the Batu Bulan Dam Irrigation Project, 28 ha of land was acquired for weir construction (March 2004), and 18.82 ha of land was acquired for updating a pipe line route (Nov 2003).
	Malaka Weir Irrigation	48 ha	0 ha	After consultation with residents land acquisition was canceled.
	Wae Dingin Irrigation	120 ha	0 ha	After consultation with residents land acquisition was canceled.
	Ponre-Ponre Dam Irrigation	304 ha	559 ha	Land for irrigation facilities: 136ha, Land for dam: 423ha
	Benua Aporo Weir Irrigation	87 ha	0 ha	Details unknown
	Sangkub Weir Irrigation	29 ha	Unknown	0ha for the right bank
	Paguyaman Weir Irrigation	22 ha	0 ha	The government completed land acquisition on the right bank 10 years prior to the project (1992). Details for other locations are unknown.
	Bella Kumpi Weir Irrigation	17 ha	Unknown	-
	Total	683 ha	-	-
Resettlement	Ponre-Ponre Dam Irrigation Project	33 households	33 households	All households received home renovations and purchased vehicles after relocation. No specific long term problems regarding compensation.

Source: Questionnaire survey results and JICA internal document

### (3) Unintended positive/negative impact

None.

In summary, both qualitative and quantitative effects and the significance of the project irrigation facilities are high, and from the beneficiary survey, the project impact, “contribution to poverty reduction in the project areas”, is also apparent. On the other hand, some information regarding environmental impact and land acquisition was missing. In light of the above, it is determined that certain effects were confirmed in this project. Therefore the effectiveness and impact of the project are fair.

## 3.4 Efficiency (Rating: ②)

### 3.4.1 Project Output

#### (1) Irrigated area

The total irrigated area was 99,250 ha at the time of appraisal. The total coverage increased to 117,588 ha as of the time of the ex-post evaluation.

(2) Number of subprojects / contracts

At the time of project appraisal, 27 subprojects were planned, in order to construct and rehabilitate irrigation facilities in a vast area covering Bali province, West Nusa Tenggara province, East Nusa Tenggara province and five provinces on Sulawesi Island. At the time of the ex-post evaluation, it was confirmed that the number of subprojects had increased to 52. This is because some subprojects were further divided<sup>10</sup> as a result of more detailed design review conducted during the implementation period. Table 17 shows the subprojects planned and implemented in this project.

Table 17: Planned and Implemented Subprojects

Province	Plan		Actual		Number of contracts	
					LCB	ICB
Bali	1	Bali Weir Irrigation Improvement	1	Saba Basin Irrigation	1	0
			2	Unda Basin Irrigation	1	0
			3	Bilukpoh-Tukadaya Basin Irrigation	1	0
	2	Bali Groundwater Irrigation	4	Bali Groundwater Irrigation	1	0
West Nusa Tenggara	1	Nangkara/Dompu Irrigation	1	Nangkara Irrigation Right Bank	1	0
	2	West Nusa Tenggara Pond Improvement	2	Pompong Pond Irrigation	1	0
			3	Tibu Kuning Pond Irrigation	1	0
			4	Telaga Lebur Pond Irrigation	1	0
			5	Pelaparado Dam Irrigation	3	0
	3	Sumbawa Dam Additional Works	6	Batu Bulan Dam Irrigation	2	0
			7	Jurang Sate Irrigation Improvement	1	0
	4	West Nusa Tenggara Irrigation Improvement	8	Mamak-Kakiang Irrigation Improvement	1	0
			9	Sambella Groundwater Irrigation	1	0
			10	Santong Irrigation	1	0
			11	Sambelia Groundwater Irrigation	1	0
	5	West Nusa Tenggara Groundwater Irrigation	12	Kempo Groundwater Irrigation	1	0
			13	Sumbawa Groundwater Irrigation		

<sup>10</sup> One of the reasons why subprojects were divided into more segments was because the scope for each subproject at appraisal was based on a rough estimate and more accurate design requirements were clarified only after a detailed on-site survey and further design reviews, resulting in a more realistic project scope later. Additionally, some subprojects were rehabilitation works of existing Japanese ODA loan projects (such as rehabilitation of the Jeneberang River dam and its hydraulic drop in South Sulawesi province), and four subprojects were taken over from the Small Scale Irrigation Project (3).

Province	Plan		Actual		Number of contracts	
					LCB	ICB
East Nusa Tenggara	1	Malaka Weir Irrigation	1	Malaka Weir Irrigation	5	0
	2	Wae Dingin Weir Irrigation	2	Wae Dingin Weir Irrigation	1	0
	3	East Nusa Tenggara Irrigation & Pond Improvement	3	Kadumbul Weir Irrigation	1	0
			4	Bena Weir Irrigation	1	0
			5	Mautenda Irrigation Complex	1	0
			6	Danau Tua Pond Irrigation	1	0
			7	Haekrit Pond Irrigation	1	0
	4	NTT Groundwater Irrigation	8	Lokojange Pond Irrigation	1	0
			9	Ponu-Fatuoni Groundwater Irrigation	1	0
			10	Maumere Groundwater Irrigation	1	0
South Sulawesi	1	Ponre-Ponre Dam Irrigation	1	Ponre-Ponre Dam Irrigation	1	1
	2	Sadang Irrigation Improvement	2	Sadang Irrigation Improvement	1	0
	3	South Sulawesi Irrigation Improvement	3	Tabo-tabo Irrigation Improvement	1	0
			4	Kalamisu Irrigation Improvement	1	0
			5	Lamasi Kiri Irrigation	1	0
			6	Kanjiro Irrigation	1	0
	7	Rubber dam and Groundsill Rehabilitation <sup>11</sup>	1	0		
4	South Sulawesi Groundwater Irrigation	8	South Sulawesi Groundwater Irrigation	1	0	
Southeast Sulawesi	1	Benua Aporo Weir Irrigation	1	Benua Aporo Weir Irrigation	2	0
	2	Southeast Sulawesi Irrigation Improvement	2	Kambara Irrigation	1	0
			3	Watotobi Irrigation	1	0
	3	Southeast Sulawesi Groundwater Irrigation	4	Konawe Selatan GW Irrigation	1	0
			5	Buton GW Irrigation	1	0
Central Sulawesi	1	Bela Kumpi Weir Irrigation	1	Bela Kumpi Weir Irrigation	1	0
	2	Central Sulawesi Irrigation Improvement	2	Sinorang Irrigation	1	0
			3	Karaopa Irrigation	1	0
			4	Sausu Weir Irrigation	2	0
3	Central Sulawesi Groundwater Irrigation	5	Central Sulawesi Groundwater Irrigation	1	0	
North Sulawesi	1	Sangkub Weir Irrigation	1	Sangkub Weir Irrigation	1	2
	2	North Sulawesi Irrigation Improvement	2	North Sulawesi Irrigation Improvement	1	0
	3	North Sulawesi Groundwater Irrigation	3	North Sulawesi Groundwater Irrigation	1	0
Gorontalo	1	Paguyaman Weir Irrigation	1	Paguyaman Weir Irrigation	1	3
	2	Gorontalo Irrigation Improvement	2	Gorontalo Irrigation Improvement Phase-1 (4 sites)	1	0
			3	Gorontalo Irrigation Improvement Phase-2 (2sites)	1	0
3	Gorontalo Groundwater Irrigation	4	Gorontalo Groundwater Irrigation	1	0	
Total	27		52		60	6

Source: Developed by the Evaluator based on related documents

Note: LCB: Local Competitive Bidding, ICB: International Competitive Bidding

<sup>11</sup> Government of Japan has extended its assistance to the rehabilitation of the Jeneberang River dam and its hydraulic drop by providing ODA loans to “Lower Jeneberang River Urgent Flood Control Project” (FY1984) (L/A amount: 5,381 million yen) and “Bili-Bili Irrigation Project” (FY1996) (L/A amount: 5,472 million yen).

At the time of appraisal, the number of contract packages was estimated at 28. With the increase in subprojects, the number of contracts had reached 66 at the time of ex-post evaluation<sup>12</sup>.

(3) Consulting Services

At the time of appraisal, consulting services worth 26,636 man months were planned for

(a) - (g) below:

(a) Project management

- Support at the central government level for the entire project
- Support at the local government level for the execution of each subproject

(b) Research for future irrigation development program formulation in Eastern Indonesia

- Survey, design, pre-qualification appraisal and bidding assistance, construction management for civil engineering work in each subproject

(c) Enhancement of WUA and skills development in Provincial / District DOWR

- Building structures for the formulation and enablement of WUA (collaboration with NGOs and local academic institutions)
- Providing guidance to WUA for operation and maintenance, and agricultural activities (facilitation through NGOs and local academic institutions)
- Skills development for provincial / district irrigation department staff for project implementation and operation and maintenance

(d) Dam irrigation project supervision

(e) Weir irrigation project supervision

(f) Irrigation rehabilitation project supervision

(g) Groundwater irrigation project supervision

- Quality management by each contractor related to civil engineering

During the project implementation period, the contract was updated with additional items listed below, and the actual for the total consulting service came in at 43,775 man months (increased by 17,139 man months). This increase was unavoidable given the increasing management works and additional services required due to the increase in subprojects and construction contract packages.

---

<sup>12</sup> Multiple contract packages were in place when a contract was divided into LCB and ICB and when construction took place in multiple locations. As a result, the number of construction contracts increased in proportion to the number of subprojects.

Table 18: Background of Provision of Additional Consulting Services

Additional Works	Background
Detailed design for the Kelara Karalloe Dam (South Sulawesi province)	Required in order to ensure the quality of technical service for increasing the project maturity.
Technical assistance for agriculture extension activities	Required in order to strengthen farmers' capability and enhance agriculture extension works through employment of community workers.
Support for scoping the subsequent project (Decentralized Irrigation System Improvement Project in Eastern Region of Indonesia (II))	Required for design review of subsequent project, pre-qualification and preparation of bidding document.
Increasing amount of project management work	Required to cope with the increase in the number of contract packages.

Source: JICA internal documents.

### 3.4.2 Project Input

#### 3.4.2.1 Project Cost

The actual cost of the project was 29,549 million yen against the planned project cost of 31,806 million yen (92% of the plan). Despite the increase in the contract packages due to subproject segmentalization and significant additions to consulting services, the cost was lower than planned due to the high appreciation of the Japanese yen and depreciation of the Indonesian rupiah during the project implementation period.

Table 19: Plan and Actual of Project Cost

Unit: million yen

Budget Item	Plan						Actual					
	Foreign Currency		Local Currency		Total		Foreign Currency		Local Currency		Total	
	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan
Construction	1,221	1,221	19,656	19,656	20,877	20,877	698	698	19,506	19,506	20,205	20,205
Equipment	0	0	260	260	260	260	0	0	0	0	0	0
C/S	1,220	1,220	3,618	3,618	4,838	4,838	1,649	1,649	3,687	3,687	5,336	5,336
Contingency	64	64	1,023	996	1,087	1,060	0	0	0	0	0	0
Land acquisition	0	0	540	0	540	0	0	0	435	0	435	0
Administration	0	0	1,541	0	1,541	0	0	0	1,340	0	1,340	0
Tax and duties	0	0	2,663	0	2,663	0	0	0	2,233	0	2,233	0
Total	2,505	2,505	29,301	24,530	31,806	27,035	2,347	2,347	27,202	23,194	29,549	25,541

Source: Questionnaire survey response from executing agency

Note 1: Numbers are rounded to the millions, so there are some discrepancies between the total amount and the sum of items

Note 2: C/S: Consulting Services

#### 3.4.2.2 Project Period

The planned project period was 63 months from October 2002 (L/A signed) to December 2007 (expected completion of consulting services contract). However, the actual project duration was 108 months from October 2002 to December 2011 (171% of the plan), exceeding the original plan significantly. The extension was unavoidable to achieve an appropriate project

outcome given the increase in the number of subprojects, construction contract packages and additional services.

The main reasons for the extended project period are as follows:

(a) Increased construction contracts

The number of contract packages was initially 28. In the end, the number of contracts for the completed subprojects was 66.

(b) Extended construction due to delays in construction contract lots

For the reason (a) above, it took longer than expected to complete signing of construction contracts. Because of this delay, consulting services were extended by approximately one year.

(c) Additional construction contracts

Certain components were added to Sausu Weir Irrigation Improvement (Central Sulawesi province), Sangkub Weir Irrigation (North Sulawesi province), and Paguyaman Weir Irrigation (Gorontalo province), which increased desk work. As such and accordingly, the consulting services period was extended by two years.

(d) Additional services

Following items were added to consulting services:

- Support for scoping the subsequent project (Decentralized Irrigation System Improvement Project in Eastern Region of Indonesia (II))

A project formulation survey was conducted from September 2005 to June 2008 and reports were submitted from April to November 2007. Design review was conducted from July 2006 to August 2008. Combined with reviews on other services, this contributed to the extension of the project for the total of approximately one year.

- Increased works on project management

With (a) to (c) of the above, the volume of management work increased. Combined with reviews on other services, this contributed to the extension of the project for the total of approximately three years.

### 3.4.3 Results of Internal Rate of Return (Reference only)

The Financial Internal Rate of Return (FIRR) at project appraisal was not calculated, and the Economic Internal Rate of Return (EIRR) of the project was 21.33%. Below is the rationale for the EIRR at the time of calculation:



Cost:	Cost required for construction and operation and maintenance of this project
Benefit:	Expansion of irrigated area, increase in unit yield, increased crop production volume through higher land usage rate
Project life:	Dam and pond irrigation: 50 years after project commencement Weir and groundwater irrigation: 25 years after project commencement
Period for effect realization:	Production of each product should increase 20% of the target annually and reach 100 % in the 5th year

In this ex-post evaluation, FIRR is not calculated as in the appraisal. Since this project has numerous subprojects, information gathering within the ex-post evaluation period is difficult. In addition, output content is very different from what was planned initially, therefore a comparison of before and after the project cannot be done appropriately. For these reasons, it is not possible to analyze EIRR in this ex-post evaluation.

To summarize, although the project cost was within the plan, the project period far exceeded the plan. Therefore, efficiency of this project is fair.

### 3.5 Sustainability (Rating: ②)

#### 3.5.1 Institutional Aspects of Operation and Maintenance

Domestic law and government regulations enacted in 2004 and 2006<sup>13</sup> define the operation and maintenance framework based on the difference of irrigation area. When the area becomes smaller-scale, subordinate organizations become responsible for the operation and maintenance of primary and secondary canals from the MOPW, provincial governments, to district governments. WUAs take the main roles in the operation and maintenance of tertiary canals no matter how big the irrigated area is (Table 20). The above government regulation stipulates an exception that “when a subordinate organization does not have financial / managing abilities, its supervising organization shall be accountable” to remain flexible in the development of implementation arrangements for operation and maintenance.

<sup>13</sup> The Water Resources Law No.7 of 2004 (UUSDA 7/2004), the Government Regulation No.20 of 2006 (PP 20/2006). No new regulations / revisions regarding water resource management have been made since 2006.

Table 20: Organizations Responsible Officially Mandated for Operation and Maintenance

Irrigation Schemes	Primary Canal		Secondary Canal		Tertiary Canal	
	Source	Agency Responsible	Source	Agency Responsible	Source	Agency Responsible
Over 3000 ha and overlaps multiple provinces	MOPW	DGWR, MOPW	MOPW	DGWR, MOPW	Determined by WUA	WUA
Over 1000 ha and less than 3000 ha; overlaps multiple districts	Provincial government	Provincial DOWR	Provincial government	Provincial DOWR	Determined by WUA	WUA
Less than 1000 ha	District government	District DOI	District government	District DOI	Determined by WUA	WUA

Source: The Water Resources Law No.7 of 2004 (UUSDA 7/2004), the Government Regulation No.20 of 2006 (PP 20/2006)

Table 21 shows which organization is responsible for operation and maintenance at different levels of canal facilities in the 7 subprojects selected for site survey (Malaka Weir Irrigation, Ponre-Ponre Dam Irrigation, Paguyaman Weir Irrigation, Sausu Weir Irrigation Improvement, Telaga Lebur Pond Irrigation, Kempo Groundwater Irrigation). With Malaka Weir Irrigation, Ponre-Ponre Dam Irrigation, Benua Aporo Weir Irrigation and Sausu Weir Irrigation Improvement subprojects, the operation and maintenance of tertiary canals was transferred to WUA and streamlined according to regulations. In these four projects, WUA formulation rates are various: 45%, 23%, 12% and 100% respectively. In Ponre-Ponre, for instance, only 1,000 ha out of 4,337 ha is covered by WUA, and 80 volunteers per water gate are deployed to maintain the facilities. But they are not yet able to cover all of their tertiary canals. Except for the Sausu project where WUA formulation rate is 100%, local DOA is covering the shortage to assist WUA with tertiary canal maintenance.

The reason that local DOA are involved in tertiary canal management is that they are more needed at field level as they are closer, and mainly support WUA management and their activities on behalf of the MOA which is supposed to take responsibility in management of WUA as stipulated in the government regulation enacted in 2007<sup>14</sup>.

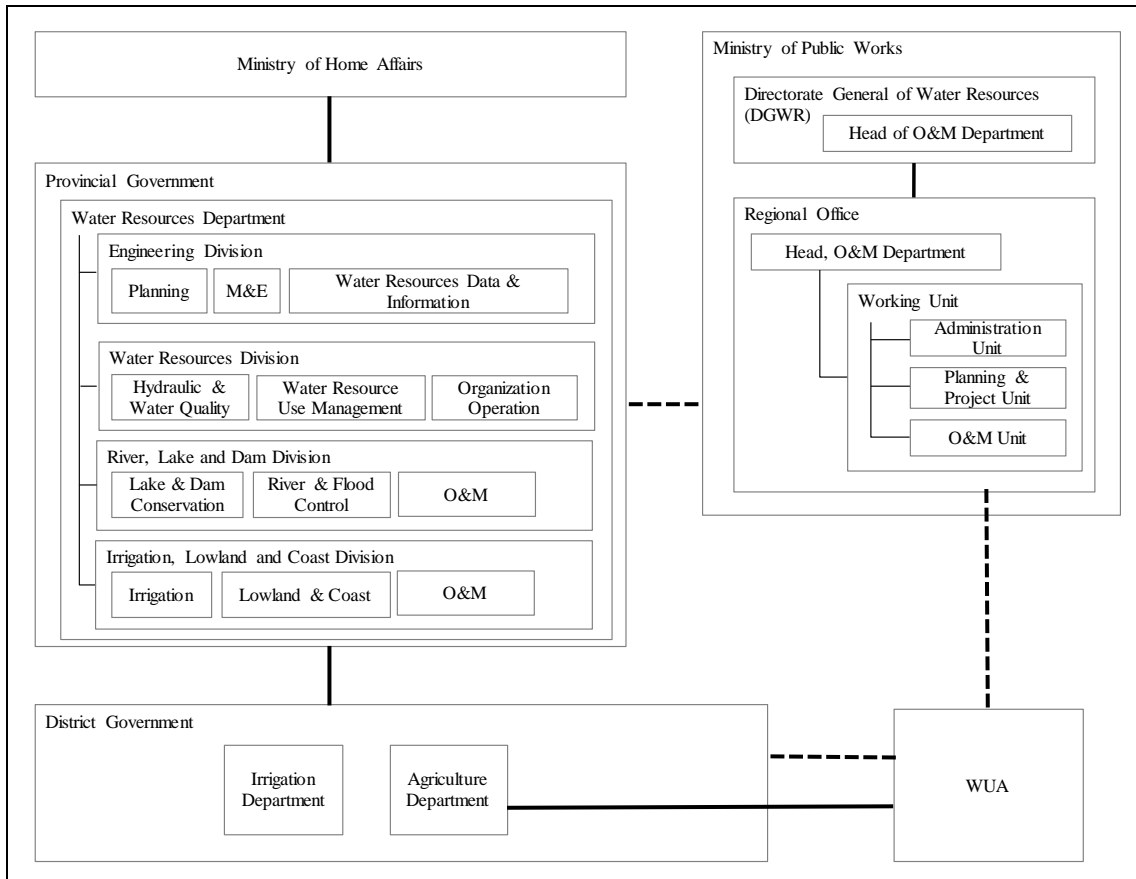
<sup>14</sup> The Government Regulation No.38 of 2007 (PP 38/2007)

Table 21: Organizations Responsible for Canal Facilities

Subproject	Irrigated area (ha)	Primary canals		Secondary canals		Tertiary canals		WUA Formulation Rate
		Source	Agency Responsible	Source	Agency Responsible	Source	Agency Responsible	
Malaka Weir Irrigation	5,716	N/A	Balai Office	N/A	Provincial DOWR	N/A	WUA and District DOA	45%
Ponre-Ponre Dam Irrigation	4,331	MOPW	Balai Office	Balai Office	Provincial DOWR	Local DOA	WUA (Supervised by local DOA)	23%
Paguyaman Weir Irrigation	5,774	N/A	Balai Office and WUA	N/A	Balai Office and WUA	N/A	Balai Office and WUA (Supervised by local government when needed)	40%
Benua Aporo Weir Irrigation	3,010	MOPW	Balai Office	MOPW	Provincial DOWR	Local DOA	WUA (Supervised by local DOA)	12%
Sausu Weir Irrigation	5,146	MOPW	Balai Office	Provincial Government	Provincial DOWR and WUA	WUA	WUA	100%
Telaga Lebur Pond Irrigation	102	MOPW	Balai Office	MOPW	Balai Office	MOPW	Farmers' Association and District DOA	0%
Kempo Groundwater Irrigation	102	N/A	Farmers' Association	N/A	Farmers' Association	N/A	Farmers' Association (Technical support by local government when needed)	0%

Source: Questionnaire survey results from executing agency

In Paguyaman, next, while the Balai Office and WUA are jointly responsible for canals from primary to tertiary, the WUA formulation rate remains at 40%. In order to cover the shortage, a structure has been built in which facility operation and maintenance is conducted with the coordination, collaboration and cooperation with the Provincial DOWR and District DOA on the ground. Figure 1 shows the cooperative structure among related organizations for operation and maintenance.



Source: Developed by the Evaluator based on the survey responses from the executing agency.

Note 1: It depends on each province and district how local government is involved in the management of the irrigation systems. This figure shows the institutional arrangements of Gorontalo Province for the management of the irrigation system of Paguyaman as one example.

Note 2: I The solid lines in the figure show the direct relations for jurisdiction and the chain of command in-between. The dashed lines show indirect and relevant conditions among organizations. For instance, WUA are under the jurisdiction of the MOA, and the solid line between the District DOA and WUA shows the leading role of DOA vis-à-vis WUA in Paguyaman on behalf of MOA. On the other hand, the dashed line between WUA and the MOPW shows indirect relations.

Figure 1: Organizational Structure for O&M at Paguyaman Weir Irrigation Project

Comments from a beneficiary who is engaged in the operation and maintenance of the Paguyaman facilities are quoted in the sidebar below.



Note: Gate operator (left) and interviewee, sluice operator (right)

Photo 3: Operation at Paguyaman Irrigation Facilities



Note: Photo taken in April, 2014

Photo 4: Dam at Paguyaman Irrigation Facilities

From a beneficiary interview: Farmer A, sluice operator (42 years old)

I am a WUA member, and chair the WUA Union comprised of several WUAs. I am in charge of sluice control when there is a flood at the Paguyaman irrigation facilities. I monitor the amount of weir water during the rainy season at rainy times of the day to see if a flood happens. When the water volume is high, I work with my friend who is in charge of the gate operation to open the weir gate.

Before we had these facilities, we relied on rain to grow rice, but now we can crop rice twice a year. I have 3 ha of farmland, and I can get 2,500 rupiah from 1 kilogram of rice. Combined with my wages as the sluice controller, my income has improved reasonably compared to the time we didn't have the facilities.

It's been only 3 years since we formed our WUA, so as an organization we need to learn more, but we are cooperating to protect the facilities. When it rains heavily at night, I come to help, and other residents who have heard the rain also gather to help. The residents, including myself, are all from the area, so we have known each other for a long time, and we trust each other.

(Interviewed on 28 April, 2014)

For Telaga Lebur Pond Irrigation and Kempo Groundwater Irrigation projects where the WUA formulation rate remains 0%, the Balai Office monitors the primary and secondary canals in Telaga Lebur, and Farmers' Associations<sup>15</sup> maintain the tertiary canals on behalf of WUAs. In Kempo, Farmers' Associations are particularly active and they take on all the maintenance from primary to tertiary.

As seen above, a legal system for irrigation facility management has been developed, and the jurisdiction and division of roles are being clarified. Based on this framework, related organizations are cooperating as required. Even with the subprojects where WUA formulation rates are low, strong field-level operation structures are present, as seen in the case where the local DOA and Balai Office cover the management of tertiary canals for WUA. Therefore there are few problems in the institutional aspect.

<sup>15</sup> Farmers' Associations are under supervision of the MOA as WUAs are.

### 3.5.2 Technical Aspects of Operation and Maintenance

#### (1) Technical skills required the operation and maintenance of canals

Regarding the current technical skills of operation and management of primary to tertiary canals under the structure seen above, the Evaluator conducted on-site hearings and interviewed staff from related organizations in the site survey to find the following:

##### (a) Malaka Weir Irrigation Project

Some voluntary efforts are made to respond to technical challenges. For example, agricultural water management technical staff are invited from the District DOA to solve technical issues. However, the water management skills of WUA staff, who are in charge of the management of tertiary canals, are not sufficient.

##### (b) Ponre-Ponre Dam Irrigation Project

WUA water management staff are lacking in both quality and quantity. Learning opportunities and directions from local DOA are desired.

##### (c) Paguyaman Weir Irrigation Project

Since the human resources of WUA are limited, retired technical staff are coaching board members of WUA with regard to water management and cultivation methodologies. Among the seven sites surveyed, only Paguyaman had such an effective use of retired engineers.

##### (d) Benua Aporo Weir Irrigation Project

A WUA is responsible for the operation and maintenance of tertiary canals supervised by local DOA. It was pointed out that the water management skills and technical knowledge are lacking on the part of the WUA, but that the supervising local DOA is not offering learning opportunities.

##### (e) Sausu Weir Irrigation Project

No information was available regarding skills for operation and maintenance as a result of the survey.

##### (f) Telaga Lebur Pond Irrigation Project

The central government conducts operation monitoring. A Farmers' Association is involved actively and manages the tertiary canals. Despite the availability of skills development training, the water management skills of technical staff are still not sufficient.

(g) Kempo groundwater Irrigation Project

A Farmers' Association is actively involved and canals are well maintained. Information on the technical level of the Farmers' Association was not available, but the local government is providing support and directions for the operation and maintenance of tertiary canals as required based on their water management expertise.

(2) Inspections and repair works of irrigation facilities

Table 22 shows the jurisdiction of responsibilities and the frequency of each inspection and repair works at each subproject irrigation facility. At each project, regular and periodic inspections and large-scale repair works are mainly in the hands of either Balai Office or local DOWR.

In many of the sites, sediments and mud get stuck and trash, sand and mud in irrigation canals at lower streams are more than the designed amount (See 3.5.4 Current Status of Operation and Maintenance). The present regular checkups and repairs are not technically sufficient or as frequent as required, which has hindered the proper operation of the site facility. Urgent improvement is desired, but detailed information on countermeasures for such an improvement was not obtained as a result of the site survey.

Table 22: Agencies Responsible for Maintenance Works, Frequency and Contents

Subproject	Item	Daily Inspection	Periodic Inspection	Large-scale Works
Malaka Weir Irrigation Project	Responsible organization	District DOWR	Provincial DOWR	Balai Office
	Frequency	Every two months	Once a year	As required
	Tasks	Weeding, sediment removal from primary canals	Sediment removal from secondary canals	Garbage and sediment removal, water gate maintenance, facilities rehabilitation
Ponre-Ponre Dam Irrigation	Responsible organization	Balai Office	Balai Office	Balai Office
	Frequency	Weekly	Monthly	As required
	Tasks	Weeding, lubricating water gates	Garbage removal from water intake gate Lubrication on water intake gate	-
Paguyaman Weir Irrigation	Responsible organization	Balai Office	Balai Office	Balai Office
	Frequency	Four times a year	Once a year	Once a year
	Tasks	Weeding	Sand/mud removal	Painting buildings, road maintenance, sediment dredging in upper stream areas
Benua Aporo Weir Irrigation	Responsible organization	Balai Office	Balai Office	Balai Office
	Frequency	Every three months	Every Year	As required
	Tasks	Weeding (once a month), garbage removal (once in three months)	Lubricating water intake gate	Office facilities maintenance

Subproject	Item	Daily Inspection	Periodic Inspection	Large-scale Works
Sausu Weir Irrigation	Responsible organization	Balai Office	Balai Office	Balai Office
	Frequency	-	-	-
	Tasks	-	-	-
Telaga Lebur Pond Irrigation	Responsible organization	Balai Office	Balai Office	Balai Office
	Frequency	Three times a year	Once a year	As required
	Tasks	Payroll Dam cleaning Lubricating water gates	Lubricating water gates, painting facilities, sediment removal	Rehabilitation
Kempo Groundwater Irrigation	Responsible organization	Farmers' Association	Farmers' Association	Balai Office
	Frequency	Once in 3-4 months	Once a year	As required
	Tasks	Engine oil change	Water distribution management to canals using water pumps, maintenance and spare parts replacement of water pumps	Engine repairs etc

Source: Questionnaire survey results from executing agency

### (3) Status of human resources development

Table 23 shows the status of human resource development at the seven subprojects where site surveys were conducted. The technical skills of current staff are not sufficient and it is desired that they are further developed.

Table 23: Training Opportunities for O&M Staff

Subproject	Program	Target	Frequency
Malaka Weir Irrigation Project	Technical skill development for maintenance and management WUA enablement	Maintenance management staff (30 staff)	Once a year
Ponre-Ponre Dam Irrigation Project	Technical skill development for maintenance and management	Maintenance management staff	Once a year
Paguyaman Weir Irrigation Project	Knowledge enhancement	Maintenance management staff (30 staff)	Once a year
Benua Aporo Weir Irrigation Project	Technical skill development for maintenance and management	Maintenance management staff	Once a year
Sausu Weir Irrigation Project	N/A	N/A	N/A
Telaga Lebur Pond Irrigation Project	Dam operation and management	1-2 staff	10 times a year
	River bank management	1-2 staff	
	Natural disaster management	1-2 staff	
	Irrigated low ground management	1-2 staff	
Kempo Groundwater Irrigation Project	Dam operation and management	1-2 staff	10 times a year
	River bank management	1-2 staff	
	Natural disaster management	1-2 staff	
	Irrigated low land management	1-2 staff	

Source: Survey results from executing agency



According to the government regulation (Government Regulation No.38: Enacted in 2007), the MOA is responsible for the skills development of WUA, and a framework has been established where WUA formulation and skill development are assisted through NGOs, and where WUA are provided with agricultural advisories and training for water management and the operation maintenance of competed irrigation systems. However, the supervisory activities of the Ministry and local governments are not sufficient.

To summarize, as outpost agencies of the MOPW, the roles assumed by Balai Offices in the field, such as the sharing of technical skills, are quite significant, and there are high expectations from related parties making skills improvement for Balai staff an urgent issue. Educating WUA for better maintenance skills and technical abilities is also important, but there isn't sufficient advisory for WUA by the MOA and local DOA. Under these circumstances, the quality of regular and periodic maintenance works and major repairs is not high. Nor is it high in quantity. Information on detailed measures for improvement was not obtained as the result of the survey.

Therefore, it can be said that there are problems with the technical aspect of operation and maintenance to some extent.

### 3.5.3 Financial Aspects of Operation and Maintenance

At the seven subprojects where site survey was conducted, MOPW and its outpost, Balai Office, local government (DOWR and DOA) and WUA bear the budget to ensure the operation and maintenance arrangements at each canal. Balai Office and local government are supposed to allocate the budget for regular and periodic checkups and repairs.

Table 24 shows the transition of budget allocation by the MOPW on the operation and maintenance of each facility. The Department of Operation and Maintenance of the Ministry is a new department created recently, and cases have been confirmed where Balai Office was not able to secure the sufficient maintenance budget that they requested in a timely manner.

Table 24: O&M Cost for Each Subproject allocated by the MOPW

Unit: 1000 rupiah

Subproject	2009	2010	2011	2012	2013
Malaka Weir Irrigation Project	1,005,000,000	1,072,000,000	1,072,000,000	1,206,000,000	1,340,000,000
Ponre-Ponre Dam Irrigation Project	-	-	692,960,000	779,880,000	886,200,000
Paguyaman Weir Irrigation Project	565,675	600,000	1,350,800	477,230	750,003
Benua Aporo Weir Irrigation Project	-	710,000,000	570,000,000	263,200,000	280,000,000
Sausu Weir Irrigation Project	921,900	983,360	1,311,360	1,475,280	1,639,200
Telaga Lebur Pond Irrigation Project	-	-	93,447,144	30,744,491	40,334,434
Kempo Groundwater Irrigation Project	26,300,000	33,538,000	46,500,000	59,341,700	102,829,000

Source: Survey responses from executing agency

No information on budget and expenditure by the local government was available at the end of the survey. As admitted in Sausu, WUAs find funds for operation and maintenance voluntarily. However, information on the amount they actually pay was not obtained as their answers remained as “such financial contribution is insufficient”. In Ponre-Ponre and Paguyaman, it is also thought that WUA members make voluntary contributions. However money is collected only from some of the members and the amount is not sufficient. Actual figures of their financial contribution were not obtained.

From the observations above, it can be seen that the financial sustainability for operation and maintenance has some problems. Empowerment of the Department of Operation and Maintenance of MOPW and its ability to deploy budget in order to improve finances for operation and maintenance is urgently needed. The budget and expenditure by the local government remains unknown, but theirs is an important role on the ground level for immediate response. Sufficient allocation of their budget is desired. Securing the financial contribution from WUA members is also an urgent issue to be tackled.

#### 3.5.4 Current Status of Operation and Maintenance

At the seven facilities where site surveys were conducted at the time of the ex-post evaluation (2014), occasional problems were seen with water distribution, but the situation did not mean stopping the irrigation service itself. As shown in the site survey results summarized in Table 25, many sites have experienced unexpected situations such as landslides caused by logging in upper stream areas and unexpected large-scale floods, which produce large amounts of sediment and litter clogging the irrigation canals beyond the technical abilities and management capacity of the current operation and maintenance teams. Repairs and regular maintenance work are not sufficient in quality or quantity for coping with such events, and some facilities incurred damages after project completion requiring major repairs, as seen in the case of the Benua Aporo project, where a large-scale flood damaged the facilities.

Under these circumstances, it is imperative that the water management skills and the quality and quantity of regular maintenance and repair works by staff are enhanced and improved in order to better manage the facilities.

Table 25: Physical Conditions of Project Facilities at the Time of Site Survey

Subproject	Physical Conditions of Project Facilities
Malaka Weir Irrigation Project	<p>Poor drainage and frequent floods partly due to landslides from the hills. Water diversion gates were damaged at multiple locations, but sluice gates were operating well despite the partial damages.</p> <p>According to the Balai Office, there isn't enough staff for operation monitoring, and they are not able to contain the stealing of water by local farmers. In some cases, holes are punctured through the canal and not enough water is distributed to lower stream areas. As a result some farmers are feeling that the water is not distributed fairly. (Photo 6)</p>
Ponre-Ponre Dam Irrigation project	<p>Landslides, sand sediment from water leakage and mud clogging caused multiple damages in canals. Lower streams are completely dry in both the dry and rainy seasons. Water reservoirs are also used for the local residents' recreation.</p>
Paguyaman Weir Irrigation Project	<p>A large amount of dirt and waste was pushed into the water due to illegal logging and gold mining in the upper stream area. Landslides and leakage damaged secondary canals, and sand / mud sediment piled up in the lower stream causing frequent floods in the rainy season (Photo 7). Other facilities were operating well.</p>
Benua Aporo Weir Irrigation Project	<p>A flood in July 2013 damaged the embankment and destroyed some facilities. Reconstruction work was underway in 2014 using budget from the Indonesian Government (Photo 8). Secondary canals on the right bank of the dam were not functioning due to the repair work. The water gate of the dam collected garbage, bamboo and wood pieces making the water stagnant. Further repair work on the tertiary canals are needed.</p>
Sausu Weir Irrigation Project	<p>Logging in the upper stream area caused wood pieces flowing into the water causing occasional clogging of the sluice. Sludge caused by floods made the water very cloudy. There are frequent water shortages in the lower stream area. There is a large amount of sand sediment, and quite a bit of damage to the facilities was seen (Photo 9).</p>
Telaga Lebur Pond Irrigation Project	<p>Water supply to residences was functioning well, but some of the main gates were damaged. As many as 4 valves that take the water from the dam to primary canals were damaged, so some farmers were relying on rain water.</p>
Kempo Groundwater Irrigation Project	<p>Some of the electric pumps for taking surface water were not used as farmers were reluctant to bear the expense. As a result, often they rely on rain water resulting in unstable cropping. Farmers are working together to repair usable pumps. 3 were working well, 2 were OK and one was out of order.</p>

Source: Site survey (Completed in May - June 2014)



Note: Canal is clogged and water is not flowing. Photo taken in May 2014

Photo 5: Tertiary Canal in Malaka



Note: Canal is clogged with mud and wood pieces from heavy rainfall. Photo taken in May 2014

Photo 6: Canal in Paguyaman



Note: Damaged by Flood. Photo taken in May 2014

Photo 7: Benua Aporo Irrigation Facilities



Note: Mud pile is hindering water distribution. Photo taken in May 2014

Photo 8: Tertiary Canal in Sausu

To summarize, in terms of maintenance and management of the project, there are minor problems in the technical and financial aspects and physical conditions of the facilities although there is no major issue with the institutional aspect. Unless these problems are addressed comprehensively, it is likely that the current conditions of the facilities will worsen further. Therefore, sustainability of the project is fair.

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

##### 4.1 Conclusion

This project intended to increase food production, mainly the rice crop, thereby to contribute to poverty reduction in Eastern Indonesia through the new construction and rehabilitation of irrigation facilities and assistance for the institutional reinforcement of irrigation water management systems in the region.

This project was well in line with Japan's ODA policy as well as with Indonesian development policy and the country's development needs such as correcting regional disparities, increasing food production and securing water resources. Therefore the project relevance is high. Effectiveness of this project is considered high, as there are tangible effects and the importance of irrigation facilities improved under the project is clear. Dual rice cropping during rainy seasons and planting in dry seasons were made possible in the Eastern region where water resources were scarce and development projects are further needed. While a positive impact of the project, "contribution to poverty reduction in the project area", was confirmed and high effectiveness of the project was apparent from the beneficiary survey, the effectiveness / impact of the project is deemed fair, as some information regarding environmental impacts and land acquisition was not available.

Efficiency of the project is fair as the project cost did not exceed the planned budget, but the project period was significantly longer than planned. In terms of maintenance and management of the project, there are minor problems in the technical and financial aspects and

physical conditions of the facilities although there is no major issue with the institutional aspect. Unless these problems are addressed comprehensively, it is likely that the current condition of the facilities will worsen further. Therefore, sustainability of the project is fair.

In light of the above, the project is evaluated as partly satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

In this project, daily field activities through resident organizations (WUAs and Farmers' Associations), such as canal cleaning and appropriate water gate operations, are essential to ensure optimal water volume throughout the irrigation systems and sufficient water distribution down to marginal areas. Also, it is very important that sufficient budget is allocated to each facility and that regular inspections and large and small-scale repair works are performed in a timely fashion.

Therefore, it is recommended that the executing agency and Balai Offices work closely with local DOA to provide long-term and continuous technical support to residents and their organizations to improve their technical skills levels required for daily maintenance checkups, to organize well-defined roles for related organizations and to promote sufficient budget allocation.

### 4.2.2 Recommendations to JICA

None.

## 4.3 Lessons Learned

### 4.3.1 Thorough Project Monitoring and Plan Reviews

Prior to the mid-term review of this project conducted in 2007, the project plan was revised significantly based on the implementation status at the time and in the circumstances after commencement of the project. In the mid-term review, the circumstances were clarified by a third party (evaluator), and information regarding the revision proposal for the Operation and Effect indicators was made public.

However, these Operation and Effect indicators were not defined outside of the pilot subprojects, and there was no confirmation of any official documents about the agreement on indicator revisions proposed in the mid-term review. As a result, the evaluator was forced to spend a significant amount of time investigating how the project scope was changed and which Operation and Effect indicator figures should be considered as the base and target figures. As a result, they were quoted as reference figures only.

In general, a sector loan such as this project does not necessarily finalize a detailed project scope during the period from project processing to appraisal. Often, a more accurate project scope is established when the design details are discussed after the project kicks off. Therefore,

it is possible that the project scope (number of subprojects and irrigation scale), Operation and Effect indicators and project period planned at the time of appraisal change significantly during the project period.

Going forward, it is strongly advised that for irrigation projects implemented under similar conditions, JICA and the executing agency review project scope, Operation and Effect indicators and project period as required, and that they create a written agreement on revisions in a timely fashion and perform monitoring and data collection based on these revisions. This would not only enhance JICA's monitoring capacities but also simplify the tasks for ex-post evaluations.

#### 4.3.2 Feedback to Similar Projects

This project is in the fourth phase of the irrigation projects that have been implemented in a long-term and sustained manner in the eastern region of Indonesia since a Japanese ODA loan project was approved in 1989 (the Small Scale Irrigation Management Project (1)), and a subsequent project is also being presently implemented. Particularly in Nusa Tenggara province, which is plagued by little annual rainfall, the impact of this project on improving the diet of the beneficiary and on household income is remarkable. Securing water resources in the future is also important.

If JICA conducts an inter-schematic evaluation focusing on achievements in the series of projects implemented in the eastern region of Indonesia, verification of lessons learned from the general and long term perspectives could be used for inclusive poverty reduction of the farmers in the said region (which may not be limited to cooperation in the irrigation sector) as well as for capacity building for project management on the part of Indonesian Government officials,

Thus, it is desirable to refer to the verification results and lessons learned derived from the above inter-schematic evaluation when formulating a long term and extensive irrigation project as well as when considering its direction.

End

### Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Output		
(1) Subproject	27 in 8 provinces	52 in 8 provinces
(2) Contract package	28	66
(3) Irrigated area	Total 99,250 ha (New construction/expansion) a) Dam/Pond Irrigation: 5,768 ha b) Weir irrigation: 20,442 ha c) Groundwater irrigation: 2,723 ha (Rehabilitation) a) Pond irrigation: 5,845 ha b) Weir irrigation: 64,477 ha	Total 117,588 ha (New construction/expansion) a) Dam/ Pond Irrigation: 5,768 ha b) Weir Irrigation: 27,538 ha c) Groundwater Irrigation: 3,020 ha (Rehabilitation) a) Pond irrigation: 533 ha b) Weir Irrigation: 77,629 ha
(4) Consulting Services	Total 26,636 M/M	Total 43,775 M/M
2. Project Period	October 2002 - December 2007 (63 months)	October 2002 - December 2011 (108 months)
3. Project Cost		
Amount paid in Foreign currency	2,505 million yen	2,349 million yen
Amount paid in Local currency	29,301million yen (2,092,928million rupiah)	27,202 million yen (2,466,760 million rupiah)
Total	31,806 million yen	29,549 million yen
Japanese ODA loan portion	27,035 million yen	25,541 million yen
Exchange rate	1Rupiah = 0.014 yen (As of October, 2001)	1Rupiah = 0.011yen (Average between 2002 -2011)