Ex-Post Project Evaluation 2015: Package IV-3 (Indonesia)

December 2016

JAPAN INTERNATIONAL COOPERATION AGENCY

Mitsubishi UFJ Research & Consulting Co., Ltd.
SHINKO Overseas Management Consulting, Inc.
Octavia Japan Co., Ltd.

EV
JR
16-60

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Republic of Indonesia

FY 2015 Ex-post Evaluation of Japanese ODA Loan Project

"Lahendong Geothermal Power Plant Project"

External Evaluator: Keiko Watanabe

Mitsubishi UFJ Research & Consulting Co., Ltd.

0. Summary

The project aimed to ease the power supply demand tightness and improve the stability in the Minahasa power system, North Sulawesi, by newly constructing a geothermal power generation plant as Unit 3 of the existing Lahendong geothermal power plant.

The objective of the project which addresses the tight power supply-demand condition by supplying power through renewable energy is well consistent with the development policy and development needs of Indonesia, as well as with the Japan's ODA policy. Therefore the relevance of the project is high. Both the project cost and project period were within the planned. Therefore efficiency of the project is high. Regarding operation and effective indicators at the time of the appraisal, those showing the availability of the power plant have reached the targets, however, those showing actual energy production have not reached the targets for about five years from the start of power generation due to the quality problem of steam (although steam supply is out of the scope of project). This fact reduced effectiveness to some extent. It was confirmed, however, that after changing the supply source of the steam, planned effect of the project has been mostly observed. Negative impact on natural and social environment by the project has not been observed and it can be said that the project has contributed to a certain extent in shifting to an energy efficient power supply and utilizing domestic energy sources. Thus, effectiveness and impact of the project are fair. In regard to the operation and maintenance, although problem of the steam quality has not been solved completely at the time of the ex-post evaluation, there is a good prospect of solving the problem. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

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

1. Project Description

Project Location

Lahendong Geothermal Power Plant

1.1 Background

The Minahasa power system in the North Sulawesi Province, where this project is located, is situated in the region with particularly tight power supply-demand among the outer islands except Java. Actual supply capacity of 2002 was limited to 118 MW while peak demand was 113 MW as a result of the ageing of the existing facilities and operational stoppages for maintenance. The power supply-demand condition was very tight. In addition, future demand growth rate was expected to grow at an annual average of 4.4 % to 6.9 %, and peak demand was forecasted to exceed supply capacity by 2004. Consequently, the expansion of the capacity and the improvement of the stability of power supply in the Minahasa power system were necessary for the social and economic development.

1.2 Project Outline

The objective of this project is to expand power supply capacity of Lahendong geothermal power plant in the Minahasa power system in North Sulawesi by newly constructing a geothermal power generating facility (20 MW-class) in the existing Lahendong geothermal power plant, thereby contributing to the improvement of the stability of the power supply in the Minahasa power system.

Loan Approved Amount/ Disbursed Amount	5,866 million yen / 4,517 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004 / March, 2004
Terms and Conditions	Interest Rate: 0.75 % Repayment Period: 40 years (Grace Period): (10 years)

	Conditions for Tied (Special Terms for Procurement: Economic Partnership (STEP))
Borrower/ Executing Agency(ies)	Republic of Indonesia / State Electricity Company (PT. PLN)
Final Disbursement Date	September, 2012
Main Contractor (Over 1 billion yen)	Sumitomo Corporation (Japan)
Main Consultant (Over 100 million yen)	West Japan Engineering Consultants, Inc. (Japan) / PT. Connusa Energindo (Indonesia) / PT. Tata Guna Patria (Indonesia)
Feasibility Studies, etc.	F/S (2001)
Related Projects	＜Other Donors, International Organizations＞ France: Lahendong Unit 1 Geothermal Power Plant (20 MW) (1999) ADB: Lahendong Unit 2 Geothermal Power Plant (20 MW) (2002) ADB: Lahendong Unit 4 Geothermal Power Plant (20 MW) (2009) WB: Lahendong Unit 5 and Unit 6 Geothermal Power Plant (20 MW each) (2014) WB: Technical assistance for PT. PLN (Institutional and financial reform)

2. Outline of the Evaluation Study

2.1 External Evaluator

Keiko Watanabe, Mitsubishi UFJ Research & Consulting Co., Ltd.

2.2 Duration of Evaluation Study

Duration of ex-post evaluation study was conducted as follows;

Duration of the Study: October 2015 – December 2016

Duration of the Field Survey: March 6 – March 16, 2016, June 26 – June 29, 2016

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance to the Development Plan of Indonesia

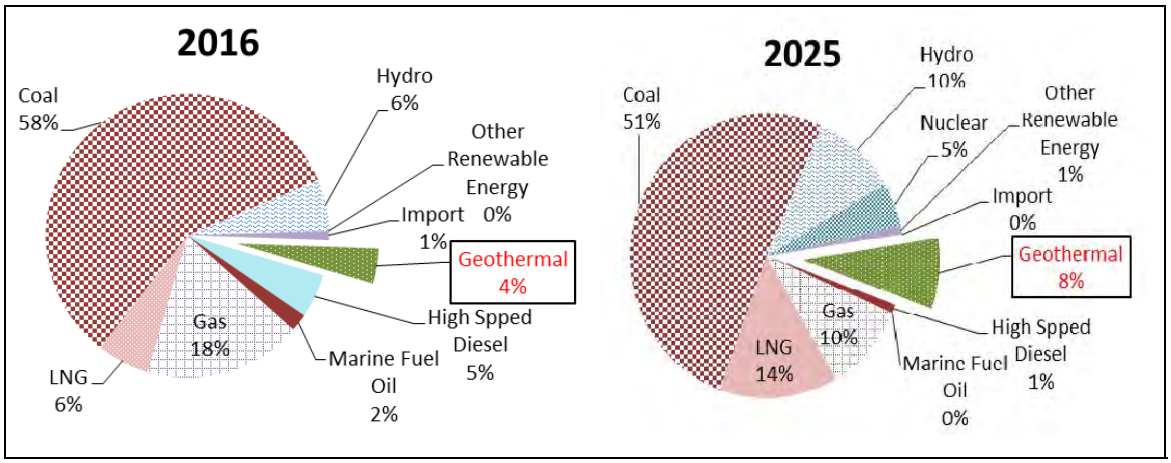
The Indonesian government has been actively promoting geothermal development and has established a business environment in order for PERTAMINA, state-owned oil

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

[2] ③: High, ②: Fair, ①: Low

and gas company, to conduct geothermal development and power generation business in Indonesia by issuing Presidential Decree No. 22 of 1981 and No. 45 of 1991, which made it possible to sell steam and electricity to the state-owned power company (PT. PLN, hereinafter referred to as "PLN"). In addition, the Presidential Decree No. 76 of 2000 advocates the active utilization of geothermal power generation as a way of diversification of energy sources and a means of energy saving. The project was regarded as the expansion of the existing Lahendong geothermal power plant in the Energy Development Plan of PLN (hereinafter referred to as "RJPP") (2003-2007) at the time of the appraisal. Accordingly, the project is consistent with the development policy of Indonesia.

At the time of the ex-post evaluation, it is also in line with the government policy which encourages the maximum use of the new and renewable energy including geothermal energy. For example, the Indonesian government sets a national goal to increase additional power generation of 35 GW within five years up to 2019. Among total increase in the power generation, 7.5 GW, 10 % to 15 % of total additional power generation is expected to be generated by the new and renewable energy including geothermal. In accordance with the national goal, the current National Medium Term Plan (hereinafter referred to as "RJPMN") (2015-2019), and the National Energy Plan (hereinafter referred to as "RUPTL") (2016-2025), set the electric power development as a priority policy that replaces the energy sources from diesel and other sources which have economically poor efficiency. Moreover, they promote the enhancement of power generation capacity through the new and renewable energy and diversification/combination of energy sources. In RUPTL, the actual amount of power generation by the new and renewable energy is expected to be raised at 23 % of the total amount of power generation by 2025, and 31 % by 2050. Regarding the component of energy sources, as shown in the Figure 1, the geothermal energy is planning to be increased from 4 % in 2016 to 8 % in 2025.



Source: RUPTL (2016-2025)

Figure 1: Transition Plan of Energy Source Composition

3.1.2 Relevance to the Development Needs of Indonesia

At the time of the appraisal of the project, development of the stable power supply system was pressing issue to cope with the tight power supply-demand in North Sulawesi. Table 1 shows the transition of power supply-demand in the Minahasa power system in North Sulawesi. In the Minahasa power system, the actual supply capacity had not caught up with the growth in demand and it had been estimated that demand would have exceeded supply by 2004. Since 1997 when the currency crises in Asia happened, no new investment in power plants by PLN had been implemented until 2002. Besides, the private investment to the power plants has not been progressed. Under this situation, aging and insufficient maintenance of the power plants were assumed to be the reasons for that. As a result, the construction of new power generation facilities was urgent need for socio-economic development of the regions.

The Minahasa power system was connected with adjacent Gorontalo power system and became as Sulbagut power system since 2011 due to the effect from the PLN structural reforms. As seen in Table 2, the power demand in North Sulawesi has been growing every year about 7-8 % even after the system became Sulbagut. Accordingly, the needs to increase power generation capacity were still high at the time of the ex-post evaluation. Although the supply-demand has still been tight, it is all the more important to supply from every single power plant. Thus, the role that the project plays is getting bigger.

In light of the above, the project, which was to complement the power supply of North Sulawesi where the supply-demand of power was very tight, is in line with the development needs both at the time of appraisal and ex-post evaluation.

Table 1：Demand and Supply of Electricity of North Sulawesi

(Estimation at the time of appraisal in 2004)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
①Peak Load (MW)	113	118	125	131	140	149	159	169	180
Demand Growth Rate (%)	－	4.4%	5.9%	4.8%	6.9%	6.4%	6.7%	6.3%	4.8%
②Actual Available Capacity (MW)	118	118	118	118	138	168	243	243	243
Reserve Margin (%) = (②－①)/ ①	4.4%	0.0%	-5.6%	-9.9%	-1.4%	12.8%	52.8%	43.8%	35.0%

Source: Information provided by JICA

Table 2: Demand and Supply of Electricity of North Sulawesi

(Actual at the time of ex-post evaluation and Estimation)

	2009	2010	2011	2012*	2013	2014	2015	2016	2017
①Peak Load (MW)	165	173	193	271	292	310	332	379	462
Demand Growth Rate (%)	6.3%	4.8%	11.7%	40.6%	7.7%	6.3%	7.1%	7.7%	8.2%
②Actual Available Capacity (MW)	142	142	252	275	262	299	300	398	572
Reserve Margin (%) = (②－①) / ①	-13.9 %	-17.9 %	30.6%	1.5%	-10.3 %	-3.5%	-9.6%	5.0%	23.8%

* Note: The rapid growth in demand growth rate in 2012 is due to the expansion of the grid system. The Minahasa grid was connected with the Gorontalo grid and became Sulbagut grid system.
Source: Results of questionnaire survey to the executing agency

3.1.3 Relevance to Japan's ODA Policy

In the Japanese assistance policy to Indonesia at the time of the appraisal in 2004, "sustainable growth led by the private sector" was one of three pillars of assistance and "economic infrastructure development for improvement of investment environment" was raised as one of the major points. In the "Medium-Term Strategy for Overseas Economic Cooperation Operation" of JICA in April 2002, the "economic infrastructure development" which was vital for recovery towards sustainable growth through economic reforms was put as one of priority areas. Country Assistance Strategy for Indonesia (November 2002, JICA) stipulates the policy to respond to urgent needs such as elimination of economic bottlenecks including power shortage.

During the time when PLN had stopped their projects after the currency crisis, this project supported power supply which contributed to the basis of economy and stable life of people. Therefore, the project was in line with the Japan's ODA policy.

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

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The project was to construct a power plant with capacity of 20 MW (geothermal steam turbine) as Unit 3 of Lahendong Geothermal Power Plant and transmission system to connect existing power plants. Comparison of planned and actual project outputs is summarized in Table 3. It should be noted that the focus of the project was the power generation part including development of geothermal power plant which is to be implemented by PLN. The development and supply of steam which are necessary for generating power were done by PERTAMINA Geothermal Energy (PGE), subsidiary company of PERTAMINA. The Heads of Agreement on steam sales for this project had been signed between PLN and PGE.

Regarding the power plant construction, intended outputs were produced as planned. There was a change in the output of transmission system. After discovering the fault was running under the planned construction site of the project, the site had to be relocated. Since the relocated site was close to the transmission lines of Unit 1 and Unit 2, the plan of installing transmission system was no longer necessary. Instead, the simple construction measures were applied to connect the transmission lines from the project (Lahendong Unit 3) with those of Unit 1 and Unit 2 by constructing transmission towers. Those transmission towers were constructed with the finance from PLN without delay. The investigation of the fault was implemented just before the construction of the main power plant, and it was not possible to find out the fault at the time of the appraisal. Therefore, the change of the construction site and the design changes of transmission system associated with it are judged as appropriate.

The contents of the consulting services were carried out as planned. Actual amount of input of the services was 204.88 man month (M/M) compared to the planned 227.75 M/M, which was 22.87 M/M smaller than the planned. This shortage was mainly resulted from the above change in the transmission system.

Table 3: Comparison of Planned and Actual Project Output

Planned		Actual
Civil Works, Equipment Procurement		
1. Power Plant Construction	・Geothermal steam turbine (20 MW x 1 unit)	As planned
	・Condensing system	As planned
	・Electric Facilities	As planned
	・Instrumentation and Control Equipment	As planned
	（Necessary construction for future expansion） ・Layout for additional power plant (Unit 4) ・Joint power house with Unit 4 ・Electric line and pipe line connected to Unit 4 ・Joint warehouse and workshop with Unit 4	As planned
2. Transmission System etc.	・Transmission line (150 kV, 3 km) from the project (Lahendong Unit 3) to existing Lahendong Unit 1 switchyard ・Switchgear and Equipment of Lahendong Unit 1 ・Auxiliary Equipment	Due to change of the construction site of the project (Lahendong Unit 3) the plan was changed. Instead of installing transmission system, the transmission lines were connected to Lahendong Unit 1 and Unit 2 by constructing transmission towers.
Consulting Services		
Review of PERTAMINA's resource study, Assistance of PLN in bidding, construction supervision, transfer of knowledge and training of PLN's personnel, Environmental monitoring, Reporting）etc.		As planned

Source: Results of questionnaire survey to the executing agency

Geothermal Turbine (above) and Generator (below)

Cooling Tower

Two Transmission Towers constructed by PLN

3.2.2 Project Inputs

3.2.2.1 Project Cost

Total project cost was planned to be 7,007 million yen (out of which 5,866 million yen was to be covered by Japanese ODA loan). In reality, the total project cost was 5,600 million yen (out of which 4,517 million yen was covered by Japanese ODA loan) which was lower than planned (80 % of the planned amount).

The reason why the total project cost was lower than planned was mainly due to the cost reduction from the transmission system compared to the plan and the effect of depreciation of Indonesia Rupiah against yen during the project period[3].

3.2.2.2 Project Period

The overall project period was planned as 73 months, from April 2004[4] (conclusion of Loan Agreement) to April 2010 (completion of liability period). In reality, the overall project period was 71 months, from April 2004 (conclusion of Loan Agreement) to February 2010 (completion of liability period), which was shorter the plan (97 % of the planned period).

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

Financial Internal Rate of Return (FIRR)

Table 4 shows the comparison of FIRR between as of appraisal and ex-post evaluation.

Table 4: FIRR as of Appraisal and Ex-post Evaluation

	Appraisal	Ex-post Evaluation
FIRR	5.4 %	1.8 %
Benefit	Revenue from electricity sales	
Cost	Construction cost, Operation and maintenance cost, Fuel cost (steam price)	
Project Life	30 years after the completion of the project	

Source: (Appraisal) Information from JICA, (Ex-post evaluation) Calculated by the evaluators using data from the executing agency

FIRR at the time of the ex-post evaluation was lower than planned. It is assumed that main reason for this was due to the significant increase in the steam price (fuel cost) than assumed price at the time of the appraisal (more than three times in Indonesia

[3] At the time of the appraisal, it was estimated as JPY 1 = 71.4 Indonesian Rupiah (IDR) and USD 1 = JPY 118. However, actual rate was a strong yen trend as JPY1 = 90.9 IDR and US$ 1 = ¥ 89.9 (average rate by IMF during 2004 and 2012)

[4] Since the loan agreement date was 31 March, 2004, the project period was calculated from April 2004.

Rupiah).

In light of the above, both the project cost and project period were within the plan. Therefore, efficiency of the project is high. It should be noted that there was no impact on the project cost and project period by the application of procurement condition of Special Terms for Economic Partnership (STEP). According to the interview to the executing agency on STEP, there was no problem in the process of procurement of equipment and consultant, and they were almost satisfied with their quality.

3.3 Effectiveness (Rating:②)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Table 5 shows the comparison of operation and effect indicators between planned at the appraisal and actual figures after the completion of the project.

As seen in the actual figure of the target year of 2011, after 1 year of completion of the project, maximum output and availability factor among operation indicators have reached the target value. Therefore, it can be said that the project has the operational capability as planned. On the other hand, plant load factor and net electric energy production have not reached the targets. In this project, the electric power is to be generated by receiving steam supply which has been developed by PGE. However, the problems occurred from the start of the operation. Those included high acidity of the hot water discharging from the major steam production well (No. 23) for this project[5], and higher contamination of non-condensable gas (NCG) in the steam compared to the level indicated in the steam sales contract[6]. For these problems, Unit 3 had to be operated with reduced output from the start of the operation. As seen in Table 6, the steam problems became serious in 2012. The Unit 3 stopped operation almost a year as PGE has stopped the supply of steam from the main production well for changing a well head of main production well in order to prevent adherence of silica scale. Therefore, the values of indicators of plant load factor and net electric energy production which take into account the actual amount of electricity generated were extremely low as 14.5 % and 13.9 GWh respectively in 2012.

[5] When the hot water from the geothermal steam had high acidity, silica (siliceous contained in the water) scales adhere to hot water supply pipes, which creates problems of decrease or stop in steam supply.

[6] In the steam sales contract between PLN and PGE, NCG level was stipulated as 1% or less for the steam quality. According to this information, the project procured the gas extractor which has capacity of NCG up to 1%. However, actual NCG level was 2.5% which was higher than expected. When the level of NCG is higher than the capacity of gas extractor, it cannot extract gas sufficiently and the pressure becomes high in the condenser. As a result, it lowers the efficiency of turbine. Therefore, the power plant has to operate with reduced output. Although the project conducted the resource study of the steam supplied by PGE as a component of the consulting services, the focus of the study was on whether the ample amount of steam could be secured or not in the future, not on the quality of steam.

Table 5: Operation and Effect Indicators of the Project (Unit 3)

	Indicator* (Unit)	Baseline 2004 Baseline Year	Target 2011 1 Year After Completion	Actual						
				2009 Start Generating Year	2010 Completion Year	2011 1 Year After Completion	2012 2 Years After Completion	2013 3 Years After Completion	2014 4 Years After Completion	2015 5 Years After Completion
Operation Indicators	Maximum Output (MW)	-	20 MW	15.5	20	20	20	18.1	18.7	20
	Availability Factor (%)	-	More than 91.8 %	99.6	99.5	99.3	99.9	99.5	99.0	99.2
	Plant Load Factor (%)	-	Over 85 %	60.6	73.7	52.7	14.5	75.4	77.4	91.7
Effect Indicator	Net Electric Energy Production (GWh/year)	-	140 GWh/ year	46.8	82.5	59.6	13.9	82.3	88.8	153.7

*Note: Availability Factor (%) = (Annual operation hour / Annual hours (365*24)) x 100. Annual operation hours include stand by hours.

Plant Load Factor (%) = Annual energy production / (Rated output x Annual hours (365*24)) x 100

Net Electric Energy Production (GWh/Year) = Annual energy production – Power consumption in the power plant

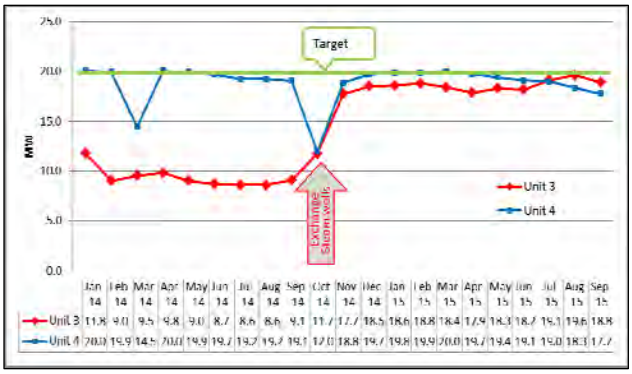
Source: Information from JICA and results of questionnaire survey to the executing agency

Table 6: Outage Time of Lahendong Unit 3

Year	2009	2010	2011	2012	2013	2014	2015
Outage Time (hour)	1,895.82	1,848.35	3,782.12	8,020.95	1,372.08	87.18	31.40
(In Days)	78.9	77.0	157.6	334.2	57.2	3.6	1.3
Of which outage time due to machine problem (hour)	3	11	8	-	3	17	-

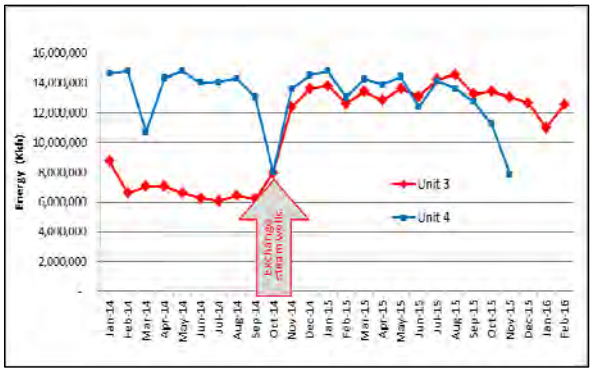
Source: Compiled utilizing information from the executing agency

On the contrary, by exchanging the main steam of Unit 3 for Unit 4 (No. 28 steam production well) in October 2014, the operation and effect indicators have reached the target since 2015. Besides, as shown in Figure 2 and Figure 3, after the exchanging the steam wells, the output and actual power generation from Unit 3 became stable.



Source: Information from the executing agency

Figure 2: Monthly Average Output (2014/2015)



Source: Information from the executing agency

Figure 3: Monthly Average Energy Production (2014/2015)

Although the effectiveness cannot be said as high since the project could not generate the expected amount of power nearly five years after the completion of the construction in 2009. However, after 2014 when the steam wells have exchanged, it was confirmed that effectiveness of the project has been confirmed. It should be noted that the issue of steam is out of scope of the project (it is the development project by PGE). Besides, the gas extractor which was procured by the project has been decided based on the contents of steam quality stipulated in the steam sales contract. Therefore, it was difficult to respond the problem in advance. The discussion has been made between PLN and PGE periodically since the beginning of the problem occurred. In relation to the high acidity problem, PGE side has implemented mitigation measures to the extent possible such as injecting a neutralizing agent (sodium hydroxide).

3.3.2 Qualitative Effects

The qualitative effects on relaxation of tight power supply-demand and Carbon dioxide emissions reduction are elaborated in the next section of “3.4 Impacts”.

Gas extractor for Lahendong Unit 3

Exchange point of steam pipeline (No.23/No.28)

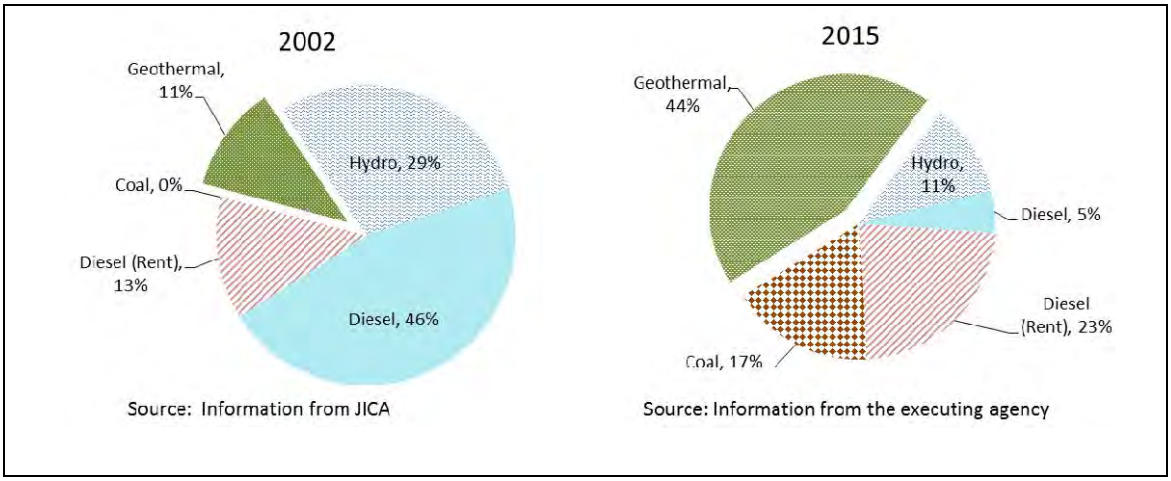
3.4 Impacts

3.4.1 Improvement of Stability of Power Supply

The available installed capacity in whole region of North Sulawesi in 2015 was 300 MW excluding the loss from aging and maintenance and the net electric energy production of the region in 2015 was 1,625 GWh. Among them, 20 MW is from this project and it generated 153.7 GWh. In other words, the project accounted for 6.7 % of the installed capacity and for 9.4 % of the net electric energy production in the North Sulawesi region. Accordingly, the project has been playing a role for the stable supply of electricity to some extent but not to a large extent.

3.4.2 Contribution to Diversification of Energy Sources and Utilization of Domestic Energy

Figure 4 shows the composition of energy sources of the Minahasa power system in 2002 and 2015. The Indonesian government has been promoting diversification of energy source and utilization of domestically produced energy in order to save fuel and as a shift to the power generation by environmentally friendly and economically efficient energy. As in Figure 4, the geothermal power generation increased from 11 % in 2002 to 44 % in 2015, which came to account for about half of the Minahasa power system. In the Minahasa power system, as of 2015 there are four geothermal power units including this project and each of them has 20 MW output. Therefore, the project accounts for 11 % of the Minahasa power system. From the perspective of geothermal power generation in the Minahasa system, the project accounts for 25 %. In light of this, it can be said that the project contributed to a certain degree to the diversification of energy sources and utilization of domestically produced energy.



Note: "Rent" means that PLN rents diesel power generating facilities which are developed by the private company.

Figure 4: Composition of Energy Sources of Minahasa Power System

3.4.3 Impacts on Reduction of Carbon Dioxide Emissions

In general, it is said that the geothermal power generation produces less carbon dioxide emission (CO_2 emission) in lifecycle of power generation compared to other power generations. According to the Agency for Natural Resources and Energy of Japan, the CO_2 emission of geothermal power generation (15 g-CO_2/kWh) consists of only 1.5 % of coal fired power generation (975 g-CO_2/kWh) [7]. The effect of CO_2 emission reduction by the project cannot be identified exactly since the data on CO_2 emission have not been taken by the executing agency. However, since the project releases less carbon dioxide than the thermal power generation when it covers the amount of power generation from the project, on such assumptions, it can be considered that the reduction effect has been realized.

3.4.4 Other Impacts

3.4.4.1 Impacts on the Natural Environment

According to the interview to the executing agency and the monitoring records, it was found that the environmental monitoring has been continuously conducted on a quarterly basis during and after the project in accordance with the environmental management policy (UKL) and the environmental monitoring policy (UPL) of the Indonesian government. The environmental monitoring had also been implemented for the transmission towers which PLN has constructed. Results of all of the critical environmental indicators for geothermal power generation shown in Table 7 (4th quarter of 2015) were lower than the standards of the Indonesian government. It was also confirmed by the interview with local residents that there were no negative impact on natural environment such as air pollution and water quality of neighboring areas.

Table 7: Results of Environment Monitoring (4th Quarter of 2015)

Indicator	Standard	Result
Sulfur hydrogen in air (H_2S)	0.02 ppm	0 ppm
Arsenic in the reinjection wells (As)	0.05 mg/L	Under the detection limit of 0.003
Mercury in the reinjection wells (Hg)	0.001 mg/L	Under the detection limit of 0.0007

Source: Results from the questionnaire to the executing agency

[7] http://www.enecho.meti.go.jp/category/resources_and_fuel/geothermal/explanation/development/merit/clean/ (November 16, 2016)

3.4.4.2 Land Acquisition and Resettlement

About 3 ha of land acquisition were required for the power plant construction. It was confirmed to the executing agency and the implementing consultant of the project that the compensation procedure to the land owner was carried out in accordance with the appropriate process and there was no problem in land acquisition, and no impact on the construction works. Since both construction sites of the power plant and the transmission towers by PLN were wooded area, agricultural land and grassland, there were no resettlement issue. Therefore, there was no negative impact by the land acquisition.

3.4.4.3 Other Impacts

According to the executing agency and the implementing consultant, about 200 people, which was about half of the 400-500 workers during the construction period, have been employed for the project locally. It can be said that the project contributed to increase employment and income for the local residents. The contribution from the project was also confirmed even after the project. At the time of the ex-post evaluation, three operators and two security guards have been hired from neighboring community for Unit 3.

In light of the above, this project has to some extent achieved its objectives. Therefore, effectiveness and impact of the project are fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The operation and maintenance of the power plant after the completion of the project is undertaken by the PLN Lahendong (Lahendong Geothermal Power Plant) under the supervision of North and Central Sulawesi-Gorontalo Regional office (hereinafter referred to as “regional office”) located in Manado, North Sulawesi. The regional office is belonging to the Sulawesi Nusa Tengarra Regional Division in PLN Headquarters. Before the restructuring of PLN, the operation and maintenance of PLN Lahendong was used to be undertaken by the North Sulawesi regional office under the East Indonesia Regional Division of PLN Headquarters. The East Indonesia Regional Division was divided by the restructuring of PLN and the Sulawesi Nusa Tengarra Regional Division took it in charge.

PLN Lahendong has four units of geothermal power plants and allocates division managers to each plant who take responsibility for operation, maintenance, and administration under the head of the plant. Those managers including the head of the plant are assigned from the PLN headquarters. As of the ex-post evaluation, total number of staff was 92, 33 from the PLN headquarters, 39 outsourcing staff, 16 security guards

and four policemen. The operators of power plants of four units work in shifts and about 5-6 operators work in one shift per unit. In this way, the staff members from the PLN headquarters have been assigned in each division and sufficient number of staff has been allocated.

Although there was change of organizational structure for maintenance by the PLN restructuring, problem cannot be observed in the system. The interview to the executing agency revealed the positive impact by the PLN restructuring. The narrowed covering areas of responsibility of the Regional Division of Headquarters made more smooth communication with the actual sites and expedited the response to the problems. The PLN Lahendong has maintained good relationship with PGE which supplies the steam. The steam problem has been discussed with PGE with holding periodical meetings.

Accordingly, there is no particular problem on the operation and maintenance of Lahendong geothermal power plant.

3.5.2 Technical Aspects of Operation and Maintenance

The participants of the trainings and the executing agency have highly evaluated the achievement of the on-the-job training (OJT) and training in Japan conducted by the implementing consultant of the project for the operators and maintenance staff members during the construction period. According to them, they have gained the know-how of operation and maintenance of the project by those trainings. The nine members who participated in the training in Japan have taught know-how to their colleagues through OJT after coming back from the training. As of the ex-post evaluation, there were only two operators left among those who have participated in the training of Japan since some of them have retired and some have transferred. However, those remaining two operators have become cores of the operation. The operation manuals which were developed during the construction period were also highly evaluated. Thus, those manuals were translated into Indonesian language by the executing agency and revised annually. It was confirmed that they have been utilized at the time of the ex-post evaluation.

Control Room

The PLN operators and maintenance engineers are obliged to attend trainings on their own areas of responsibility and trainings according to the level of their own qualification at the PLN Learning Centers (three centers nationwide) every six months. In this way, appropriate human resource management system has been built in PLN. The

responsible staff members of the project also have attended this kind of trainings. The daily maintenance has been conducted by utilizing manuals. The periodical maintenance has also been undertaken. In the case of necessity arises, it is supported by outsourced organizations[8]. Therefore, no particular problem has been identified regarding the technical aspects of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The operation and maintenance costs are budgeted by PLN Lahendong, and the budget is applied and approved by the PLN Headquarters through the regional office. The approved budget is allocated to the regional office. According to the regional office and PLN Lahendong, the operation and maintenance costs necessary to the project has been allocated sufficiently every year as planned and the good operation and maintenance has been in place[9]. Therefore, no particular problem has been identified regarding the financial aspects of operation and maintenance.

3.5.4 Current Status of Operation and Maintenance

As of the ex-post evaluation, almost all the defects which were found at the First Year Inspection after the completion of the project and during the warranty period have been responded and no major problem was observed in operation and maintenance.

The maintenance for Unit 3 is conducted based on the maintenance plan formulated with the type of maintenance, budget, inspection schedule, etc. The plan is reviewed and updated every year. In principle, PLN Lahendong carries out the large scale inspection (overhaul) at 48-month interval, the periodical maintenance at 24-month interval and daily maintenance (checking the status of equipment such as turbine, filters, motors, etc. based on the manuals).

Although the periodical maintenance had not been conducted since the outage time was long due to the steam problem, it has been conducted during May to the end of July at the time of the ex-post evaluation survey in 2016. Overhaul is planned to be implemented in 2018.

Nevertheless, the steam problem has not been completely solved yet. As stated above, the steam of the project has been exchanged into that of Unit 4. However, the NCG concentration level of the exchanged steam itself is 1.4 % which is still higher than the

[8] The periodic maintenance is basically conducted by the internal human resources but is outsourced to the maintenance service sector of Java-Bali power generation company (PJB-S) of PLN groups or private companies as necessary.

[9] According to the executing agency, when the necessity arises to secure the costs more than the planned budget, the regional office can flexibly secure the costs from other projects. Therefore, there is a system that can quickly cope with such situation. It was also confirmed that there is no problem on the timing of the budget disbursement.

acceptable range of Unit 3 of 1.0 %. In addition, the pressure of the exchanged steam is sometimes weak. When the steam pressure is weak, the steam for Unit 3 has been mixed with the steam from No. 23, the original steam well. Therefore, the problems of high acidity of the hot water and the concentration of NCG in the steam have not been completely solved yet[10]. According to PGE, in order to cope with the problems, they are planning to mix steams from the other two steam wells[11] by October 2016. If this is realized, it is expected that the NCG issue will be solved and the problem of high acidity of steam supplied to the project will be mitigated.

From the above, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendation

4.1 Conclusion

The project aimed to ease the power supply demand tightness and improve the stability in the Minahasa power system, North Sulawesi, by newly constructing a geothermal power generation plant as Unit 3 of the existing Lahendong geothermal power plant.

The objective of the project which addresses the tight power supply-demand condition by supplying power through renewable energy is well consistent with the development policy and development needs of Indonesia, as well as with the Japan's ODA policy. Therefore the relevance of the project is high. Both the project cost and project period were within the planned. Therefore efficiency of the project is high. Regarding operation and effective indicators at the time of the appraisal, those showing the availability of the power plant have reached the targets, however, those showing actual energy production have not reached the targets for about five years from the start of power generation due to the quality problem of steam (although steam supply is out of the scope of project). This fact reduced effectiveness to some extent. It was confirmed, however, that after changing the supply source of the steam, planned effect of the project has been mostly observed. Negative impact on natural and social environment by the project has not been observed and it can be said that the project has contributed to a certain extent in shifting to an energy efficient power supply and utilizing domestic

[10] When the steam pressure from the exchanged No. 28 is weak, about 5 % of the steam from No.23 which has been used before is additionally injected. For that reason, the level of NCG sometimes increases as high as 2%. As a result, the amount of power generation becomes lower since the power plant has to be operated with reduced output.

[11] NCG level of both of the steam production wells is lower than 0.8 %.

energy sources. Thus, effectiveness and impact of the project are fair. In regard to the operation and maintenance, although problem of the steam quality has not been solved completely at the time of the ex-post evaluation, there is a good prospect of solving the problem. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

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

4.2 Recommendation

4.2.1 Recommendations to the Executing Agency

Continuation of consultation with PGE and Monitoring the progress

Unit 3 has to generate power with reduced output since the levels of NCG and acidity of the steam are still high even the steam has been exchanged into the steam from No. 28 well in October 2014. Moreover, when the steam pressure from No. 28 well is weak, the steam has to be mixed with steam from No. 23 well which has high concentration of NCG. Thus, it becomes necessary to further reduce the output. In order to respond to this problem, PGE has developed two steam production wells, No.47 and 48 which have low level of acidity and concentration of NCG and is planning to secure the sufficient amount of steam for the project by mixing the steam from these two steam wells with steam from No. 28 by October 2016.

PLN (regional office) is required to continuously consult this issue with PGE (North Sulawesi office) at monthly meetings and to confirm the progress of the countermeasure. Furthermore, PLN Headquarters is recommended to actively address this issue such as by participating in monthly meetings at the regional level and holding a meeting with PGE Headquarters as necessary.

4.2.2 Recommendation to JICA

None.

4.3 Lessons Learned

Confirm the quality of steam before deciding specification of procuring equipment

In this project, the equipment specification was decided based on the steam sales contract between PLN and PGE, which promised to supply steam with NCG value of 1 % or less. Therefore, the equipment including a gas extractor that can accept NCG values of 1 % or less was procured[12]. In reality, the supplied steam to the project had NCG value

[12] According to PGE, since the NCG level of the steam near the No. 23 well was less than 1 %, same figure was used in the contract without actually surveying steam quality.

exceeding 1 %, therefore, the problem was observed right after the project completion and the project has not been able to produce the target amount of power generation. After learning lessons from this project, PLN obliged PGE to submit “Resource Confirmation” after signing of steam sales contract since 2014[13]. It shows the amount and quality of steam identified by the survey. This was realized after PLN learned lessons from this project. In this way, it is very important to confirm the amount and quality of steam based on the actual survey before deciding the specification of equipment. Although even after the survey the quality of steam may change afterwards since it is a natural element, it is necessary to determine the specification of equipment at least after confirming the actual findings by the survey. If the actual survey results such as “Resource Confirmation” are not available in advance, it is considered that the specification should allow wider ranges to the extent possible.

[13] As the first applied case, the Resource Confirmation was submitted to PLN in August 2014 in relation to the JICA ODA loan project “Geothermal Development Acceleration Program (Hulu Lais Geothermal Power Plant (Engineering Service)”)(L/A: Dec. 2015).

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
①Project Outputs	1) Civil Works, Equipment Procurement ・ Geothermal Turbine (Installing 20 MW-class x 1 unit) ・ Condensing system ・ Electric Facilities ・ Instrumentation and Control Equipment ・ Necessary construction for future expansion ・ Auxiliary Equipment 2) Transmission System ・ Transmission line (150 kV, 3 km) from the project (Lahendong Unit 3) to existing Lahendong Unit 1 switchyard ・ Switchgear and Equipment of Lahendong Unit 1 ・ Auxiliary Equipment 3) Consulting Services ・ Review of PERTAMINA's resource study Assistance of PLN in Prequalification of bidders, construction supervision, transfer of knowledge and training of PLN's personnel, Environmental monitoring, Reporting	1) Civil Works, Equipment Procurement ・ As planned ・ As planned ・ As planned ・ As planned ・ As planned ・ As planned 2) Transmission System ・ Due to change of the construction site of the project (Lahendong Unit 3) the plan was changed. Instead of installing transmission system, the transmission lines were connected to Lahendong Unit 1 and Unit 2 by constructing transmission towers. 3) Consulting Services ・ As planned
②Project Period	April, 2004 – April, 2010 (73 months)	April, 2004 – February, 2010 (71 months)
③Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	4,494 million yen 2,513 million yen (Local Currency) 179,500 million IDR 7,007 million yen 5,866 million yen 1 IDR = JPY 0.014 (as of October, 2003)	4,430 million yen 1,170 million yen (Local Currency) 106,374 million IDR 5,600 million yen 4,517 million yen 1 IDR = JPY 0.011 (Average rate during the period from 2004 to 2012)

Republic of Indonesia

FY 2015 Ex-Post Evaluation of Japanese ODA Loan Project

"Tarahan Coal Fired Steam Power Plant Project"

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

0. Summary

This project constructed coal-fired steam power plants with the aim of establishing stable power supply system, and coping with tight supply-demand balance in Lampung in the Southern area of Sumatra Island. The project objectives – to diverse electric power sources by utilizing coal and to improve stability of power supply – are consistent with Indonesia's energy and power policies and with development needs as well as Japan's ODA policy which stipulated the assistance for developing the industrial base; thus, the relevance of the project is high. Although the project cost was within the plan, the project period significantly exceeded the plan; thus, efficiency of the project is fair. As Operation and Effect Indicators of this project were not set at the time of appraisal, the alternative indicators set at the time of ex-post evaluation were confirmed. Most of the executing agency's yearly targets were achieved and the power plants have largely generated its planned effects, producing electricity smoothly. The power plant is located in Lampung where reserve margin is the lowest in Sumatra Island and is playing an extremely important role to reduce power loss and to maintain quality of power supply in this area. Also, the project has been contributing to improving reliability of power supply, to establishing efficient power supply system, to reducing consumption of oil, to accumulating and sharing know-how of the new technology on Circulating Fluidized Bed (hereinafter referred to as "CFB") boiler in the executing agency, and contributing to local industrial development (economic effects). Therefore, effectiveness and impact of the project are high. No negative impacts on natural environment, land acquisition and relocation have been observed. No major problems have been identified in the institutional, technical and financial aspects of the operation and maintenance system as well as in the current status; thus, sustainability of the project effects is high.

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

1. Project Description

Project Location

Tarahan Coal Fired Steam Power Plant

1.1. Background

Electricity demand in the Sumatra Island was increasing responding to rapid economic growth. Especially electricity demand in Southern Lampung area accounted for approximately 40% of that of the whole of Sumatra, and was drastically increasing at an average rate of more than 10% per year. To meet the growing electricity demand of Southern Lampung area, where improvement of stability and reliability of power supply were urgent issues, coal-fired steam power plants and related facilities were constructed based on the Japanese ODA Loan "Engineering Services for Tarahan Coal Fired Steam Power Plant Project" signed in 1993.

1.2 Project Outline

The objective of the project is to increase the power supply in Lampung area in Sumatra Island by constructing coal-fired steam power plants (installed capacity of 200MW: 100MW x 2units) and related facilities for base-load power source, thereby contributing to improving stability of power supply and to increasing the efficiency of power supply system.

Loan Approved Amount/ Disbursed Amount	34,023 million yen / 26,783 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	January, 1998 / January, 1998
Terms and Conditions	Interest Rate 2.7% (Consultant 2.3%) Repayment Period 30 years (Grace period) (10 years) Conditions for Procurement General Untied

Borrower / Executing Agency	Republic of Indonesia / State Electricity Company (PT. PLN)
Final Disbursement Date	September, 2008
Main Contractor (Over 1 billion yen)	PT. Adhi Karya (Indonesia)/ Toa Corporation (Japan) (JV), Marubeni Corporation (Japan), P.T. Doosan Indonesia (Indonesia) / Alstom Corporation (Japan) / Mitsui Miike Machinery Co., Ltd. (Japan) (JV), PT. Alstom Power Energy System Indonesia (Indonesia) / Marubeni Corporation (Japan) / Alstom Power Inc. (USA) (JV)
Main Consultant (Over 100 million yen)	PT Jaya Konstruksi Manggala Pratama (Indonesia) / Tokyo Electric Power Services Co., Ltd. (Japan) (JV)
Feasibility Studies, etc.	・F/S (December, 1988) ・SAPS for Tarahan Coal Fired Steam Power Plant Project (E/S) (February, 1997)
Related Projects	Japanese ODA Loan (Loan Agreement signing year and month in parentheses) ・Tarahan Coal Fired Steam Power Plant Project (E/S) (November, 1993) Technical Cooperation ・Japan International Cooperation Agency (JICA) Development Study "Survey on power sector for the most optimum electric power resource development" (2002) ・JICA Expert (dispatched to the Ministry of Energy and Mineral Resources) (2011-2016) World Bank ・Technical Assistance (Assistance for restructuring corporation and finance led by PLN) ・Java-Bali Power Sector Restructuring and Strengthening Project (2003 - 2013)

2. Outline of the Evaluation Study

2.1 External Evaluator

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

2.2 Duration of Evaluation Study

Duration of the Study: October, 2015 – December, 2016

Duration of the Field Study: February 18, 2016 – March 25, 2016, June 16, 2016 – June 29, 2016

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance to the Development Plan of Indonesia

At the time of appraisal, Government of Indonesia adopted National Medium Term Development Plan 1989-1993, which stipulated to promote non-dependence on oil as a basic policy, aimed to support industrial development by diversification of power resources and ensuring stable power supply. Moreover, in a power policy, new power source development in an environmentally-friendly manner was aimed. In this regard, construction of coal-fired power plants which alternate diesel-powered plants was preferred.

At the time of ex-post evaluation, National Medium Term Plan (hereinafter referred to as "RPJMN") (2015-2019) and Long Term Electricity Development Plan (hereinafter referred to as "RUPTL") (2015-2024) by the State Electric Company, PT. PLN (Persero)[3], stipulate to develop power sources which replace the utilization of economically inefficient energy resources such as diesel fuel and to strengthen power capacity through facilitation of energy mix. RUPTL states that planned target for the reserve margin in Sumatra to be 61% by 2024. For additional power source development, improving economical efficiency, utilizing the coal fuel in Sumatra, is promoted. In addition, the Jokowi administration, which was established in 2015, considers "Rural Development" as priority, and put up a policy to allocate funding for developing power supply outside of Java Island on a priority basis.

Therefore, implementation of the project is consistent with energy and power policy in Indonesia both at the time of appraisal and ex-post evaluation.

3.1.2 Relevance to the Development Needs of Indonesia

At the time of appraisal, coping with tight power supply-demand in South Sumatra and establishing stable power supply system were a pressing issue. Electricity demand in South Sumatra area accounted for approximately 40% of that of the whole of Sumatra, and was drastically increasing at an average rate of more than 10% per year. Reliability of power supply of existing power generation facilities was low and coping with rapid growth of power demand and deterioration of generating capacity were urgent issues. Although power source development continued to take place, reserve margin decreased year by year since increase of demand exceeded that of supply, thus, through responding to pressing needs of power demand and developing alternative power source to replace inefficient diesel, it was expected to enhance stability and reliability of power supply and efficiency of power

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[2] ③: High, ②: Fair, ①: Low
[3] PT. Perusahaan Listrik Negara (Persero)

facilities in the region.

At the time of ex-post evaluation, increasing power generation capacity in the area continues to be an urgent issue[4] to tackle with. Especially, Lampung Province is one of the most serious areas facing power shortage. As shown in the Table 1, the reserve margin in Lampung is negative figure, significantly lower than 25%[5], which is considered to be necessary reserve margin for stable power supply, thus alleviation of the supply-demand balance is a pressing issue.

Table 1：Trend of Power Supply-Demand Balance and Reserve Margin
In Lampung System, the Sumatra Island

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
①Maximum Power Demand (MW)	288	387	423	457	482	538	623	690	675	737
②Power Supply (MW)	217	414	407	383	433	516	547	549	671	600
Reserve Margin (%) = (②-①)/①	-24.6	7.0	-3.8	-16.1	-10.1	-4.1	-12.2	-20.5	-0.5	-18.6

Source：Results from questionnaire survey of executing agency
Note：Power supply of power facilities constructed by this project commenced from December, 2007

3.1.3 Relevance to Japan's ODA Policy

The Country Assistance Policy for Indonesia by Japanese Government (prepared in February, 1994) indicated "industrial infrastructure development (economic infrastructure)" as priority area for assistance in Indonesia. In addition, from the viewpoint of rural development, providing assistance outside of Java Island was regarded as priority.

At the time of appraisal, power supply and demand in South Sumatra was tight and it was an urgent issue to improve the power supply and demand balance. Therefore, implementation of this project with the aim of developing power source for economic development in regional areas outside the Java Island was consistent with the above policy.

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

3.2 Efficiency(Rating: ②)

3.2.1 Project Outputs

This project is to construct coal-fired steam power plants (100MW x 2units) and related facilities (coal handling equipment, transmission facilities etc.) at Tarahan Coal Fired Power Plant. In this project, CFB boiler[6] is adopted, which is the first case in Indonesia.

[4] According to RUPTL 2015-2024, demand for power in Sumatra is expected to increase from 31.2TWh in 2015 to 82.8TWh in 2024, an average of 11.6% increase per year.
[5] Source: National Energy Policy (RUKN) 2003-2022 of the Government of Indonesia
[6] In the CFB boiler, coal is burned with combustion mediator (Silica sand). Since the thermal conductivity is

Table 2 shows the comparison of planned and actual project outputs.

Table 2： Comparison of Planned and Actual Project Outputs

Plan	Actual
Civil Works, Procurement of Equipments etc.	
・ Main power generating facilities (boiler, turbine equipment) 100MW x 2units (using Circulating Fluidized Bed boiler)	・ As planned
・ Coal Handling Equipment	・ As planned
・ Ash Handling Equipment	・ As planned
・ Electric facilities	・ As planned
・ Switchyard and transmission facilities (150kV GIS, 150kV transmission lines – 2 lines, 18km)	・ As planned
・ Relevant civil works and construction	・ As planned
Consulting services	
・ Consulting services (Assistance in tendering, construction supervision, inspection, testing and delivery control, assistance in operation and maintenance, assistance in environmental management, transfer of knowledge and technology, personnel training etc.)	・ As planned

Source：Results from questionnaire survey of executing agency

There was no change with respect to project scope for civil works and procurement of equipments etc.

As regards MM of consulting services, while the initial plan was 852MM, it turned out to be 986.66MM in actuality – significant increase of total MM (116% of the planned MM). This was due to the delay of conclusion of coal supply contract, which delayed project implementation. It was deemed necessary for consultants to be on board including prolonged project period, which resulted in increase of their inputs. Although the situation can not necessarily be regarded as efficient, it is understandable from the perspective of quality control.

Turbine in the Power Plant

high inside of the CFB boiler, the materials are burned efficiently. In addition, the combustion temperature is low, leading to lower NO_x emissions. Moreover, CFB boiler makes possible to desulfurize fuels inside the boiler, hence desulfurization equipment is not necessary.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 42,712million yen (out of which 34,023million yen was to be covered by Japanese ODA loan). Since the cost of land acquisition is unclear, comparison between the planned project cost excluding the cost of land acquisition, 42,204million yen, and actual cost excluding the cost of land acquisition, 34,635million yen (out of which 26,783million yen was covered by Japanese ODA loan) is carried out. The actual cost is within the planned cost (81% of the planned amount). In spite of significant increase of consulting services cost, the actual cost is lower than planned cost because of depreciation of the local currency (Indonesia Rupiah) compared with Japanese yen during project implementation.

3.2.2.2 Project Period

The overall project period was planned as 84months, from November, 1997 (conclusion of Loan Agreement) to October, 2004 (completion of warranty period) as opposed to 132months in actuality, from January, 1998 (conclusion of Loan Agreement) to December, 2008 (completion of warranty period), which is significantly longer than planned (157% of the initial plan). Loan period was extended in February, 2005 due to project delay, and the final loan period was set as September, 2008. Main reasons for project delay were: (1) delay of commencement of consultant selection due to economic and social conditions influenced by the Asian currency crisis (1997), (2) delay of identification of the coal kind, and (3) difficulties in negotiations with coal supplier under fluctuating market price of coal, in the absence of the regulation on domestic coal market obligation[7]. Since conclusion of coal supply contract was set as a necessary condition for tender announcement and concurrence of contract of civil works, the delay of coal supply contract has led to delay of tendering as well as overall project schedule.

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

Financial Internal Rate of Return

The financial internal rate of return (FIRR) calculated at the time of project appraisal was 9.8%, on the assumption that sales from power generated from the project to be considered as benefit, expenses for construction cost, fuel cost (coal), limestone cost, and operation and maintenance cost to be regarded as cost, and project life assumed to be

[7] In Indonesia, the new Mining Law enforced in 2009 imposed an obligation of domestic coal supply (obligation of prioritizing coal sale in domestic market) to coal supply companies. However, until 2009, there was no regulation on domestic coal supply obligation, hence, it took time to negotiate with coal suppliers which preferred to export coal.

25years. The FIRR recalculated at the time of ex-post evaluation based on the same assumptions as the appraisal turned out to be 8.9%. The reason for the lower figure in comparison with the figure at the time of appraisal can be attributed to the increase in fuel cost.

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

3.3 Effectiveness[8](Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Since the Operation and Effect Indicators for this project were not set at the time of appraisal, the indicators (Maximum Output, Plant Load Factor, Availability Factor, Auxiliary Power Ratio, Gross Thermal Efficiency, Outage Hours due to Periodic Maintenance and Inspection, Outage Hours due to Human Error, Outage Hours due to Machine Trouble and Annual Power Production) were established at the time of ex-post evaluation. Since the figures after 2years of project completion, from 2010 to 2012 were not available at the time of ex-post evaluation, comparison was made between the target figures[9] and the actual achievement figures from 2013 to 2015. (Refer to Table 3)

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

[9] The targeted figures are set based on the contract which is concluded every year between PLN (Headquarter) and PLN Head Unit in Palembang (upper unit of PLN Tarahan), which supervises 10 existing power plants in 4 provinces in Southern area of the Sumatra Island.

Table 3：Operation and Effect Indicators

(Unit 3 and Unit 4 of Tarahan Coal Fired Power Plant[10])

Indicator	Target			Actual		
	2013	2014	2015	2013	2014	2015
	5Years after Completion	6Years after Completion	7Years after Completion	5Years after Completion	6Years after Completion	7Years after Completion
Maximum Output (MW) Note1)	100×2	100×2	100×2	100×2	100×2	100×2
Plant Load Factor (%) Note 2)	89	91	90	90	93	90
Availability Factor (%) Note 2)	81	78	75	82	82	78
Auxiliary Power Ratio (%) Note 2)	12	11	11	11	11	11
Gross Thermal Efficiency (%) Note 2)	-	-	-	38	39	34
Outage Hours due to Periodic Maintenance and Inspection (hour/year) Note1)	2,880	-	1,968	1,767	1,403	1,205
Outage Hours due to Human Error Note1)	-	-	-	-	-	-
Outage Hours due to Machine Trouble Note 1)	1,008	-	1,042	1,032	1,250	1,743
Annual Power Production (GWh/year) Note1)	1,227	1,268	1,291	1,285	1,327	1,227

Source：Information provided by JICA, and results from questionnaire survey of executing agency
Note 1) Total amount of Unit 3 and Unit 4
Note 2) Average of Unit 3 and Unit 4
Note 3) The year of project completion = the year of completion of Warranty Period is 2008

According to the actual achievement figures of the Operation and Effect Indicators, most of the yearly targets were achieved and power plants have been generating electricity mostly smoothly. However, according to the executing agency, the power plants had been encountering unexpected power outages[11] frequently due to troubles s from 2009, two years after the commencement of power plant operation, to 2012 which led to power production loss (GW/h).

Based on the situation mentioned above, it is considered that the target indicators from 2013 to 2015 were adjusted, taking into consideration of the past damages. Therefore it is difficult to analyze the effectiveness of the power plants only by the fact that most of the

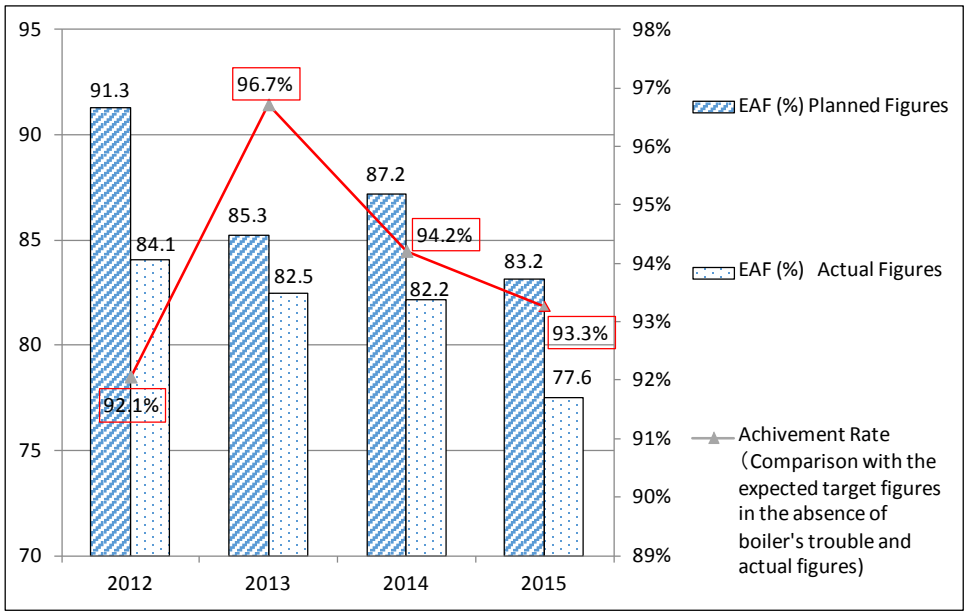
[10] This project constructed the Unit 3 and Unit 4 power plants at the Tarahan coal fired steam power plant. Although the Unit 1 and Unit 2 power plants were planned to be constructed by PLN's own funds, they have not been constructed at the time of ex-post evaluation.

[11] According to the executing agency, as a reason of sudden outage, the abrasion of the boiler pipe by the burning material (Silica sand) of CFB boiler was pointed out. This abrasion was considered as the problem of the design itself.

targets set by the executing agency were achieved from 2013 to 2015.

Accordingly, the Equivalent Availability Factor (hereinafter referred to as "EAF [12]"), which is one of the performance indicators standardized by the executing agency was taken in and comparison between planned figures and actual figures (average figures of Unit 3 and Unit 4) from 2012 to 2015 were made. As a result, it revealed that the power plants have achieved 90% or above the planned targets. (Refer to Figure 1). The planned figures calculated by the executing agency are the expected figures supposing there was no above-mentioned boiler trouble.

Due to the problem in the boiler design, power plants have encountered frequent troubles, which affected the effectiveness such as creation of power production loss. However, the actual achievement of EAF is 90% or above the planned target which is estimated in the absence of boiler troubles. Therefore, it is considered that enough effectiveness has been generated, based on the originally expected level.



Source：Prepared by the evaluator based on the information provided by executing agency

Figure 1： EAF of the Tarahan Coal Fired Steam Power Plant
(Planned Figures and Actual Figures between 2012 and 2015)

3.3.2 Qualitative Effects

Table 4 summarizes the share of net capacity of the power plants in the Central and Southern Sumatra System and in Lampung System.The share in the Central and Southern Sumatra System is 4.74% which implies that the project's contribution to the improvement

[12] EAF (Equivalent Availability Factor)：It is calculated by equalizing the operating ratio (percentage of annual operational hours including stand-by hours), taking the sudden outage time and outage hour due to maintenance into consideration.

of power supply-demand balance and increase of reserve margin in the region is limited. On the other hand, considering that the power plants are located in Southern Lampung area, a largest power demand area, and the share of the net capacity in the Lampung System is 29.67%, it can be said that the power plants play an important role to ensure stability of power supply of the same system and to maintain quality of electric power. (Refer to "3.4 Impact" below.)

Table 4：Share of Tarahan Coal Fired Steam Power Plant (Unit 3 and Unit 4)

Net Capacity[13] (2015)	Net Capacity of the Power Plants (2015)	Share
Central and Southern Sumatra System：3,758MW	178MW	4.74%
Lampung System：600MW		29.67%

Source：Information provided by JICA, and results from questionnaire survey of executing agency

3.4 Impacts

3.4.1 Intended Impacts

Among power facilities constructed by this project, the Unit 3 commenced its operation in December, 2007 and the Unit 4 commenced in October, 2007. Therefore, in regard to the Lampung System, the figures before commencement of operation (before 2007) and the figures after commencement of operation (since 2008) were compared (Refer to the Table 1 above.) Although the reserve margin was minus at the time of ex-post evaluation, the average of reserve margin from 2008, which is just after commencement of operation, to 2015 is -10.7%. Improvement has been seen when compared with reserve margin before this project.

The Lampung System, the area of tightest power demand-supply in the Sumatra Island, adjusts its supply and demand gap through power interchange from other systems of other provinces and from Central and Southern Sumatra System. Considering that the power plants are located in Lampung where reserve margin is the lowest in Sumatra Island, the project is playing an extremely important role to ensure the stability of power supply and maintain quality of power supply in Lampung as well as Central and Southern Sumatra System, hence contributing to the improvement of reliability of power supply[14].

In addition, according to the executing agency, it can be said that the CFB boiler which

[13] Net capacity is equivalent to gross capacity or installed capacity minus the amount of power consumed within a power plant.

[14] The executing agency explained the following as its logic: when the place for power generation is far from power consuming area (when power transmission distance is long), electric resistance increases and power loss increases, hence power voltage reduces. Since power transmission from other systems or provinces can cause increase of the power loss and decline of power voltage, it is important to generate power in the same area with the aim of ensuring the stability of power supply and maintaining quality of power supply.

was adopted in Tarahan power plant, can generate power with lower costs than using the former boilers. Therefore, it can be considered that Tarahan power plant has contributed to the establishment of efficient power supply system. Moreover, the proportion of oil dependence for fuel declined from 6% (483.1GW/h) in 2006 to 1.9% (355.0GW/h) in 2015 in Central and Southern Sumatra System when looking at power production composition ratio based on the fuel kinds, thus, it can be said that Tarahan power plant has contributed to the reduction of oil consumption.

Furthermore, it was confirmed that the accumulated operational know-how on CFB boiler from Tarahan coal fired steam power plant, the first power plant which adopted the CFB boiler in Indonesia, has been utilized for the planning and operation of other power plants[15]. Since the executing agency has established internal knowledge-sharing system for sharing challenges and know-how on boiler maintenance, improvement of technology and accumulation of operation know-how have taken place, and new power plants adopting the CFB boiler have been disseminated all over the country at the time of ex-post evaluation.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

After the Environmental Impact Assessment Report (hereinafter referred to as "AMDAL") was approved in 1992, the revised AMDAL was drawn due to the change of installed capacity (from 130MW to 200MW). In 1996, revised AMDAL was approved together with the Environmental Management Plan (hereinafter referred to as "RKL") and the Environmental Monitoring Plan (hereinafter referred to as "RPL").

The executing agency conducted environmental monitoring before and during the project as well as after commencement of operation, and no particular negative environmental impact has been reported. The results of the environmental monitoring after the commencement of operation show that all the indicators have met national environmental standards regulated by the Indonesian Government (Ministry of Environment). Tarahan power plant is receiving "Certificate of Blue", which authenticates "satisfactory" in complying with the environmental requirements. In addition, no major issue on negative environmental impacts has been identified form the results of interview with local residents[16].

[15] Normally the CFB boilers are utilized for power plants with capacity of around 100MW class. At the time of ex-post evaluation, based on accumulation of know-how at the Tarahan power plant, CFB boilers are introduced in power plants with capacity of around 400MW class. In addition, there are 7 or more coal-fired power plants which have introduced CFB boilers all over the country.

[16] Although the dust was generated during construction of power plant, the countermeasures for the dust (planting bamboos) were taken by the executing agency. Hence, there were no huge negative impacts.

3.4.2.2 Land Acquisition and Resettlement

Regarding land acquisition and resettlement, necessary land was already acquired prior to the project, and resettlement was taken place based on the compensation policy without particular problems. Through interview survey with the local residents, no complaints or problems were identified in regard to resettlement process.

From the above results, this project has generally achieved its objectives as planned. Therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The operation and maintenance of the power plants after project completion is undertaken by PLN Tarahan. Previously, PLN Region IV Office used to be in charge of operation and maintenance of the Tarahan coal-fired steam power plant, however, after restructuring of PLN in 2015, PLN Region IV Office was dissolved and its role has been transferred to PLN Head Unit in Palembang, which is the upper unit of PLN Tarahan. PLN Head Unit in Palembang is in charge of coordinating operation and decision-making within the region, supervising the existing 10 power plants located in Southern area of the Sumatra Island. PLN Tarahan and PLN Head Unit in Palembang have a close cooperation system, hence necessary budget and human resources etc. are duly allocated.

PLN Tarahan allocates division managers who take responsibility for engineering, operation, maintenance, administration and finance under the head of the plant. Approximately 100 staff members work at the whole power plant. As regards necessary number of engineers who are in charge of operation and maintenance, allocated number is more than the target[17] set by PLN Tarahan. Although there was change of organizational structure for maintenance, the responsibilities and decision making process among organizations are clear and there is no particular problem on the operation and maintenance system.

3.5.2 Technical Aspects of Operation and Maintenance

In regard to the CFB boiler, technical troubles had occurred frequently for about 20 times per year since 2009, after two years of commencement of operation, until 2012. As for maintenance, the executing agency couldn't directly contact with the designer of boiler or vender of spare parts[18]. In spite of this situation, the executing agency tried to solve the

[17] PLN Tarahan set up the targeted number of appropriate human resource allocation to be 86 staffs (operation: 48 staffs, maintenance: 38 staffs)

[18] In addition to no assistance from designer of the boiler and contractors, it was unable to contact directly with spare-part venders when exchanging spare parts.

problems and promoted internal knowledge sharing[19], and successfully secures smooth operation now. Moreover, the internal knowledge-sharing system for design and maintenance for next-generation CFB boiler power plants has been established, from experiences and lessons learned acquired from this power plant regarding repair, maintenance management and maintenance plan of CFB boiler. Today PLN has become recognized as one of the specialized agencies on CFB boiler in Indonesia[20].

In regard to operation and maintenance, engineers who have gained sufficient power plant operation experiences and have been qualified by Indonesia Electricity Power Expert Association are undertaking the operation and maintenance work of the power plants. Engineers are required to take training based on their professional areas and levels of qualification. Moreover, on the job training is provided for operation and maintenance staffs. Therefore, it can be observed that adequate management system for human resource development has been established. In addition, the manuals of operation and maintenance and the recording data systems[21] developed by the project are utilized for daily operation and maintenance work. Furthermore, the PLN Tarahan has acquired ISO 90001 (quality management system), ISO 14001 (environmental management system), ISO 28000 (safe management system of supply chain), OHSAS 18001 (occupational health and safety management system) etc., and operation and maintenance of Tarahan power plant has been taken place in conformity with these management systems. Therefore, no particular problem has been identified regarding the technical aspects of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The operation and maintenance costs are estimated by PLN Tarahan, and the estimation will be applied for Head Unit in Palembang and then approved by PLN Headquarter. After this process, budget will be allocated based on the contract with Head Unit in Palembang. Table 5 shows comparison of actual budget allocation and actual expenditure of operation and maintenance cost of the power plant after project completion. The power plant's maintenance cost has been properly secured[22], and is well operated and maintained.

Therefore, no particular problem has been identified regarding the financial aspects of operation and maintenance.

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[19] Meetings with the aim of sharing current problems of maintenance and repair of CFB boiler and discussing solutions have been held regularly at the PLN Head Unit in Palembang and PLN Learning Center.

[20] Many domestic and foreign engineers and groups concerned with coal-fired steam power plants have visited to PLN to learn about its technology and management know-how on CFB boiler. Moreover, the technical know-how and experience from Tarahan coal-fired steam power plant are disseminated by sharing the materials through E-learning and other documents at internal portal site and by holing relevant open seminars.

[21] Record data system on the efficiency and performance of the power plant.

[22] It was confirmed that there is no problem on the timing of budget allocation. In case when unplanned additional budgets were necessary, budgets were allocated promptly by ex-post application.

Table 5：Operation and Maintenance Cost of the Power Plant

(Unit: million IDR : Indonesian Rupiah)

2013		2014		2015	
Actual Allocation	Actual Expenditure	Actual Allocation	Actual Expenditure	Actual Allocation	Actual Expenditure
663,711	492,697	552,844	531,338	589,848	573,327

Source：Results from questionnaire survey of executing agency

3.5.4 Current Status of Operation and Maintenance

In Tarahan power plant, the long-term (five year-term) Maintenance Plan has been developed and it sets down the types of maintenance, necessary budget and cycle of maintenance. Based on this, maintenance activities have been conducted appropriately and no particular problem has been observed. Specifically, major inspections (every four years), regular inspections (twice a year (every 4,000hours of operation)), daily maintenance, condition based maintenance, preventive maintenance (inspection of related facilities, etc.) (every 52weeks) and predictive maintenance[23] are conducted.

Regarding regular inspection, the frequency of inspection has been increased[24] since 2009, based on the situation where PLN Tarahan had been encountering frequent boiler troubles. By conducting frequent regular maintenance and inspection activities, frequency of condition based emergency maintenance as well as sudden power shortage was reduced. For example, according to PLN Tarahan, the annual outage hours due to boiler trouble was reduced from 1,316hours (in 2009) to 777hours (in 2015). The number of frequency of boiler trouble was declined as well from approximately 20 times since after 2010 to less than five times a year after 2013. As regards spare parts, the power plant has introduced a supply chain management system and inventory management system (a system which minimum necessary stocks for maintenance are secured and stored in the ware-house of PLN Tarahan), thus, spare parts have been procured on a timely basis.

Although there were technical troubles with CFB boiler, based on the lessons learned, the executing agency has been successfully managing and operating the facilities adequately by increasing the frequency of regular maintenance, developing human resources of engineers and establishing adequate inspection system.

Therefore, no particular problem has been identified regarding current status of operation and maintenance.

[23] Maintenance activities for preventing machine troubles in advance by predicting problems beforehand and taking countermeasures.

[24] The frequency of inspection was changed from once a year to twice a year (every 4,000hours of operation) with the aim of reducing the accident rate and preventing sudden outage.

A Staff Bringing Combustion Mediator (Silica Sand) which is Used for CFB Boiler

A Scene of the Central Management Room (Display of the PC Monitor)

Therefore, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project constructed coal-fired steam power plants with the aim of establishing stable power supply system, and coping with tight supply-demand balance in Lampung in the Southern area of Sumatra Island. The project objectives – to diverse electric power sources by utilizing coal and to improve stability of power supply – are consistent with Indonesia's energy and power policies and with development needs as well as Japan's ODA policy which stipulated the assistance for developing the industrial base; thus, the relevance of the project is high. Although the project cost was within the plan, the project period significantly exceeded the plan; thus, efficiency of the project is fair. As Operation and Effect Indicators of this project were not set at the time of appraisal, the alternative indicators set at the time of ex-post evaluation were confirmed. Most of the executing agency's yearly targets were achieved and the power plants have largely generated its planned effects, producing electricity smoothly. The power plant is located in Lampung where reserve margin is the lowest in Sumatra Island and is playing an extremely important role to reduce power loss and to maintain quality of power supply in this area. Also, the project has been contributing to improving reliability of power supply, to establishing efficient power supply system, to reducing consumption of oil, to accumulating and sharing know-how of the new technology on CFB boiler in the executing agency, and contributing to local industrial development (economic effects). Therefore, effectiveness and impact of the project are high. No negative impacts on natural environment, land acquisition and relocation have been pointed out. No major problems have been observed in the

institutional, technical and financial aspects of the operation and maintenance system as well as in the current status; thus, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

The importance of risk analysis in order to ensure implementation of the fuel procurement plan

The main reason for project delay was the failure of securing coal supply in a timely manner. Since conclusion of coal supply contract was set as a necessary condition for tender announcement and JICA's concurrence of contract of civil works, the delay of securing coal supply has led to delay of overall project schedule.

Such significant project delay and extension of disbursement date could have been avoided to some extent by setting schedules based on results of detailed risk analysis and by working out risk control countermeasures prior to the commencement of the project. In this respect, when similar projects are planned in the future, it is necessary to set an appropriate schedule plan and devise risk control measures taking into consideration the expected time necessary for contract negotiation with fuel suppliers and the risk analysis regarding fuel supply purchase contract.

The importance of securing follow-up and after-care system when introducing new technology in a project

This project was the first coal fired steam power plant project which adopted the CFB boiler in Indonesia, and the executing agency has faced with technical boiler troubles. The executing agency tried to solve the problems by taking measures on its own efforts such as conducting frequent maintenance and inspection activities, and sharing lessons learned and knowledge within the organization, thereby successfully secures smooth operation now. On the other hand, there were not enough after-care services from the contractor, therefore additional tasks for the executing agency on maintenance such as repair works and replacement maintenance on its own have increased. In this regard, for some executing agencies, which do not have enough institutional system and capacity, would not have fully

managed the situations. Therefore, in the case of preparing similar projects adopting new technology which the executing agencies do not have prior knowledge and experiences, it is crucial to conduct design for various facilities based on an appropriate risk analysis conducted at the F/S stage and to ensure enough after-care system after the introduction of the new technology t as well.

End

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil Works, Procurement of Equipments etc. ・ Main power generating facilities (boiler, turbine equipment) 100MW x 2units (using Circulating Fluidized Bed boiler) ・ Coal Handling Equipment ・ Ash Handling Equipment ・ Electric facilities ・ Switchyard and transmission facilities (150kV GIS, 150kV transmission lines – 2 lines, 18km) ・ Relevant civil work and construction 2) Consulting Services ・ Assistance in tendering, construction supervision, inspection, testing and delivery control, assistance in operation and maintenance, assistance in environmental management, transfer of knowledge and technology, personnel training etc.	1) Civil Works, Procurement of Equipments etc. ・ As planned ・ As planned ・ As planned ・ As planned ・ As planned ・ As planned 2) Consulting Services ・ As planned
2. Project Period	November, 1997 – October, 2004 (84months)	January, 1998 – December, 2008 (132months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	 34,023million yen 8,689million yen (167,096million IDR) 42,712million yen 34,023million yen 1IDR＝0.052yen (As of May, 1997)	 26,783million yen 7,863million yen (639,262million IDR) 34,646millon yen 26,783million yen 1IDR＝0.0123yen (Average between 2001 and2008)

Republic of Indonesia

FY 2015 Ex-Post Evaluation of Japanese ODA Loan Project

"Tanjung Priok Gas Fired Power Plant Extension Project"

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

0. Summary

This project constructed new gas-fired combined cycle generating facilities at the Tanjung Priok Gas Fired Power Station with the aim of increasing power supply and improving stability of power supply in the Java-Bali system. The project objective – to convert energy source from oil to gas and to cope with tight power supply-demand condition – is consistent with Indonesia's power policy and with the development needs, as well as Japan's ODA policy; thus, the relevance of the project is high. Although the project cost was within the plan, the project period exceeded the plan; thus, efficiency of the project is fair. Operation and Effect Indicators set at the time of appraisal have achieved around 90% of the target figures. It is worthy of special mention that the project is located in Jakarta Capital Region and supplying power to industrial area in the east and to Tanjung Priok Seaport in the north, and is playing an important role to reduce power loss and to maintain quality of power supply in the Java-Bali system. The power plant has largely generated its planned effects; thus, effectiveness and impact of the project are high. No negative impact on natural environment has been observed, and neither land acquisition nor relocation has taken place. As regards impacts of four ODA loan projects[1] including this project, it can be pointed out that past achievements of gas-fired combined cycle power plant projects utilizing ODA loans have facilitated introduction of Japan's high quality infrastructure technology in Indonesia as well as encouraged conversion of energy source from oil to gas in Indonesia. No major problem has been observed in the institutional, technical and financial aspects of the operation and maintenance system as well as in the current status; thus, sustainability of the project effects is high.

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

[1] Four projects are: "Tanjung Priok Gas Fired Power Plant Extension Project", "Muara Karang Gas Power Plant Project", "Muara Tawar Gas Fired Power Plant Extension Project" and "South Sumatra-West Java Gas Pipeline Project".

1. Project Description

Project Location

Tanjung Priok Gas Fired Power Plant (Block 3)

1.1. Background

Demand for power in Indonesia has increased sharply with the economic recovery following the currency crisis which occurred in 1997, and the easing of power supply-demand in the Java-Bali system, which accounted for about 80% of all annual power sales in Indonesia, was a particularly pressing issue. However, power source development using funding from the State Electricity Company, PT. PLN (Persero)[2] (hereinafter referred to as "PLN") and privately-funded power source development, was limited. Therefore, it was necessary to develop power sources using overseas public funds. Responding to the tight power supply-demand condition in the Java-Bali system, the project was expected to ensure stable power supply by newly constructing power generating facilities in the suburbs of Jakarta Capital Region.

1.2 Project Outline

The objective of this project is to increase power supply in the Java-Bali system by constructing new gas-fired combined cycle generating facilities (720MW class: 250MW class gas turbine generator×2units, 220MW class steam turbine generator×1unit) at the Tanjung Priok Gas Fired Power Station located in the suburbs of the Special Capital Region of Jakarta, thereby contributing to improve stability of power supply in the Java-Bali system.

Loan Approved Amount/ Disbursed Amount	58,679 million yen / 56,647 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004 / March, 2004

[2] PT. Perusahaan Listrik Negara (Persero)

Terms and Conditions	Interest Rate 1.3% Repayment Period 30 years (Grace Period) (10 years) Conditions for Procurement General Untied
Borrower / Executing Agency	Republic of Indonesia / State Electricity Company (PT. PLN)
Final Disbursement Date	March, 2014
Main Contractor (Over 1 billion yen)	Mitsubishi Corporation (Japan)
Main Consultant (Over 100 million yen)	Fichtner GMBH & Company KG. (Germany) / PT. Jaya CM Manggala Pratama (Indonesia) / PT. Kwarsa Hexagon (Indonesia) / PT. Connusa Energindo (Indonesia) / PT Hasfarm Dian Konsultan (Indonesia) / Tokyo Electric Power Company Holdings, Incorporated (Japan) / Tokyo Electric Power Services Co., Ltd. (Japan) (JV)
Feasibility Studies, etc.	F/S (2002)
Related Projects	Japanese ODA Loan (Loan Agreement signing year and month in parentheses) ・ South Sumatra-West Java Gas Pipeline Project (March, 2003) ・ Muara Karang Gas Power Plant Project (July, 2003) ・ Muara Tawar Gas Fired Power Plant Extension Project (July, 2003) Technical Cooperation ・ Study on the Effective Use of Captive Power in Java-Bali Region (2002) ・ Electric Power and Energy Policy Adviser dispatched to the Ministry of Energy and Mineral Resources Grant Aid (Exchange of Notes signing year and month in parentheses) ・ The Project for Rehabilitation of Gresik Steam Power Plant Units 3 and 4 (July, 2004) World Bank ・ Technical Cooperation (Supporting PLN's Corporate and Financial Restructuring) ・ Java-Bali Power Sector Restructuring and Strengthening Project Asian Development Bank ・ Power Transmission Line Improvement Sector Project ・ Renewable Energy Development Sector Project

2. Outline of the Evaluation Study

2.1 External Evaluator

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

2.2 Duration of Evaluation Study

Duration of the Study: October, 2015 – December, 2016

Duration of the Field Study: February 18, 2016 – March 25, 2016, June 16, 2016 – June 29, 2016

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of Indonesia

At the time of appraisal, PLN's Long Term Electricity Development Plan (hereinafter referred to as "RUPTL") 2003-2010, stipulated the necessity to construct additional generation facilities of about 8,500MW by 2010 in the face of power demand increase in the Java-Bali system – power demand was expected to increase on an average of 8.3% per year by 2010 and the forecasted maximum power demand in 2010 was 27,073MW. However, of which, financial sources to develop 4,000MW power generation facilities was undecided. In addition, in RUPTL, there was a plan to increase the ratio of gas fuel utilization, and to reduce the ratio of oil usage in the energy mix for power generation. The project objective to contribute to increase power supply in the Java-Bali system by constructing new gas-fired combined cycle generating facilities is consistent with the above policy.

At the time of ex-post evaluation, according to RUPTL 2015-2024, power demand is expected to increase on an average of 7.8% per year in the Java-Bali system – the forecasted maximum power demand would increase to 53,707MW in 2024 from 27,061MW in 2015 – and coping with the tight power supply-demand condition continues to be an urgent issue. In addition, the Additional 35GW Power Development Plan 2015-2024, which the Jokowi administration considers as priority, allows additional gas fuel – natural gas and LNG[5] – allocation to PLN. The project objective continues to be consistent with Indonesia's power policy at the time of ex-post evaluation.

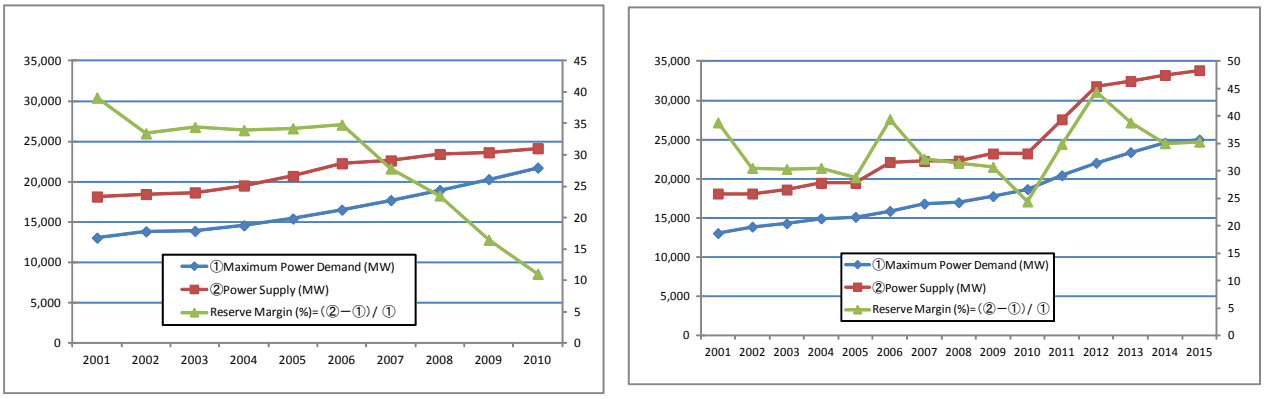
3.1.2 Relevance to the Development Needs of Indonesia

At the time of appraisal, coping with tight power supply-demand in the Java-Bali system

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

and establishing stable power supply system were a pressing issue. PLN's financial situation worsened and development of power resources stagnated due to the effects from the Asian Financial Crisis in 1997. For such reasons, the plan to construct new power generation facilities was not enough to cope with growing demand in the future. Reserve margin was expected to decrease from 33% in 2002 to 11% in 2010 even if development of new power sources was taken into consideration[6]. Trend of power supply and demand balance, and reserve margin in the Java-Bali system is shown in Figure 1.

At the time of ex-post evaluation, facilitation of development of power sources in the Java-Bali system, which supplies power to Jakarta Capital Region, continues to be a pressing issue. According to RUPTL 2015-2024, the demand for power in Java-Bali system is expected to increase from 165.4TWh in 2015 to 324.4TWh in 2024, and the easing of power supply-demand is an urgent issue to tackle with.



Source: Results from questionnaire survey of executing agency

Figure 1: Trend of Power Supply-Demand Balance and Reserve Margin in the Java-Bali System (Figure on the left is the estimation at the time of project planning and figure on the right is the actual)

3.1.3 Relevance to Japan's ODA Policy

The Medium-Term Strategy for Overseas Economic Cooperation Operations of JICA (April, 2002) indicated "economic infrastructure development" as priority area for assistance in Indonesia. In addition, JICA put up "improvement of enabling environment for private investment-led economic growth" as one of the priority issues in its Country Assistance Strategy for Indonesia (prepared in October, 2003). Furthermore, the ODA Country Data Book for Indonesia (2002) by the Japanese Ministry of Foreign Affairs

[6] At the time of appraisal, there was a plan to develop new power sources, totaling 5,035MW, including this project, "Muara Karang Gas Power Plant Project", "Muara Tawar Gas Fired Power Plant Extension Project" (these three projects were ODA loan projects) and other power generation projects from different funding sources. However, reserve margin was expected to go down to 11% in 2010 even if taking into account these new development plan. But the actual reserve margin in 2010 was 24.4% (not 11%) because the maximum power demand turned out to be less than the forecasted level.

pointed out economic recovery and stability of people's livelihood as issues to cope with since the Asian economic crisis. The project objective to provide support for power supply which serves the industrial base and stability of people's lives was consistent with the above policy.

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

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The project newly developed a 2:1:2 structured combined cycle power generation, consisting of two gas turbine generators, one steam turbine generator and two heat recovery steam generators in the existing Tanjung Priok Gas Fired Power Station Block 3. Table 1 shows the comparison of planned and actual project outputs.

Table 1: Comparison of Planned and Actual Project Outputs

Plan	Actual
Civil Works, Procurement of Equipments etc.	
・ Construction of two gas turbine generators (250MW class×2units)	・ As planned
・ Construction of one steam turbine generator (220MW class×1unit)	・ As planned
・ Construction of two heat recovery steam generators	・ As planned
・ Associated equipments for the above construction and related works	・ As planned
・ Installation of two terminal towers for the 150kV double-circuit cables	・ As planned
・ Change of the connection of two transmission lines to the Plumpang substation	・ As planned
・ Extension line bus at the Plumpang substation	・ As planned
・ Installation of related equipments including additional circuit breakers at the Plumpang substation	・ As planned
・ Spare parts for two years after the commencement of operation	・ As planned < Additional scope > ・ Installation of shoring protection ・ Rehabilitation of existing oil dike ・ Construction of additional gas piping
Consulting Services	
・ Detailed design, assistance in tendering, construction supervision, inspection, testing and delivery control, assistance in O&M, assistance in environmental management, transfer of knowledge and technology, and human resource development etc.	・ As planned

Source: Results from questionnaire survey of executing agency

As regards civil works, (1) installation of shoring protection, (2) rehabilitation of existing oil dike, and (3) construction of additional gas piping were added to the scope. (1) Shoring protection was installed to protect the power plant from inundation against big waves from the Java Sea, and to secure smooth operation of the power plant. This measure was carried out as a result of flood damages due to big waves caused by the recent strong wind. (2) Rehabilitation of existing oil dike was conducted in order to prevent oil leak from the existing oil dike. The fuel of this power plant is dual-use – both gas and HSD[7] can be utilized. Therefore, in case of shortage of gas fuel, HSD can be utilized for power generation. (3) Construction of additional gas piping was an additional work from the gas supply point to the power plant, which had not been included in the original scope. (The scope was added based on the actual situation in order to transmit gas smoothly.) Total inputs have increased for consulting services as a result of the additional project scope. The additional output is deemed appropriate, commensurate with inputs, in light of ensuring smooth operation of the power plant.

As regards MM of consulting services, while the initial plan was 984MM, it turned out to be 1,080MM in actuality – about 10% increase. This was due to the extended period for detail design as a result of additional outputs, as well as the delay of gas supply. For the latter, although the situation can not necessarily be regarded as efficient, it was deemed necessary for consultants to be on board including prolonged project period, which resulted in increase of their inputs.

Facility where Gas Turbine is Installed

Heat Recovery Steam Generator

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 69,252million yen (out of which

[7] High Speed Diesel.

58,679million yen was to be covered by Japanese ODA loan). In actuality, the total project cost was 68,999million yen (out of which 56,647million yen was covered by Japanese ODA loan), which is lower than planned (100%[8] of the planned amount).

3.2.2.2 Project Period

The overall project period was planned as 78months, from March, 2004 (conclusion of Loan Agreement) to September, 2010 (completion of warranty period) as opposed to 106months in actuality, from March, 2004 (conclusion of Loan Agreement) to January, 2013 (completion of warranty period), which is longer than planned (136% of the initial plan). Loan period was extended due to project delay.

Main reasons for project delay were: (1) delay of gas supply[9] and (2) delay in detailed design period due to additional project outputs.

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

Financial Internal Rate of Return

The financial internal rate of return (FIRR) calculated at the time of project appraisal was 22.6%, on the assumption that sales from power generated from the project to be considered as benefit, expenses for construction cost, operation and maintenance cost and fuel cost to be regarded as cost, and project life assumed to be 25years. The FIRR recalculated at the time of ex-post evaluation based on the same assumptions as the appraisal turned out to be 21.1%. The reason for the lower result in comparison with the figure at the time of appraisal can be attributed to the increase in gas fuel cost.

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

3.3 Effectiveness[10] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Table 2 summarizes the operation and effect indicators with targets set at the time of

[8] This percentage was calculated by comparing the actual cost after the scope change and the planned cost before the scope change.

[9] Background for the delay of gas supply, and measures taken by the executing agency: The executing agency initially planned to utilize natural gas to be transmitted through the gas pipeline connecting South Sumatra and West Java, in addition to the gas supply from the existing gas field in the off-shore of Java to secure necessary gas fuel. However, negotiation broke down without reaching an agreement between the executing agency and a private company over risk-taking of the gas pipeline which was under construction. For this reason, the executing agency had to revise the original gas procurement plan, and to secure gas fuel from a state-owned gas enterprise in Indonesia (PGN) as well as from the LNG Terminal (FSRU) in the end. A set of such processes required considerable time, resulting in delay of gas supply as well as the commencement of the power plant operation.

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

project appraisal and their actual figures between 2013 and 2015.

Table 2: Operation and Effect Indicators (Block 3 power plant)

	Baseline Note 1)	Target	Actual					
	2003	2011	2013		2014		2015	
	Baseline Year	1 Year After Completion	Completion Year Note 2)		1 Year After Completion		2 Years After Completion	
Maximum output	—	720MW Note 3)	757MW		721MW		718MW	
Plant load factor	—	70% or more	57.65%		65.57%		64.48%	
Availability factor	—	80% or more	88.95%		93.92%		95.95%	
Gross thermal efficiency	—	48% or more	47.94%		49.67%		48.86%	
Net Electric Energy Production	—	4,305GWh or more/year	2,986GWh		3,743 GWh		3,850 GWh	
Percentage of outage hours due to periodic maintenance and inspection Note 4)	—	—	Target 2.84%	Actual 4.72%	Target 6.85%	Actual 5.83%	Target 3.56%	Actual 3.81%
Percentage of outage hours due to machine trouble Note 4)	—	—	0.88%	12.36%	1.54%	0.87%	0.86%	0.84%
Outage hours due to human error Note 4)	—	—	0hour	0hour	0hour	0hour	0hour	0hour

Source: Information provided by JICA, and results from questionnaire survey of executing agency

Note 1) Baseline figures did not exist at the time of appraisal because the project is a construction of new power plant.

Note 2) The figures in 2014 shall be compared with target figure, and the figures in 2013 (the year of project completion: i.e., at the year of completion of Warranty Period) were provided as reference.

Note 3) Maximum output and annual power production were subject to change, depending on the difference in actual specification from planned specification as a result of bidding.

Note 4) Percentages of outage hours due to periodic maintenance or due to machine trouble in total availability hours, respectively. Although these indicators had not been established at the time of appraisal, the target figures [11] set within the executing agency and their actual figures were provided as reference.

Since the commencement of power plant operation up to the time of ex-post evaluation, the operational condition is satisfactory, generating electricity smoothly. While actual figures for plant load factor and net electric energy production of the power plant have not reached their targets set at the time of appraisal, they have achieved either more than 90% of the target (plant load factor) or a little less than 90% of the target (net electric energy production) in 2014 and 2015. According to executing agency, this was not because of

[11] The target figures were established in the yearly signed Asset Management Contract between the executing agency and the Indonesia Power (a generation affiliate company of PLN. It undertakes operation and maintenance of the project after completion.). The Indonesia Power reports the actual figures (monitoring results) to the executing agency every year.

technical problem of the power plant but because power generation was controlled by dispatchers. In other words, in view of saving generation costs of the entire Java-Bali system, dispatchers controlled the operation of this power plant for which generation cost was relatively expensive in light of rising LNG cost[12]. Thus, executing agency indicated that such control by no means reduces the effectiveness of the project.

As regards percentage of outage hours due to periodic maintenance and inspection/machine trouble, which were provided as reference indicators, executing agency pointed out that the reason for the actual figures in 2013 exceeding the target was because of more maintenance works were carried out/initial trouble in the electric system and turbine system occurred during start-up period of the power plant operation. In this regard, the executing agency considers it should not be regarded as a problem. Target figures are mostly achieved in 2014 and 2015. No outage hour due to human error has occurred after the commencement of power plant operation.

3.3.2 Qualitative Effects

Table 3 summarizes the share of net capacity[13] of the power plant in the entire Java-Bali system and in Jakarta Capital Region, respectively.

Table 3: Share of Tanjung Priok Gas Power Plant (Block 3)

Net Capacity: (2015)	Net Capacity of the Power Plant (2015)	Share
Entire Java-Bali System: 31,694MW	720MW	2.27%
Jakarta Capital Region: 5,996MW		12.01%

Source: Information provided by JICA, and results from questionnaire survey of executing agency

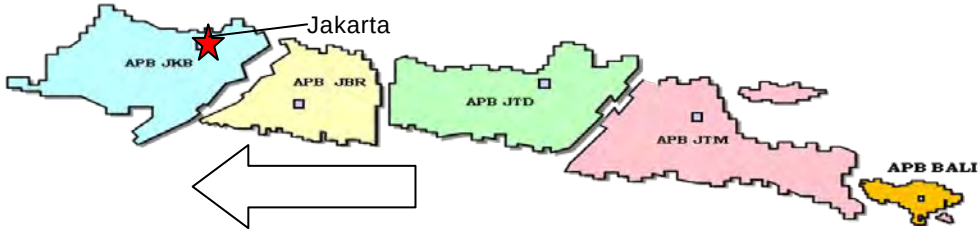
The electricity generated is supplied to the Jakarta Capital Region, and this power plant carries an extremely important role to supply power to industrial area in the east (Bekasi Area) and to Tanjung Priok Seaport in the north. The net capacity of the power plant has a share of more than 12% of the net capacity in Jakarta Capital Region, and this figure also shows that it has a critical role in securing power supply and demand balance in the country's capital. Furthermore, considering that the power plant is located in Jakarta Capital Region, the largest power demand center, it can be said that it plays an extremely

[12] The main fuel source of the power plant is LNG. The assumed fuel costs written in each RUPTL are listed below. While the cost of natural gas is within the range of U$6-7/MMBTU, LNG cost has been rising from U$10 to 16/MMBTU.
RUPTL 2010-2019 Natural gas: USD6/MMBTU, LNG: USD10/MMBTU
RUPTL 2012-2021 Natural gas: USD6/MMBTU, LNG: USD13/MMBTU
RUPTL 2013-2022 Natural gas: USD7/MMBTU, LNG: USD16/MMBTU
RUPTL 2015-2024 Natural gas: USD7/MMBTU, LNG: USD16/MMBTU

[13] Net capacity is equivalent to gross capacity or installed capacity minus amount of power consumed within a power plant.

important role to reduce power loss and to maintain quality (voltage) of power supply in the Java-Bali system [14].

Net capacity and load for each of the five service/load dispatch area of the executing agency in the Java-Bali system are shown in Figure 2. Because load (demand) exceeds net capacity in the West Java area (JKB [15]) where Jakarta Capital Region is located, it means that power supply to this area is covered by electricity produced in other areas. Such power interchange beyond business/load dispatch areas would cause voltage drop and power loss [16] of trunk power system, and would become a bottleneck for stable and efficient power supply. Hence, it is important to supply power within the same business/load dispatch area as much as possible so as to secure stability and appropriate power quality in the entire power system. In this regard, it is extremely significant that the power plant is located in Jakarta Capital Region.



	JKB	JBR	JTD	JTM	BALI
Net Capacity (MW)	9,282	7,673	5,216	8,561	962
Load (MW)	9,987	5,074	3,884	5,260	808

Source: Prepared by the evaluator based on the information provided by executing agency

Figure 2: Comparison of Net Capacity of Power Plant and Load by Area in the Java-Bali System (2015)

3.4 Impacts

3.4.1 Intended Impacts

Table 4 shows the trend (actual and projection) of energy sales, transmission and distribution losses and peak load in Jakarta Capital Region. Since the power plant commenced its operation in October, 2012, comparison was made before (before 2011) and after (after 2013) the start of power generation. Energy sales and peak load have been increasing steadily, while percentages of transmission and distribution losses have

[14] Among power plants constructed with a support of ODA loan in the same period, this project, "Muara Karang Gas Power Plant Project", and "Muara Tawar Gas Fired Power Plant Extension Project" are located in Jakarta Capital Region, and are playing an extremely important role for stable power supply in Capital Region/West Java Region.

[15] Jakarta and Bandung Load Dispatch Area

[16] The executing agency explained the following as its logic: "When the place for power generation is far from power consuming area (when power transmission distance is long) ➔ electric resistance increases ➔ power loss increases ➔ power voltage reduces."

decreased. Therefore, it can be considered that to a certain extent, additional power supply from this project has been contributing to push up energy sales and power supply at a peak load. Also, given the gradual increase of share of energy production of the power plant (Net Electric Energy Production, refer to Table 2) in Jakarta Capital Region, 10.4% in 2013, 12.3% in 2014 and 12.8% in 2015, it can be said that the project has been contributing to the increase of power production in Jakarta Capital Region.

Table 4: Trend of Energy Sales, Transmission and Distribution Losses and Peak Load in Jakarta Capital Region

	Actual						Projection		
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Energy Sales (GWh)	23,788	25,012	26,959	27,733	28,378	27,992	29,029	33,108	35,374
Transmission and Distribution Losses (%)	8.04	7.55	6.74	6.76	6.64	6.24	6.15	6.05	5.96
Peak Load (MW)	3,383	3,970	4,070	4,208	4,345	4,356	4,643	5,287	5,641

Source: Prepared by the evaluator based on the information provided by executing agency

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

The project falls under A category of "Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations" (established in October, 1999) because it is a development project of a large-scale power plant. At the time of appraisal, impact on natural environment in the project surrounding area was considered to be small, given that habitat of ecologically precious species did not exist, and anticipated results regarding project impacts on ambient air quality, water quality etc. were minimal. Environmental Impact Assessment Report (AMDAL), Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL) have been approved on October 15, 2002 by Regional Assessment Commission of Environmental Impact Analysis of DKI[17] Jakarta Province.

The executing agency conducted environmental monitoring (ambient air, noise, vibration etc.) during the project preparation and implementation as well as after the commencement of operation, and no particular negative environmental impact has been reported at the time of ex-post evaluation. In addition, no negative project effect has been identified from the results of interview with the local residents.

[17] Daerah Khusus Ibukota

3.4.2.2 Land Acquisition and Resettlement

At the time of appraisal, necessary land was already acquired and neither land acquisition nor relocation was expected. In actuality, relocation and land acquisition did not take place.

3.4.2.3 Impacts on Local Residents

Through interview survey with the executing agency and local residents, creation of employment after project completion and benefits to the local community, generated from CSR (Corporate Social Responsibility) activities by Tanjung Priok Power Plant, were confirmed. For example, as part of its CSR activities, Tanjung Priok Power Plant has been providing funding for "Health Village Program" activities, a participatory, proposal type program undertaken by the local community for initiatives such as segregation and disposal of garbage, health education in elementary schools and kindergartens, and health management and promotion activities. The activity incorporates a mechanism to facilitate competition among different villages and to provide funding to a village which serves as a model for others. As a result, it has contributed to provision of incentives to community activities, reinforcement of unity among residents and activation of interaction among residents. Also, Tanjung Priok Power Plant has been providing other CSR services such as improvement of school buildings and mosques, free healthcare services by visiting physicians in the community.

Interview with Local Residents

3.4.2.4 Impacts of Four ODA Loan Projects in Package

In addition to this project, three ODA loan projects implemented around the same time – "Muara Karang Gas Power Plant Project", "Muara Tawar Gas Fired Power Plant Extension Project" and "South Sumatra-West Java Gas Pipeline Project" – were taken up to analyze their integrated impacts. The analysis revealed that gas-fired combined cycle power plant projects utilizing ODA loans have set a precedent for introducing Japan's high quality infrastructure technology in Indonesia. Also, a gas pipeline project utilizing ODA loan has encouraged conversion of energy source from oil to gas, through facilitation of

domestically produced gas in Indonesia.

PLN is planning to construct 800MW class gas-fired combined cycle power plant, utilizing its own funds plus private funds[18] in Block 4, an adjacent area to this power plant in Block 3. A joint venture consisting of Japanese and local companies has been awarded from PLN to undertake the construction work etc. with full turnkey contract[19]. Following Muara Karang Gas Power Plant and this project, which have been constructed utilizing the ODA loans, Japanese gas turbine combined cycle technology, the world's highest technology, will be introduced in Block 4. It can be pointed out that past achievements of gas-fired combined cycle power plant projects utilizing ODA loans have facilitated Japan's high quality infrastructure technology in Indonesia[20].

Total gas supply in West Java – total amount of natural gas and LNG – is 601MMSCFD[21] as of 2015. Of which, about 43%, equivalent to 260MMSCFD, is transmitted from Sumatra Island through the gas pipeline developed by the ODA loan. Thus, the gas pipeline project is contributing to enhance utilization of unused gas from Sumatra Island as well as to increase gas supply in West Java. Furthermore, the analysis on the state of fuel utilization for the entire generating facilities of Muara Tawar, Muara Karang and Tanjung Priok Power Plants, including three power plant units constructed by the ODA loans (total of about 1,700MW), has shown following results – energy production utilizing gas has increased by about 1.5 times, from 13,763GWh (2009) to 20,893GWh (2015), whereas HSD has decreased from 5,886GWh (2009) to 169GWh (2015). This fact shows that conversion of energy source from oil to gas has been facilitated.

As of now, Muara Tawar Gas Fired Power Plant is the only power plant which utilizes gas fuel transmitted through ODA loan assisted South Sumatra-West Java Gas Pipeline. On the other hand, Pertagas, an affiliate company of Pertamina, is constructing an open access gas pipeline connecting Muara Tawar Power Plant and Muara Karang Power Plant (expected to be completed in August, 2016). When construction of this gas pipeline is completed, three power plants, Muara Tawar, Muara Karang and Tanjung Priok, will be connected physically[22]. This will enable three power plants to utilize natural gas transmitted from Sumatra Island through South Sumatra-West Java Gas Pipeline[23]. Through new power plant construction, further utilization of gas is expected in the future.

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[18] Proportion of PLN's own funds will be 30%.

[19] A type of contract agreement for which a single contract for engineering, procurement of equipments, construction and commissioning to be provided by the same party.

[20] Refer to the website of Ministry of Foreign Affairs of Japan. http://www.mofa.go.jp/files/000095681.pdf

[21] Million Standard Cubic Feet per day.

[22] Tanjung Priok Power Plant is already connected to Muara Karang Power Plant through an existing pipeline.

[23] Various adjustments, including gas pressure, are necessary for the pipeline to become available. According to PLN, negotiations between PLN and Pertagas are carried out regarding amount of gas supply, gas prices and so on.

From the above results, this project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The operation and maintenance of the power plant after project completion is undertaken by Indonesia Power (hereinafter referred to as "IP"). IP is an affiliate company of PLN, the executing agency, and is undertaking operation and maintenance of the existing Tanjung Priok gas fired power plants. The total number of employees at the Tanjung Priok Power Plant is 306, of which 160 are engineers in charge of operation and maintenance. 89engineers, more than half of total engineers, are undertaking operation and maintenance of this project – Block 3 power plant (as of February, 2016). According to power plant staffs, number of engineers necessary for operation and maintenance has been secured.

Also, Asset Management Contract based on performance has been concluded between PLN and IP and is renewed every year, and operation and maintenance budget has been allocated to IP from PLN based on the contract.

In addition, an operation contract has been concluded between IP and Tanjung Priok Power Plant and is renewed every year. Table 5 summarizes the authorities among PLN, IP and Tanjung Priok Power Plant. Since 2016, "Asset Manager" role of PLN has been transferred to IP. Responsibilities and decision making process within and among organizations are clear.

Therefore, no particular problem has been identified regarding the institutional structures of operation and maintenance of this power plant.

Table 5: Authorities among PLN, IP and Tanjung Priok Power Plant

Organization	Between 2013 and 2015	After 2016
PLN	Asset Owner, Asset Manager	Asset Owner
IP	Asset Operator	Asset Manager, Asset Operator
Tanjung Priok Power Plant	Implementer for actual operation and maintenance of the power plant	Implementer for actual operation and maintenance of the power plant

Source: Prepared by the evaluator based on the information provided by executing agency

3.5.2 Technical Aspects of Operation and Maintenance

Engineers who have gained sufficient experiences through operation and maintenance of the existing power plants are undertaking the operation and maintenance work of the power plant after completion of this project. In addition, during project implementation,

contractors and consultants have provided necessary training and actual equipment exercises for operation and maintenance of Block 3 power plant to 34 IP staffs[24]. Moreover, on the job training is provided to engineers in charge of operation and maintenance work. They are also required to attend training at the PLN Learning Canter[25] more than twice a year and to receive relevant training in accordance with their areas in charge and qualification levels. Therefore, it can be observed that adequate management system for human resource development has been established.

Also, manufacturer of generating facilities has prepared manuals for staffs and they have been utilized for daily operation and maintenance work as well as periodic inspections. Furthermore, IP has acquired ISO 90001 (quality management system), ISO 14001 (environmental management system), ISO 55000 (asset management system/risk management system), OHSAS 18001(occupational health and safety management system), and operation and maintenance of Tanjung Priok power plant has been taken place in conformity with these management systems.

Therefore, no particular problem has been identified regarding the technical aspects of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The operation and maintenance costs are estimated by Tanjung Priok power plant, and via IP, the estimation will be reviewed by PLN, which allocates budget to the Power Plant in conformity with the performance based Asset Management Contract concluded between PLN and IP. Table 6 shows comparison of actual budget allocation and actual expenditure of operation and maintenance cost of the power plant after project completion. The power plant's maintenance cost has been properly secured, and is well operated and maintained.

Therefore, no particular problem has been identified regarding the financial aspects of operation and maintenance.

Table 6: Operation and Maintenance Cost of the Power Plant (Block 3)

(Unit: million IDR: Indonesian Rupiah)

2013		2014		2015	
Actual Allocation	Actual Expenditure	Actual Allocation	Actual Expenditure	Actual Allocation	Actual Expenditure
206,316	19,371 Note 1)	275,735	256,732	121,619	120,161

Source: Results from questionnaire survey of executing agency

Note 1) According to executing agency, actual expenditure in 2013 was significantly below the actual

[24] Of which, 12staffs have participated in training and site inspection in Japan, and 22staffs have received on-site training. Until now, most of these engineers have been in charge of operation and maintenance work of the power plant constructed by the project.

[25] It is a training institute of PLN which is located in three areas within the country (Jakarta, Palembang and Surabaya).

allocation because payments to vendors were made in the subsequent year due to late issuance of relevant invoices.

3.5.4 Current Status of Operation and Maintenance

The power plant facilities have been maintained well and operated smoothly. Continuous discussion has been carried out with the manufacturer for smooth operation of the power plant. Maintenance activities have been conducted appropriately and no particular problem has been observed. With the aim of increasing efficiency of the entire operation, a maintenance plan called "52 Weekly Planning" for the power plant has been introduced. It sets down planned activities for preventive maintenance (target assets for maintenance, frequency, duration and schedule for maintenance work, list of consumable supplies, staff assignment etc.) and is updated every three months based on the actual situation.

As regards power plant inspections, (1) inspections concerning combustion facilities are conducted for every 8,000hours of operation, (2) inspections related with turbine are conducted for every 16,000hours of operation, and (3) major inspections are conducted for every 48,000hours of operation. According to executing agency, no problem has been observed and facilities have been well maintained as a result of inspections (1) and (2). Inspection (3) will take place for the first time in 2017.

As regards spare parts, the power plant has introduced a system called MAXIMO[26] for the management. Daily consumable supplies and specified spare parts are stored in the warehouse in the power station site. Other spare parts have been procured on a timely basis based on long-term service contract with the manufacturer. In addition, cooperation system with neighboring power plants has been established to accommodate spare parts.

Therefore, no particular problem has been identified regarding the current status of operation and maintenance.

From the above results, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project constructed new gas-fired combined cycle generating facilities at the Tanjung Priok Gas Fired Power Station with the aim of increasing power supply and improving stability of power supply in the Java-Bali system. The project objective – to

[26] IP has introduced an integrated system (MAXIMO) in 1998 for comprehensive management of the entire organization including asset management, personnel management, management and procurement of maintenance system and spare parts, fuel management, safety management etc. This system has permeate across staffs in Tanjung Priok Power Plant.

convert energy source from oil to gas and to cope with tight power supply-demand condition – is consistent with Indonesia's power policy and with the development needs, as well as Japan's ODA policy; thus, the relevance of the project is high. Although the project cost was within the plan, the project period exceeded the plan; thus, efficiency of the project is fair. Operation and Effect Indicators set at the time of appraisal have achieved around 90% of the target figures. It is worthy of special mention that the project is located in Jakarta Capital Region and supplying power to industrial area in the east and to Tanjung Priok Seaport in the north, and is playing an important role to reduce power loss and to maintain quality of power supply in the Java-Bali system. The power plant has largely generated its planned effects; thus, effectiveness and impact of the project are high. No negative impact on natural environment has been observed, and neither land acquisition nor relocation has taken place. As regards impacts of four ODA loan projects including this project, it can be pointed out that past achievements of gas-fired combined cycle power plant projects utilizing ODA loans have facilitated introduction of Japan's high quality infrastructure technology in Indonesia as well as encouraged conversion of energy source from oil to gas in Indonesia. No major problem has been observed in the institutional, technical and financial aspects of the operation and maintenance system as well as in the current status; thus, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

<u>The importance of risk analysis and taking measures accordingly to ensure fuel supply for thermal power plants</u>

The delay of gas supply was one of the main reasons for the project delay. It is critical that the executing agency extensively conducts cross-sectoral and comprehensive risk analysis on fuel supply, urges the central government based on the analysis as required, and encourages the government to take appropriate actions including cross-ministerial coordination.

End

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil Works, Procurement of Equipments etc. ・ Construction of two gas turbine generators (250MW class×2units) ・ Construction of one steam turbine generator (220MW class×1unit) ・ Construction of two heat recovery steam generators ・ Associated equipments for the above construction and related works ・ Installation of two terminal towers for the 150kV double-circuit cables ・ Change of the connection of two transmission lines to the Plumpang substation ・ Extension line bus at the Plumpang substation ・ Installation of related equipments including additional circuit breakers at the Plumpang substation ・ Spare parts for two years after the commencement of operation 2) Consulting Services ・ Detailed design, assistance in tendering, construction supervision, inspection, testing and delivery control, assistance in O&M, assistance in environmental management, transfer of knowledge and technology, and human resource development etc.	1) Civil Works, Procurement of Equipments etc. ・ As Planned ・ As Planned ・ As Planned ・ As Planned ・ As Planned ・ As Planned ・ As Planned ・ As Planned ・ As Planned < Additional scope > ・ Installation of shoring protection ・ Rehabilitation of existing oil dike ・ Construction of additional gas piping 2) Consulting Services ・ As Planned
2. Project Period	March, 2004 – September, 2010 (78months)	March, 2004 – January, 2013 (106months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	 49,854million yen 19,398million yen (1,385,539million IDR) 69,252million yen 58,679million yen 1IDR=0.014yen (As of October, 2003)	 56,647million yen 12,352million yen (1,215,986million IDR) 68,999million yen 56,647million yen 1IDR=0.0102yen (Average between 2005 and 2014)

Republic of Indonesia

FY 2015 Ex-Post Evaluation of Japanese ODA Loan Project

"South Sumatra–West Java Gas Pipeline Project"

External Evaluator: Masumi Shimamura,

Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project constructed gas transmission pipelines from Sumatra to West Java with the aim of facilitating effective utilization of unused gas in Sumatra and dealing with the problems of gas supply shortage in West Java. The project is consistent with Indonesia's energy policy and with the development needs at the time of appraisal and ex-post evaluation, as well as Japan's ODA policy at the time of appraisal; thus, the relevance of the project is high. Project cost exceeded the plan and project period significantly exceeded the plan. Therefore, efficiency of the project is low. Operation and Effect Indicator – transmission volume of gas – set at the time of appraisal has considerably exceeded the target figure. In addition, the project has been contributing to effective use of unused gas and increase of gas supply in West Java. Furthermore, employment generation and benefits to local residents and companies after the project completion have been confirmed. The project has largely generated its planned effects; thus, effectiveness and impact of the project are high. No negative impact on natural environment has been pointed out. Relocation and land acquisition processes have been implemented properly without any problems. As regards impacts of four ODA loan projects[1] including this project, it can be pointed out that conversion of energy source from oil to gas has been encouraged, and past achievements of gas-fired combined cycle power plant projects utilizing ODA loans have facilitated introduction of Japan's high quality infrastructure technology in Indonesia. No major problem has been observed in the institutional, technical and financial aspects of the operation and maintenance system as well as in the current status; thus, sustainability of the project effects is high.

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

[1] Four projects are: "South Sumatra-West Java Gas Pipeline Project", "Tanjung Priok Gas Fired Power Plant Extension Project", "Muara Karang Gas Power Plant Project", and "Muara Tawar Gas Fired Power Plant Extension Project".

1. Project Description

Project Locations

Pagardewa Station

1.1. Background

The Indonesian government has been promoting the development of alternative energy resources of oil in its energy policy. Natural gas, of all other fuel, has enough reserves, and is superior fuel in terms of energy efficiency, safety, and environmental aspects; thus it is considered to be the most promising alternative energy. Under such situation, it was necessary to construct West Java gas pipelines in West Java where consumption of gas is the most in Indonesia, transport gas from Sumatra where it has excess supply capacity to West Java where it has great demand, utilize unused gas, facilitate effective use of resources, and cope with gas supply shortage problems in West Java where Capital Jakarta is located.

1.2 Project Outline

The objective of this project is to enhance unused gas utilization by constructing gas transmission pipelines to transport natural gas produced at gas fields in Sumatra to Java, and developing gas supply networks in West Java, thereby contributing to dealing with the problems of gas supply shortage in West Java and to the development of competitive gas market.

Loan Approved Amount/ Disbursed Amount	49,088million yen / 48,538million yen
Exchange of Notes Date/ Loan Agreement Signing Date	January, 2003 / March, 2003
Terms and Conditions	Interest Rate 0.95% (0.75% for Consulting Services)

	Repayment Period 40years (Grace Period) (10years) Conditions for Procurement Japan Tied (Special Yen Loan) (Bilateral Tied for Consulting Services)
Borrower / Executing Agency	Republic of Indonesia / PT Perusahaan Gas Negara (Persero) (PGN)
Final Disbursement Date	July, 2013
Main Contractor (Over 1 billion yen)	Nippon Steel Corporation (Japan), JFE Engineering Corporation (Japan)
Main Consultant (Over 100 million yen)	PT. Connusa Energindo (Indonesia) / Osaka Gas Engineering Co., Ltd. (Japan) /Oriental Consultants Co., Ltd. (Japan) / Japan Oil Engineering Co., Ltd. (Japan) (JV)
Feasibility Studies, etc.	・ F/S (University of Indonesia, 1996) ・ Implementation Plan (PGN, 1999)
Related Projects	Japanese ODA Loan (Loan Agreement signing year and month in parentheses) ・ Muara Karang Gas Power Plant Project (July, 2003) ・ Muara Tawar Gas Fired Power Plant Extension Project (July, 2003) ・ Tanjung Priok Gas Fired Power Plant Extension Project (March, 2004) World Bank ・ Support for Energy Sector Reform including Securing Market Mechanism in Oil and Gas Market (Domestic Gas Market Development Project) ・ Gas Distribution Project in Java Island Asian Development Bank, European Investment Bank ・ Gas Transmission and Distribution Project between Duri in Sumatra Island and Grissik and between Grissik and Singapore

2. Outline of the Evaluation Study

2.1 External Evaluator

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

2.2 Duration of Evaluation Study

Duration of the Study: October, 2015 – December, 2016

Duration of the Field Study: February 18, 2016 – March 25, 2016, June 16, 2016 – June 29, 2016

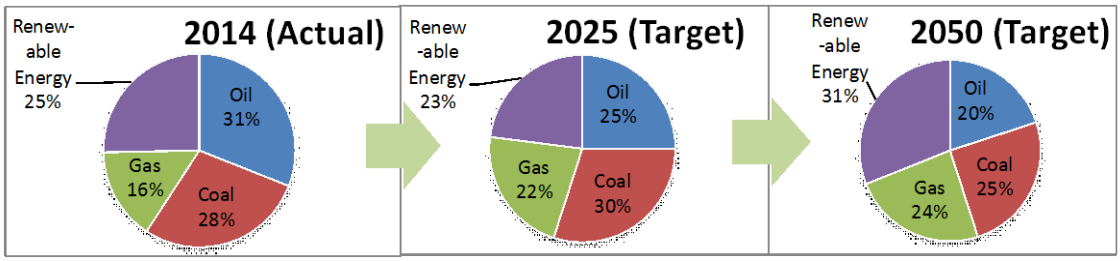
3. Results of the Evaluation (Overall Rating: B[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance to the Development Plan of Indonesia

At the time of appraisal, the five-year National Development Program (PROPENAS) 2000-2004 put up utilization of relatively inexpensive, environmentally friendly energy, maintenance of sound and fair competition, correction of monopolistic market system, and gradual reduction of subsidy to energy such as light and heavy oil for industrial use and fuel for consumer use in order to achieve fiscal soundness of the country. In line with this policy, Oil and Gas Law was enforced in November, 2001 with the aim of fostering competitive gas market and under this legal framework, the Ministry of Energy and Mineral Resources prepared Gas Pipeline Network Development Plan. This project was regarded as a second phase initiative in this plan and the Indonesian government highly prioritized the project.

At the time of ex-post evaluation, the Indonesian government sets its national target for primary energy mix in the National Energy Policy – the government states that gas consumption to be increased to 22% in 2025 and to 24% in 2050 (refer to Figure 1). In addition, the Indonesian government stipulates in the National Medium Term Development Plan (RPJMN) 2015-2019 the necessity for infrastructure development to facilitate gas utilization including construction of gas pipelines. The importance of this is project is unchanged at the time of ex-post evaluation.



Source: Prepared by the evaluator based on information provided by executing agency and National Energy Policy

Figure 1: Targets for Primary Energy Mix in Indonesia

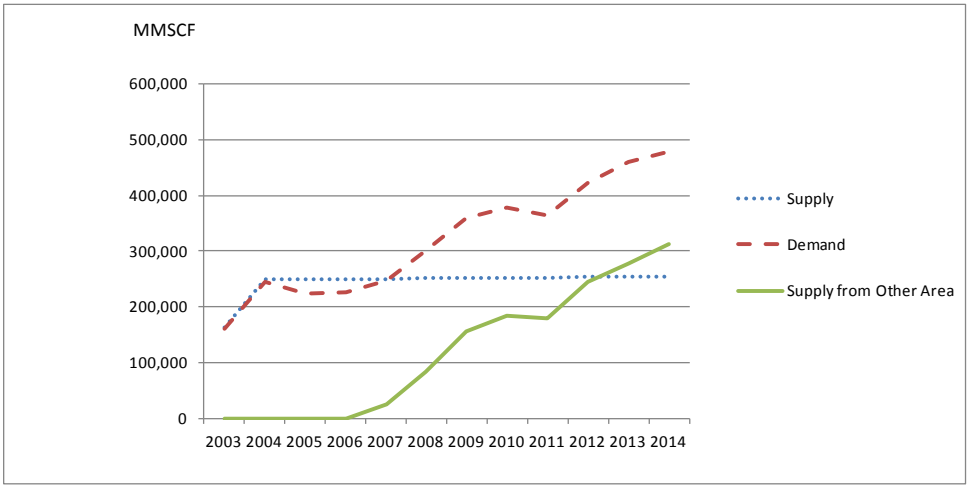
3.1.2 Relevance to the Development Needs of Indonesia

At the time of project appraisal, the necessity to cope with issues on effective utilization of unused gas in Sumatra, facilitation of efficient use of natural resources through converting energy sources from oil to gas, tackling with insufficient gas supply problems in West Java, and development of competitive energy sector was pointed out. In this regard,

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

the Indonesian government put high priority to this project.

At the time of ex-post evaluation, demand for natural gas and liquefied natural gas (hereinafter referred to as "LNG") in West Java continues to increase significantly and the area is highly dependent on gas supply from Sumatra to fill the gap. Figure 2 shows that gas demand has largely increased while supply from West Java has remained flat since 2004, and thus the gap has been filled by the natural gas supply from other areas, including South and Central Sumatra (approximately 65.6% (equivalent to 313,518MMSCF[4]) of the demand in 2014 (equivalent to 477,768MMSCF) has been supplied from South and Central Sumatra). Natural gas has been transported to West Java through the gas pipelines constructed by this project, which has played an extremely important role at the time of ex-post evaluation.



Source: Results from questionnaire survey of executing agency

Figure 2: Supply and Demand Trend of Natural Gas and LNG in West Java

3.1.3 Relevance to Japan's ODA Policy

The ODA Country Data Book for Indonesia (2002) by the Japanese Ministry of Foreign Affairs pointed out economic recovery and stability of people's livelihood as issues to cope with since the Asian economic crisis. In addition, the Medium-Term Strategy for Overseas Economic Cooperation Operations of JICA (April, 2002) indicated "economic infrastructure development" as priority area for assistance in Indonesia. Furthermore, JICA put up its policy to cope with development issues that would contribute to resolve bottlenecks of economic activities in its Country Assistance Strategy for Indonesia (September, 2001). It is consistent with the above policy to facilitate energy sector reform in Indonesia and to develop core infrastructure facilities that would contribute to resolve

[4] Million Standard Cubic Feet.

bottlenecks to private investment through the project.

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

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

The project constructed gas transmission pipelines to transport natural gas produced at gas fields in Sumatra to Java. Table 1 shows the comparison of planned and actual project outputs.

Table 1: Comparison of Planned and Actual Project Outputs

Plan	Actual
Civil Works (EPC[5] Contract)	
(1) Onshore gas transmission pipeline from Pagardewa Station to Labuhan Maringgai Station (distance: 270km/diameter: 32 inch)	(1) As planned[6]
(2) Submarine gas transmission pipeline from Labuhan Maringgai Station to Cilegon (distance: 105km/diameter:32 inch)	(2) As planned
(3) Onshore gas transmission pipeline from Cilegon in West Java to Cimanggis	(3) Installation of pipeline section was reduced to "Bojonegara (Cilegon) – Cikande and Cikande – Bitung"[7]
(4) West Java (Cilegon area) gas distribution pipeline	(4) As planned
(5) Compressor Stations	(5) As planned
Consulting Services	
(6) Project Management Consultancy (PMC) Services - Detail design, review of bid documents, assistance in tendering, construction supervision, and environmental monitoring	(6) As planned

[5] EPC (Engineering, Procurement, and Construction) Contract is a form of contracting arrangement where the contractor is made responsible for all the activities from design, procurement of equipments to construction.

[6] The executing agency implemented a part of project scope (as listed below) utilizing its own funds in "Phase 2" project (refer to BOX 1 to be described later), removing the scope from ODA loan portion, in the face of the soaring price of steel materials.

- Onshore gas transmission pipeline (distance: about 4km/diameter: 28inch) from Pertamina's (*) Pagardewa Station to the executing agency's Pagardewa Station. (*) Pertamina is the state's largest oil and gas company owned by the government of Indonesia.
- Pipeline Stations (four stations).
- Installation of SCADA (Supervisory Control and Data Acquisition Facilities).

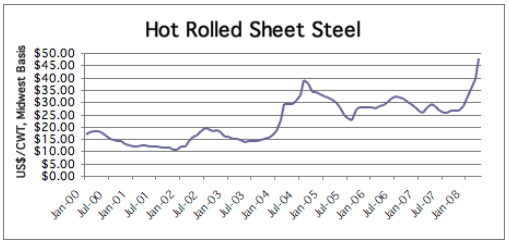
[7] The executing agency removed this project scope from the ODA loan portion due to soaring price of steel materials, and implemented the reduced scope utilizing its own funds in other project.

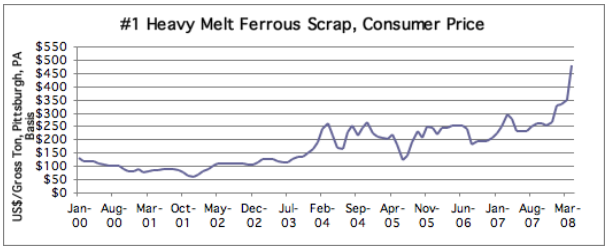
(7) Operation and Maintenance Consulting Services - Necessary technical support and training for safe and stable operation and maintenance activities during operation	(7) Deleted

Source: Results from questionnaire survey of executing agency

A part of project scope for (1) as well as (3) were removed from ODA loan portion, and the Operation and Maintenance Consulting Services, (7) were deleted from the project scope. The executing agency took such measures in order to cope with the increasing project cost due to the soaring price of steel materials etc. during the project implementation period. (Refer to Figures 3 and 4 for trends in hot rolled steel sheet price and heavy melting scrap price.) The executing agency adopted this measure to avoid project cost-overrun due to unforeseen circumstances beyond its control, and implemented a part of the project scope which was removed from ODA loan portion with its own funds – such as through "Phase 2" project – in order to generate project effectiveness. (Refer to BOX 1.) As regards Operation and Maintenance Consulting Services, the executing agency has had experiences of gas pipeline operation and maintenance work[8], and no particular problem due to the cancellation was identified.

As regards Table 1 (2), additional work (pre-study) was conducted regarding feasibility and profitability of the project as a result of drastic changes of gas fuel price. Regarding (4), pipeline construction route was modified as a result of adjustment with local residents, and an additional work such as soil investigation and survey was conducted as a result. The additional work is deemed appropriate, commensurate with inputs, in light of ensuring smooth implementation of the project.





Source: Information provided by executing agency

Figure 3: Trends in Hot Rolled Steel Sheet Price Figure 4: Trends in Heavy Melting Scrap Price

Table 2 summarizes the inputs for consulting services man-month (MM). While the initial plan was 1,686MM, it turned out to be 5,584.08MM in actuality – significant increase of total MM. This was due to the additional work as mentioned above and

[8] The executing agency has had experiences of gas pipeline operation and maintenance work between Grissik and Duri (within Sumatra Island) since 1998, and between Sakernan, Batam and Singapore (connecting Sumatra Island and Singapore) since 2003.

extended project period. For the latter, although the situation can not necessarily be regarded as efficient, it was deemed necessary for consultants to be on board including prolonged project period in order to secure quality of project implementation, which resulted in increase of their inputs.

Table 2: Comparison of Planned and Actual Inputs of Consulting Services

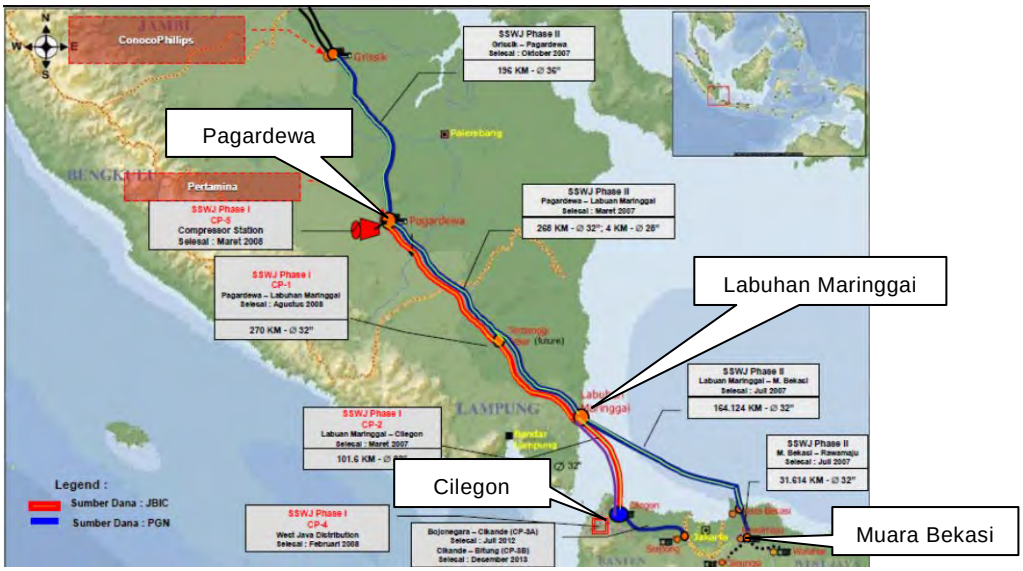
Unit: M/M

	Plan	Actual	Comparison
International Consultants	272.5	710.10	Increased by 437.60
Local Consultants	1,413.5	4,873.98	Increased by 3,460.48
Total	1,686.0	5,584.08	Increased by 3,898.08

Source: Results from questionnaire survey of executing agency

BOX 1: "Phase 2" Project Implemented by the Executing Agency

The executing agency has implemented "Phase 2" project utilizing its own funds, almost in parallel with this project. (In Figure 5, the red line indicates the ODA loan project and the blue line indicates the "Phase 2" project, which has been implemented by the executing agency.) According to the executing agency, the gas pipeline development plan was initially considered as one project since 1995, but because of change of situations (effects of the Asian currency crisis in 1997, and emerging chance of implementing the project utilizing ODA loan), it was decided that the project would be divided into two phases – Phase 1 to be implemented by ODA loan and Phase 2 to be carried out by the executing agency's own funds.



Source: Information provided by executing agency

Figure 5: Project Locations for This Project and "Phase 2" Project

"Phase 2" project constructed gas transmission pipelines from Pagardewa to Labuhan Maringgai in South Sumatra, in parallel with this project, and supplies gas to Muara Bekasi near Jakarta in the end. As regards project period for "Phase 2" project, the "Phase 2" project has commenced slightly later than this project, however, selection of contractors and civil works have completed earlier than this project as shown in Table 3. (Although selection of contractors for "Phase 2" project has commenced one month later than that of this project, selection process has completed five months earlier, and civil works has completed about two years earlier than this project.) As mentioned above, the executing agency has implemented a part of the project scope utilizing its own funds, including "Phase 2" project and others, in the face of the soaring price of steel materials during the project.

Table 3: Comparison of Schedule for Selection of Contractors and Civil Works between This Project and "Phase 2" Project

This Project ・Selection of Contractors: May, 2004 – Jul., 2006 (27months) ・Civil Works (EPC Contract): Feb., 2006 – Jul., 2009 (42months) "Phase 2" Project ・Selection of Contractors: Jun., 2004 – Feb., 2006 (21months) ・Civil Works (PCC[9] Contract): Nov., 2005 – Jul., 2007 (21months)

Source: Results from questionnaire survey of executing agency
Note) The schedule mentioned above indicates the period between "the package which has commenced the earliest" and "the package which has completed the latest" within different packages.

The executing agency considers this project and "Phase 2" project as one, and has concluded gas purchase agreement contract with different gas companies and has undertaken operation and maintenance (including budgeting and staff assignment) for both projects in an integrated manner.

Natural gas transmitted through the gas pipelines of both projects is integrated at Labuhan Maringgai and gas supply from Labuhan Maringgai is adjusted in accordance with the demand of final supply destination in Cilegon and Muara Bekasi. In this regard, gas supplied to Cilegon has been transmitted through gas pipelines constructed not only by this project but also by "Phase 2" project. On the other hand, gas supplied to Muara Bekasi has been transmitted through gas pipelines constructed not only by "Phase 2" project but also by this project.

[9] Under PCC (Pipeline Construction Contract), the contractor is responsible for civil works and installation of equipments, whereas the executing agency itself undertakes design and procurement of equipments. Project period can be shortened since selection of contractors and procurement of equipments can be carried out in parallel. Compared to EPC Contract where responsibility of the contractors are comprehensive, the scope of works for PCC contractors are partial. Therefore, PCC is advantageous from the stand point of competitiveness in bidding in the sense that more contractors can participate in the bid. On the other hand, EPC Contract has an advantage for the executing agency in the sense that it can save the executing agency's work load to contract out design, procurement of equipments, construction etc. in several different packages, which enables the executing agency to supervise the project in a comprehensive manner.

Labuhan Maringgai Station

Bojonegara Station (Cilegon)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 59,079million yen (out of which 49,088million yen was to be covered by Japanese ODA loan). In actuality, the total project cost was 59,957million yen (out of which 48,538million yen was covered by Japanese ODA loan), which is higher than planned (101% of the planned amount). The project cost increased mainly due to increase in steel materials price as well as input cost increase due to significant increase in consulting service man-month.

By the way, the total project cost includes cost related with project scope which has been implemented by the executing agency's own fund, in other words, project scope which was removed from ODA loan portion. Because this project is a pipeline development project, project scope which has been removed from ODA loan portion should be regarded as an integral part of this project. Therefore, above measure has taken place for calculating project cost with a judgment that the expected project purpose would not be achieved unless all the original project scope is completed.

3.2.2.2 Project Period

The overall project period was planned as 59months, from March, 2003 (conclusion of Loan Agreement) to January, 2008 (completion of PMC services) as opposed to 109months in actuality, from March, 2003 (conclusion of Loan Agreement) to March, 2012 (completion of PMC services), which is significantly longer than planned (185% of the initial plan). (Refer to Table 4)

Table 4: Comparison of Planned and Actual Project Period

Item	Plan (At Project Appraisal)	Actual (At Ex-post Evaluation)
Right of Way Acquisition	Mar., 2003 – Mar., 2004 (13months)	Jul., 2004 – Jan., 2007 (31months)
Selection of PMC Consultants	Mar., 2003 – Jan., 2004 (11months)	Apr., 2003 – Jan., 2004 (10months)
Detailed Design	Jan., 2004 – Jul., 2004 (7months)	N.A.
PMC Services	N.A.	Jan., 2004 – Mar., 2012 (99months)
Selection of Contractors	Feb., 2004 – Jul., 2005 (18months)	May, 2004 – Jul., 2006 (27months)
Construction/Installation Work (EPC Contract)	Mar., 2005 – Dec., 2006 (22months)	Feb., 2006 – Jul., 2009 (42months)
Selection of O&M Consultants	Feb., 2005 – Jan., 2006 (12months)	Cancelled
O&M Consulting Services	Jan., 2006 – Jan., 2008 (25months)	Cancelled

Source: Information provided by JICA, and results from questionnaire survey of executing agency

Main reasons for project delay were: (1) delay of selection of contractors and (2) prolonged implementation period for civil works. According to the executing agency, PMC services significantly delayed as a result. In addition, the reason for continued PMC services for 33months after project completion was due to the necessity for consultants to be on-board in order to cope with technical issues during warranty period as well as to deal with financial and accounting issues. (By the way, land acquisition delayed because adjustments with local residents regarding pipeline routes in gas supply development section in West Java (in Cilegon area) took time, and settlement among local residents regarding ownership of the land also delayed. However, the main reasons for project delay – (1) and (2) above – incorporated the delay of land acquisition.)

For the same reason as project cost, length of time required to implement project scope which has been removed from ODA loan portion was also taken into consideration to calculate project period. However, the scope implemented by the executing agency's own funds has been virtually completed prior to the civil works eligible for ODA loan, therefore, comparison was made between actual period to implement ODA eligible project scope and planned period at the time of appraisal as a result.

Customer satisfaction survey on special yen loan[10] was conducted for the executing agency since this project was implemented as a special yen loan project. The results showed that effects on project cost and project period attributable to special yen loan were seen to some extent. This project is comparable to "Phase 2" project implemented at the same time by the executing agency utilizing its own funds. Accordingly, limitation of this

[10] Special yen loan was introduced in December, 1998 in order to support economic structural reform of developing countries mainly in Asia, which had been affected directly and indirectly by the Asian currency crisis in 1997. Basic condition for procurement of main contractor is Japan tide. In addition, rules regarding country of origin are applied under the special yen loan system.

project due to special yen loan conditions was brought into sharp relief. The executing agency pointed out the following: (1) regarding selection of contractors, options for eligible contractors were limited because procurement condition was Japan tied, which affected the selection period of contractors and the price competitiveness for bid, and (2) regarding period for civil works, long time was spent for confirmation of specific conditions, and coordination and adjustment with relevant parties including manufacturers in order for contractors to fulfill Japanese content requirements[11]. In fact, the executing agency pointed out that selection period for contractors for "Phase 2" project became shorter than that of this project because of larger number of participants in the bid and competitiveness was secured[12]. Moreover, the executing agency explained that "Phase 2" project did not take much time compared with the ODA project since Japanese content requirements for civil works did not exist, and the form of contracting arrangement was PCC. (Refer to Table 3)

In implementing the project, necessity to secure consistent schedule between pipeline construction by this project and gas field development was pointed out during project planning stage. Regarding this, a part of information regarding progress of gas field development could not be obtained from Pertamina (Pertagas, an affiliate company of Pertamina, is in charge at the time of ex-post evaluation). Therefore, it was impossible to fully grasp the facts. The processes leading to the conclusion of gas purchase and sale agreement between the executing agency and Pertamina are as follows. Gas purchase and sale agreement was concluded and went into force prior to the selection of contractors.

- September 13, 2001: Heads of Agreement (HoA) was concluded regarding gas supply
- November 20, 2002: HoA was extended
- December 11, 2002: Basic agreement was made regarding important matters
- June 26, 2003: Gas purchase and sale agreement was concluded (contract period is until December 31, 2025)
- December, 2003: Gas purchase and sale agreement entered into force

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

Financial Internal Rate of Return

Table 5 shows the result of recalculation of the financial internal rate of return (FIRR). The FIRR assessed at the time of ex-post evaluation was significantly higher than the figure at the time of appraisal. This was primarily because revenue from gas transmission and gas sales has increased.

[11] Ratio of the goods and services procured from Japan.
[12] According to the executing agency, when the number of bidders was limited, it took time for selection because careful judgment had to be made whether the bid documents fall within the acceptable range in case partial inconsistency was found between bid documents and bid requirements.

Table 5: Assumption and Results of FIRR Recalculation

	At Project Appraisal	At Ex-post Evaluation
FIRR	9.6%	18.2%
Benefit	Revenue from gas transmission and gas sales	
Cost	Construction cost, gas purchase cost, and operation and maintenance cost	
Project Life	20years after project completion	

Project cost exceeded the plan and project period significantly exceeded the plan. Therefore, efficiency of the project is low.

3.3 Effectiveness[13] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Table 6 summarizes the operation and effect indicators with targets set at the time of project appraisal and their actual figures in 2014 and 2015.

Table 6: Operation and Effect Indicators

Unit: MMSCFD[14]

	Baseline	Target	Actual Note1)	
	2002	2011	2014 Note 2)	2015 Note 2)
	Baseline at the time of appraisal	(6 years after the commencement of gas transmission)		
Transmission Volume of Gas	—	200	299.25 Note 3)	259.77

Source: Information provided by JICA, and results from questionnaire survey of executing agency

Note 1) Actual volume includes volume of gas transmitted through the pipelines constructed by this project (the onshore gas pipeline from Pagardewa to Labuhan Maringgai) and gas transmitted from Labuhan Maringgai to Muara Bekasi through the pipeline constructed by "Phase 2" project.
Note 2) As regards commencement of gas transmission, the earliest was on April, 2007, the submarine gas pipeline from Labuhan Maringgai to Cilegon, and the latest was on September, 2008, the onshore gas pipeline from Pagardewa to Labuhan Maringgai.
Note 3) Figures are not necessarily consistent with those in Table 7 due to rounding error.

Since the commencement of gas transmission, state of gas transportation (for both this project and "Phase 2" project) up to the time of ex-post evaluation is satisfactory. Actual figures in 2014 and 2015 significantly exceed the target figure (200MMSCFD) set at the time of appraisal.

Table 7 shows gas demand and supply data regarding this project (projection and actual).

[13] Sub-rating for Effectiveness is to be put with consideration of Impact.
[14] Million Standard Cubic Feet per day.

When looking into future projection, gas demand and supply is steadily increasing. Therefore, it is expected that this project will maintain high effectiveness in the future.

Table 7: Gas Demand and Supply Data regarding This Project (Projection and Actual)

Unit: MMSCFD

Year	Supply		Demand	
	Actual (Pertamina)	Actual (From Other Sources)	Actual Sales (Cilegon)	Actual Sales (Muara Bekasi) Note 3)
2006	-	-	-	-
2007	60.59	0.00	34.26	26.33
2008	140.90	0.00	64.75	76.15
2009	182.62	30.67	49.74	163.55
2010	167.60	84.02	90.96	160.66
2011	133.34	112.87	81.90	164.31
2012	115.90	162.71	87.95	190.67
2013	110.86	173.93	109.73	175.06
2014	130.32	168.94	146.91	152.36
2015	147.56	112.21	166.80	92.98
	Projected Supply Note 1)		Projected Sales Note 2)	
2016	256.79		235.04	
2017	261.93		249.46	
2018	269.80		256.95	
2019	277.89		264.66	
2020	286.23		272.60	
2021	294.81		280.77	
2022	303.66		289.20	
2023	312.76		297.87	
2024	322.15		306.81	
2025	331.81		316.01	

Source: Prepared by the evaluator based on the results from questionnaire survey of executing agency

Note 1) Actual supply between 2016 and 2025 is projected supply. (Gas supply contract with Pertamina is expected to expire in the end of 2017. At the time of ex-post evaluation, the executing agency is negotiating with potential gas suppliers including suppliers other than Pertamina for new contracts.)
Note 2) Projected sales is the total projected sales to both Cilegon and Bitung in Muara Bekasi.
Note 3) Actual sales of gas transmitted through the pipelines constructed by this project (the onshore gas pipeline from Pagardewa to Labuhan Maringgai) and gas transmitted from Labuhan Maringgai to Muara Bekasi through the pipeline constructed by "Phase 2" project.

3.3.2 Qualitative Effects

According to the Ministry of Energy and Mineral Resources, natural gas reserve of existing gas fields in South and Central Sumatra, West Java and the Riau Islands is said to decrease in the future in order to cover domestic demand and export to Singapore. When taking into consideration the decrease of future production of existing gas fields[15] as well as Figure 2 above (Supply and Demand Trend of Natural Gas and LNG in West Java[16]), it

[15] According to the Ministry of Energy and Mineral Resources, production of natural gas in these areas is said to decrease from 238MMSCFD in 2016 to 159MMSCFD in 2022.
[16] Gas demand has almost tripled between 2003 and 2014.

can be said that the gas pipelines constructed by this project has been contributing to an effective utilization of unused gas in Sumatra Island.

3.4 Impacts

3.4.1 Intended Impacts

Breakdown of volume of gas supplied to West Java Area (including breakdown of volume of natural gas supplied through gas pipelines constructed by this project and "Phase 2" project) is shown in Table 8. After 2008 when the entire gas pipelines developed by this project started operation, total volume of natural gas and LNG supplied to West Java has significantly increased, and about 80 to 90% of which has been transmitted through the pipelines developed by this project and "Phase 2" project. (Of which, about half of natural gas has been transmitted by the pipelines developed by this project.) From this, it can be understood that the project has been greatly contributing to the increase of gas supply in West Java area. Furthermore, from Table 8 and Figure 2 above (Supply and Demand Trend of Natural Gas and LNG in West Java), it can be also considered that the project has been contributing to cope with gas supply shortage problems in West Java.

Table 8: Breakdown of Volume of Gas Supplied to West Java Area

Unit: MMSCFD

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Natural Gas and LNG Supply in West Java	269	533	596	596	652	626	673	601	580	700	750	790
Of which Volume of Gas Transmission by the Pipeline Constructed by this Project and "Phase 2 project	227	427	503	493	557	570	650	591	580	700	750	790
Of which Volume of Natural Gas Transmission by the Pipeline Constructed by this project	141	213	252	246	279	285	299	260	235	250	257	265

Source: Prepared by the evaluator based on results from questionnaire survey of executing agency

Note) Total volume of natural gas and LNG supply in West Java between 2016 and 2019 is the projected volume. (Volume of gas supply other than through gas pipelines is not reflected because of unavailability of data. On the other hand, volume of LNG (150-280MMSCFD) via LNG terminal (FSRU) is included in the table.)

Table 9 shows gas supply (volume of gas supply to the executing agency's customers) to Bojonegara (Cilegon) area. The executing agency has been supplying gas to the area since 2007, and by 2020, gas supply is expected to triple the volume of gas supply when the service initially started.

Table 9: Gas Supply to Bojonegara (Cilegon) Area

Unit: MMSCFD

Customers Note 1)	Actual		Projection
	2007	2015	2020
Power Plant Industry Sector Commercial	34.42	80.39	102

Source: Prepared by the evaluator based on results from questionnaire survey of executing agency
Note: Breakdown according to customers is not available.

Table 10 shows gas supply (volume of gas supply to the executing agency's customers) to Lampung area in South Sumatra (refer to Figure 7). The executing agency has been supplying gas to the area since 2015, and by 2020, gas supply is expected to become 50times the volume of gas supply when the service started – about 4.5times the volume of actual gas supply in 2016.

Table 10: Gas Supply to Lampung Area

Unit: MMSCFD

Customers Note 1)	Actual		Projection
	2015	2016	2020
Power Plant Industry Sector Commercial Domestic & Small Scale Costumer	1	11	50

Source: Prepared by the evaluator based on results from questionnaire survey of executing agency
Note: Breakdown according to customers is not available.

According to the above, it can be understood that the project has been contributing to the increase of gas supply (acquisition of new customers and expansion of gas supply) in these areas.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

The project falls under A category of "Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations" (established in April, 2002) because it is a development project of a large-scale gas pipelines.

Environmental Impact Assessment Report (AMDAL) has been approved on August, 1999 by the Ministry of Environment after examination by the Environmental Impact Analysis Committee established under the Ministry of Energy and Mineral Resources, Directorate General of Oil and Gas. During project implementation, environmental check list was prepared and environmental monitoring was conducted based on AMDAL. As regards consideration of wildlife resource protection and conservation which has been pointed out as an issue to be noted at the time of appraisal, measures such as installation of fences and signs as well as provision of environmental education to civil workers have been taken place, and monitoring of such countermeasures has been conducted.

During and after project completion, the executing agency has been reporting the results of environmental monitoring to the Ministry of Environment every six months based on its regulation. In addition, the executing agency has been reporting the results of environmental monitoring to all the provincial and city governments where the gas pipelines pass through. Furthermore, during project implementation, validation of environmental monitoring results has been conducted by a third party organization. Table 11 shows the results of environmental monitoring and validation. Adequate measures have been taken place in accordance with the regulations of the Ministry of Environment and no particular environmental impact has been reported. In addition, no negative project effect has been identified from the results of interview with the executing agency and local residents.

Table 11: Environmental Checklist, Monitoring and Verification Results/Countermeasures

Environmental Checklist	Monitoring and Verification Results
Impact of land clearance on vegetation	Restoration to original state (mangrove plantation)
Impact of pipe installation on noise	No problem
Impact of pipe installation on soil erosion	Slope protection and restoration to original state
Impact of pipe installation on drainage	Maintaining drainage and irrigation facilities or restoration to original state
Impact of pipe installation on road traffic	Restoration to original state
Impact of pipe installation on aesthetics	No problem
Impact on sea bed/shore crossing	Restoration to original state
Impact on sea water quality	No problem
Impact on marine life	No problem

Source: Prepared by the evaluator based on results from questionnaire survey of executing agency

3.4.2.2 Land Acquisition and Resettlement

Table 12 summarizes the comparison of planned and actual resettlement and land acquisition. Areas of land acquisition have slightly decreased and number of resettled

households has increased compared with the plan. This was due to the result of detailed design and adjustments made with local residents after project commencement, upon decision of the concrete project sites (with partial changes of pipeline routes).

Table 12: Comparison of Planned and Actual Resettlement and Land Acquisition

Plan		Actual	
Areas of Land Acquisition	Number of Resettled Households	Areas of Land Acquisition	Number of Resettled Households
678ha	About 20	645.9ha	47

Source: Results from questionnaire survey of executing agency

Land acquisition has been adequately conducted in accordance with the Indonesian regulations[17]. A land acquisition committee called "Panitia Sembilan" (Committee 9), in which the executing agency became the responsible agency, was established, and repeated consultation with affected local residents was conducted with the Committee's mediation. The members of the Committee were composed of those related to local governments and police. According to the executing agency, a part of pipeline routes in gas supply development section in West Java (in Cilegon area) was changed as a result of adjustment with the local residents. In addition, settlement among local residents regarding ownership of the land was necessary, and there were cases for which the court arbitrated conflicts. However, land acquisition process (including payment of compensation) was completed before the start of civil works for each construction package in the end. Residents who needed to be resettled received compensation and desired to move to the nearby land on their own, therefore, development of alternative land was not necessary for the executing agency. According to the interview survey with the residents, no particular problem was pointed out regarding process for land acquisition and payment of compensation.

3.4.2.3 Impacts on Local Residents and Local Business

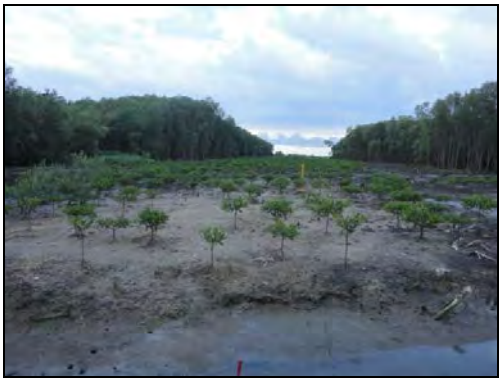
Through interview survey with the executing agency and local residents, creation of employment after project completion and benefits to the local community, generated from CSR (Corporate Social Responsibility) activities by the executing agency, were confirmed. After the completion of gas pipeline construction, local residents have been newly hired as security guards, cleaners, drivers, office boys and so on. In addition, as part of its CSR services, the executing agency has provided support for construction of nursery schools, kindergartens and elementary schools as well as construction and improvement of mosques,

[17] In conformity with the Presidential Degree No.55-1993.

development of wells and bridges for the community, and rehabilitation of roads for local residents. Such activities have also been contributing to reinforce unity among residents and activate interaction among residents.

Furthermore, through interview survey with several local companies (manufacturing companies) it became evident that these companies converted their fuel from traditional high speed diesel (hereinafter referred to as "HSD") to natural gas, and significant savings of fuel costs have been realized (30 to 38% cost reduction) as a result, after the project. Additionally, it was also confirmed from the data provided by a food and beverage company in Lampung that emission of nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particles has decreased, leading to alleviation of environmental burden as a result of fuel conversion.

A Mosque constructed by Executing Agency (Pagardewa)



Newly Planted Mangrove (Labuhan Maringgai)

3.4.2.4 Impacts of Four ODA Loan Projects in Package

In addition to this project, three gas-fired combined cycle generation projects supported by Japanese ODA loan around the same time in Indonesia – "Tanjung Priok Gas Fired Power Plant Extension Project", "Muara Karang Gas Power Plant Project", and "Muara Tawar Gas Fired Power Plant Extension Project" – were taken up to analyze their integrated impacts. The analysis revealed that gas-fired combined cycle power plant projects utilizing ODA loans have set a precedent for introducing Japan's high quality infrastructure technology in Indonesia. Also, a gas pipeline project utilizing ODA loan has encouraged conversion of energy source from oil to gas, through facilitation of domestically produced gas in Indonesia.

Table 13 shows the energy production of Muara Tawar, Muara Karang and Tanjung Priok Power Plants. When looking at the Table over time, it can be observed that conversion of energy source from oil to gas has been facilitated, since volume of gas

utilization (total volume) has shown increasing trend for these power plants as implementation of ODA loan projects proceeds. By the way, at the time of ex-post evaluation, Muara Tawar Gas Fired Power Plant is the only power plant which utilizes natural gas fuel transmitted through South Sumatra-West Java Gas Pipeline. On the other hand, Pertagas, an affiliate company of Pertamina, is constructing an open access gas pipeline connecting Muara Tawar Power Plant and Muara Karang Power Plant (expected to be completed in August, 2016). When construction of this gas pipeline is completed, three power plants, Muara Tawar, Muara Karang and Tanjung Priok, will be connected physically[18].This will enable three power plants to utilize natural gas transmitted from Sumatra Island through South Sumatra-West Java Gas Pipeline[19]. Through new power plant construction, further utilization of gas is expected in the future.

Table 13: Energy Production of Muara Tawar, Muara Karang and Tanjung Priok Power Plants

Unit: GWh

Power Plant	Fuel	2008	2009	2010	2011	2012	2013	2014	2015
Muara Tawar	Gas[20]	3,199	8,973	6,894	6,026	7,266	7,662	8,606	5,737
	Of which, energy production from the power plant constructed by Japanese ODA loan (natural gas)	-	-	-	573	1,483	1,596	1,696	1,490
	HSD	2,419	423	1,049	2,548	654	189	70	103
Muara Karang	Gas	2,223	2,156	4,470	4,745	5,710	7,766	7,704	7,929
	Of which, energy production from the power plant constructed by Japanese ODA loan (LNG)	-	603	3,086	4,084	3,554	3,954	3,869	3,902
	HSD	3,473	3,577	1,438	2,610	1,482	32	46	37
Tanjung Priok	Gas	3,501	2,634	2,732	1,770	4,678	6,693	7,331	7,227
	Of which, energy production from the power plant	-	-	-	-	1,588	3,002	3,747	3,865

[18] Tanjung Priok Power Plant is already connected to Muara Karang Power Plant through an existing pipeline.
[19] Various adjustments, including gas pressure, are necessary for the pipeline to become available. According to National Electricity Company (PLN), which is the executing agency of the three gas-fired combined cycle power plant projects, negotiations between PLN and Pertagas are carried out regarding amount of gas supply, gas prices and so on.
[20] Gas includes both natural gas and LNG.

	constructed by Japanese ODA loan (LNG)								
	HSD	3,517	3,360	3,399	3,584	1,367	436	183	29
Total	Gas	8,923	13,763	14,096	12,541	17,654	22,121	23,641	20,893
	HSD	9,409	7,360	5,886	8,742	3,503	657	299	169

Source: Prepared by the evaluator based on the information provided by PLN

The National Electricity Company[21] (hereinafter referred to as "PLN[22]") is planning to construct 800MW class gas-fired combined cycle power plant (Block 4), utilizing its own funds plus private funds in Tanjung Priok Power Plant compartment. A joint venture consisting of Japanese and local companies has been awarded from PLN to undertake the construction work etc. with full turnkey contract, and operation is expected to start in 2018. Following Muara Karang Gas Power Plant (Block 2) and Tanjung Priok Gas Power Plant (Block 3), which have been constructed utilizing the ODA loans, Japanese gas turbine combined cycle technology, the world's highest technology, will be introduced in Tanjung Priok Gas Power Plant Block4. It can be pointed out that past achievements of gas-fired combined cycle power plant projects utilizing ODA loans have facilitated introduction of Japan's high quality infrastructure technology in Indonesia[23].

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

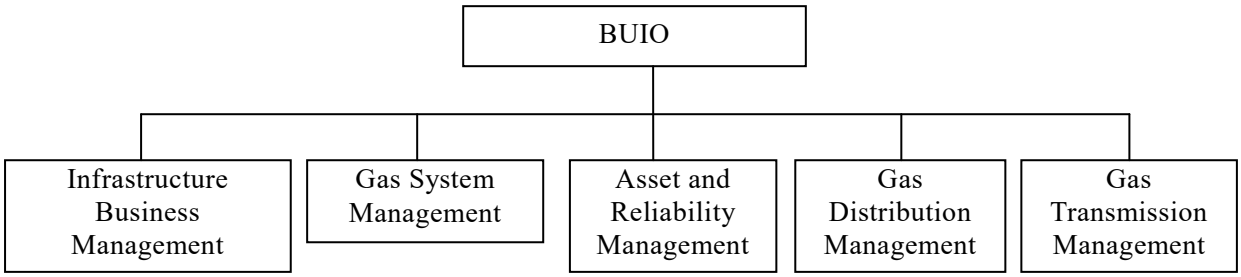
3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The operation and maintenance of gas pipelines, gas distribution network, related equipments etc. after project completion is controlled by Business Unit Infrastructure Operations Department (hereinafter referred to as "BUIO[24]"), which is the operation and maintenance department of the executing agency, National Gas Company (hereinafter referred to as "PGN[25]") at the head office level. The organizational structure of BUIO, consisting of five departments and about 140staffs, is shown in Figure 6. Among these, Gas Transmission Management Department is in charge of operation and maintenance of gas

[21] National Electricity Company is the executing agency of the above-mentioned three gas-fired combined cycle power plant projects.
[22] PT. Perusahaan Listrik Negara (Persero)
[23] Refer to the website of Ministry of Foreign Affairs of Japan. http://www.mofa.go.jp/files/000095681.pdf
[24] Business Unit Infrastructure Operations
[25] PT. Perusahaan Gas Negara (Persero)

pipelines and related equipments constructed by this project and “Phase 2” project, and Gas Distribution Management Department is in charge of operation and maintenance of gas distribution network developed by this project in Cilegon area.



Source: Prepared by the evaluator based on the information provided by executing agency

Figure 6: Organizational Structure of Business Unit Infrastructure Operations

PGN started its organizational change since July, 2015, and reorganization mainly at the head office is still continuing at the time of ex-post evaluation. Prior to organizational change, operation and maintenance work of this project was controlled by Strategic Business Unit (hereinafter referred to as “SBU”) at the head office. SBU belonged under the Directorate of Commerce, but after restructuring, BUIO, which was established under the Directorate of Infrastructure and Technology, took over this responsibility. According to PGN, BUIO consists mainly of engineers, and operation and maintenance work including technical aspects was strengthened as a result of restructuring.

This organizational change has been undertaken at the head office level, not affecting the organizational structure of the three Operation Areas (South Sumatra, Lampung, and West Java) in charge of operation and maintenance at the project site. (Refer to Figure 7.) Each Operation Area has been in close coordination with BUIO for actual operation and maintenance work. It is pointed out that smooth communication and coordination between BUIO and each Operation Area have been facilitated after restructuring. Also, responsibilities and decision making process within the organization are clear.

Source: Information provided by executing agency

Figure 7: Three Operation Areas in Charge of Operation and Maintenance of This Project

Table 14 summarizes the breakdown of number of staffs and engineers in charge of operation and maintenance deployed in each Operation Area (as of March, 2016). According to the interview survey with each Operation Area, number of engineers necessary for operation and maintenance has been secured.

Table 14: Breakdown of Number of Staffs and Engineers in Charge of Operation and Maintenance Deployed in Each Operation Area Note 1)

Operation Areas	South Sumatra	Lampung	West Java
Total number of staffs	212	186	137
Of which, number of engineers in charge of operation and maintenance Note 2)	61	43	35

Source: Prepared by the evaluator based on the information provided by executing agency

Note 1) Staffs and engineers in charge of operation and maintenance are covering their work for both this project and "Phase 2" project. (Staffs/engineers only in charge of this project cannot be separated out,)
Note 2) The number of engineers in charge of operation and maintenance was calculated by subtracting the number of supporting teams (administrators, security guards, drivers etc.) from sub-total of the number of staffs in each Operation Area.

Therefore, no particular problem has been identified regarding the institutional structures of operation and maintenance of the gas pipeline.

3.5.2 Technical Aspects of Operation and Maintenance

Engineers in charge of operation and maintenance at the project site have gained sufficient experiences and technology through eight to nine years of operation and

maintenance work experience since the start of operation of the gas pipelines developed by this project. On the job training and training in Japan by contractors are provided to engineers in charge of operation and maintenance work, and among them, there are engineers who acquired master's degree, utilizing studying-abroad program of the executing agency. In addition, based on the human resource development strategy of the executing agency, all the PGN staffs including staffs in charge of operation and maintenance of this project are required to attend training for at least 6.5days a year. Therefore, it can be observed that adequate management system for human resource development has been established. According to the interview survey with staffs in charge of operation and maintenance work on site, necessary training to carry out operation of this project has been appropriately conducted, and no particular problem has been identified regarding its technical aspect.

According to PGN, no negative impact has been observed due to the deletion of operation and maintenance consulting services from this project. The operation and maintenance staffs of the project also answered to the same question that they found no particular problem.

Each Regional Operation Area has prepared standard operation procedures and operation guidelines, and operation and maintenance staffs have been utilizing them for their daily work. The operation procedures and guidelines have been reviewed and revised every year in accordance with the actual situation and needs at the project site.

According to the interview survey with each Regional Operation Area, maintenance management plans have been prepared according to frequency of maintenance (daily, weekly, monthly, every three months, every six months and yearly), and the number of total maintenance items exceeds 1,000. These plans have also been reviewed and revised every year, and utilized by operation and maintenance staffs on the ground.

Therefore, no particular problem has been identified regarding the technical aspects of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The operation and maintenance costs are estimated by each Regional Operation Area, and then the estimation will be reviewed by PGN head office, which approves the budget. According to the interview survey with each Regional Operation Area and PGN head office, budget has been approved almost according to the requested amount, and no particular problem has been identified regarding the financial aspects of operation and maintenance. Table 15 shows the actual expenditures for operation and maintenance after completion of the project.

Table 15: Annual Operation and Maintenance Expenditure for this Project
(Actual Expenditures) Note1)

Unit: million Yen

2007	2008	2009	2010	2011	2012	2013	2014	2015
272	465	958	1,277	1,557	1,655	2,063	2,673	1,408 Note 2)

Source: Prepared by the evaluator based on the information provided by executing agency

Note 1) Although operation and maintenance costs for this project and "Phase 2" project are integrated, the divided cost for this project (calculation made by the executing agency) is provided in the table. Only the figures for actual expenditures are provided since it was difficult to extract the amount of requested and allocated budget for this project.
Note 2) Operation and maintenance cost increased in 2013 and 2014 because improvement maintenance work, replacement of some parts[26], and checking of installation state of submarine pipeline were carried out. In addition, preliminary maintenance[27] for a gas turbine compressor was conducted in 2013. The actual expenditure decreased in 2015 compared to the previous year because operation and maintenance resumed to the ordinary situation.

Income statement and balance sheet of PGN are shown in the tables below.

Table 16: Income Statement of PGN Note 1)

Unit: million USD

	2012	2013	2014
Gross Profit	1,472	1,418	1,465
Other Income	21	27	50
Distribution and Transmission Expense	270	293	301
General and Administrative Expense, Other Expenses	205	219	232
Operating Profit	1,018	933	982
Non-Operating Profit and Loss Note 2)	130	132	-3
Tax Expense	233	228	231
Profit for the Year	915	838	748
Other Comprehensive Income After Tax	-0.1	-6	0.1
Income for the Year	914	832	748

Source: PGN Financial Statements
Note 1) Partial inconsistency of figures exists due to rounding error
Note 2) Interest Income and Cost, Gain and Loss on Foreign Exchange etc.

Table 17: Balance Sheet of PGN Note 1)

Unit: million USD

	2012	2013	2014
Total Assets	3,908	4,318	6,215
Total Non-Current Assets	1,924	2,537	4,355
Total Current Assets	1,983	1,781	1,861
Total Liabilities and Equity	3,908	4,318	6,215
Total Equity	2,354	2,671	2,963
Total Non-Current Liabilities	1,081	761	2,162
Total Current Liabilities	473	886	1,091

Source: PGN Financial Statements
Note 1) Partial inconsistency of figures exists due to rounding error

[26] Precise cleaning within the pipelines (Intelligent Pigging, carried out every five years) was implemented in 2012, and as a result, improvement maintenance work and partial replacement of parts were conducted in 2013 and 2014 in order to cope with potential problems which may occur in the future.
[27] Preliminary maintenance is carried out for every 20,000hour of compressor operation.

Although PGN is a state owned company, government subsidy is not injected. While gross profit generally continues to be constant between 2012-2014, distribution and transmission expense as well as general and administrative expense, and other expenses show increasing trend year after year. In recent years, total non-current assets are significantly increasing, and its figure in 2014 is about 2.3times the figure of two years ago.

On the other hand, operation and maintenance cost for this project has been appropriately financed and the gas pipelines have been well operated and maintained. Therefore, PGN's overall financial situation will not directly affect financial aspect of the project.

Therefore, no particular problem has been identified regarding the financial aspects of operation and maintenance.

3.5.4 Current Status of Operation and Maintenance

The facilities developed by the project have been maintained well and operated smoothly. Major operation and maintenance activities are as follows.

- Daily patrol of pipelines (submarine and onshore).
- Inspection of compressor stations (Pagardewa), metering stations, gas filters etc.
- Reparative maintenance (such as pipeline coating)
- Pipeline cleaning (Conducted every two years. more precise cleaning to be conducted every five years.)

As regards spare parts, according to PGN, it has established an inventory management system, by developing a list of necessary spare parts in accordance with (1) consumables for daily use, (2) spare parts necessary for replacement in medium-term and (3) spare parts necessary for replacement in long-term, and stocktaking and necessary measures have always been carried out. Major consumables for daily use are kept in storages of Regional Operation Areas. As regards other individual spare parts, the executing agency has concluded a comprehensive contract with the manufacturers, therefore a system has been secured to procure necessary spare parts in a timely manner.

SBU has conducted an analysis in its "Pipeline Integrity Management and Risk Assessment" regarding risks to be considered during operation and maintenance (probability of occurrence of pipeline damages by earthquakes or arrhythmic pressures etc.). According to the results of analysis, about 75% of problems which had occurred during operation and maintenance were related with various "activities" by local residents and third parties within the pipeline sites. In other words, not only technical aspects but

also communication and adjustments with local residents are important for operation and maintenance of the project and therefore, daily patrol is crucial. According to the Regional Operation Areas, each Regional Operation Area has considered measures for local residents based on the results of analysis and has reflected them into its operation and maintenance plan.

Therefore, no particular problem has been identified regarding the current status of operation and maintenance.

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

Gas Compressor (Pagardewa)

Spare Pipe (Cilegon)

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project constructed gas transmission pipelines from Sumatra to West Java with the aim of facilitating effective utilization of unused gas in Sumatra and dealing with the problems of gas supply shortage in West Java. The project is consistent with Indonesia's energy policy and with the development needs at the time of appraisal and ex-post evaluation, as well as Japan's ODA policy at the time of appraisal; thus, the relevance of the project is high. Project cost exceeded the plan and project period significantly exceeded the plan. Therefore, efficiency of the project is low. Operation and Effect Indicator – transmission volume of gas – set at the time of appraisal has considerably exceeded the target figure. In addition, the project has been contributing to effective use of unused gas and increase of gas supply in West Java. Furthermore, employment generation and benefits to local residents and companies after the project completion have been confirmed. The project has largely generated its planned effects; thus, effectiveness and impact of the

project are high. No negative impact on natural environment has been pointed out. Relocation and land acquisition processes have been implemented properly without any problems. As regards impacts of four ODA loan projects including this project, it can be pointed out that conversion of energy source from oil to gas has been encouraged, and past achievements of gas-fired combined cycle power plant projects utilizing ODA loans have facilitated introduction of Japan's high quality infrastructure technology in Indonesia. No major problem has been observed in the institutional, technical and financial aspects of the operation and maintenance system as well as in the current status; thus, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

None

End

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil Works ・ Onshore gas transmission pipeline from Pagardewa Station to Labuhan Maringgai Station (distance: 270km/diameter: 32 inch) ・ Submarine gas transmission pipeline from Labuhan Maringgai Station to Cilegon (distance: 105km/diameter: 32 inch) ・ Onshore gas transmission pipeline from Cilegon in West Java to Cimanggis ・ West Java (Cilegon area) gas distribution pipeline ・ Compressor Stations 2) Consulting Services ・ Project Management Consultancy (PMC) Services ・ Operation and Maintenance Consulting Services	1) Construction and Related Works ・ As planned ・ As planned ・ Installation of pipeline section was reduced to "Bojonegara (Cilegon) – Cikande and Cikande – Bitung" ・ As planned ・ As planned 2) Consulting Services ・ As planned ・ Deleted
2. Project Period	March, 2003 – January, 2008 (59months)	March, 2003 – March, 2012 (109months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	42,005million yen 17,074million yen (1,219,571million IDR) 59,079million yen 49,088million yen 1IDR=0.014yen (As of March, 2002)	47,148million yen 12,809million yen (1,280,900million IDR) 59,957million yen 48,538million yen 1IDR=0.010yen (Average between 2003 and 2012)

The Republic of Indonesia

FY2015 Ex-Post Evaluation of Japanese ODA Loan

"Development of Faculty of Medicine and Health Sciences of Syarif Hidayatullah State Islamic University"

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

0. Summary

This project developed hard and soft infrastructures for the Faculty of Medical and Health Science (Fakultas Kedokteran dan Ilmu Kesehatan; hereafter referred to as "FKIK"[1]) of the Syarif Hidayatullah State Islamic University Jakarta (Universitas Islam Negeri Jakarta; hereafter referred to as "UIN Jakarta"), located in Banten Province near the capital Jakarta, with a view to expanding opportunities for higher education in medicine within rural areas and among the poor, as well as supplying doctors and nurses to rural areas[2]. With regard to relevance, through the time of ex-ante and ex-post evaluation, the Indonesian Government is advocating for the need to nurture medical human resources in documents, such as the "National Development Plan" and the "National Medium-term Development Plan". Additionally, securing medical personnel, especially for rural areas, has become an urgent task in Indonesia. Furthermore, the project is consistent with the Japanese assistance policy at the time of the appraisal; thus, relevance is high. Concerning efficiency, the project period was slightly prolonged due to the delay in a fellowship program; however, the project cost was kept within the initial plan's budget. As such, efficiency is fair. Regarding the effectiveness of this project, the numbers of total students and female students at the FKIK generally reached what were initially expected, while there were positive comments on the improvement in educational standards at the FKIK from current and graduated students and those who participated in the fellowship program. However, considering the fact that only a small percentage of the FKIK students are from rural areas at the time of the ex-post evaluation, and that the percentage of its graduates who get jobs at medical facilities in rural areas is unknown, it cannot be said that the project has necessarily achieved outcomes that had initially been expected. Thus, effectiveness and impacts are fair. On the other hand, no particular problems are observed in the institutional, technical and financial aspects of the

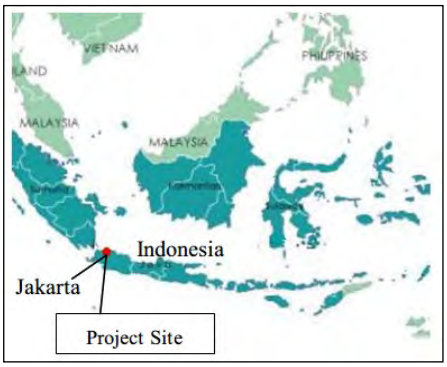
[1] At the time of the ex-post evaluation, there are four departments at the FKIK: Departments of Medicine, Pharmacy, Public Health and Nursing. However, only the Departments of Pharmacy and Public Health existed when it was established in 2004.

[2] Although there is no clear definition of "rural areas" as such, the FKIK said in an interview that a town/village is considered "rural", unless it is a major city in that province (e.g., Padang City in West Sumatra, Banda Aceh in Aceh Province and Makassar in South Sulawesi), thereby distinguishing it from the urban area.

operation and maintenance of this project; thus, sustainability of the effects of this project is high.

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

1. Project Description



Project Location

FKIK School Building Developed by This Project

1.1 Background

In Indonesia, there have been large disparities among rural areas in terms of medical infrastructures, such that strengthening the system and capacity of healthcare administration was an issue. Before the start of this project, the number of doctors was 13[3] per 100,000 people on average; a shortage of medical personnel was particularly serious in rural areas and there was an urgent need to nurture human resources to be engaged in rural medicine[4]. Under these circumstances, UIN Jakarta, the university which focused on contributing to rural areas/regions, set out on a mission of "contributing to the quality improvement of social life" and was actively accepting students from rural areas; half of its students were from rural areas. By extending assistance to the FKIK of this university, it was expected that students who received medical education would engage in the medical sector within rural areas in the future, which would contribute to narrowing regional disparities in terms of medical personnel through developing human resources engaged in rural medicine.

1.2 Project Outline

The objective of this project is to expand opportunities for higher education in medicine within rural areas and among the poor, as well as to supply doctors and nurses to rural areas by

[3] 2001 data; the source is the JICA document.
[4] The number of doctors per 100,000 people varies from 31.28 in the Special Region of Yogyakarta to 5.06 in West Kalimantan Province. (1998 data; the source is the JICA document.)

developing hard and soft infrastructures at the FKIK of the UIN Jakarta, located in Banten Province, near the capital Jakarta, thereby contributing poverty reduction through fulfilling the country's need for medical personnel and supplying basic healthcare services in rural areas.

Loan Approved Amount/Disbursed Amount	2,983 million yen /2,606 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2005/March 2005
Terms and Conditions	Main Construction Work and Consulting Services: Interest Rate: 1.3% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied Fellowship Program and Consulting Services for the Fellowship Program: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Government of the Republic of Indonesia/Directorate General of Islamic Education[5] (hereafter referred to as the "DGIE")
Final Disbursement Date	July 2013
Main Contractor (Over one billion yen)	PT. Pembangunan Perumahan (Indonesia)
Main Consultant (Over 100 million yen)	PT. Darena Prakarsa Utama (Indonesia)/PT. Duta Hari Murthi (Indonesia)/Unico International (Japan)/Yamashita Sekkei, Inc. (Japan)
Feasibility Studies etc.	Implementation Plan (IP) (UIN Jakarta, September 2004)
Related Projects	・World Bank: "Health Workforce and Service Project" (2003, 105.6 million USD)

[5] The executing agency at the time of the appraisal was the Directorate General of Islamic Institutions (DGII) of the Ministry of Religious Affairs. After the project began, the Indonesian Government indicated its position in terms of promoting the development of educational institutions, such that the DGII was changed to the Directorate General of Islamic Education (DGIE). However, the FKIK of the UIN Jakarta virtually acted as an executing agency.

	・Asian Development Bank: “Health and Nutrition Sector Development Program” (1999, 100 million USD) ・Canadian International Development Agency (CIDA): “IAIN Indonesia Social Equity Project” (2001, 11 million CAD) (for educational content development for Muslim-based universities and human resources development project) ・ Islamic Development Bank (IDB): “Facility Development for the Islamic University of Malang” (2004, 26.5 million USD), “Facility Development for the Islamic University of Sunan Kalijaga” (2004, 31 million USD)

2. Outline of the Evaluation Study

2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study:	October 2015	–	December 2016
Duration of the Field Study:	February 28	–	March 11, 2016; and
	May 22	–	May 27, 2016

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance (Rating: ③[7])

3.1.1 Relevance to the Development Plan of Indonesia

At the time of the appraisal, the Indonesian Government formulated the “National Development Plan” (2000-2004), in which expansion of higher education opportunities was set as one of its goals. Additionally, the government formulated the “National Medium-term Development Plan” (2005-2009), which aimed to increase capacity of the departments to accommodate students which may contribute to/improve quality of life, as well as narrow regional disparities related to higher education, incomes and gender. Furthermore, the policy for the healthcare sector aimed to increase the number and improve the quality of healthcare

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

personnel, expand medical services in remote areas, promote a plan for nurturing human resources, as well as educating and training people.

At the time of the ex-post evaluation, the government has formulated "National Medium-term Development Plan" (2015-2019). In the plan, the government advocates the necessity of nurturing medical human resources and increasing the number. Additionally, the Ministry of Health (hereafter referred to as the "MOH") repeatedly stipulates the necessity of nurturing medical human resources in accordance with the above-mentioned development plan, in the internal documents, as well as advocating the need to nurture medical human resources across the entire country and expand the medical health systems. Furthermore, the DGIE points out the importance of narrowing regional disparities with a view to improving access to education and achieving equality in education as per Article 90, which was set out in 2013 (No. 90, 2013).

Based on the above, the importance of nurturing medical personnel has been recognized, while achieving equal education has been an aim in Indonesia both at the time of the appraisal and ex-post evaluation. Therefore, this project is consistent with the policies in terms of national and sectoral plans.

3.1.2 Relevance to the Development Needs of Indonesia

As discussed above, there were large regional disparities in terms of medical infrastructures, including human resources, in Indonesia at the time of the appraisal. In particular, there was a serious shortage of medical personnel in rural areas, such that nurturing human resources to be engaged in rural medicine was an urgent task. Under such circumstances, the UIN Jakarta was active in accepting students from rural areas who made up half of its total students; thus, it was expected that supporting the FKIK of this university would lead to more students receiving medical education so that they could help deliver rural medical services in the future. Additionally, it was expected that nurturing human resources for delivering rural medical services would alleviate the regional gaps in terms of medical personnel.

At the time of the ex-post evaluation, the number of doctors is 20[8] per 100,000 people in the country. Compared to other Southeast Asian countries, such as Thailand, where there are 39 doctors per 100,000 people, and Malaysia, where there are 120 doctors per 100,000 people, the number of doctors is still insufficient. Along with economic growth, populations

[8] 2012 data; the source is the WHO.

concentrate in urban areas; therefore, improving medical services in rural areas and securing medical personnel to narrow the regional gaps continue to be urgent issues[9]. Every year, 300-400 students are admitted to the FKIK of the UIN Jakarta, including at the time of the ex-post evaluation; since its foundation in 2004, a total of 2,100 students have studied there. A certain level of enrollment is maintained every year, while it is expected to continue contributing to the improvement in the country's medical service standards.

Based on the above, there is a need to develop and secure human resources to be engaged in medicine at the times of both the appraisal and ex-post evaluation; thus, this project is consistent with the development needs.

3.1.3 Relevance to Japan's ODA Policy

The "Country Assistance Program for Indonesia", formulated by Japan's Ministry of Foreign Affairs in November 2004, listed improvements in education and healthcare services as priorities for poverty reduction assistance in order to "create a democratic and fair society". Additionally, the JICA formulated the "Strategy for Overseas Economic Cooperation Operations" in April 2002, in which "strengthening poverty reduction", "support for human resource development" and "support for rural development" were listed as priorities; thus, support for the development of human resources was regarded as important. Furthermore, the "Country Assistance Strategy for Indonesia", formulated by the JICA in September 2004, said that they would support the development of medical personnel.

This project supports the improvement in Indonesia's healthcare sector and the development of human resources, while contributing to rural development. Thus, it is consistent with Japan's assistance policy.

In light of the above, this project has been highly relevant to the development policies and development needs of Indonesia, as well as to Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

[9] The source is the DGIE and the interviews are with the MOH. Data on the number of doctors in the regions, regional disparities and figures by city at the time of the ex-post evaluation were not available.

At the FKIK of UIN Jakarta, this project assisted the development of hard and soft infrastructures through the construction of school buildings and the procurement of educational materials and equipment, as well as by enhancing the quality of personnel engaged in education. Table 1 shows the planned and actual outputs of this project.

Table 1: Planned and Actual Outputs of the Project

Planned Outputs at the Time of Appraisal (2005)	Actual Outputs at the Time Ex-Post Evaluation (2016)
1) Civil engineering works, procurement of equipment etc. ① School building construction (total area: 16,000m^2) (a) FKIK classrooms: 7,000m^2 (b) Laboratory: 3,000 m^2 (c) Dormitory: 3,000 m^2 (d) Library: 3,000 m^2 ② Procurement of equipment ③ Procurement of furniture ④ Fellowship program ・Long study abroad in Japan for a doctoral program: 29 fellows ・Short study abroad in Japan for courses other than a doctoral program: 20 fellows	1) Civil engineering works, procurement of equipment etc. ① School building construction (total area: 18,021m^2) (a) FKIK classrooms: 6,196m^2 (b) Laboratory: 5,758 m^2 (c) Dormitory: 2,990m^2 (d) Library: 3,077 m^2 ② Procurement of equipment (722 items) ③ Procurement of furniture (286 items) ④ Fellowship program ・Long study abroad in Japan for a doctoral program: 30 fellows ・Short study abroad in Japan for courses other than a doctoral program: 82 fellows
2) Consulting services Mainly detailed design, bidding assistance, construction management, support for studying abroad (selection of school, assistance before and during the period of studying abroad), support for management and operations related to the overall implementation of the project. (International: 50M/M, local: 458M/M)	2) Consulting services The tasks listed on the left were mostly implemented in accordance with the plan. (International: 57.59M/M, local: 374.70M/M)
	【Additional Output】 Construction of the Research Teaching and Clinic Unit (RTCU) for the purpose of

	conducting research relevant to rural medicine, training and clinical services (two places): ・Buaran: 2,926 m^2 ・Reni Jaya: 2,476 m^2 Total: 5,402 m^2

Source: Documents provided by the JICA (planned outputs at the time of the appraisal), answers to the questionnaire (actual outputs at the time of the ex-post evaluation).

A slight difference is observed between the planned outputs at the time of the appraisal and the actual outputs of this project. The reasons for the difference in the outputs shown in Table 1 are as follows:

1) Civil engineering works, procurement of equipment etc.

The ① construction of (a) FKIK classrooms was implemented mostly as planned. On the other hand, the total area of the (b) laboratory increased in comparison to the initial plan. This is because the FKIK decided to introduce Problem Based Learning (PBL)[10], an educational method that had been mainstreamed in Indonesia's medical education at the time of the detailed design following the start of the project; for this to be realized, a larger space was needed for the laboratory. The (c) dormitory was constructed in accordance with the plan and it is now being used as a women's dormitory[11]. The (d) library, the ② procurement of equipment and the ③ procurement of furniture[12] were implemented mostly as planned. Under the ④ fellowship program, it was planned that, at the time of the appraisal, 29 fellows would study abroad at Japanese medical universities on a doctoral program[13], while another 20 would enroll on shorter medical training courses other than doctoral programs[14]. The main targets were faculty members of the FKIK. In reality, the number of fellows who studied abroad on doctoral programs was almost as planned, while the number of fellows who participated in shorter programs was significantly more than the plan. This is because there were more applicants than expected and also because the FKIK wanted as many applicants as possible to gain experience at Japanese centers of advanced medicine.

2) Consulting Services

[10] This refers to a learning method in which one identifies causes for phenomena and problems that can actually occur at medical sites and finds ways to address these matters.
[11] On the other hand, the men's dormitory was constructed under a project financed by the IDB, which was implemented some time before this particular project.
[12] They were mostly for experiments and training experiments for the laboratory, including electronic computers, desks and shelves.
[13] The period was three to four years on average.
[14] The period was one week to two months on average.

These were implemented as per the plan. The international M/M slightly increased because of the implementation of additional outputs, such as the Research Teaching Clinic Unit (hereafter referred to as RTCU), which will be discussed below. The local M/M was less than as planned. This is because payments to the construction management consultants were in the local currency (i.e., Indonesian rupiah (IDR)) and due to a change in currency exchange (JPY appreciating against IDR) during the project implementation M/M was reduced because it was expected that expenses would increase in Japanese yen[15].

【Additional Outputs】

Around the time of the commencement of this project, FKIK students were mostly trained at an affiliated educational hospital (Fatmawati Hospital[16]) and medical health facilities. At these facilities, while training curricula were established, training hours and space were limited, which meant that students in training were not able to gain sufficient hands-on experience in realistic medical settings. Thus, the UIN Jakarta decided to provide opportunities for gaining experience by building comprehensive medical training facilities for FKIK students, requesting that the JICA assist in the establishment of the RTCU. Based on such a request, the JICA made a decision to support the establishment of the RTCU in terms of additional outputs at two sites[17]: Buaran and Reni Jaya in South Tangerang City, Banten Province. During the evaluation study, it was confirmed, through interviews with the FKIK and site inspections, that these two facilities had been constructed without problems or delays[18]. Additionally, medical equipment was procured and installed at both facilities. The utilization status is generally good; however, X-ray examination machine is not in use at the time of the ex-post evaluation because radiology technicians have not been recruited. It is thought that the UIN Jakarta should have recruited or planned for the recruitment of such technicians before the device was procured and installed[19]. According to the UIN Jakarta, in addition to medical training for students, there is a certain demand

[15] To be more specific, M/M was adjusted in accordance with the adjustment of the amount in rupiah since the contract of consulting services was estimated in Japanese yen.
[16] A hospital located in the southern part of Jakarta.
[17] Both facilities are three to four kilometers from the FKIK campus.
[18] Every day, 30-50 residents living in the vicinity visit for medical consultations. The first floor of the RTCU comprises departments, such as those for Internal Medicine and Dentistry, as well as a pharmacy, which functions as a facility to provide regional medicine. Additionally, the second floor not only functions as a training facility for the FKIK students, but also used as a community-friendly medical facility.
[19] The probable explanation here relates to the fact that radiology technicians tend to be recruited via referral facilities (e.g., large general hospitals), as there are insufficient numbers of radiology technicians to cover all medical facilities, which means that smaller facilities, such as the RTCU, face difficulties in securing personnel.

for X-ray examinations from residents near to the RTCU; thus, they would like the matter to be addressed in a swift manner.

Constructed Dormitory

Constructed Laboratory and Classroom in the FKIK building

3.2.2 Project Inputs

3.2.2.1 Project Cost

While the total project cost was planned to be 3,510 million yen (of which 2,983 million yen was an ODA loan), the actual total project cost was 2,775 million yen (of which 2,606 million yen was an ODA loan), which was within the planned budget (about 79% of the plan). The main reason was the fluctuation in the currency exchange rate[20]. As discussed above, the RTCU was constructed, while medical equipment and goods were procured as an additional output (the total expense was about 250 million yen). The actual amount of 2,775 million yen includes cost for additional outputs and still within the planned total cost due to the fluctuation in the currency exchange rate (Japanese yen was stronger against rupiah).

3.2.2.2 Project Period

At the time of the appraisal, the project period was planned to last seven years and three months (87 months) from March 2005 to May 2012. On the other hand, the actual project period lasted nine years and one month (109 months) from March 2005 to March 2014, which was longer than planned (about 125% of the plan). The main reason for the delay was that the process by which the institutions accepted fellowship program participants (Japanese medical educational institutions) required time, as did the coordination with preceptors.

[20] At the time of the appraisal USD 1 = JPY 110.36 and IDR1.=JPY0.012 while, during the project implementation between 2009 and 2012, USD 1 = JPY 85.24 on average,IDR1 = JPY 0.009.

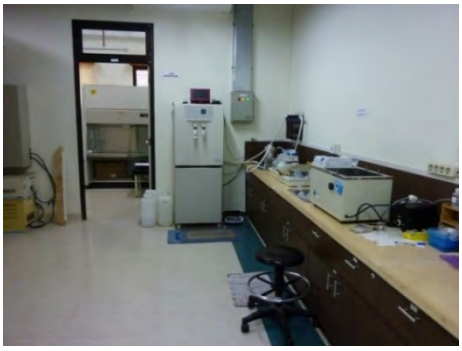
3.2.3 Results of Calculations of Internal Rates of Return (Reference Only)

The internal rates of return were not calculated at the time of the appraisal; thus, they were not recalculated as part of this study.

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

The RTCU Constructed as an Additional Output

Treatment in Action at the RTCU (Dentistry)



Procured Medical Equipment for Training inside the FKIK

Procured Equipment for Training inside the FKIK (electronic computers)

3.3 Effectiveness[21] (Rating: ②)

3.3.1 Quantitative Effects (Operational and Effect Indicators)

Table 2 shows the baselines, targets and actual figures of the quantitative effects of this project.

[21] Sub-rating for Effectiveness is to be put with the consideration of impact.

Table 2: Data Indicating Quantitative Effects of this Project
(Baselines, Targets and Actual Figures).

Indicator	At the Time of the Appraisal		At the Time of the Ex-Post Evaluation	
	Baseline	Target	Actual	
	2004	Two Years After Project Completion (2014)	2013/2014	2014/2015[22]
1) Total students at the FKIK (no. of persons)	110	2,296	1,697	2,176
2) Female students at the FKIK (no. of persons)	74	946	1,178	1,374
3) Percentage of students from the rural areas (%)	50 (figure for the entire UIN Jakarta; a figure specific to the FKIK is not known - see Note 1)	70[23] (figure for the entire UIN Jakarta; a figure specific to the FKIK was not set)	40 or smaller (entire UIN Jakarta)	40 or smaller (entire UIN Jakarta)
			Around 20 (FKIK)	Around 20 (FKIK)
4) Percentage of FKIK graduates engaged in rural medicine (%)	N/A	50	N/A	N/A

Source: Documents provided by the JICA (baseline and target), answers to the questionnaires and interview results (actual).
Note 1: According to the FKIK, however, students from rural areas accounted for 0-10% at the FKIK when it was founded in 2004.

Below is the summary of indicators 1) to 4) as shown in Table 2:

1) Regarding the total number of students at the FKIK, the target (2,296 students) was an accumulated figure covering the period up to two years after the project completion. As seen in relation to the actual three years after the project completion (2,176 students as of 2014/2015), the initially expected target was mostly achieved (95%).

2) Similar to 1) above, the target and actual numbers of female students at the FKIK are accumulative. At the time of the ex-post evaluation, the actual number exceeded the target. Additionally, the male to female ratio has been 4:6 ever year; i.e., there are more female students. One of the probable explanations for this is that the FKIK has an excellent reputation for providing quality education in the Nursing Department, which is mostly

[22] Since data of these two fiscal years (2013/2014 and 2014/2015) were only available through this ex-post evaluation survey, the analysis of comparison is basically done between data of 2014/2015 and the planned target which was set at the time of the appraisal (2004). However in reality it is ideal that the target should be compared with data of 2015/2016, which is two years after the completion of the project (cf. the actual completion was March 2014).

[23] The UIN Jakarta has a philosophy of "contributing to the improvement in the quality of social life" and focuses on supporting rural areas and regions; thus it was expected at the time of the appraisal that the percentage of students from the regions would increase to 70% in the future.

popular among female students because it offers a good learning environment for this reputation (including the women's dormitory that was constructed as part of this project). For example, during the interviews conducted as part of the field study, female students who were currently studying at the Nursing Department commented: "I don't think the nurse training equipment we are using here is available in other universities. It is as if we are working under real nursing situations. The constructed dormitory is also comfortable." With this comment, it can be judged that providing a good learning environment for female students is one of the reasons behind the increase in the number of students at the FKIK.

3) With regard to the percentage of students from rural areas, it was confirmed through interviews with the university that the baseline at the time of the appraisal (50%) and the target (70%) were consistent with the entire UIN Jakarta. On the other hand, the actuals at the time of the ex-post evaluation, with the UIN Jakarta in the upper part and the FKIK in the lower part in the Table 2, were lower than the baseline and the target. The reasons for this are as follows. Firstly, with regard to entrance exams and scholarships for universities at the time of the ex-post evaluation in Figure 1, the SBMPTN and the SNMPTN are the nationally standardized entrance exam systems governed by the Ministry of Education of Indonesia. At the UIN Jakarta, 30-40% of the total students enroll through the SBMPTN, while about 20% enroll through the SNMPTN (50-60% in total) every year. Actually, most of the students who enroll through these two systems are from urban areas[24]. Secondly, the PTKIN, which is governed by the DGIE, was newly established during the implementation of this project; this is an entrance exam/scholarship for students from rural areas. Those who enroll through this system represent less than 20% of the total students every year. Additionally, the MANDIRI is an entrance exam/scholarship system for all students in the country, which is implemented by each university, including the UIN Jakarta. The percentage of students from rural areas who enroll through this system equates to 20% or less every year. In other words, the percentage of students from rural area who enroll in the UIN Jakarta through the PTKIN and the MANDIRI equates to 40% or less (20% or less plus 20% or less). Apart from this, some students enroll through scholarship programs run by local governments; however, the proportion is relatively small[25]. This means that 50-60% of all students come through the SBMPTN and the SNMPTN and are mostly from urban areas, while about another 40% are students who come through the PTKIN, the

[24] It is probably because of the difference in academic performance between students from urban areas and rural areas, meaning that it is difficult for students from rural areas to enter universities using these two systems.
[25] According to the FKIK, the percentage is 1-5%, although this differs from year to year.

MANDIRI and scholarships provided by local governments. On the other hand, with regard to students from rural areas at the FKIK, accurate figures could not be obtained in terms of the percentage of students from rural areas at the time of the appraisal; however, according to the FKIK, the percentage was around 0-10%, while no target had been set for the future. As for the actual figure at the time of the ex-post evaluation, the percentage of students enrolling at the FKIK through the MANDIRI, along with others from rural areas, is around 20%. This is lower than the percentage of students from rural areas at the UIN Jakarta. The probable reason behind this is that many students from rural areas graduate from Muslim-based boarding schools (pesantren)[26] and their pass rate is low because their curriculum is not compatible with FKIK enrollment. However, some pesantren have entrance exam courses that focus on language and liberal arts (these are known as madrasas)[27]; indeed, a certain proportion of students enter via a madrasa. Actually, students from a madrasa constitute "around 20%" of the enrolled students shown in Table 2. Compared to the estimate above (0-10%), there seems to have been an increase. That said, considering that this project initially planned to "give priority in enrollment to students from rural areas and poor families"[28], and that the percentage including that of the FKIK was expected to reach the target of 70%, what has been achieved is judged to have reached the halfway point[29]. In order to further increase the number of students from rural areas at the UIN Jakarta, including the FKIK, in the future, it is thought that entrance and scholarship systems could be improved[30].

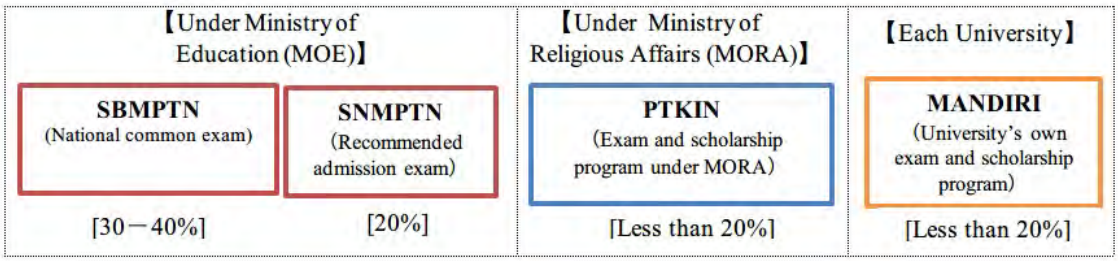
[26] They are Muslim-based boarding schools. Education is given based on Islamic scripture, with many students becoming Islamic leaders of the future.

[27] Although, like pesantren, they specialize in religious education, they also offer courses such as liberal arts, English and Islamic literature for the college-bound. In some cases, madrasas exists inside pesantren, while others exist independently. Given the contrasting situations in each region, it is not easy to capture the whole picture.

[28] Documents provided by the JICA are the source.

[29] Although this is difficult to evaluate, given that the targeted percentage of students from rural areas at the FKIK after the completion of the project was not set at the time of the appraisal, the proportion of students from rural areas is not significant as compared with the total number.

[30] Based on such a situation, the DGIE introduced a new entrance exam and scholarship program, "Program Scholarship Santri Excellency (PBSE)", in 2015 for students from rural areas (especially those in the eastern regions). The program had already started at the time of the ex-post evaluation (May 2016). Students who currently attend pesantren and are from ① rural areas, ②peripheral regions or ③ poor families are eligible. Based on these three criteria, applicants are examined, with those who demonstrate a good academic performance selected. This program is fund by the DGIE's budget, with tuition, accommodation and transportation covered. In 2016 (the first year), about 6,000 students from rural areas applied (of which about 600 students applied to the FKIK of the UIN Jakarta); 38 passed (according to the interviews with the DGIE's management). Successful candidates will be enrolled after taking a foundation course (three to six months), which will prepare them for the FKIK classes and its living environment.



Source: Made by external evaluator based on interview results with DGIE, UIN Jakarta and FKIK
Note: The figure shows the percentage of students who enroll using each system. Apart from this, some students enroll through the scholarship process operated by local governments, although the proportion is small.

Figure 1: University Entrances and Scholarships in Indonesia at the Time of Ex-Post Evaluation (Illustration).

4) Regarding the percentage of FKIK graduates engaged in rural medicine, the target at the time of the appraisal was for about half of the graduates (50%) to work in rural areas after graduation. However, there is no record about graduates engaged in rural areas after the project completion. It is difficult to capture what percentage of graduates work at medical institutions in rural areas because graduates are not obligated to report to the FKIK where they are going to work. Thus, it is not possible to quantitatively evaluate. As the DGIE and the UIN Jakarta only have partial information about graduate careers, it is thought preferable that the UIN Jakarta should form an alumni society and try to capture what its graduates are doing.

3.3.2 Qualitative Effects (Other Effects)

Improvement in Access to Healthcare Services for Rural Residents

During this evaluation study, FKIK graduates were interviewed using a questionnaire about improvements in rural residents' access to healthcare services[31]. As shown in Figure 2, they were asked about whether they think that this project had contributed to the increase in medical personnel (doctors) in rural areas; there were many positive answers. While this result indicates that both FKIK graduates and people around them work at medical institutions in rural areas, the exact number could not be captured; thus, it is not assertive. On the other hand, as shown in Figure 3, they were asked about what should be addressed concerning medical situations in rural areas. Respondents pointed to the shortage of medical personnel and equipment, the increasing number of patients who were beyond the capacity of existing facilities, and the need to improve the skills of medical personnel; thus, it is

[31] Of 21 valid responses, 16 were female and five were male. Questionnaires were sent to graduated students using the FKIK alumni list, which is owned by the DGIE; 21 graduates responded.

presumed that these issues still exist in Indonesia. As such, it cannot be claimed that rural residents' access to healthcare services has largely improved since the time of the appraisal. However, one fellowship program participant commented: "I make my rounds to medical institutions in rural areas more often, and I think I am utilizing what I learned." This comment will be discussed later as part of the beneficiary survey results under the Impacts heading. Thus, it can be presumed that FKIK-related personnel are more active in rural areas, as well as interact with local residents and provide healthcare services more often than before the start of this project.

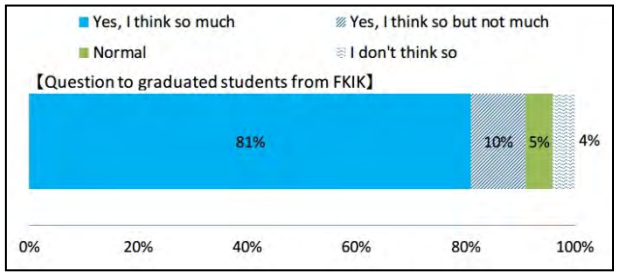


Figure 2: Do you think that this project has contributed to an increase in medical personnel (doctors) in rural areas?

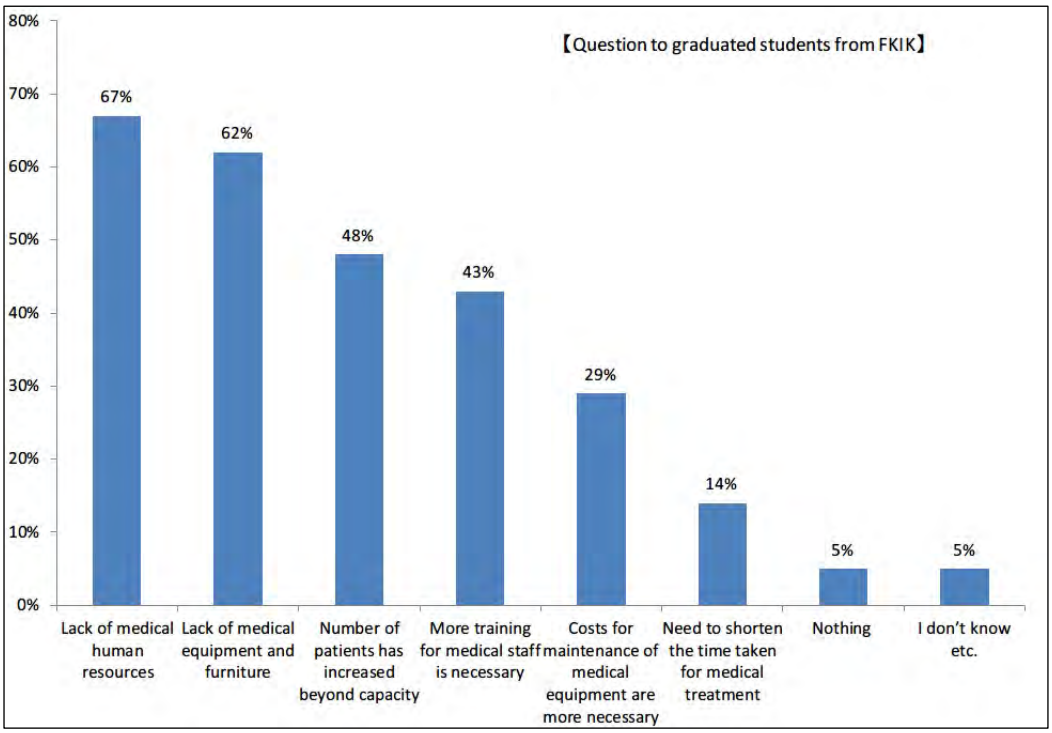


Figure 3: Do you think there is any issue to be addressed concerning medical situations in rural areas? If yes, what do you think is the issue? (Multiple answers allowed.)

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Contribution to the Fulfillment of the Need for Medical Personnel and Poverty Reduction Through the Provision of Basic Healthcare Services in Rural Areas

As discussed in Section 3.3.2 "Qualitative Effects (Other Effects)", a beneficiary survey was conducted to assess the level of satisfaction with this project, improvements in the educational standards at the FKIK and the contribution made in order to fulfill the need for healthcare personnel. The results are shown in Figures 4-10. These items targeted current and graduated students of the FKIK and participants on the fellowship program. The sample size (valid responses) totaled 121[32], of which 85 were current students[33], 21 were graduates[34] and 15 were participants on the fellowship program[35].

First, as shown in Figure 4, current and graduated students were asked if they were satisfied with the constructed FKIK classrooms; responses were generally positive. Reasons given included: "There are facilities suitable for the degree program, such as the library and laboratory. The design of the facilities is modern. The classroom is spacious." On the other hand, some current students said they were "dissatisfied" as a result of outstanding repairs: "The toilet doors need repair", for example. As shown in Figure 5, which was about procured equipment and furniture, while the level of satisfaction was generally high among graduates, many of the current students answered "normal" or "dissatisfied". Some commented that the amount of equipment and furniture is "appropriate considering the number of students", while others commented that the amount of equipment "is not enough for practical training. Some are broken". It is presumed that, while graduates were satisfied with the procured equipment and furniture, current students tend to be more dissatisfied some years after the completion of the project because the equipment and furniture were either not available or old at the time of the ex-post evaluation. As such, it can be judged that the FKIK needs to purchase, replace, maintain and repair its facilities according to the serviceable life. As shown in Figure 6, current and graduated students were asked about the project's

[32] The sampling methods were as follows: ① 85 students were drawn from the list of current students, in a balanced manner, with regard to the enrollment year (2013-2015) and department (Medicine, Pharmaceutical, Public Health or Nursing); the sample was drawn using the student list submitted by the FKIK. ② As the FKIK did not have sufficient records of graduates, information owned by the DGIE was used; all 21 people whose information was available were targeted by the survey. ③ All 15 responded when all those participating in the long program were asked to respond.

[33] 62 were female, while 23 were men.

[34] The breakdown is the same as that of the sample size from 3.3.2 Qualitative Effects (Other Effects) (i.e., 16 females and five males).

[35] The breakdown is 10 females and five males.

contribution to the improvement in education standards at the FKIK; many from each category answered: “I greatly think so”. When the respondents were interviewed, they commented: “Classrooms and laboratories are spacious, and we can [could] study in a comfortable environment. The procured medical equipment is [was] modern, practical and suitable for the needs of the laboratories and Nursing Department.” From these statements, it can be presumed that the construction of classrooms and the procurement of medical equipment throughout this project are among the factors contributing to the improvement in educational standards. As shown in Figure 7, when current female students were asked whether they felt positive about majoring at the FKIK, the majority said “yes”. When asked for the reasons why, they commented: “There is a women’s dormitory, which helps [with] our living aspect. We can wear Muslim-style clothes. Students around me have entered this university having the same ideas. There is a good learning environment.”

As most of the participants on the fellowship program were FKIK faculty members, a direct contribution to rural medicine is not observed. On the other hand, as shown in Figures 8 and 9, the level of satisfaction with this program is high. Indeed, there were positive answers to a question which asked whether the content of, and experience from, the program are contributing factors to the improvement in the FKIK’s educational standards. Additionally, as per the participants’ comments in Box 1 regarding the presentation of research findings, the contribution of articles, and the sharing of the knowledge and experience with FKIK students, it can be judged that the implementation of this program is generally contributing to an improvement in the FKIK’s educational standards.

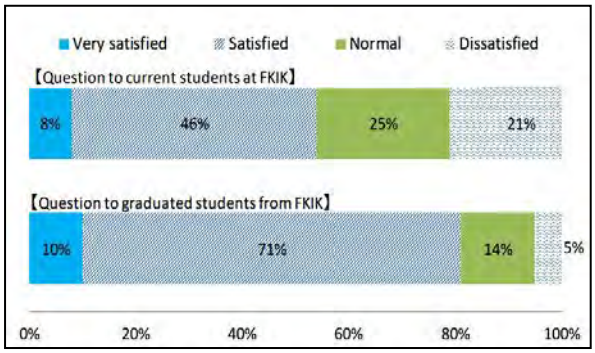


Figure 4: Are you satisfied with the developed FKIK classrooms?

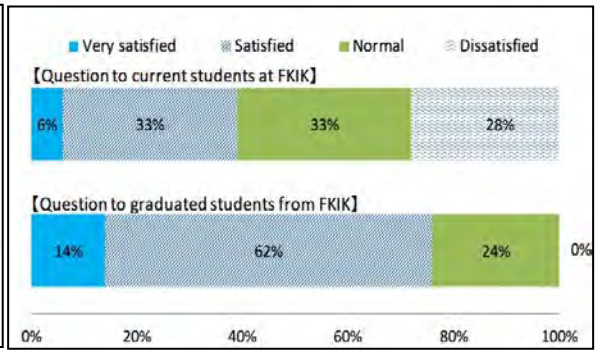


Figure 5: Are you satisfied with the procured equipment and furniture?

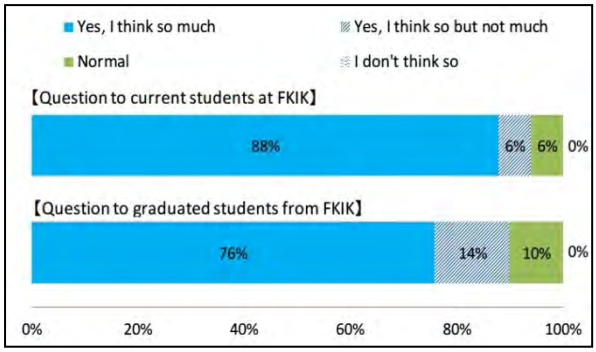


Figure 6: Do you think this project has contributed to improvements in educational standards?

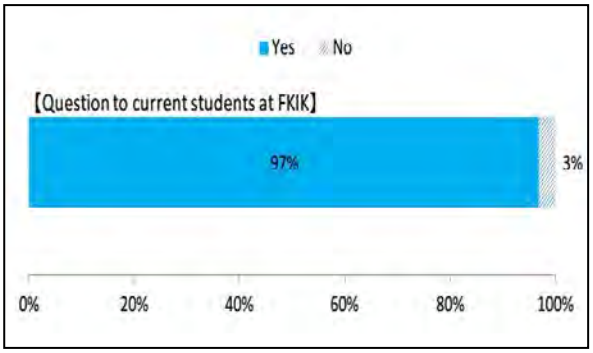


Figure 7: As a female student, do you feel positive about studying and living at the FKIK?

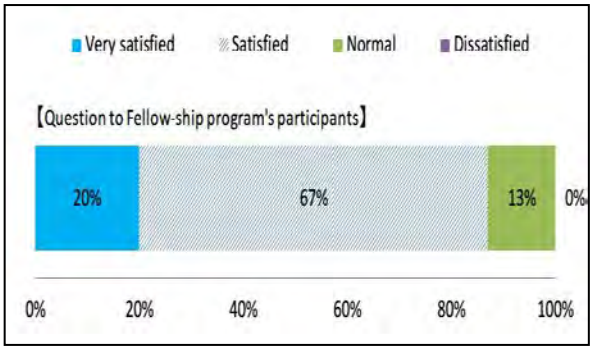


Figure 8: Are you satisfied with the implemented fellowship program?

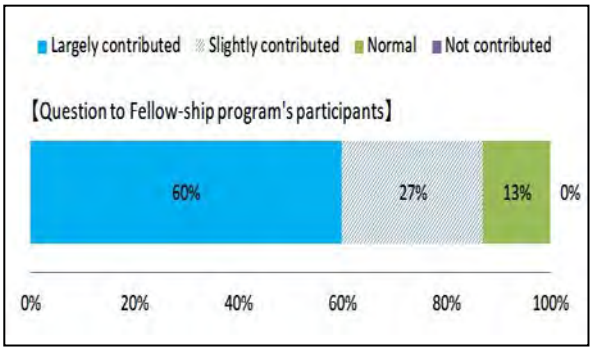


Figure 9: Is the content of, as well as the experience from, the implemented fellowship program contributing to improvements in the work standards?

【Box 1. Comments from Fellowship Program Participants】

■ It was meaningful to have learned in Japan where medical systems are advanced. My preceptor, who taught me how to write research papers and present them, was polite and kind.

■ After coming back to Indonesia, I write more articles and present more at academic societies and conferences. We gained knowledge through the fellowship program and connected more with people outside the university. As a result, I think the FKIK's educational standard has improved and we have more academic diversity.

■ Since the fellowship program, I visit medical institutions in rural areas for work more often. As I have opportunities to utilize the gynecological knowledge I gained in Japan at the medical institutions in rural areas, I think the program is contributing to the improvement in rural medical situations. In particular, as something I learned from Japan's advanced healthcare, I feel that disseminating maternal handbooks is important. It is not common yet in Indonesia, so I would like to make it my goal to distribute maternal handbooks in the future.

■ I learned about otology in Japan. I witnessed treatments at a university hospital and the program offered ample training opportunities.

■ In Japan, I conducted research into nursing/caring of children with disabilities. I had opportunities to present not only in Japan, but also in other countries (mainly Southeast Asian countries), and it was meaningful. After coming back to Indonesia, I have written a few

research papers and articles for professional journals based on such experience and knowledge. Through more academic presentations and article contributions, I think the program is contributing to the improvement of the FKIK's research findings and educational standards.
■ At the FKIK, I studied family medicine, while I studied universal health coverage in Japan. The system is advanced in Japan and I learned that Indonesia has a lot to learn. After returning to Indonesia, I would like to make efforts toward spreading information about universal health coverage by presenting at symposiums in and outside Indonesia.
■ I learned about tropical environment medicine in Japan. In the near future, I think I will have opportunities to pass on my knowledge and research findings to FKIK students. Since my return, I have been sharing my research findings and information with the Japanese university at which I studied. I think there is a possibility of accepting students and fellows from Japan in the future.

With regard to the "contribution to the fulfillment of the need for medical personnel", which was supposed at the time of appraisal, the "improvement in both quality and quantity of healthcare services for rural residents" and the "contribution to poverty reduction", no relations or concrete effects/impacts were confirmed by the beneficiary survey, interviews and information/data collection conducted during this evaluation study.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

During the project implementation and after the completion, it was confirmed by the questionnaires, interviews with the FKIK and site inspections that there were no negative environmental impacts. No air pollution, water pollution, noise, vibration or negative impacts on the ecosystem were observed around the constructed FKIK classrooms, dormitory and RTCU[36].

Regarding the environmental monitoring of this project, the Central Public Health Service Division, which reports directly to the Dean of the FKIK, takes care of the environmental works, planning and implementation of medical waste management on periodic basis. If any problem occurs, immediate actions are taken to address the matter. However, since no environmental problem especially occurred following the completion of this project, no measure was taken based on the monitoring results.

3.4.2.2 Land Acquisition and Resettlement

It was confirmed by the questionnaire and interviews with the FKIK that no land

[36] The environmental impact assessment (EIA) of the project was approved by the governor of Tangerang, in the province of Banten in November 2004, before the project started.

acquisition and resettlement, which was associated with this project, occurred. There was no need to acquire new land because the premises upon which the RTCU was constructed as an additional output belonged to the UIN Jakarta (the category of the land was raw land) before the start of this project.

(Summary of Effectiveness and Impact)

Regarding the quantitative effects of this project, the number of FKIK students and female students mostly reached the initial expectation. However, considering that the percentage of students from rural areas is still low, and that the percentage of graduates who are working at medical facilities in rural areas is unknown (although following up on students after graduation is not within the scope of this project and not necessarily related to this project), it cannot be concluded that the initially expected outcomes have been achieved. In particular, with regard to the small percentage of students from rural areas, since the initial plan of "giving priority in enrollment to students from rural areas and poor families" remains at the halfway stage, it is still necessary to continue trying. On the other hand, according to the beneficiary survey, which targeted current students, graduates and participants of the fellowship program, on the subject of classrooms, dormitories and the library that had been constructed, as well as the medical equipment that had been procured through this project, it was confirmed that the classrooms and laboratories were spacious, while the environment was considered to be comfortable. Furthermore, it was confirmed that this project offers a certain contribution to the improvement in the FKIK's educational standards and practical medical skills of the graduates. Based on the above, this project has to some extent achieved its objectives. Therefore, the effectiveness and impact of the project are fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The executing agency of this project is the DGIE, which manages the UIN Jakarta and the broader education system, including budget allocations. On the other hand, it is FKIK of UIN Jakarta that operates and maintains the constructed classrooms and dormitories, as well as the procured medical equipment and furniture, operates the undergraduate education program, and implements the budgets. At the time of the ex-post evaluation (as of the end of December 2015), the total number of FKIK staff is 52. It was confirmed by this study that a sufficient number of staff was assigned to the operation and the maintenance divisions of the FKIK, and

that there is no shortage in the number of faculty members[37].

Based on the above, it can be judged that there is no major problem in terms of the institutional aspect of the operation and maintenance of this project.

3.5.2 Technical Aspects of Operation and Maintenance

In recent years (2012–2015), training has been held for the operation and maintenance staff of the FKIK. For example, training entitled "Procurement System Training and Examination" has been delivered by the National Procurement Committee, while training on "Library Computer Science" and "Elevator Maintenance Technology" has been conducted by private companies, with "Web Design at Laboratory Experiment Facilities" run by another university. On-the-job training is also given as needed when staff are newly recruited, while maintenance technologies and skills are shared. Additionally, it was confirmed through the site inspections that experienced staff members[38] were in appropriate positions within the FKIK. Furthermore, it was confirmed that participants of the fellowship program were still working there at the time of the ex-post evaluation.

Maintenance manuals were provided by the supplier of the procured medical equipment. FKIK staff operate and maintain the medical equipment by referring to such manuals.

Based on the above, no major problems are observed regarding the technical aspect of the operation and maintenance of this project.

3.5.3 Financial Aspects of Operation and Maintenance

Table 4 shows the operation and maintenance costs of different departments in the FKIK for the last three years[39].

Table 4: Operation and Maintenance Costs of Each Course and Department at the FKIK
(the upper row is the allocated amount for that year, while the lower row is the actual amount)

(Unit: Thousand rupiah)

Department		2012	2013	2014
Medicine	Allocation	6,768,458	7,369,513	8,216,841
	Actual	6,737,657	6,285,167	7,111,322
Nursing	Allocation	980,994	1,394,580	1,702,881
	Actual	925,661	1,264,364	1,771,914

[37] It was confirmed through interviews that, at the FKIK, efforts are being made to operate the school in order to avoid staff shortages occurring in accordance with the number of students.
[38] Almost all staff members are degree holders or higher and have passed civil service exams (i.e., National Uniform Exams).
[39] According to the FKIK, data for 2015 could not be obtained because it would take too much time to put things in order.

Pharmacy	Allocation	1,326,040	1,795,510	1,904,638
	Actual	1,163,968	1,443,295	1,849,376
Public Health	Allocation	959,308	1,315,678	1,336,197
	Actual	862,849	1,022,559	932,996
Registrar	Allocation	6,680,232	11,867,716	12,297,582 (allocation)
	Actual	5,715,453	7,890,691	
Dormitory	Allocation	901,325	2,262,900	9,887,699 (actual) - see Note
	Actual	666,503	907,038	
RTCU	Allocation	571,280	763,554	2,009,425
	Actual	214,037	570,090	1,134,610
Total	Allocation	18,187,637	26,769,451	27,467,564
	Actual	16,286,128	19,383,204	22,687,917

Source: Document provided by the FKIK.
Note: The allocated and actual budgets of the registrar and dormitory were merged in 2014.

Funding for operating the UIN Jakarta comes from the Indonesian Government. The FKIK's operation and maintenance are also funded from this budget. According to the interviews with FKIK management and financial staff: "Allocated budgets have been enough to operate each department recently." The actuals (lower row) in Table 4 are within the allocated amount (upper row)[40], except for the Nursing Department in 2014, which is showing an increasing trend. According to the UIN Jakarta, should a shortage occur in one department, the necessary budget will be allocated from the total budget so that things will run smoothly.

Based on the above, it can be judged that there is no major concern about the operation and maintenance budget of the FKIK.

3.5.4 Current Status of Operation and Maintenance

No major problems have occurred in terms of the status of the operation and maintenance of the FKIK classrooms, dormitories, library, medical equipment and furniture, as well as the RTCU, which was constructed in the course of this project. Every year, the UIN Jakarta and the FKIK jointly develop a maintenance plan, based on which operation and maintenance works are carried out.

With regard to medical equipment, in the event of problems and breakages or if there is something unclear, operational and maintenance staff will contact the local agent of the supplier in an attempt to address the matter. However, as shown in the beneficiary results, under Section 3.4.1 (Impacts), some procured medical equipment and furniture were damaged before the end of their serviceable life or are already at the end of serviceable life. Therefore, it

[40] In 2014 the Department of Nursing required more money for the medical equipment maintenance than expected; and the actual expense exceeded the initial budget. However, there was no problem as additional budget was immediately provided based on the request.

is thought necessary that the FKIK try to undertake purchases, replacements or active repairs in accordance with the respective serviceable life. Most of the spare parts about medical equipment and furniture can be procured inside the country, and no problem has occurred to date[41]. It was confirmed during the site inspections that the FKIK keep records of the medical equipment and furniture while managing parts.

On the other hand, as discussed in Section 3.2.1 Project Outputs under the Efficiency heading, it is thought that the executing agency should address the fact that the X-ray machines (two in total), which had been procured for the RTCU as an additional output, are not being used[42].

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project developed hard and soft infrastructures for the FKIK of the UIN Jakarta located in Banten Province near the capital Jakarta, with a view to expanding opportunities for higher education in medicine within rural areas and among the poor, as well as supplying doctors and nurses to rural areas. With regard to relevance, through the time of ex-ante and ex-post evaluation, the Indonesian Government is advocating for the need to nurture medical human resources in documents, such as the "National Development Plan" and the "National Medium-term Development Plan". Additionally, securing medical personnel, especially for rural areas, has become an urgent task in Indonesia. Furthermore, the project is consistent with the Japanese assistance policy at the time of the appraisal; thus, relevance is high. Concerning efficiency, the project period was slightly prolonged due to the delay in a fellowship program; however, the project cost was kept within the initial plan's budget. As such, efficiency is fair. Regarding the effectiveness of this project, the numbers of total students and female students at the FKIK generally reached what were initially expected, while there were positive comments on the improvement in educational standards at the FKIK from current and graduated students

[41] The maximum delivery time is one to two months.

[42] At the time of the ex-post evaluation, the exact timing of when the machines will be used is not known. However, according to the FKIK, as of October 2016, license to provide radiology services at RTCU will be obtained from Banten Province Health Office, and FKIK will ensure budgets for radiology staff for 2017 and conduct the recruitment. Maintenance works will be carried out based on the plan discussed in the beginning in terms of when it is going to start servicing the machines.

and those who participated in the fellowship program. However, considering the fact that only a small percentage of the FKIK students are from rural areas at the time of the ex-post evaluation, and that the percentage of its graduates who get jobs at medical facilities in rural areas is unknown, it cannot be said that the project has necessarily achieved outcomes that had initially been expected. Thus, effectiveness and impacts are fair. On the other hand, no particular problems are observed in the institutional, technical and financial aspects of the operation and maintenance of this project; thus, sustainability of the effects of this project is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

・At the time of the ex-post evaluation, the FKIK is considering whether to establish an alumni society in order to gather information about what their graduates are doing; as such, it is recommended that it does so promptly. By establishing an alumni society, which can gather information about the career pursuits of all graduates, it will become possible to identify the number of FKIK graduates working in rural medicine, meaning that, in turn, the extent of this project's contribution can be accurately captured.

・At the RTCU which was constructed as an additional output, x-ray machine is not in use. It is recommended that the FKIK take measures toward its utilization quickly[43] (e.g., accelerating the process of allocating radiology technicians, etc.).

・As shown in the beneficiary survey results, while the FKIK graduates were satisfied with the equipment and furniture procured by this project when they were students, current students tend to show discontent at the time of the ex-post evaluation since some years have passed and there are some damages. Thus, it is recommended that the FKIK purchase new equipment or repair it in accordance with its serviceable life.

4.2.2 Recommendations to JICA

None.

[43] As described in 3.5.4 Current Status of Operation and Maintenance, FKIK will plan to ensure budgets for radiology staff and conduct the recruitment.

4.3 Lessons Learned

The Need to Understand Risks Related to the Utilization of Procured Equipment

The X-ray machines at the RTCU, which were constructed as an additional output of this project, are not in use. It is presumed that the plans for recruiting radiology technicians and operating the equipment were not fully realistic. For similar projects in the future, on the basis that the procurement and operation of equipment, such as X-ray machine, which requires special skills, it is recommended that the project implementing agency/operator should have a concrete plan to recruit such technicians and to operate the equipment as much as possible at the time of project formation, simulating the actual site condition after the completion of the project (in consultation with suppliers who have specialized knowledges on the if necessary.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil engineering works, procurement of equipment etc. ① School building construction (total area: 16,000m^2) (a) FKIK classrooms: 7,000m^2 (b) Laboratory: 3,000 m^2 (c) Dormitory: 3,000 m^2 (d) Library: 3,000 m^2 ② Procurement of equipment ③ Procurement of furniture ④ Fellowship program ・Long study abroad in Japan for a doctoral program: 29 fellows ・Short study abroad in Japan for courses other than a doctoral program: 20 fellows	1) Civil engineering works, procurement of equipment etc. ① School building construction (total area: 18,021m^2) (a) FKIK classrooms: 6,196m^2 (b) Laboratory: 5,758 m^2 (c) Dormitory: 2,990m^2 (d) Library: 3,077 m^2 ② Procurement of equipment (722 items) ③ Procurement of furniture (286 items) ④ Fellowship program ・Long study abroad in Japan for a doctoral program: 30 fellows ・Short study abroad in Japan for courses other than a doctoral program: 82 fellows
	2) Consulting services Mainly detailed design, bidding assistance, construction management, support for studying abroad (selection of school, assistance before and during the period of studying abroad), support for management and operations related to the overall implementation of the project. (International: 50M/M, local: 458M/M)	2) Consulting services The tasks listed on the left were mostly implemented in accordance with the plan. (International: 57.59M/M, local: 374.70M/M)
		【Additional Output】 Construction of the Research Teaching and Clinic Unit (RTCU) for the purpose of conducting research

		relevant to rural medicine, training and clinical services (two places): ・Buaran: 2,926 m^2 ・Reni Jaya: 2,476 m^2 Total: 5,402 m^2
2. Project Period	March 2005 – May 2012 (87 months)	March 2005 – March 2014 (109 months)
3. Project Cost		
Amount Paid in Foreign Currency	1,442 million yen	2,587 million yen
Amount Paid in Local currency	2,068 million yen (=Approx.172,333 million Rp.)	188 million yen (=Approx.20,300 million Rp.)
Total	3,510 million yen	2,775 million yen
Japanese ODA Loan Portion	2,983 million yen	2,606 million yen
Exchange Rate	1 USD=110.36 JPY 1Rp.=0.0012 JPY (As of March 2005)	1 USD=85.24 JPY 1Rp.=0.0009 JPY (Average during the project's implementation. Source: International Financial Statistics, IMF)

Republic of Indonesia

FY2015 Ex-Post Evaluation of Japanese ODA Loan Project

"ICT Utilization for Education Quality Enhancement in Yogyakarta Province"

External Evaluator: Masami Sugimoto, SHINKO Overseas Management Consulting Inc.

0. Summary

This project was implemented, as a model project for utilizing Information & Communication Technology (hereinafter referred to as "ICT") in the field of basic education in Indonesia, with a purpose to enhance education quality and to equalize the education level throughout the region by facility development through providing total 500 primary and secondary schools in Yogyakarta Special Province with necessary ICT equipment, ICT environment and e-Learning system development as well as assistance in participatory school operation and activities.

This project is highly relevant corresponding to the Indonesia's development policy and development needs both at the time of appraisal and ex-post evaluation, and also to the Japan's ODA policy at the time of appraisal. On the other hand, the efficiency is fair with its implementation period longer than planned due to the prolonged procurement process, while the project cost is lower than planned.

E-education is actively progressing at five hundred elementary and secondary schools selected as beneficiaries under the project with increased educational motivation in both teachers and students' sides. The project is also contributing to the equalization of the education level throughout the region. In addition to that, the Education Communication Technology Center (hereinafter referred to as "BTKP") of Department of Education, Youth and Sports of Yogyakarta Special Region (hereinafter referred to as "DIKPORA") whose function has been much strengthened under this project has been distributing electronical teaching materials and information through internet networks beyond the provincial border, which enables nation-wide supply of ICT-based education services. In Yogyakarta, the education sector leads trade, manufacturing and other regional industries in promoting ICT application. Therefore, the project has been thus mostly producing planned effects, therefore effectiveness and impact of the project are high.

Operation of the ICT facilities installed at the 500 selected schools is not faced with particular financial problems, however, allocation of budgets for repair and replacement at most of the schools is financially restricted. In the technical aspect, limited use of intranet and helpdesk functions was found. Another technical challenge is that smooth and timely BTKP technical support has not be realized. Thus, some minor problems have been observed in financial and technical aspects. Therefore sustainability of the project effects is fair.

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

1. Project Description

Project Location

ICT Utilizing Classwork at Primary School PC Lab

1.1 Background

The net enrollment rates[1] of basic education in Indonesia were 94% for primary education and 65% for secondary education in 2006[2]. However, the quality of education still involved challenges. According to the Programme for International Student Assessment (hereinafter referred to as "PISA") undertaken in 2003 by the Organization for Economic Co-operation and Development, (hereinafter referred to as "OECD") on 15-year old students at the time of completion of basic education, Indonesia ranked in the lowest group in all four subject areas[3]. Under this situation, the "National Medium Term Development Plan (Rencana Pembangunan Jangka Menengah Nasional, hereinafter referred to as "RPJMN") 2004-2009 placed importance on improving quality of basic education. The National Education Strategic Plan (RENSTRA DEPDIKNAS: Rencana Strategis Departemen Pendidikan Nasional) 2005-2009 also stated that increasing access to high-quality education was essential for the development of the country. On the other hand in Yogyakarta Special Region which is the implementation site of this project, ICT utilization in every economic and social sectors was promoted under the slogan "Jogja Cyber Province" led by the governor, Sultan Hamengkubuwana X, and its application to the

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1 Enrolment of the official age-group for a given level of education expressed as a percentage of the corresponding population.

2 STATISTICS INDONESIA, Central Bureau of Statistics (Badan Pusat Statistik, hereinafter referred to "BPS") Web Site: https://www.bps.go.id/linkTableDinamis/view/id/1051

3 Indonesia ranked below 37th among the total 40 countries participated on all the four subject areas; "Mathematics Literacy," "Reading Literacy," "Science Literacy" and "Problem Solving."

basic education sector was also prioritized[4].

ICT utilization also gained momentum at the central government level. The Ministry of Communication and Information Technology formulated the "One School One Computer Laboratory Program" based on the Minister's Decision No. 17, 2003, and promoted ICT utilization in education of all the schools in Indonesia.

Reflecting the situation above, the Government of Indonesia officially requested this project to the Japanese Government in October 2006 as one of the ODA loan projects proposed with a purpose to introduce ICT based education to totally 500 schools comprising 300 primary and 200 secondary schools in Yogyakarta Special Region.

1.2 Project Outline

The objective of this project, as a model in the utilization of ICT in basic education, is to promote improvement in quality of education by enhancing educational facilities through the procurement of necessary materials and equipment, the establishment of an ICT environment, the development of an e-Learning system, and by providing assistance with a participatory approach to school management and educational activities, thereby contributing to the total improvement of education quality throughout the country by widespread application of the lessons learned from this project.

Loan Approved Amount / Disbursed Amount	2,911 million yen / 1,520 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March, 2007 / March, 2007
Terms and Conditions	Interest Rate 1.5% Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency	Republic of Indonesia / Directorate General of ICT Applications, Ministry of Communication and Information Technology (KOMINFO)
Final Disbursement Date	December, 2014
Main Contractor (Over 1 billion yen)	

[4] "Blueprint Jogja Cyber Province," Yogyakarta Special Region Governor Regulation No. 42, 2006

Main Consultant (Over 100 million yen)	Consortium led by PT. Nusantara Secom Infotech (Indonesia), in association with PT. Duta Astakona Girinda (Indonesia) and Pasco Corporation (Japan)
Feasibility Studies, etc.	Special Assistance for Project Formation（SAPROF）for Project for Educational Quality Enhancement Through IT Utilization In Yogyakarta Province, JICA, February 2006
Related Projects	(Technical Cooperation Projects) "Regional Educational Development and Improvement Program Phase 1, 2" JICA, 1999-2005 "Local Educational Administration Improvement Program" JICA, 20042008 (Other Aid Agencies and International Organizations) "Decentralized Basic Education Project (DBEP)" ADB (Asian Development Bank), 2002-2009, "Managing Basic Education (MBE) Project" USAID (United States Agency for International Development) 2003-2007

2. Outline of the Evaluation Study

2.1 External Evaluator

Masami Sugimoto, SHINKO Overseas Management Consulting, Inc.

2.2 Duration of Evaluation Study

Duration of the Study: October, 2015 – December, 2016

Duration of the Field Study: February 21 – March 3, 2016, May 28 – June 5, 2016

2.3 Constraints during the Evaluation Study

The project implement plan at the time of appraisal planned to set up a "Project Office" at the Directorate General of ICT Applications, Ministry of Communication and Information Technology (hereinafter referred to as "KOMINFO"), and KOMINFO was supposed to undertake overall project implementation and cost management. However in reality, the comprehensive management including project accounting was not systematically conducted, therefore the total project cost expended from the government was found unknown. Therefore the efficiency was evaluated in this evaluation study based on the actual total cost assumed from the disbursed amount of ODA loan and the expenditure from the Indonesian government reported in the

Mid-term Review carried out in 2012.

3. Results of the Evaluation (Overall Rating: B[5])

3.1 Relevance (Rating: ③[6])

3.1.1 Relevance to the Development Plan of Indonesia

At the time of appraisal, RPJMN 2004-2009 attached importance of quality improvement of the basic education. The National Education Strategic Plan (RENSTRA DEPDIKNAS: Rencana Strategis Departemen Pendidikan Nasional) 2005-2009 also stated that increasing access to high-quality education is essential for the development of the country, and remarked (1) increasing educational opportunities, (2) improving quality of education and (3) improving governance and accountability as the three pillars of the strategy. In RENSTRA DEPDIKNAS, ICT was also referred to as playing a role in effective learning at the stage of basic education. On the other hand, the President Instruction (INPRES: Instruksi Presiden) No.3, 2003 regarding "Policy and Strategy for Promoting e-Government" placed all the central and regional ministries and agencies under an obligation to prepare and implement Strategic Development Plans (RENSTRA) to accelerate introduction of e-Government. Under that policy of e-Government promotion at the national level[7], Yogyakarta Special Region especially put emphasis on ICT utilization and was promoting it in whole sectors in the region based on the Governor Regulation No.42, 2006 "Blueprint Jogja Cyber Province." The education sector was placed as one of the priority sectors there.

RPJMN 2015-2019 at the time of ex-post evaluation strongly reflects the manifesto of President Joko Widodo who was inaugurated in preceding year, 2014, which mentions "education quality betterment" for improving quality of human life as one of the nine priorities "Nawa Cita." In that framework, the RPJMN aims for improving primary and secondary education through policy measures like "Smart Indonesia Program." The President has been making much of bottom-up political approach making full use of ICT since the former position as governor, and continuously makes much of ICT promotion in the public sector after the presidential inauguration. Current RENSTRA 2015-2019 of the Ministry of Information and Communication Technology also places "Human Resource Development" as one of the seven priority areas, and puts forward this project as one of its performances of the preceding RENSTRA 2010-2014 in that particular field. At the regional level, the ICT utilization has been continuously promoted in all the social and economic sectors including education under the Blueprint of the above stated

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

6 ③: High, ②: Fair, ①: Low

7 The government policy to promote ICT utilization as interfacing measure widely open to the nation and users for the purpose to deliver better public services.

Governor Regulation No.42.

Thus, this project is relevant to the country's national, regional development plans of the education and information sectors both at the times of appraisal and ex-post evaluation.

3.1.2 Relevance to the Development Needs of Indonesia

The net enrollment rates of basic education in Indonesia at the time of appraisal were 94% for primary and 65% for secondary education in 2006, which had not reached the level required as the compulsory education. The quality of education also involved weakness resulting in the performance in which Indonesia ranked in the lowest group in all four subject areas in the test of "PISA" of OECD, therefore its improvement constituted one of the serious problems of the country.

The following table shows some improvement in the conditions of basic education at the time of ex-post evaluation, however, the challenges have not been removed both at national and regional levels. (Table 1)

(1) National Level

Table 1: Conditions of Basic Education in Latest Years at the Time of Ex-post Evaluation

	Primary Education	Secondary Education
Net Enrollment Rate	96.7% (2014)	77.8% (2014)
Rate of Enrollment Disparity between Regencies (Kabupaten) and Cities (Kota)	1.9% (2014)	12.75% (2014)
Ratio of Schools above B Grade in School Accreditation	68.7% (2013)	62.5% (2013)

Source: STATISTICS INDONESIA (BPS), RENSTRA 2015-2019 Ministry of Education & Culture

The net enrollment rate should be aimed at 100% as compulsory education, however as indicated above, it has not reached (especially for secondary education) the target, and in addition, the enrollment regional disparity is still significant. The ratio of schools that get above B Grade which is regarded as satisfactory as an educational institution by the country's institutionalized accreditation system is also low[8]. In the recent result of PISA of OECD in 2012, Indonesia further fell from 2009 to almost the bottom; namely, 64th (mathematics literacy), 60th (reading literacy) and 64th (science literacy) among 65 countries participated. Thus, basic education in Indonesia needs further improvement in terms of access, equal opportunity and quality.

In the communication and information technology sector, "RENSTRA of the Ministry of

[8] In Indonesia, schools are individually evaluated by the "Accreditation Board for Schools/Madrasah" established at the central and regional levels. Full score is 100 and schools are graded A (86~100), B (71~85) or C (56~70). RENSTRA of the Ministry of Education & Culture (2015-2019) takes the ratio of schools above B grade as an indicator of development performance.

Communication & Technology" points out prevailing disparity in people's access to information due to the ICT utilization gap which hinders "improvement of human life quality" as one of the nine priorities of the national goal "Nawa Cita." It also mentions challenges of unsatisfactory internet connections at schools, and emphasizes needs of improvement in those weaknesses.

(2) Regional Level

Yogyakarta Special Region is known as a leading educational district in Indonesia. According to the BPS statistics, the net enrollment rates are 99.2% (1st rank among all 33 provinces) and 82.9% (4th), well above the national average (96.7% for primary and 77.8% for secondary schools). However, respective RENSTRA of Yogyakarta Special Region and DIKPORA point out challenges in (1) quality and equitable education, (2) ICT utilization in education and education based on regional sense with international insight, (3) dissemination of compulsory education at the village level and (4) synergy of improvement between education and other sectors, and emphasize importance of improvement. As the final goal of this project is the rollout of the ICT based education to other provinces, it corresponds to the project needs to have selected Yogyakarta Special Region which already has the base for introduction with high-standard education level as the pilot region.

On the other hand in the communication and information technology sector, the provincial RENSTRA 2012-2017 points out unsatisfactory establishment and operation of ICT infrastructure to promote improved e-Government services, and aims for improvement.

Thus, challenges in the education sector found in appraisal have not been solved up until now, and needs for improvement of the basic education and ICT utilization in whole sectors including education are high at the central as well as regional levels. Therefore this project is consistent also with the current development needs of Indonesia.

3.1.3 Relevance to Japan's ODA Policy

"Creation of democratic society" which was one of the priority areas of the "Country Assistance Policy for Indonesia" in 2004 included improvement of public services of education and health as a part of poverty alleviation. In addition to that, the "Medium-term Strategy for Overseas Economic Cooperation Operations" by JICA (April, 2005) mentioned "Infrastructure Development for Sustainable Growth," "Assistance in Human Resource Development" as priority areas, and recognized that promotion of ICT utilization leads to quality improvement of education and other social services. The "Country Assistance Strategy for Indonesia" in 2006 also mentioned education quality improvement led by regional governments under decentralization as one of the priority themes.

Thus, consistency of this project with the Japan's ODA policy at the time of appraisal is high.

In light of the above, this project has been highly relevant to the country's development plans and needs both at the times of appraisal and ex-post evaluation, as well as the Japan's ODA policy at the time of appraisal. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

This project[9] implements variety of activities summarized as follows to strengthen capacity and develop facilities in order to be able to conduct ICT-based education in totally 500 selected schools comprising 300 primary and 200 secondary schools in Yogyakarta Special Region. The figure below illustrates an image of the total system being developed by this project. (Figure 1)

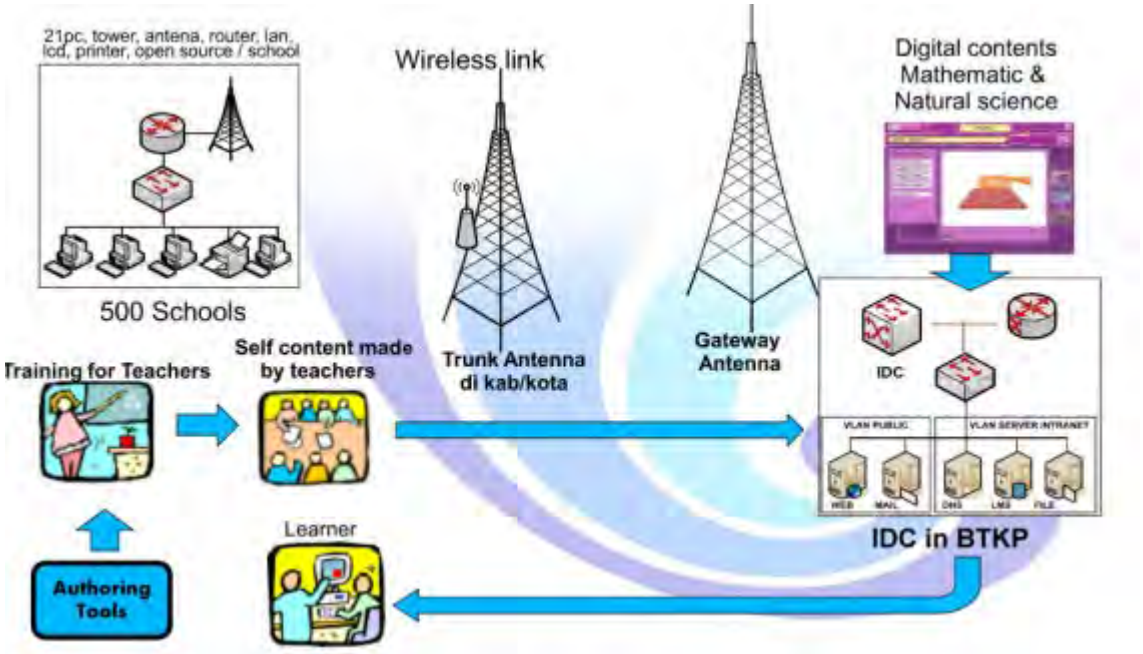

Figure 1: Conceptual Scheme of Total System

Source: "Role Model: ICT Utilization for Education Quality Enhancement in Yogyakarta Province" Boni Pudjianto, International Conference on Innovative ICT, CIO and Natural Disasters, Manila, October 6-7th, 2011

The actual outputs of each component are shown against the plan as follows. (Table 2)

9 This project is commonly known as "ICT-EQEP" standing for ICT Utilization Project for Education Quality Enhancement in Yogyakarta Province in Indonesia.

Table 2: Project Components and Output Performance against the Plan

Project Components	ODA Loan	Plan*1	Performance
<Main Part>			
1.Installation of ICT Equipment & Connecting Environment			
(1) ICT Equipment for Schools	Financed	500 Schools	500 Schools
(2) ICT Equipment for Project Offices	Financed	One Set	As Planned
(3) ICT Equipment for IDC*2	Financed	One Set	As Planned
(4) Upgrading of Schools' Electric Power Capacity	Out of Finance	500 Schools	500 Schools
(5) ICT Operation & Maintenance (Anti-virus Software License Fee, Internet Connection Fee, Help Desk Operation Cost, Maintenance Contract Fee)	Out of Finance	One Set	As Planned except Anti-virus License Fee
2. Provision of Necessary Materials & Equipment for Schools and Assistance in School Activities (Block Grant)	Out of Finance	500 Schools	500 Schools
3. Conducting Training Programs for Teachers, Etc.	Partially Financed	3,130 People	Over 5,000 People
4. ICT-based Teaching Materials Development *2	Partially Financed	-	75 Study Topics
5. System Development for IDC*3	Financed	4 System Areas	4 System Areas
<Consulting Services>			
1. International Consultants	Financed	33.0MM	45.75MM
2. Domestic Consultants	Financed	196.0MM	296.25MM

*1 Planned targets reviewed in the Mid-term Review

*2 Consists of procurement of ready-made teaching material development software and outsourced teaching materials by the former. No planned quantity was provided in appraisal and other documents. Only the number of study topics of the latter performance is shown here.

*3 Internet Data Center

<Main Component>

(1) Installation of ICT Equipment & Connecting Environment

a) ICT Equipment for Schools (500 primary & secondary schools)

Main contents are desktop computers (21 sets for students of each school and 1 set for teachers which is also used as a server, totally 22 sets per school), antennae, and necessary materials & equipment for LAN (Local Area Network), printers, projectors and other supporting equipment.

Yogyakarta Special Region consists of one City (Kota) and 4 Regencies (Kabupaten). The numbers of total and selected schools under this project are indicated as follows (Table 3). The performance of implementation was as planned.

N3 Wonosari Secondary School at Kabupaten Gunung Kidul and Tower Antennae installed under this Project

Table 3: Distribution of Numbers of Total and Selected Schools in the Project Region

Kabupaten, Kota	Total Number at the time of Project Implementation			Number of Selected Schools for this Project Implementation			Ratio
	Primary	Sec-ondary	Total	Primary	Second-ary	Total	
Gunung Kidul	487	107	594	65	34	**99**	17%
Sleman	498	104	602	72	61	**133**	22%
Kulon Progo	349	67	416	38	25	**63**	15%
Bantul	346	85	431	78	50	**128**	30%
Kota Yogyakarta	182	57	239	47	30	**77**	32%
Total	1,862	420	2,282	300	200	**500**	22%

Source: Consultant's Completion Report

(Note) : The latest figures in 2015 are 1,844 (primary school) and 435 (secondary school) respectively. (Source: BAPPEDA <Regional Development Planning Board> Yogyakarta Website: http://bappeda.jogjaprov.go.id/dataku/data_profil)

b) ICT Equipment for Project Offices

A set of equipment for project administration is installed in the project offices set up at the KOMINFO (executing agency) and DIKPORA (operation & maintenance agency) consisting of desktop and laptop computers, printers and other supporting equipment. The performance of

implementation was as planned.

c) ICT Equipment for Internet Data Center (hereinafter referred to as "IDC")

IDC is a unit mainly functioning for system development relating to establishing educational information database, helpdesk operation, educational contents management and gateway functions[10], which was set up at BTKP. Main equipment installed under this project consists of various kinds of servers, UPS (Uninterruptible Power Supply), antennae, helpdesk equipment and materials for developing educational contents. The performance of implementation was as planned.

Server and Other Equipment
Contained in the Rack Mount in IDC

d) Upgrading of Schools' Electric Power Capacity

This component consists of improvement of power receiving facility and contract ampere increase at 500 schools where the project PC equipment are installed for their stable operation. The performance of implementation was as planned.

e) ICT Operation & Maintenance

This component consists of "anti-virus software license fee," "internet connection fee," "helpdesk operation cost" and "maintenance contract fee." The performance of implementation was as planned except the "anti-virus software license fee."[11]

(2) Provision of Necessary Materials & Equipment for Schools and Assistance in School Activities (Block Grant)

The "Block Grant" is a government's education improvement model scheme (commonly known as "REDIP") based on the concept that the party concerned in the field knows best about the actual priorities of education development there. It finances education development activities proposed with bottom-up approach (hereinafter referred to as "BUA") appraising proposals submitted by schools or communities concerned. In this project, having appraised proposals from the selected 500 schools regarding supporting activities to effectively implement education

[10] Gateway is a device or equipment that enables mutual communication of data having different protocols in a network and/or system.

[11] As an Operating System (OS), open-source Linux was adopted. Based on the idea that Linux is virus-free, pay virus software was not installed, so no license fee was incurred. Objection against that view is also prevailing, however, no case of virus infection in PC of this project was found during the ex-post evaluation study.

utilizing installed ICT equipment, this scheme allocated necessary fund according the following purposes. The provision of the proposals are assisted by the "professional facilitators (hereinafter referred to as "PF") employed under the project consulting services. The performance of implementation was as planned. Amounts of the grant are uniformly 15 million rupiah for primary and 20 million rupiah for secondary schools respectively. The criteria of provision according to different purpose of use are as follows. (Table 4)

Table 4: Criteria for Provision of Block Grant according to Categorized Purpose of Use

Purpose of Use	Criteria of Provision	Examples of Use
(1) Procurement of Materials & Equipment	Max. 45%	Capacity increase of receiving power, Equipment for security purpose of PC lab, PC security measures, Facilities in PC lab, Air conditioning of PC lab.
(2) ICT Using Activities	Min. 50%	●ICT training at school 40% ●Education material development 40% ●ICT materials 20%
(3) Preparation &Reporting Activities		Stationery for preparing activity reports, Postal charges, Printing cost, etc.

Source: Consultant's Completion Report

(Note) In order to set the descending order of priorities, (2), (1) and (3), minimum percentage for (2) and maximum percentage for (1) are fixed respectively. Additionally, use for (3) is conditionally allowed only when purposes of (2) an (1) have been achieved.

(3) Activities for Capacity Development on ICT

A. Domestic Training

(a) Technical Training on ICT Utilization (ICT Literacy)

In order to become able to carry out ICT-based training utilizing equipment provided by the project, the training scope covers technical training on utilization of hardware, OS (Linux), software, operation and maintenance of PC labs in the field and also includes DIKPORA's education policy. The participants include both teachers and ICT trainers. It was implemented from May 2010 up to June 2013 involving totally 3,580 participants. The planned number of participants was 2,920 people at the time of appraisal.

(b) Technical Training for Education Material Development

The development of e-Learning materials is outsourced as well as self-made by teachers themselves. This training was carried out for the latter type to develop teachers' capacity. A cas-

cade method[12] was adopted, and totally 1,170 teachers primarily trained in two batches consisting of 20 to 30 trainees each (totally 40 to 60 people) from July 2011 until May 2013. They are requested to conduct technical transfer to other teachers after this training. As a post training follow-up, hands-on facilitation by the project consultants was conducted at selected one school from each Kabupaten as well.

(c) Training for BUA Activities

The purpose of this training is the enhancement of BUA self-management, and the major contents include ICT-base accounting control regarding school management and educational data collection and management on a BUA basis. Dissemination of ICT related regulations of DIKPORA was also attempted. Through this training, technical transfer of ICT technologies to be applied to school management in addition to the education itself was performed involving totally 750 teachers and school staffs during the period from March 2011 until May 2012.

B. Oversea Training[13]

The main purposes of the Oversea Training were to study actual implementation practice in Japan regarding (1) e-Learning material development (2) required school activities for ICT utilizing education and (3) building of e-Learning systems by developing ICT including networks. The training was conducted in four batches (Kyoto 3, Tokyo 1), totally 55 participants (teachers 26, KOMINFO 20, DIKPORA 9) during the period from October 2010 until December 2012. Institutions visited included Kyoto Prefectural Education Center, Otemae University and Kyoto University of Education in Kyoto, the sister city of Yogyakarta, NHK and Secom Data Center in Tokyo. They also visited totally 11 schools (primary school 6, secondary school 4 and high school 1) and observed classrooms where ICT-based education was going on. According to the participants' report afterwards, especially the school visits to directly observe actual ICT-based education and direct contact with field education activities associated with its visual image through discussions with teachers much contributed to this project operation. They also mentioned that they had learned high morality and ethics of Japanese by experiencing the school lunch system, observing classroom cleaning by students after school and clean spaces of corridors and rooms.

Total number of teachers trained in various schemes above reached over 5,000 people, which is well over the target, 3,130, set at the mid-term review.

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[12] Like a Telephone Game, it is a mechanism to disseminate certain new knowledge or information to others stagedly via multiple layers. Practically, a small number of experts or master trainer initiate training contents to some trainees first, and then the trainees transmit what they have learnt as sub-trainers to other lower-layer trainees. Finally, the knowledge or method learnt is transmitted down to the field implementers for pragmatic application.

[13] The oversea training was conducted as a part of the consulting services under ODA loan. However, it is classified under the category here as one of the components of the ICT capacity development,

C. Workshop Activities

As a part of capacity development activities, various workshops were conducted to supplement the trainings above. The contents widely vary from the type of complementing A. Domestic Training above to individual particular items such as e-Learning media evaluation, baseline studies, problem analyses of project activities and model schools development. Total number of participants reached 2,201 people spreading over various positions including teachers, principals, lab managers, administration staff and educational officers of the province and kabupatens. The baseline studies had been originally planned to constitute a set with a counterpart "advanced studies" to conduct the end-line research. However, this intended monitoring practice was not realized eventually due to the project implementation delay and resultant extension of the consulting services. Instead, the consultant proposed at their service completion periodic self-monitoring and evaluation one year, two years and five years after the project completion, however, this proposal is indicated not to have been systematically practiced by related Indonesian agencies.

As these workshop activities were not clearly stated in the project plan at the time of appraisal, it is deemed additional practice to support planned trainings.

Facilitation at a Primary School

D. Direct Facilitation Activities at Schools

In addition to the intensive capacity development activities (A to C), ad hoc hands on facilitation was widely conducted by the consultants, PF and BTKP staff.

(4) Development of Teaching Materials

Besides the self-developed materials by teachers, development of teaching materials (learning and testing materials) used in PC labs were also outsourced[14], and the products were stored in school servers. As they are also stored in the IDC server, they are externally accessible via intranet and internet networks by anyone.

ICT-based teaching materials developed under this project cover arithmetic for 4th, 5th and 6th grades of primary schools and mathematics and science for 7th, 8nd and 9th grades of secondary schools[15], and totally 75 materials were developed. The breakdown according to the curriculum

[14] Open-source software "Moodle" was used for the LMS (Learning Management System) as an e-Learning platform. For teaching material production, e-Learning material development tool "LECTORA INSPIRE" and "LECTORA INTEGRATE" were procured and used.

[15] In Indonesia, grades of compulsory education are summed up from primary school, therefore secondary school grades are indicated as 7th, 8th and 9th.

topics is shown below. (Table 5)

Table 5: Breakdown of Developed Teaching Materials

	Primary School			Secondary School		
	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade	9th Grade
Arithmetic /Mathematics	8	11	7	7	8	6
Science	-	-	-	8	11	9

Source: Consultant's Completion Report

(5) System Development for IDC

The roles of IDC being set up at BTKP are collective management and publishing of education-related information in Yogyakarta Special Region (database function), provision of helpdesk support to the 500 schools, guidance on ICT-based education, distribution and storage of developed teaching materials and operation of gateway function for providing internet connection services for the 500 schools. Moreover, its service includes distribution of comprehensive ICT-based educational services through the developed portal site entitled "jogjabelajar: http://jogjabelajar.org/." (Figure 2) Various areas of system development[16] were planned to enable provisions of those services, and implemented as planned.

From the left, **jbmedia** (teaching materials storage site) **jbtube** (animation distribution site) **jbradio** (radio distribution site) **jbbudaya (**cultural information distribution site) **jbclass (**online Q&A site with teachers <member enrollment is required>)

Figure 2: "jogjabelajar" Homepage

[16] It consists of (a) Network system development, (b) Database system development, (c) e-Learning system development and (d) Helpdesk system development (e) Website system development.

It can be concluded that this project has mostly produced the outputs of each component as planned.

<Consulting Services>

The consulting services were performed comprehensively covering almost all the main project components above. Outline of implementation is as follows.

1. General implementation management (review and preparation of the implementation plan, coordination among institutions involved, implementation supervision, selection of schools, preparation of the rollout plan, etc.)

2. Implementation assistance of the main component (detailed designing, preparation assistance of tender documents and procurement plans, procurement supervision, tender evaluation, assistance in contract negotiation, facility installation supervision, contractor payment supervision, assistance in request for JICA disbursement, etc.)

3. Assistance in teaching materials development (study on current conditions of education and needs for teaching materials in Yogyakarta Special Region, preparation of specification for outsourcing materials development, procurement supervision, facilitation for teachers on materials self-development, etc.)

4. ICT-based education, BUA and oversea training implementation assistance (needs research, preparation of specification guidelines for outsourced training, assistance in preparing block grant proposals through PF, planning of oversea training in Japan and implementation supervision, etc.)

5. Others (assistance in preparing progress reports, assistance in JICA's mid-term review implementation, etc.)

In addition to normal assistance services like planning, designing and implementation supervision in infrastructure development projects, the consulting services of this project directly participate in implementing the main project components and include various kinds of technical assistance. The whole activities were carried out as planned.

Thus, both the main components and the consulting services were mostly implemented as planned in each sub-component, and planned outputs were produced as well.

3.2.2 Inputs

3.2.2.1 Project Costs

The total project cost was initially planned to be 4,376 million yen (out of which 2,911 million yen was to be covered by Japanese ODA loan). Actually disbursed amount of the ODA loan was 1,520 million yen, but the actual amount of the total project cost is unknown because the accounting record of project expenditures from the Indonesian government side is incomplete. However, from the facts that the loan disbursed amount is 52% of the approved and the reported amount of the actual government expenditure at the mid-term review in October 2012 was only 15% of the planned amount, the total project cost actually incurred is presumed significantly smaller than the planned. The main reasons of the significantly lower actual cost than the planned are considered to be as follows.

(1) The average rupiah exchange rate against yen during the implementation period was 0.0091 (2009-2014 average rate from the International Financial Statistics of IMF), which was depreciated 27% against 0.0124 applied at the appraisal.

(2) As stated in (4) below, due to the remarkable delay in the procurement of ICT equipment, the actual price of the goods with the same specification was much lower than the appraised estimated price.

(3) Estimated costs of OS and license fee of anti-virus software were saved by adopting open-source Linux[17].

(4) The procurement of ICT equipment was performed in three packages. Due to the significant delay, contractual penalty (reduction of payment) was imposed to the contractor concerned.

(5) Some project activities planned were cancelled without affecting the project purpose achievement. They include oversea visits to China to observe state of affairs of ICT materials and equipment supply, which had turned unnecessary because it became possible to be confirmed domestically.

In light of the above, although the actual total project cost is unclear, it can be considered lower than planned. It is also assumed from the large amount of unused ODA loan balance.

[17] In the technical training of ICT literacy (P.12), users were intensively trained how to use Linux, and successful result was proved by the questionnaire survey to teachers executed in the consulting services. The visiting survey of this ex-post evaluation to schools also found that teachers and students were well handling Linux as well. No negative effect of the introduction of Linux has been observed.

3.2.2.2 Project Period

The overall project period was planned from March 2007 to December 2012 (5 years and 10 months or 70 months). The actual period was from March 2007 up to December 2014 (7 years and 10 months or 94 months), which is 134% of the plan. The selection of consultant commenced in November 2007, but after committing unsuccessful invitation, two-time retendering due to imperfect proposal documentation and other procedural errors delayed service commencement for about two years until July 2009 (planned to start in December 2007). In addition to this main cause, there were some other reasons for delay; such as, prolonged procurement process due to reshuffling of the contract packages, service delay of the third-package contractor whose service commencement was overlapped with the transition between 2012 and 2013 fiscal budgets and delivery and installation delay due to worker allocation failure of that contractor.

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

3.3 Effectiveness[18] (Rating: ③)

Such evaluation indicators to measure the effectiveness were assumed as (1) ratio of schools with IDC access (%), (2) number of teaching staff who have undergone training, (3) number of students per PC in primary and secondary schools, (4) number of subjects utilizing ICT, (5) ratio of schools which have computer labs and use PCs during class, (6) net enrollment rate at primary and secondary schools. However in actual fact, IDC access is possible for anyone with internet environment (1), it was found in the field studies of this ex-post evaluation that the direct influence of introducing ICT-based education on school enrollment is minimal (6) and the ratio of schools which have computer labs and use PCs during class (5) is not statistically captured. Therefore those are not adopted as quantitative effect indicators in this ex-post evaluation. For (2) and (3), they are output indicators inherently. However, focusing only on the 500 schools, their target figures were reviewed as quantitative effect indicators at the mid-term review. Following that attempt, this ex-post evaluation tries to compare the reviewed targets and performance and evaluate the effectiveness by means of whole 500 school online questionnaire survey and direct survey visits to selected 50 schools.

3.3.1 Quantitative Effects (Operation and Effect Indicators)

The mid-term review conducted in 2012 updated and revised the quantitative targets assumed at the appraisal as follows. (Table 6)

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

Table 6: Indicators at Mid-term Review and Performance

Indicators	Baseline At Mid-term Review (2012)	Revised Targets (2014) 1 Year After Completion	Actual (2015) 1 Year After Completion
Number of teaching staff who have undergone training	2,170 (Primary & Secondary Schools)	3,130	4,750
Number of students per PC in primary schools	18	15	11
Number of students per PC in secondary schools	19	11	
Number of original ICT teaching materials that teachers have developed based on available ICT teaching materials	352 (Primary:215 Secondary:137)	500 (Primary:300 Secondary:200)	673*

Source: Questionnaire answer at mid-term review

Note: The project was estimated to complete in 2013 at the time of mid-term review in 2012, but the actual completion was delayed until 2014.

* Number of items stored in the IDC sever only

(1) Number of teaching staff who have undergone training

Number of teachers who have undergone the domestic ICT technical training reached 3,580 people, and participants of the teaching material development are 1,170. Total number of people is 4,750 teachers, which exceeds the revised target.

(2) Number of students per PC in schools

Based on the average number of students per primary and secondary school in Yogyakarta Special Region (cf. 3.5.3 Financial Aspects of Operation and Maintenance), the number of students per PC in the 500 schools is 7.6 people for primary schools and 14.2 people for secondary schools (10.9 people on average[19]), which has achieved the targets for the year 2014 revised at the mid-term review, 15 and 11 (13.0 on average) respectively[20]. However, not a small number of the selected 500 schools already possess PCs out of this project whose number is unknown. Therefore the numbers of students per PC above were calculated only for the PCs provided under this project.

[19] The comparison with the target was made on average, because the number of distributed PCs is uniformly 21 sets per school while primary school students are about 2.2 times of the number of secondary school students.

[20] Individual number of students at each school was statistically available only for all the schools (2,279 as of 2015) collectively. To precisely pick out the 500 schools one by one is infeasible within the limited time of the evaluation study. Therefore, the total number of students of the 500 schools was estimated applying the average number of whole schools.

(3) Number of original ICT teaching materials that teachers have developed

The "Number of original ICT teaching materials that teachers have developed based on available ICT teaching materials[21]" is a newly prepared indicator at the mid-term review, and the target was set at 500 items. Against this target, the number of actually developed teaching materials up to the time of ex-post evaluation reached 673, just ones stored in BTKP database. As will be stated in the following section 3.3.2 Qualitative Effects, the "500 school online survey" revealed the fact that number of schools which have ever self-developed at least one teaching material was 385, and also there were schools that have developed well over 10 materials. Therefore, it can be assumed that the total number has considerably exceeded the target of 500.

3.3.2 Qualitative Effects

Project effects on the basic education and ICT utilization in Yogyakarta Special Province were evaluated from the results of the following two kinds of surveys.

A: Online questionnaire complete survey of 500 implementing schools under this ex-post evaluation

B: Direct visiting survey of optionally selected 50 schools under this ex-post evaluation

A. Complete online questionnaire survey of 500 implementing schools

A complete online questionnaire survey was conducted in this ex-post evaluation, and answers were fully collected (includes partly no answer to some of the questions). In advance to the survey, a preliminary visiting survey was executed in five sample schools including one good-performance school and four questionable schools based on hearing to BTKP. Key checkpoints were then identified from the actual conditions on usage of the project facilities; namely, (1) school subjects utilizing ICT, (2) teaching staff of ICT utilizing subjects, (3) ICT teaching materials being used, (4) conditions of teaching materials self-development and tools used, (5) communications with BTKP and (6) physical conditions of provided equipment. Questionnaire to ask those points were prepared and sent online to whole implementing schools. Points of questions and summarized results from the answers are as follows.

(1) e-Learning using School Subjects and Activities

Although 7% of the schools use the facility only for ICT training, the ICT systems provided under the project are used in all the implementing schools, including cases of ones having ever used, without exception. 93% of the schools apply ICT to mathematics (including arithmetic in

[21] Because tools for teaching material self-development are an authoring tool LECTORA and other Windows Office Applications, the expression "based on available ICT materials" is not precise. But it is applied replacing it with a suitable wording.

primary schools, the same shall apply hereinafter) and science which are the priority subjects, and 67% extend its application to other subjects and activities.

(2) Teaching Staff for e-Learning

Primarily, e-Learning of each subject shall be conducted by teachers in charge of the subject concerned (training is also provided for that purpose under this project), however, ICT teachers and staffs are doing instead in 12% of the schools mainly due to insufficiency of ICT capability of subject teachers.

(3) Teaching Materials Used

35% of the schools use only materials stored in "jogjabelajar" developed under this project. In addition to that, 39% use self-developed and/or procured materials.

(4) Usage of Self-developed ICT Materials and their Tools

77% of the schools have ever developed at least one material, among which 52% developed teaching materials only and additionally 25% schools have ever developed testing materials as well. Only 37% utilize the authoring tool "LECTORA," and most of others use software of Windows Office (PowerPoint: 86%, Word: 69% and Excel: 59%).

(5) Usage of BTKP Intranet

Usage of the intranet device prepared under this project is not so satisfactory. Schools which answered making full use are no more than 24%. While 25% answered having ever used, 15 answered never used. According to the direct visiting survey dealt with in the next section, however, there prevails confusion among the schools between "Intranet" and "Internet," therefore the above figures seem to involve connections with "Internet," consequently the intranet usage may therefore be further lower. It is also represented by remarkably low helpdesk usage (only 11% that use it even partially).

(6) Occurrence of Equipment Breakdown

91% of the schools have ever experienced breakdowns of ICT equipment. The overwhelming majority is student PCs (1,439 cases), which is followed by UPS (349 cases) and headsets (270 cases). While showing that ICT equipment is physically vulnerable, it also indicates high utilization rate of the facility in the field.

(7) Communication with BTKP

Only 11% of the schools answered that they are using the helpdesk to mainly settle technical troubles even partially. Means of communication which is most frequently used is Short Message Service: SMS (65%) which is followed by telephone communications (13%). Multiple devices are used, so the figures are duplicate.

In spite of no dead line of the answer submission fixed in advance, whole the 500 school that received the questionnaire sent their answers almost within 10 days. This response itself evidences smooth connection environment has been established through the ICT network developed in this project.

The result of A Survey indicates generally good performance of the ICT utilizing education implemented with materials and equipment introduced under this project.

B. Direct visiting survey of optionally selected 50 schools

Following the above complete online survey, this ex-post evaluation carried out visiting survey in order to directly grasp field conditions deeply and organically by means of direct observation and hearing to the beneficiaries.

(1) Method of selecting 50 sample schools

Ten schools from each four kabupaten and one kota (six primary schools and four secondary schools) were selected. A field survey was conducted visiting ten schools consisting of one good-performance school and nine other questionable schools in terms of conditions and performance in utilizing PC lab facilities provided under this project based on the explanation of BTKP[22].

(2) Persons interviewed

Interviews were held to principals, school lab coordinators (in some cases, teachers assume the assignment concurrently), teachers and students. Summarized survey results are as follows.

(3) Confirmed project effects

As an educational effect, enhanced motivation was found both in teachers' as well as learners' sides. At practice of e-Learning classes, students' learning attitudes were serious, and all the students interviewed responded that e-Learning was enjoyable. Principals and other school management staff feel proud of being selected as an implementing school and providing advanced education applying ICT devices. Some of the schools newly introduced entrance examinations to select from considerably increased applicants for enrollment after introducing ICT-based education, which further enhanced educational incentive there. It was also seen in the teachers' side, which is reflected in the fact that a number of teachers have already developed ICT utilizing teaching materials by themselves based on the technical knowledge acquired through trainings under this project and use them in their classes.

[22] Since the already completed 500 online survey above showed that conditions of project performance were generally satisfactory, the visiting survey tried to mainly select questionable schools on purpose rather than choosing good-performing schools. However, the schools deemed questionable beforehand were found not to have particular problems in PC lab operations, which proved high standard ICT utilizing education practice in general in 500 implementing schools.

Additionally, the ex-post evaluation revisited following two selected primary schools whose performance stood out from others identified in the 50-school beneficiary survey to obtain detailed explanation concretely. The schools had further developed their own ICT skills from the technical training given in the project, and produced and was operating their own portal site that contains self-developed teaching materials and other rich contents for education. In addition to their full use for their own education purpose internally, it is open to the public enabling anybody to have access through internet.

- Muhammadiyah Bodon Primary School（http://sdmuhbodon.net/intra/）
- Muhammadiyah Condongcatur Primary School (sdmuhcc.net/elearning/）

At Muhammadiyah Bodon Primary School, in addition to the production of own ICT teaching materials using LECTORA introduced in the project, one of the teachers has written and published a detailed book manual regarding teaching material development using LECTORA. The book is being commercially sold at bookshops, and it is already the third impression which is published since the first publication in November 2012 contributing to dissemination of method of e-Learning material production to many educators and educational agencies[23]. The performance of the two schools above is prominent from others, which is judged due to individual talent and capability of the teachers in charge who directly dealt with this project implementation and operation.

Figure 3: Example of e-Learning Material Developed
(Primary School Geometry: “Flat Figure” and “Solid Figure”)

Source: ICT EQEP in Indonesia
(https://inafu6212-001-2012-3.wikischolars.columbia.edu/ICT+EQEP+in+Indonesia)

[23] Electric PDF version is open to the public at https://fe.uny.ac.id/sites/fe.uny.ac.id/files/Tutorial%20Lectora%20Lengkap.pdf.

Although schools BTKP considers questionable in performance were mainly selected for the visits, the PC lab facility installed under the project was well utilized in general (other than one exceptional school below) as a survey result. However, following minor problems in individual cases were found.

(a) Insufficient number of PCs (Some schools procured additional PCs with their own budget. There was another case in which wifi connection was installed to enable remote access from ordinary classrooms.)

(b) Resistant sentiment against ICT among aged teachers (over 50 years old)

(c) Fund raising for repairs and replacement (Possibility and amount of budget allocation depend on each school and community's degrees of recognition of advantage and necessity of ICT utilizing education)

(d) Insufficient dissemination of understanding on "intranet"

(e) Limited BTKP support (technical support and training)

There was a secondary school which does not use the project equipment at all due to the lack of will of the former principal[24].

As a result of the surveys, although minor problems were partly found individually, the performance of ICT utilizing education introduced by this project is satisfactorily achieved in general, and it was also confirmed that educational motivation in both teachers' and learners' sides had been enhanced.

3.4 Impacts

3.4.1 Intended Impacts

The purpose of this project is the education quality enhancement and the ICT utilization is the means to attain it. Aspects of qualitative change prevail in education quality enhancement, but a school record representing improvement in students' academic ability is suitable to measure its achievement. Further goal of this project is rollout of the project attainment to other provinces aiming for nationwide development. The impact evaluation examines those two aspects and other impacts of this project on education and ICT sectors.

[24] This fact was reported to BTKP after the school visit. Hearing that fact, the head of BTKP promptly visited the school and discussed with the present principal. As a result, the present principal corrected his unrecognition of this fact, and promised to carry back a set of equipment presently stored in the warehouse to the PC lab and would resume its utilization for the school's ICT-based education.

(1) Scores on Graduation Exams

Both appraisal and mid-term review set "difference in the average scores on graduation exams in targeted primary and secondary schools (difference in average scores before and after the project of target schools less the difference in the average scores before and after the project of non-target schools), however, the aggregated score of the whole subjects is not suitable to judge presence and/or degree of project impact, because ICT applied school subjects are quite limited and degree of application varies. Therefore this ex-post evaluation tried to make before (2010) and after (2015) comparison of graduation exam scores on two priority subjects on ICT introduction, mathematics and science, between whole schools in Yogyakarta Special Region (including targeted 500 schools) and purely 500 targeted schools. The result is shown below. (Table 7)

Table 7: Before/After Comparison of Average Scores of Graduation Exams

Schools	Subjects	School Groups	A 2010 (Before Project)	B 2015 (After Project)	B-A/A (%)
Primary	Mathematics	Whole Schools	6.98	6.84	△2.00%
		Targeted 300 Schools	7.28	7.18	△1.37%
	Science	Whole Schools	6.97	7.70	10.47%
		Targeted 300 Schools	7.16	7.92	10.61%
Secondary	Mathematics	Whole Schools	6.43	5.33	△17.11%
		Targeted 200 Schools	6.91	6.16	△10.85%
	Science	Whole Schools	6.68	5.76	△13.77%
		Targeted 200 Schools	7.09	6.42	△9.45%

Source: Calculation from DIKPORA statistics

(Note) Cf. "Table 3: Distribution of Numbers of Total and Selected Schools in the Project Region" for the total number of schools in 2010, and 2015

The fact that the average scores in 2015 are generally lower than that of 2010, except for primary school science, indicates that degree of difficulty comparatively increased in 2015. In those circumstances, the rates of before/after change in average scores of the targeted schools are superior to the whole schools throughout all subjects[25], which suggests that the utilization of

[25] As the whole schools include targeted 500 schools, the difference would have been bigger if the comparison had

ICT in education may have positively contributed to the academic performance of the targeted 500 schools to a certain degree.

(2) Rollout to Other Provinces

As clearly mentioned in the project purpose, the rollout of this project experience to other provinces is specified as the project impact. The "Roll Out Team" was supposed to be organized calling KOMINFO and Ministry of National Education (Ministry of Education & Culture at the time of ex-post evaluation) as its members and would take charge of the task. In November 2011, the "e-Government Forum was held inviting 14 provinces to explain this project and promote understanding regarding necessary considerations for practical application. However, any particular rollout activities have not been conducted afterwards by the central government up until the time of ex-post evaluation. On the other hand, as will be mentioned in section 3.4.2 (2) ICT Development Promotion by BTKP in Yogyakarta Special Region below, e-Learning contents by various ICT media contained in the portal site "jogjabelajar" are being distributed via internet and become widely known over the country. According to BTKP, it has received several groups of observation visits from multiple provinces. It can be said that natural flow of rollout without involvement of the central government has begun to proceed. This kind of demand-pull natural rollout is considered solider and more preferable than government led supply-push-type rollout. Like an example of the two excellent primary schools taken in section 3.3.2, there appear cases in which the performance attained in this project was constructively internalized and numbers of useful self-developed educational contents contained in well-established portal sites are being widely distributed via internet. In this way, this project is already indirectly influencing education of other schools nationally. KOMINFO and the Ministry of Education & Culture should support this movement from the side by means of public relations and other functions to actively promote the rollout.

3.4.2 Other Impacts

(1) Education Service and Its Quality Equalization in Yogyakarta Special Province

Yogyakarta Special Region consists of a kota and four kabupatens, and quality gap between city and remote areas is prevailing in education in terms of teachers and facilities.

This project also contributes significantly to level regional disparity in education enabling provision of equalized education services by ICT utilization. In some of official documents, the project title/purpose is indicated as "Educational quality improvement and equalization." For instance, the "Operational Handover Note (Serah Terima Operasional)" entitles this project as "ICT Utilization Project for Education Quality Enhancement and Equalization in Yogyakarta

been made with non-targeted schools.

Province," which will be mentioned later in section 3.5.1 Institutional Aspects of Operation and Maintenance.

(2) ICT Development Promotion by BTKP in Yogyakarta Special Region

BTKP is an institution under DIKPORA mandated to conduct hard and software ICT development and service delivery in Yogyakarta Special Region. Its function was considerably strengthened as stated below both in name and in reality as the communication technology center of Yogyakarta Special Region in financial and human capacity aspects as well as physically by establishing the IDC within under this project.

(a) Education Sector

The enhanced function of BTKP includes distribution of e-Learning contents and cultural information by means of developing a portal site "jogjabelajar-Unlimited Learning Experience." ("belajar" means "learning" in Indonesian language) It also operates radio and television studios, and the digital voice materials and animation educational contents produced there are widely delivered via internet networks. In addition, it also operates internet-connected direct communication site between teachers and students. It should be considered that these services are already realizing national level rollout of ICT utilizing education over the boundary of Yogyakarta Special Region.

(b) ICT Sector

As stated in section 3.1.1 Relevance to the Development Plan of Indonesia, Yogyakarta Special Region has been promoting ICT utilization in health, agriculture, trade & industry, service and other industries under the slogan "Jogja Cyber Province," and the leading sector is the education in reality where BTKP that has been significantly enhanced by this project is playing the central role.

The points are summarized as follows. The ICT utilizing education was highly developed in the targeted 500 schools with enhanced educational motivation both in teachers' and learners' sides under this project. The project is also contributing to the regional equalization of education. In addition to that, variety of ICT teaching materials and information are being distributed by enhanced BTKP by this project through internet over the boundary of Yogyakarta Special Region. It enables ICT

Education Communication Technology Center (BTKP)

utilizing education delivery with nation-wide scope, which can be considered that the rollout to other provinces have been already proceeding spontaneously. It is also recognized that BTKP is playing a leading role in promoting ICT utilization in other sectors in Yogyakarta Special Province.

Thus, the project has largely achieved its objective, therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

Operation and maintenance responsibility is carried by each target school for the PC lab facilities or by DIKPORA for the network facilities respectively, which is basically the same at present as the time of appraisal.

Four professional organizations are instituted under DIKPORA; namely "Technical Education Training Agency (BLPK)," "Development of Learning Activities Agency (BPKB)," "Educational Communication Technology Agency (BTKP)," and "Youth and Sport Agency (BPO)." BTKP is the professional agency that solely undertakes ICT-related development, service delivery and capacity development in the education sector and plays a central role of operation and maintenance of this project.

BTKP is an organization staffed with totally 51 personnel under the head officer, and 22 ICT engineers as a "technical working team" engaging in field works are assigned in addition to 20 administrative staff members. In relation to this project, the development & production division deals with the development and preparation of ICT technical guidelines, teaching material development and production, and capacity development (training), while the provision of various ICT education services, dissemination of developed e-Learning materials and operation of the portal site "jogjabelajar" are handled by the service promotion division. In addition to that, the helpdesk was established within BTKP in this project and ready to render technical support for individual target schools, but a minor problem that it has not been fully operational is prevailing as will be mentioned in the following section.

BTKP is thus charged with the central role in promotion of developing ICT utilization and its operation in the education sector of Yogyakarta Special Region. As the head officer has ever articulated that the ICT-EQEP (this project) has finished for KOMINFO, but for BTKP it has started, BTKP will be continuously engaged in total project operation and management including non-hard aspects as the core agency. As for the rollout to other provinces, while KOMINFO is officially nominated to conduct it as the executing agency, BTKP is expected to give substantial contribution as a central body to present a vital example of actual practice.

Under this overall management by BTKP, ICT materials and equipment installed out of BTKP are operated and maintained under the responsibility of each agency to which they belong, which is considered appropriate corresponding to the respective locational responsibility.

3.5.2 Technical Aspects of Operation and Maintenance

Technical guidance by means of training, workshops and hands-on facilitation is provided for the targeted schools under this project (cf. 3.2.1 (3) Activities for Capacity Development on ICT) and operation manuals for operating PC labs are also prepared and delivered.

It is necessary to get BTKP's assistance through its helpdesk or direct technical support regarding technical problems which cannot be solved independently, however, the helpdesk is not fully operational due to incomplete spread of understanding of intranet operation and therefore support request by telephone and SMS is prevailing. As stated above, technical capability of BTKP is organizationally enough with 22 professional engineers, however in practice according to the beneficiary survey result, timely support is not satisfactory enough mainly due to its understaffed condition. The online questionnaire survey to the 500 schools tells that student PCs of almost all the schools have ever experienced or are currently suffering physical troubles. Most of those troubles are spontaneous due to their long time use, not by users' technical failure or insufficiency. It is basically not possible for the schools to fix those troubled machines by themselves and have to resort to onerous repair services outside, which needs to be treated as a "financial" issue of the sustainability dealt with in the next section.

3.5.3 Financial Aspects of Operation and Maintenance

As stated in section 3.5.1 above, IDC and network facilities are operated and maintained by BTKP. Annual amounts of budget for each fiscal year allocated for this project operation and maintenance are as follows. Reflecting the high priority of the ICT sector in Yogyakarta Special Region, ample budgets are allotted.

Table 8: Operation and Maintenance Budget Expenditure for BTKP

Year	Budget Expenditure (thousand rupiah)	Particulars
2013	45,000	
2014	400,000	
2015	1,200,000	Including special budget of 605,745 thousand rupiah for replacement of the tower antennae installed in this project[26] for enhancement
2016	800,000	

Source: BTKP answer to the questionnaire

On the other hand, operation and maintenance responsibility of PCs and supporting equipment installed at each school is left to respective schools concerned. The right of operation of assets installed in this project has been transferred from the central government (KOMINFO) to each school by "Operational Handover Note (Serah Terima Operasional)," however the problem is that the ownership has not yet been transferred[27]. For assets without ownership, schools are not allowed to request budget for operation and maintenance to controlling regional governments concerned, therefore they are presently managing to apply insufficient "school operation subsidies" provided in the forms of BOS (central government) and BOSDA (regional governments). Those are allocated to subsidize educational operation during the nine-year compulsory education for six and three years at primary and secondary schools respectively. The following are each amount provided in the latest 2015. (Table 9)

[26] This tower antennae was already removed at the time of the field survey and stored at BTKP to be reused at a school in future.

[27] According to the mention made by the Director General of KOMINFO at the wrap-up meeting on the last day of the second field survey, decision of the ownership transfer had been approved by the president. Further development needs follow up.

Table 9: Annual Provision of BOS/BOSDA per Student

	Primary School		Secondary School		System of Provision
	Rupiah (Rp.)	In Japanese Yen (¥)	Rupiah (Rp.)	In Japanese Yen (¥)	
BOS	Rp.800,000	¥6,960	Rp.1,000,000	¥8,700	Remittance through provincial governments to schools
BOSDA	Rp.110,000	¥957	Rp.190,000	¥1,653	Direct remittance to schools

Source: Information provided by BTKP

(Note) Conversion into Japanese Yen is based on the month-end rate, May 2016, of IFS (International Financial Statistics, IMF)

BOSDA is provided based on the Governor Regulation No.14, 2010 (amounts are revised every year). It gives prominence to the use for the operation and maintenance of the facilities introduced under this project (ICT-EQEP) as an example.

Calculating from the average numbers of students per school in Yogyakarta Special Province, 159 for primary and 299 for secondary schools, amounts of the annual school operation subsidies per school are Rp.144,690,000 (¥1,258,803) for primary and Rp.355,810,000 (¥3,095,547) for secondary schools[28].

As identified in the online questionnaire survey of 500 schools, PCs became out of order in almost all the target schools. In most cases it is difficult to repair them by the schools' limited technological skill from the nature of equipment, and needs to be sent for repair outside or replaced with new ones. The main fund source for the operation and maintenance is presently BOS/BOSDA above. However, since that fund is to be used for school operation in general, the limited fund is shared among various operational uses, and the allocation depends on schools' operational policy set by principals and school management as well as priority of each operational activity. Cases vary, for instance, while there were schools which could not send broken PCs for repair, some schools self-invested in wifi system installation to facilitate remote e-Learning at individual classrooms. In an extreme case of a school which have fallen on burglary[29] and lost whole 21 sets of PCs under this project, the school gave priority to allocate

[28] Calculated based on the statistics of the Regional Development Planning Agency (BAPPEDA) Yogyakarta Special Region in 2015 on the homepage (http://bappeda.jogjaprov.go.id/dataku/data_profil): total number of schools (primary: 1,844, secondary: 435), total number of students (primary: 292,301, secondary: 130,203).

[29] Successive burglary by a professional gang of five thieves has occurred at 20 target schools from 2012 to 2014. Supported also by strengthened school security, no such cases have occurred since their arrestment in December 2014.

budget to PC purchase for gradual replacement and eventually more than the original number 25 sets were acquired. In another example in which the surrounding community's awareness toward ICT utilizing education is high, the visiting survey has found cases where a part of the budget of the school committee was used for repair and replacement purchase of PCs and other ICT equipment.

There was also an idea to rent the PC labs during unoccupied hours to other schools (open school) or to district communities to earn fund for operation and maintenance, but it has not been apparently observed at the time of ex-post evaluation.

As have been examined in this section, no particular financial difficulty was observed for operation of the ICT facilities installed in the targeted 500 schools, however, funds for repair and replacement are limited in many schools. Therefore, there is a little concern regarding the financial sustainability of this project in future.

3.5.4 Current Status of Operation and Maintenance

From the result of both 500 school online questionnaire and 50 school visiting surveys, conditions of the installed materials and equipment utilization were found generally fine. However by their very nature of a PC, spontaneous machine troubles (especially in student PCs) are prevailing in most of the schools. But few schools leave them as they are, but most of the schools are trying to sustain lab function partially or gradually by outside repair or replacement within the limited BOS/BOSDA subsidy funds.

3.5.5 Summary

Operation and maintenance of this project is carried out by individual schools under the leadership and guidance of BTKP and no significant institutional problems are found there. No particular financial difficulty was observed either in operation of ICT facilities installed at 500 schools, but funds for repair and replacement are limited in many schools. Although technical capability of BTKP as an institution is judged satisfactory, it is pointed out that the intranet and helpdesk are not optimally operated and their technical supports are sometimes not smoothly and timely delivered. Thus, some minor problems have been observed in terms of technical and financial aspects of operation and maintenance. Therefore sustainability of the project effects is fair.

4. Conclusion, Lesson Learned and Recommendations

4.1 Conclusion

This project was implemented, as a model project for utilizing ICT in the field of basic education in Indonesia, with a purpose to enhance education quality and to equalize the education level throughout the region by facility development through providing total 500 primary and

secondary schools in Yogyakarta Special Province with necessary ICT equipment, ICT environment and e-Learning system development as well as assistance in participatory school operation and activities.

This project is highly relevant corresponding to the Indonesia's development policy and development needs both at the time of appraisal and ex-post evaluation, and also to the Japan's ODA policy at the time of appraisal. On the other hand, the efficiency is fair with its implementation period longer than planned due to the prolonged procurement process, while the project cost is lower than planned.

E-education is actively progressing at five hundred elementary and secondary schools selected as beneficiaries under the project with increased educational motivation in both teachers and students' sides. The project is also contributing to the equalization of the education level throughout the region. In addition to that, BTKP whose function has been much strengthened under this project has been distributing electronical teaching materials and information through internet networks beyond the provincial border, which enables nation-wide supply of ICT-based education services. In Yogyakarta, the education sector leads trade, manufacturing and other regional industries in promoting ICT application. Therefore, the project has been thus mostly producing planned effects, therefore effectiveness and impact of the project are high.

Operation of the ICT facilities installed at the 500 selected schools is not faced with particular financial problems, however, allocation of budgets for repair and replacement at most of the schools is financially restricted. In the technical aspect, limited use of intranet and helpdesk functions was found. Another technical challenge is that smooth and timely BTKP technical support has not be realized. Thus, some minor problems have been observed in financial and technical aspects. Therefore sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) As regard to the monitoring of conditions of ICT facility utilization and operation of the ICT-based education at the targeted 500 schools, it is recommended that DIKPORA assign respective monitoring responsibility among those who are involved in management and operation of the project, namely BTKP, kota, kabupatens, kecamatans and the schools, and regularly supervise their periodic monitoring and evaluation activities along the following points proposed by the consultant during the project implementation. Systematic monitoring and evaluation were not conducted institutionally at the time of ex-post evaluation, however by doing that, it will be able to continuously grasp active effects and prevailing challenges in the field, thus enhancing

project sustainability by executing corrective actions and measures for improving.

a. Rating by school accreditation
b. Students' academic achievement
c. Development of ICT-based teaching materials by teachers
d. Level of intra and internet usage
e. Level of parental and school committee's involvement in educational activities

In conducting the monitoring, it can be recommended to utilize online questionnaire survey, as one of the effective measures, based on the questionnaire applied in this ex-post evaluation with additional items considered necessary.

(2) The implementation plan at the time of appraisal intended to perform the rollout of this project performance to other provinces based on the rollout plan proposed in the project under cooperation between KOMINFO and the Ministry of Education & Culture, however there has been no concrete progress after the e-Government Forum held in November 2011. Meanwhile, the performance of this project has been widely disseminated through the BTKP portal site and other means, which consequently led the project' effectiveness into its spontaneous rollout including visits of several observation missions from other provinces. KOMINFO and the Ministry of Education & Culture should positively facilitate indirect promotion to accelerate these rollout movements through means of public relations and other promoting activities.

4.2.2 Recommendation to JICA

JICA should follow up the progress and performance of the above (1) and (2) actions, which have not been implemented during and after the project, for five years or so. The proposed five years follows the consultant's proposal in this project, but it is also based on the view that if the positive effects and impacts have been confirmed after five years, further development will be expected afterwards.

4.3 Lessons Learned

(1) Comprehensive Approach in ICT-related Projects.

Project formation and implementation of ICT-related projects tends to focus only on hardware aspect such as provision of PCs with supporting equipment and technical aspect of ICT skills. However, it is also important to establish and develop a central operation and management unit with strengthened technical and management capability like BTKP in this project, and thus factor comprehensive system management element into the project design in order to consolidate realization of project effects and self-reliant sustainability. It was done in this project, which led the project into the successful performance. An international report about negative effect of

ICT-based education warned lately "the more PCs, the lower students' academic performance"[30]. Projects without establishing and strengthening the central agency of operation and management and lack of comprehensive implementation with biased focus only on equipment supply and technical training of ICT staff may possibly invite those results.

(2) Project Management during Implementation

For small-scattered type projects comprising complicate multiple components like this project, it is required to establish a project implementation unit that comprehensively control the whole project implementation and organize site-level individual project management and regular reporting system to the central implementation unit at the time of project formulation. JICA should monitor whether the organized system is working as planned during the project implementation. This project lacked comprehensive management by the executing agency and project accounting, which prevented the ex-post evaluation from precisely grasping actual total project cost incurred and restricted the overall evaluation.

[30] "Computers 'do not improve' pupil results" OECD, September 2015 (http://www.bbc.com/news/business-34174796)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	<Main Part> 1.Installation of ICT Equipment & Connecting Environment (1) ICT Equipment for Schools (500 schools) (One set) (2) ICT Equipment for Project Offices (One set) (3) ICT Equipment for IDC (One set) (4) Upgrading of Schools' Electric Power Capacity (500 schools) (5) ICT Operation & Maintenance (One set) (Anti-virus Software License Fee, Internet Connection Fee, Help Desk Operation Cost, Maintenance Contract Fee) 2. Provision of Necessary Materials & Equipment for Schools and Assistance in School Activities (Block Grant) (500 schools) 3. Conducting Training Programs for Teachers, Etc. 4. ICT-based Teaching Materials Development 5. System Development for IDC (1) Network System (2) Database System (3) e-Learning System (4) Helpdesk System (5) Website System <Consulting Services> International: 33.0MM Domestic: 196.0MM	<Main Part> Except the Anti-virus Software License Fee in 1.(5) ICT Operation & Maintenance, implemented as planned <Consulting Services> International: 45.75MM Domestic: 296.25MM
2. Project Period	March 2007-December 2012 (70 months)	March 2007-December 2014 (94 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	116 million yen 4,260 million yen (343,548million rupiah) 4,376 million yen 2,795 million yen 1rupiah = 0.0124 yen (As of September 2006)	Unknown except Japanese ODA Portion 1,520 million yen