Ex-Post Project Evaluation 2011: Package I-2
(Malaysia, Thailand)

August 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

OPMAC Corporation

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Preface

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

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2009, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2008. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

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

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

August 2012
Masato Watanabe
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

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

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

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

Malaysia

Ex-Post Evaluation of Japanese ODA Loan Project
"Universiti Malaysia Sarawak (UNIMAS) Development Project"

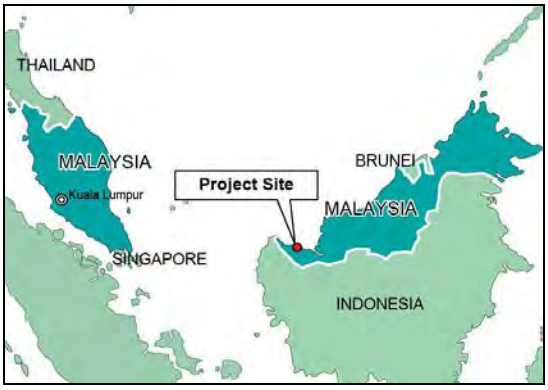
External Evaluator: Tanaka Erika, OPMAC Corporation

0. Summary

The objective of the project was to improve the quality and quantity of human resource development of UNIMAS by the construction of facilities for five faculties, the provision of educational equipment, and training and exchange programmes for university staff and students. Thus, the aim was to contribute to the development of human resources who can contribute to the development of Malaysia, thus in turn contributing to the improvement of the economic gap among regions. The objective is relevant with the development plan and development needs of Malaysia at the time of both the appraisal and the Ex-Post Evaluation, therefore its relevance is high. The facilities and equipment provided by the project are essential to education and research at UNIMAS and the number of students has been increasing. A cademic staff dispatched to Japan on the Soft Development Programme have utilized the results of the programme and some of them participate in programmes implemented by industrial-academic-government consortia, thus contributing to local society. T herefore, the effectiveness of the project is high considering impact. The outputs of the project are generally relevant, in that the area of the faculty buildings was increased from the original plan but is sufficient to accommodate the increased number of students. However, the project cost was higher than planned and the project period was longer than planned. Therefore, efficiency is fair. The operation and management structure of UNIMAS is well established, without financial problems. Although some parts of the facilities have rainwater leakage, UNIMAS has already taken measures against the problem. Most of the academic and management staff dispatched to Japan on the Soft Development Programme still work at UNMAS. Thus, sustainability is high.

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

1. Project Description



Project Location

UNIMAS: Faculty of Applied & Creative Arts Building

1.1 Background

The Malaysian government has seen the education sector as one of the priorities of the Malaysia Plan (five-year development plan) since 1966 and has implemented various reforms.

However, the capacity and quality of domestic universities were insufficient and the Malaysian government depended on higher education institutes overseas. The government tried to improve domestic universities, reducing dependency on overseas universities. Six universities, including one private institution, were newly established in 1990, but the plan to enhance universities was delayed partly due to the economic crisis.

The project to support the Universiti Malaysia Sarawak (hereinafter called UNIMAS) through facility construction, equipment supply, and Soft Development Programmes (human resource development programmes) was implemented against the above background.

1.2 Project Outline

The objective of the project was to improve the quality and quantity of the human resource development of UNIMAS by the construction and improvement of five priority faculties, the provision of educational equipment, and through training and exchange programmes for university staff and students. Thus, the aim was to contribute to the development of human resources, which would contribute to the development of Malaysia, and improve the economic gaps among regions.

Loan Approved Amount / Disbursed Amount	18,549 million yen/ 18,403 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March, 1999/ March, 1999
Terms and Conditions	Interest Rate: 0.75 % Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency	Malaysia / UNIMAS
Final Disbursement Date	September, 2009
Main Contractor (Over 1 billion yen)	Taisei Corporation (Japan), Zecon Engineering Berhad (Malaysia)
Main Consultant (Over 100 million yen)	Project Management Service Consultant: Unico International Corporation (Japan)/ Hasmi (Malaysia) Engineering Service Consultant: Nihon Sekkei Inc. (Japan)/ ADC Akitek Sdn Bhd (Malaysia)/ Perunding, Hashim & NEH Sdn Bhd (Malaysia)
Feasibility Studies, etc.	None
Related Projects (if any)	Technical Cooperation Project: Multi-Media Network Education Project Grant Aid: Japanese language learning laboratory (Cultural Grant Aid)

2. Outline of the Evaluation Study

2.1 External Evaluator

Tanaka Erika, OPMAC Corporation[1]

[1] Participated in the evaluation as a complementary member from Global Link Management, Inc..

2.2 Duration of Evaluation Study

Duration of the Study: August, 2011 – August, 2012
Duration of the Field Study: October 23, 2011 – November 5, 2011,
February 26, 2012 – March 3, 2012

2.3 Constraints during the Evaluation Study

None in particular.

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

3.1 Relevance (Rating:③[3])

3.1.1 Relevance with the Development Plan of Malaysia

The Malaysian government prioritizes human resources development in order to contribute to economic development in its development plans at the time of both the appraisal and the Ex-Post Evaluations. The project is relevant to Malaysian policy.

The Malaysian government has prioritized the education sector in the Malaysia Plans (five-year development plan) since 1966 and listed human resources development as key to making the country a developed nation by 2020. The Malaysian government, however, did not positively enhance domestic universities. It did not grant the establishment of private universities, and complemented higher education by sending students overseas. Thus, the enrolment rate at domestic universities was limited to approximately 3.7% (1995). In the Seventh Malaysia Plan (1996-2000) at the time of appraisal, the objective of education was defined as the development of a quality work force and human resources with high moral and favourable labour ethics. Priorities were a quantitative improvement of the educational environment, improvement of the quality of education, the correction of regional disparities, and the enhancement of higher education institutes, especially in terms of human resources development for science research. Therefore, the project, which improved the physical environment, the quality of education and university management, all with a focus on science and technology faculties, was consistent with the Malaysian development plan.

At the time of the Ex-Post Evaluation, the Tenth Malaysia Plan (2011-2015) states that nurturing globally competitive, creative and innovative human resources is the foundation for Malaysia needed to become a high-income nation.

Seven strategic thrusts were listed in the National Higher Education Strategic Plan beyond 2010 (published in 2004). These were widening access and increasing equity, improving the quality of teaching and learning, enhancing research and innovation, strengthening higher education institutions, intensifying internationalisation, enculturation of lifelong learning and reinforcing the delivery systems of the Ministry of Higher Education (MoHE). As the project includes facility construction and human resource development, it is consistent with the strategies. There was also a list of four critical factors for the success of higher education, namely, governance, culture, infrastructure, and resources. Infrastructure includes facilities as one of its physical aspect and training as a non-physical aspect, and these are also relevant to the project.

3.1.2 Relevance with the Development Needs of Malaysia

Relevance with development needs is high, at both the time of the appraisal and the Ex-Post Evaluations. Enrolment at public universities is expected to increase according to estimates by MoHE.

At appraisal, there were only a limited number of higher education institutes in Malaysia, as stated in 3.1.1. Based on the policy to enhance domestic universities, six new universities

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

(one of these is private) were established in the 1990s but this whole plan was delayed after the economic crisis.

UNIMAS was established in 1992 as the eighth national comprehensive university and the only university in Sarawak State. However, UNIMAS had only temporary buildings and student enrolment was limited to about 2000, only one-third of applicants. The Malaysian government had formulated a plan to enhance the capacity of UNIMAS but implementation was impeded due to financial difficulties.

UNIMAS has the following kinds of faculties: those with high economic and social needs (Faculty of Medicine & Health Sciences, Faculty of Engineering, Faculty of Information Technology), faculties with a comparative advantage based on the natural resources of Sarawak (Faculty of Resource Science & Technology, Faculty of Applied & Creative Arts), and a faculty with interdisciplinary characteristics (Faculty of Cognitive Sciences & Human Development). The project targeted five faculties, namely, the Faculty of Resource Science & Technology (FRST), the Faculty of Information Technology (FIT), the Faculty of Applied & Creative Arts (FACA), the Faculty of Engineering (FE), and the Faculty of Cognitive Sciences & Human Development (FCSHD). The Faculty of Medicine & Health Sciences was not included in the scope of the project as it had already sufficient facilities. The Faculty of Social Sciences and the Faculty of Economics & Business were also excluded from the project as they did not need much equipment and could use the facilities of other faculties when necessary. The selection of five faculties is adequate.

At the time of the Ex-Post Evaluation, both the population of higher education age (17 to 23) and university enrolment were expected to increase, according to the estimates of MoHE (Table 1).

Table 1: Enrolment in higher education

Unit: Year/%

	2003	2005	2010	2015
Population of 17-23 year olds	3,277,338	3,399,200	3,628,300	3,840,900
Total enrolment in higher education*	979,745	1,140,040	1,485,600	1,759,200
Enrolment rate in higher education, population of 17-23 year olds	29.9	33.5	40.9	45.8
Enrolment in post-secondary education**	158,459	235,740	351,700	388,300
Enrollment rate in post-secondary education, population of 17-23 year olds	4.8	6.9	9.7	10.1
Enrolment in public colleges***	140,999	200,100	250,500	304,800
Enrolment rate in public colleges, population of 17-23 year olds	4.3	5.9	6.9	7.9
Enrolment in private education institutions	337,949	336,900	465,700	567,800
Enrolment rate in private education institutions, population of 17-23 year olds	10.3	9.9	12.8	14.8
Number of students overseas	62,301	56,800	50,000	50,000
Rate of students overseas, population of 17-23 year olds	1.9	1.7	1.4	1.3
Enrolment in public universities	**280,037**	**310,500**	**371,700**	**458,300**
Enrolment rate in public universities, population of 17-23 year olds	**8.5**	**9.1**	**10.2**	**11.9**

Source: National Higher Education Strategic Plan beyond 2020

Notes: Date for 2003 is actual.

* Total of post-secondary education, public colleges, private education institutions, public universities and students overseas.

** Post-secondary education includes institutions for students with secondary education completion certificate (A-level or equivalent)

*** Public colleges include polytechnics and community colleges under MoHE, training institutes under Ministry/Department/Agency and others.

In East Malaysia (Sarawak and Sabah), there were only two public universities at the time of the Ex-Post Evaluation, and the need to improve UNIMAS was still high. According to an interview with MoHE, UNIMAS is considered to be one of the best comprehensive universities in Malaysia. At a comprehensive university, emphasis is placed not only on academic research but on education for students at undergraduate level as well. Thus it was appropriate to construct faculty buildings to accommodate the expected increase in students. It was noted that there were quite a number of students and academic staff going abroad to study or research in spite of the government policy to improve domestic universities. Against this background, UNIMAS has been trying to achieve a synergy effect produced by improved education inside UNIMAS and by study/research overseas. The project, which included construction as well as the soft component in Japan, was in line with the policy of UNIMAS

3.1.3 Relevance with Japan's ODA Policy

The project is consistent with one of the four priority areas of the policy of Medium-Term Strategy for Overseas Economic Cooperation Operations toward Malaysia, i.e. human resource development – human resources with a high level of knowledge and skills..

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

3.2 Effectiveness[4] (Rating:③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

In the plan at appraisal, it was expected that the number of students (operation and effect indicator) would increase from 2000 in 1998 to 5300 in 2004.

The number of enrolled students and graduates has been increasing since the appraisal (1999) as shown in Table 2 and Table 3. It is expected that the number of students enrolled will be 15000 in 2015, as planned, which means that the expected effects are produced, through building construction. UNIMAS estimates that the faculty buildings constructed have sufficient capacity to accommodate students until 2015 and there are plans to expand facilities after that. It is pointed out, however, that the building is already short of space at FACA, where the number of students has been sharply increasing since 2008.

Table 2: Transition of number of students enrolled at UNIMAS

(Faculty/year)	1999	2005	2008	2011
FACA	256	608	915	1,768
FCSHD	363	1,221	1,043	1,338
FE	405	610	968	1,225
FIT	398	355	402	594
FRSD	385	745	933	1,336
Total (all faculties)	2,835	5,504	6,429	9,611

Source: Documents submitted by UNIMAS

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

Table 3: Transition of number of graduates at UNIMAS

(Faculty/year)	1999	2005	2008	2011
FACA	62	124	198	212
FCSHD	82	301	351	217
FE	74	155	99	266
FIT	91	69	75	39
FRSD	40	177	266	287
Total (all faculties)	490	1,251	1,470	1,517

Source: Documents submitted by UNIMAS

The ratio of students from areas other than Sarawak increased from about 30% at appraisal to 65% at the Ex-Post Evaluation. (Table 4).

Table 4: Number of students classified by place of residence at UNIMAS

(Area/Year)	1999	2005	2008	2011
Peninsular Malaysia	275	875	828	2,262
Sarawak	778	862	844	1,396
Sabah	71	130	121	279
Others	3	17	19	45
Total	1,127	1,884	1,812	3,982
Rate of students from Sarawak	69.0	45.7	46.6	35.0

Source: Documents submitted by UNIMAS

3.2.2 Qualitative Effects

Qualitative effects of the building and equipment supplied through the project are recognized in terms of education for students and research by academic staff. All the faculty buildings are used for classes. Specifications are appropriate to accommodate an increased number of students, to place laboratories, and to provide education effectively.

Questionnaires taken during the Ex-Post Evaluation show that both academic staff and students are satisfied with the specifications of faculty buildings (Table 5). According to interviews, administrative staff are also satisfied with the buildings. The reason why some academic staff are not satisfied with the building may be that the buildings have rainwater leakage (for details, see 3.5 Sustainability).

Table 5: Opinions about the buildings of academic staff and students

	Totally satisfied	Satisfied	More or less satisfied	Not satisfied	Total (5 faculties)
Academic staff	1	9	11	3	24
Students	6	31	6	0	43

Source: Questionnaire during the Ex-Post Evaluation

Equipment supplied through this project is utilized during classes. Academic staff and students consider the equipment to be useful, according to the questionnaire (Table 6). Equipment is essential especially at FRST, FIT, FE, and FACA[5]. A lthough there was not much

[5] Some students did not clearly recognize which equipment had been supplied through the project. However, all the faculties frequently utilize equipment supplied through the project, therefore it can be assumed that students realize that they use project equipment quite often.

difference between the faculties in the questionnaire, the interviews at FCSHD reveal that the evaluation of equipment was not very high. This is partly because FCSHD is specializes in humanities, where the need for equipment is not as high as at the other four faculties of science and technology, and partly because the bulk of equipment supplied to FCSHD was computers whose specifications are already becoming outdated. Nonetheless, computers are important at FASHD in analyzing data and compiling, and therefore it is considered adequate to supply the faculty with computer. According to data compiled by UNIMAS, there was a remarkable increase in the number of research projects at the five faculties in 2010. As subsidies for research also increased in the same year, it is difficult to discern a clear connection with this project. However, it was confirmed through interviews that the equipment is essential for a majority of classes and research since some of the equipment is basic and utilized broadly for various types of experiments.

Table 6: Opinions about equipment of academic staff and students

	Totally satisfied	Satisfied	More or less satisfied	Not satisfied	Total (5 faculties)
Academic staff	1	18	4	1	24
Students	10	29	4	0	43

Source: Questionnaire during the Ex-Post Evaluation

Computer laboratory at FCSHD

Auditorium in Central Teaching Facilities

Academic staff who participated in the Soft Development Programme are satisfied with the programme (Table 7), mentioning that the programme was useful in acquiring knowledge necessary for research as well as knowledge of Japanese culture and ways of thinking. Administrative staff who participated in the technical and management programme had observation tours on the management of Japanese universities and the operation and maintenance of facilities. They were satisfied with their visit (Table 7), commenting that they had learned about university management and labour ethics, which are useful when implementing their duties at UNIMAS. O ne notable course in the Soft Development Programme is “internship”, where participants visited one university during their stay in Japan. The participants were highly satisfied with this course as they had the opportunity to visit several departments of the university and to experience actual management work. The participants have already incorporated their experiences into their work, for example, student event management and activities to support dormitory student committees. O ther management courses included visits to several universities during a stay. Although these were useful in grasping an overview of Japanese university management, they were not sufficient to learn specific management and technical skills.

Table 7: Opinions about the Soft Development Programme
(Academic and administrative staff)

	Totally satisfied	Satisfied	More or less satisfied	Not satisfied	Total
Academic staff	3	7	0	0	10
Administrative staff	1	1	0	0	2

Source: Questionnaire during the Ex-Post Evaluation

3.3 Impact

3.3.1 Intended Impacts

At appraisal, it was expected that the project would contribute to the nurturing of human resources, contributing to the development of Malaysia, and also to the correction of regional disparities. The Ex-Post Evaluation evaluated that the capacity for human resource development at UNIMAS had been enhanced, and that human resources contributing to local society were being developed.

(1) Development of human resources contributing to Malaysia

① Improvement of education and research

The quality of education at UNIMAS is considered to have been improved by the fact that the educational facilities and equipment are well utilized and that academic staff who have acquired degrees through the project are now engaged in education at UNIMAS. Therefore it can be expected that UNIMAS will produce human resources with high quality education. In addition, it is pointed out that research activities have been enhanced. Research exchanges with Japanese universities are especially active through the Soft Development Programme. Currently UNIMAS has Memoranda of Understanding (MOU) for academic collaboration with 59 universities worldwide (as of the end of December 2011), out of which nine have been signed with Japanese universities. The majority of MOU with Japanese universities were concluded, having been triggered by the soft component program of this project. This can be seen as an indirect impact of the Project. If more research is conducted based on MOU, this will lead to further improved education at UNIMAS, contributing further to the production of quality human resources.

UNIMAS promotes interdisciplinary research. Equipment supplied through the project is used in research in collaboration with other faculties, and academic staff who have participated in human resource development conduct research with other faculties. Thus the benefits of the project trickle down to other faculties, leading to an improvement in education and research at the university as a whole and thus contributing to the production of human resources which will contribute to Malaysian development in the future.

After the completion of the project UNIMAS was awarded a prize by the Malaysian government for its excellent facilities. In 2011, UNIMAS was ranked among the “Asian top 200 universities” evaluated by Quacquarelli Symonds, a Hong Kong research body. These facts show that external evaluation of UNIMAS has improved and that the project has contributed to this.

② Contribution to local society

The Sarawak State government is implementing the Sarawak Corridor of Renewable Energy (SCORE), a large scale project by a government-academic-industry consortium. At UNIMAS, quite number of academic staff, including the participants of the Soft Development Programme of the project, are participating in SCORE.

In regard to the employment of graduates, which is one of indicators showing the contribution made by the project to local society, no clear relation with the project has been found. In a tracer study conducted by UNIMAS, only “employed” or “unemployed” were

indicated, without descriptions of the field of employment. In addition, many students had not secured employment at the time of the tracer study taken place at convocation.

(2) Correction of regional disparities

No clear impact on the correction of regional disparities was found at the Ex-Post Evaluation. However, if local projects like SCORE bring about benefits to local society through the participation of UNIMAS staff, this will contribute to the correction of regional disparities in the future.

3.3.2 Other Impacts

Some positive impacts produced by the project can be pointed out, for example, the utilization of facilities open to local people and the economic benefits to local communities. No negative impacts have been reported.

(1) Impacts on the Natural Environment

The Environmental Impact Assessment at appraisal did not find any major negative impact on the natural environment. Nor was any negative impact on the natural environment found in the Ex-Post Evaluation. The majority of the construction site was not in primary forest (natural virgin forest) but in secondary jungle cleared by burning, and a serious impact on the natural environment was not expected. According to an interview during the Ex-Post Evaluation, chemical substance and waste water were being properly treated in accordance with government regulations. Appropriate consideration was given to the natural environment during and after construction.

(2) Land Acquisition and Resettlement

No problems were found in land acquisition and resettlement. Land acquisition had been almost completed in accordance with Malaysian regulations at the time of appraisal. According to an interview with the person in charge of environment at UNIMAS, some families continued to live on the construction site because they did not need to move immediately. They left soon after compensation was paid and resettlement was completed without a major problem.

(3) Unintended Positive/Negative Impact

UNIMAS leaves some facilities open to communities, for example, the Center for Academic Information Services (library) and sports centers, which means that some of the project benefits are shared with local communities. In addition, commercial complexes have been constructed around UNIMAS since 2005, when the construction works were under progress, giving stimulus to the local economy.

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

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

This project consisted of 1) building construction, 2) infrastructure, 3) equipment, 4) the Soft Development Programme, and 5) consulting services. The total space of faculty buildings was larger than the original plan, while the provision of infrastructure and equipment was implemented as planned. Parts of the Soft Development Programme, such as the Japanese Language Training Programme and the Short-term Student Exchange Programme, were not conducted as planned because there was not much need for them.

1) Building Construction

The specifications of buildings are as follows.

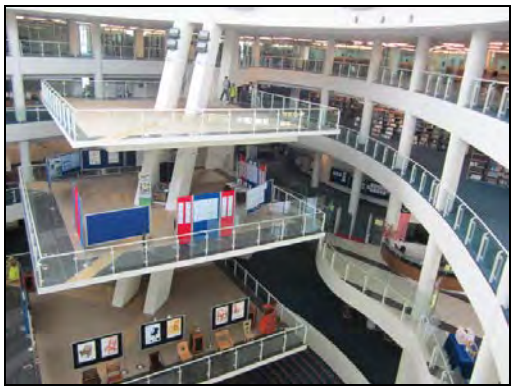
Table 8: Specifications of building construction

Facility/building	Plan		Actual	
	Floor area (m^2)	Accommodation capacity (persons)	Floor area (m^2)	Accommodation capacity (persons)
Academic & research facilities				
FRST	14,200.00	710	62,500.00	3,125
FIT	10,500.00	1,167	17,000.00	1,875
FACA	5,700.00	285	20,000.00	1,000
FE	11,600.00	430	33,800.00	1,250
FCSHD	(Shared with FIT)		6,939.00	771
(Sub-total)	**(42,000.00)**	**(2,592)**	**(140,239.00)**	**(8,021)**
Academic support & administration facilities				
Center for Language & Communication Studies	3,560.00		3,600.00	400
Center for Academic & Information Services	15,800.00		21,351.50	
Chancellery & Administration	8,500.00		17,590.00	
University House	4,065.00		Included in Chancellery & Administration	
Center for Student Development	8,242.00		11,196.00	
Central Teaching Facilities	2,800.00	1,191	6,580.00	2,800
(Sub-total)	**(42,967.00)**		**(60,318.00)**	
Student Hostel & Staff Quarter				
Student College	10,800.00	600	11,000.00	611
Staff Quarter G	3,600.00	36 units	2,100.00	20 units
Staff Quarter H	Included in Staff Quarter G		1,700.00	20 units
(Sub-total)	**(14,400.00)**		**(14,800.00)**	
Others				
Energy Supply Facilities	6,000.00		2,700.00	2,700.00
Grand total	**105,367.00**		**218,057.00**	

Source: Documents of appraisal, Documents submitted by UNIMAS

In the plan at appraisal, the construction of faculty buildings (FRST, FIT/FCSHD <to be shared>, FACA, FE), academic support & administration facilities, student hostels, staff quarters, and energy supply facilities was planned with a total floor area of 105,367$m^{2.}$ At appraisal one building was planned for FIT and FCSHD. In 2000, a proposal for scope change was issued, requesting the construction of two individual buildings for FIT and FCSHD instead of one shared building, as the number of students was expected to increase more sharply than had been estimated in the Ex-Ante Evaluation. The proposal was in line with the original request for five individual buildings before appraisal and the estimated construction costs did not exceed the plan. Therefore, the proposal was approved.

FIT building



Centre for Academic Information Services, inside

The total floor area of faculty buildings was expanded, compared to the original plan. This was because individual buildings were constructed for FIT and FCSHD, as mentioned above, and the floor area of each faculty building was enlarged based on the estimates of the number of students. Construction costs were estimated based on international standards at appraisal. When the actual cost was calculated based on estimates from local suppliers at the time of bidding, it proved possible to construct buildings to accommodate the student numbers which were increasing more sharply than was originally expected. The increase in construction costs that resulted from the enlarged floor area was covered by UNIMAS's own financial source. T he floor area of other buildings such as the academic support & administration facilities and the student hostels was also larger than the original plan, but not by much.

As to the actual number of students in comparison with the accommodation capacity of the faculty buildings, there is difference among the faculties. S ome faculties have more students than the planned capacity, while others have less. However, the number of students for the five faculties in total is not very much different from the total accommodation capacity of the buildings. Therefore, it is concluded that there is not a major problem in the expansion of the floor area of faculty buildings.

2) Infrastructure

At appraisal, building platforms preparation work and basic infrastructure works (road, water supply, drainage, power supply, sports facilities, etc.) were planned as an infrastructure component. The infrastructure works were completed almost as planned.

3) Equipment

Documents from appraisal state that the types of equipment would be specified for each faculty after the commencement of the project. Equipment was supplied to each of the five faculties and in 10 packages due to the bidding procedures. The details are as follows.

Table 9: Equipment supplied

Package	Type of equipment
Package 1	Computers (FIT/FCSHD)
Package 2	IT software & Hardware (FIT)
Package 3	Civil Engineering Research Equipment (FE)
Package 4	Mechanical Engineering Research Equipment (FE)
Package 5	Electronics & Telecommunication Engineering Research Equipment (FE)
Package 6	AV systems & Stage Lighting/Flying Systems (FACA)
Package 7	Scientific Analytical Equipment (FRST)

Package	Type of equipment
Package 8	TV/Photo Equipment (FACA)
Package 9	Special-use computers and software (FACA)
Package 10	Industrial Research Equipment (FACA)

Source: Documents submitted by UNIMAS

To select equipment, UNIMAS organized selection committees for each faculty comprised of academic staff in accordance with intra-university regulations. Each committee compiled a list of equipment to be supplied based on an education plan for the coming three to five years. After compiling the list, equipment was supplied through the bidding procedure stipulated by UNIMAS. Although a number of academic staff who did not work at UNIMAS at the time of equipment selection commented that, for them, the reason for the selection of some equipment was not clear, the majority of academic staff consider that the selected equipment is appropriate for education and research. It can be said that the procedure for equipment supply was appropriate.

4) Soft Development Programme

The details of Soft Development Programme are as follows.

Table 10: Soft Development Programme

Plan		Actual	
Programme	Description	Programme	Participants (person)
1. Academic Staff Training (Master, Ph.D)	4 batches Total 24 persons	1. Academic staff (Master)*	15
		Academic Staff (PhD) *	12
2. Academic Staff Exchange	4 months, 6 batches Total 7 persons	2. Academic Staff Exchange (short-term)	3
3. Short-term Student Exchange	1 year, 7 batches Total 11 persons	3. Short-term Student Exchange	Student: 11 Staff: 3 **
4. Japanese Language Training Programme	1 year, 3 batches Total 3 persons	4. Japanese Language training Programme	None
5. Academic & management staff programme	1 month, 7 batches Total 12 persons	5. Academic & management staff programme	71 (4 days to 1 month)
6. Supporting & technical staff programme	3 months, 6 batches Total 12 persons	6. Supporting & technical staff programme	
7. Japanese professors/lecturers visiting at UNIMAS	6 months, 6 batches Total: 6 persons	7. Japanese professors/lecturers visiting at UNIMAS	None
		8. Internship	5

Source: Documents submitted by UNIMAS

Notes: * Academic staff dispatched to the Master/PhD programmes obtained their expected degrees except for two, who were waiting for the results of their thesis at the time of the Ex-Post Evaluation.

** Students were guided by staff at the Student Affairs Section.

As for Academic Staff Training (Master/PhD) Programmes, where 24 were planned to be dispatched, 27 persons were in fact dispatched, all of whom obtained a degree (including those who were waiting for results at the time of the Ex-Post Evaluation). In order to select participants for academic staff training, UNIMAS defined the criteria and procedures and presented them to JICA for approval. In fact, all those who wanted to participate in the programme were accepted by UNIMAS upon application, as there were not so many applicants. However, the setting up of clear selection criteria was considered an appropriate procedure.

In the Short-term Student Exchanges, students visited the universities where academic staff

were dispatched through the project programmes, and enjoyed exchange events with students in Japan. At first, UNIMAS had planned to have student exchange visits to Indonesia as a student council programme, apart from this project. Later, however, the visits were made a part of the programmes of this project and students were sent to Japan instead. This is the only programmme under the Short-term Student Exchange, and one-year study programme that was originally planned was not conducted.

Japanese Language Training Programmes and Japanese professors/lecturers visits were not conducted at all. Had these programmes been implemented, UNIMAS would have had more academic staff familiar with Japan and the Japanese language, which would have provided a positive impact on other staff at UNIMAS, and thus would also have promoted other Soft Development Programmes as a result.

The following is the reasons why the Soft Development Programme was not implemented as planned or why there was not much need for the Programme.

Table 11: Issues regarding the Soft Development Programme

Programme	Reason (Programmes not implemented as planned / Needs for the Programme not high)
Academic Staff Training (Master, PhD)	- A sufficient needs survey was not conducted at planning. - Information was not sufficient or not appropriately presented to candidates for smooth recruitment. - Insufficient support for research through Japanese and English by academic staff at Japanese universities. Japanese classes were not sufficiently provided. - Insufficient support for families of dispatched academic staff.
Short-term Student Exchanges	- System to transfer academic units for exchange students was not well established. - A majority of students wanted to have an exchange programme in a country where classes are given in English (Australia, the United Kingdom, etc.)
Japanese professors/lecturers visiting UNIMAS	- The need for Japanese study was low. - There was a concern about studying Japanese. - Information about research and research exchange for Japanese professors/lecturers was not sufficient.

Source: Interview at UNIMAS

5) Consulting Services

Based on the plans, Project Management Services Consultants were designated to support UNIMAS in project management, coordination with related organizations, equipment selection, and Soft Development Component implementation. Also, Engineering Service Consultants were assigned to support UNIMAS in the development of basic and detailed design, the elaboration of tender documents, and the management of construction works. According to interviews at the Ex-Post Evaluation, these consultants provided essential support for smooth project implementation.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The total project cost was mostly as planned considering the increase in the output.

The total project cost, which was estimated as 24,732 million yen at planning, turned out to be 31,103 million yen due to the increased outputs.

The project cost at planning and at the Ex-Post Evaluation is as shown in Tables 12 and 13. The cost for building construction and infrastructure increased to 161% of the original plan. This is because the total floor plan of buildings was expanded to almost twice of the original plan, in accordance with the estimate of the number of students.

The cost for buildings was originally calculated using international standard prices, but when the cost estimation was made based on the prices of local suppliers, the estimation turned out to be lower than the original, which made it possible to construct buildings with an

expanded floor area. The increased portion of the cost was covered by contingency and the cost for other components by loans and by Malaysian funds. The Malaysian portion of the buildings and infrastructure increased from 4,371 million yen to 11,193 million yen, which was 2.6 times of the original. Thus, the rate of the Malaysian portion of the buildings and infrastructure increased from 29% in the original plan to 46% actual.

Table 12: Project cost breakdown (Original plan)

Unit: Million yen

Component	Foreign Currency		Local Currency		Total		
	Total	Japanese ODA Loan portion	Total	Japanese ODA Loan portion	Total	Japanese ODA Loan portion	Malaysian portion
Building construction & Infrastructure	5,185	5,185	9,890	5,519	15,075	10,704	4,371
Equipment	3,280	3,280	162	162	3,442	3,442	0
Soft Development Programme	523	523	0	0	523	523	0
Electric works and other facilities	0	0	162	0	162	0	162
Contingency	899	899	1,020	505	1,920	1,404	516
Consulting Services	1,463	1,463	1,013	1,013	2,476	2,476	0
Tax	0	0	1,135	0	1,135	0	1,135
Grand total	11,349	11,349	13,382	7,200	24,732	18,549	6,183

Source: Documents submitted by UNIMAS
Note: The exchange rate applied to calculation of the Malaysian portion is: 1RM=31.9 yen. (As of December 1998)

Table 13: Project cost breakdown (Actual)

Unit: Million yen

Component	Foreign Currency		Local Currency		Total		
	Total	Japanese ODA Loan portion	Total	Japanese ODA Loan portion	Total	Japanese ODA Loan portion	Malaysian portion
Building construction & Infrastructure	2,042	2,042	22,174	10,980	24,216	13,023	11,193
Equipment	998	998	3,166	1,641	4,164	2,639	1,525
Soft Development Programme	443	443	0	0	443	443	0
Consulting Services	2,266	2,266	13	13	2,279	2,279	0
Grand total	5,750	5,750	25,353	12,634	31,103	18,384*	12,719

Source: Documents submitted by UNIMAS and documents of JICA
Note: * 18,403 million yen with 0.1% commission for disbursement. Contingency and taxes indicated in the original plan were not described as independent components in the final report. The exchange rate is: 1RM=30.5 yen (average from the IMF "International Financial Statistics" 1999-2009)

3.4.2.2 Project Period

The project period was longer than planned. The original project period was from March 1999 to March 2007, a total of 97 months. The actual project period was March 1999 to April 2009, a total of 122 months, which was 126% of the original plan. Details of the planned and actual project period are shown in Table 14. The period necessary for building construction & equipment and for the Soft Development Programme was considerably prolonged.

Table 14: Project period (Original & Actual)

Original		Actual	
Consulting Services	January 2000 to October 2005	Consulting Services	January 2000 to September 2006
Construction & Equipment	January 2000 to October 2005	Construction & Equipment	January 2000 to March 2008 (including the period for test operation and training)
Soft Development Programme	April 1999 to March 2007	Soft Development Programme	June 1999 to April 2009
Completion*	March 2007	Completion*	April 2009
Project period	97 months	Project period	122 months

Source: Documents of JICA in planning, Documents submitted by UNMAS
Note: * Definition of completion: at the time of completion of the programme for the last person to be dispatched in the Soft Development Programme

During project implementation, UNIMAS or ganized a committee com prising of responsible persons and held re gular meetings to m onitor progress. Information was shared with the Ministry of Education. The project implementation system is considered to have been appropriate. The extended project period can be partly attributed to the floor area of faculty buildings being larger than the ori ginal plan. H owever, a more significant factor in the extended project period was that UNIM AS personnel were not familiar with the procedures for and operation of Japanese ODA loans and thus they needed longer than expected. The project was the first ODA loan project for UNIMAS. Procedures for the tenders for equipment supply took an especially long time. In the tender for equipment suppl y based on the original plan, there was only a limited number of suppliers. Therefore, UNIMAS decided to convene tender for equipment in 10 packages. However, it took a long time to implement the tender process again. In these circumstance s, according to an interview , the support for project implementation from the PMS consultant was u seful. In addition, to fa cilitate project implementation and to improve ODA loan procedures, Special Assi stance for Project Implementation (SAPI) was implemented in March 2003.

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

Due to the nature of the project, a quantitative analysis of the internal rate of return was not possible

Although the project cost exceeded the plan, it is regarded as reasonable consi dering the increase in t he output. O n the other hand, proj ect period also exceeded the plan, therefore, efficiency of the project is fair.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

UNIMAS is considered to have an adequate management system for the university and the maintenance of its physical facilities.

UNIMAS has an academ ic unit (eight faculties and four centres), a research unit (seven institutes) and an ad ministration unit, under the Vice-Chancellor. Matters of the management of UNIMAS are discussed and decided by a steering committee comprising of representatives of UNIMAS (Vice-Chancellor and the directors of facul ties and institutes) and of r elated agencies (Economic Planning Unit, Ministry of Finance, Ministry of Ed ucation, State government of Sarawak, etc.). Planning for the maintenance of the facilities of the whole university as well as the maintenance of the facilities for common u se is managed by the Development and Asset

Management Division. The maintenance of facilities and equipment at faculties, including the budget, is managed by the maintenance section of each faculty. A large part of equipment is maintained by external agencies, with a maintenance record administered by the Development and Asset Management Division.

3.5.2 Technical Aspects of Operation and Maintenance

Sustainability in the technical aspect is high. A sufficient number of personnel is allocated to the Development and Asset Management Division and the maintenance sections of the five faculties. A total of 193 persons are allocated to the Development and Asset Management Division, including workers and drivers. Four of the 193 are engineers and 16 are assistant engineers (As of February 2012, source: documents of UNIMAS). Op eration and maintenance are conducted properly. A t the time of the handover of facilities and equipment, training was provided only for operation, and there was no training for maintenance, only the provision of manuals. Therefore, some members of staff felt that they did not have the sufficient knowledge and skills for maintenance, according to interviews.

Participants in the Soft Development Programme still remain at UNIMAS, except for one, who has retired. P articipants, both academic and management staff, are still exchanging information in order to continuously improve their knowledge and skills, although there is no official alumni organization.

3.5.3 Financial Aspects of Operation and Maintenance

The financial sources for the operation and maintenance of facilities is stably secured at UNIMAS. UNIMAS is planning to expand profitable research and projects in addition to receiving regular revenue allocated by the government.

The budget of UNIMAS is classified into two categories: an operating budget and a development budget. Expenditure for the operation and maintenance of facilities and equipment is disbursed from the operating budget. The budget and the actual expenditure for the operation and maintenance of facilities and equipment are as follows. Every year the total expenditure actually spent on operation and maintenance is within the allocated budget. According to interviews, operation and maintenance expenditure at faculty level sometimes exceeds the annual budget allocated for each faculty. However, the budget can be spent in a flexible way with transfer among faculties. Therefore, UNIMAS has so far not seen a huge deficit in its total operation and management expenditure for the whole university. In addition, UNIMAS has been making efforts to secure its own financial foundation and has sufficient financial capacity as seen in the fact that UNIMAS allocated its own budget for expanded facility construction as described in “3.4. Efficiency”.

Table 15: Budget and expenditure for operation and maintenance at UNIMAS

Unit: RM

Year	1999	2005	2008	2011
Development Budget	13,007,369	320,866,029	36,644,127.	189,431,769
Operating Budget	58,199,400	118,598,460	201,964,500	173,010,791
Maintenance (in operating budget)	n.a	13,538,000	26,182,000	18,238,419
Actual expenditure for maintenance	n.a	6,594,485	16,638,742	16,335,800

Source: Documents submitted by UNIMAS

Note: The amount of the development budget varies year to year as it dependes on specific development planning.

To further secure financial foundation, UNIMAS is planning to expand the ratio of its own income within the total revenue up to 30% by 2015. T his includes a plan to establish a holding company to facilitate the expansion of profitable academic business such as research and consulting.

3.5.4 Current Status of Operation and Maintenance

The current status of operation and maintenance is good for most of the facilities and equipment.

Some buildings have had rainwater leakage since construction was completed. Sometimes classes or experiments are not conducted as planned due to heavy leakage. Leakage occurs repeatedly in the same parts of buildings even though they have been repaired. UNIMAS believes that this is because the slant of building roofs is not steep enough to prevent leakage. They have already started taking fundamental repair measures by putting in steeper roofs over the existing ones. The budget for repair has already been approved by the Malaysian government. UNIMAS has made a request for structural analysis of construction to a design firm. Except for the leakage, there has been no major problem reported so far.

Some of the equipment, including built-in desks and chairs, cannot be used at four faculties (except FCHD) due to a lack of spare parts or technicians with the appropriate expertise. However, the number of pieces of equipment that cannot be used does not exceed 10 at any faculty and the majority of equipment is utilized in an acceptable condition. Five years have passed since computers were supplied to FIT and FCSHD and UNIMAS are planning to replace them.

Electric power and air conditioners are centrally controlled because this was considered more efficient than to maintain everything individually. Some have commented that this is in fact less efficient or less economical because, for example, rooms that are not in use are also air-conditioned under the centrally controlled system. Actual analysis on energy efficiency was not obtained during the Evaluation.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the project was to improve the quality and quantity of human resource development of UNIMAS by the construction of facilities for five faculties, the provision of educational equipment, and training and exchange programmes for university staff and students. Thus, the aim was to contribute to the development of human resources who can contribute to the development of Malaysia, thus in turn contributing to the improvement of the economic gap among regions. The objective is relevant with the development plan and development needs of Malaysia at the time of both the appraisal and the Ex-Post Evaluation, therefore its relevance is high. The facilities and equipment provided by the project are essential to education and research at UNIMAS and the number of students has been increasing. Academic staff dispatched to Japan on the Soft Development Programme have utilized the results of the programme and some of them participate in programmes implemented by industrial-academic-government consortia, thus contributing to local society. Therefore, the effectiveness of the project is high considering impact. The outputs of the project are generally relevant, in that the area of the faculty buildings was increased from the original plan but is sufficient to accommodate the increased number of students. However, the project cost was higher than planned and the project period was longer than planned. Therefore, efficiency is fair. The operation and management structure of UNIMAS is well established, without financial problems. Although some parts of the facilities have rainwater leakage, UNIMAS has already taken measures against the problem. Most of the academic and management staff dispatched to Japan on the Soft Development Programme still work at UNMAS. Thus, sustainability 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

Repair of facilities and equipment

It is necessary to take measures for the repair of equipment that is not used due to failure. It is also desirable that UNIMAS immediately implement the repair of roofs (which is already under way). It may be useful for UNIMAS to examine the cause of leakage more carefully including the possibility of problems in maintenance other than the structural ones currently discussed.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

(1) Soft Development Programme

The need for the Soft Development Programme in Japan was not very strong. According to interviews, this was because potential participants were concerned about daily life and research in Japan. Providing information on daily life in Japan may help to increase the number of applicants. It should be noted, however, that many researchers in Malaysia are likely to prefer English-speaking countries to Japan. Therefore, it is important that the number of researchers to be dispatched is estimated as precisely as possible, with a comparison with the number of researchers who have been dispatched to foreign countries other than Japan.

In the management and technical programme, visits to several organizations in a short time might have been useful to grasp the overall picture, but they were not very effective to obtain practical knowledge and techniques, due to the limited time for in-depth discussions and questioning. On the other hand, staying in one organization is useful to obtain specific skills such as organizational management and communication,s even though the total stay in Japan is the same for both. I t is important to plan a practical programme with the targeted organization(s) in accordance with the programme objective.

(2) Information and Needs Analysis of the Target University

To examine impact in higher education projects, it is important that the executing agency has the relevant data on the tracer study of graduates, the research themes of academic staff, and so on. I n the tracer studies of UNIIMAS, the type of employment of graduates is not identified, which has made it d ifficult to discern a relation between the students' professions and the project effects. If the executing agency does not have such data, it may be useful to conduct a survey during the project. The data would be useful in examining the impact after project completion as well as in planning similar projects. In conducting a tracer study, it is helpful if the data for graduates is available via an alumni network.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	(1) Building construction (Buildings for five faculties, Chancellery & Administration, Student Colleges, etc.) Total floor area: 105,367m^2 (2) Infrastructure (road, water supply, drainage, etc.) (3) Equipment (educational equipment) (4) Soft Development Programme (Academic staff, Management staff, etc.) Total: 75 persons	(1) Building construction (Buildings for five faculties, Chancellery & Administration, Student Colleges, etc.) Total floor area: 218,057m^2 (2) As planned (3) As planned (4) Soft Development Programme (Academic staff, Management staff, etc.) Total: 108 persons
2.Project Period	March 1999 to March 2007 (97 months)	March 1999 to April 2009 (122 months)
3.Project Cost Amount Paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 11,349 million yen 13,382 million yen (419 million RM) 24,732 million yen 18,549 million yen 1RM＝31.9 yen (As of December 1998)	 5,750 million yen 25,353 million yen (831million RM) 31,103 million yen 18,403 million yen 1RM＝30.5 yen (Average between March 1999 – April 2009)

Malaysia

Ex-Post Evaluation of Japanese ODA Loan
"Look East Policy"

External Evaluator: Keiko Kita, OPMAC Corporation

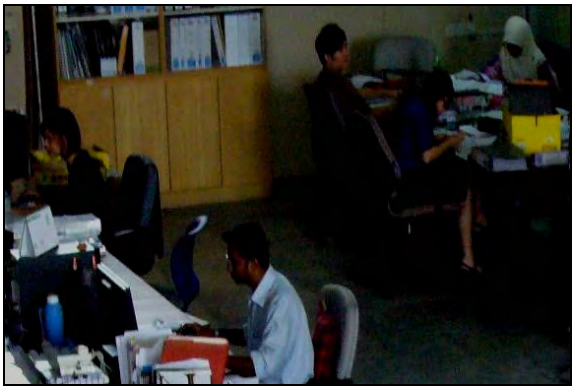
0. Summary

The objective of the project was to develop human resources able to use advanced technology and with Japanese work ethics by providing Malaysians with learning opportunities in Japan thereby, in turn, contributing to the industrialization of Malaysia. The Project was launched as a Yen Loan project in response to the urgent need of the Malaysian government, when economic crisis of 1997 presented the country with difficulties in continuing her "Look East Policy Program" undertaken since 1982. The relevance of the Project is high as the Project has been consistent with the development policies of Malaysia and with Japan's assistance policy to the country. The effectiveness and impact of the Project are satisfactory: among four courses under the LEP Program, the Project objectives were almost achieved for the Graduate course and the Japanese language course, aiming at capacity development for the government sector, while challenges remain for the Undergraduate course and the Technical education course which aim at capacity development for the private sector. Efficiency is satisfactory due to a combination of a lower project cost than planned and the longer project period due to some students repeating the grade. The Look East Policy Program has been managed with more emphasis on t he Graduate course since the end of this project, which suggests that the sustainability of the Project remains high.

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

1. Project Description

Project Location



An ex-student of the Yen Project working in a design firm

1.1 Background

The Look East Policy (LEP) Program is a scholarship program launched in 1982 in line with the national development plan in which higher education was identified as one of the priority areas. It was Prime Minister Dato' Seri Dr. Mahathir bin Mohamad who announced this initiative, based on his belief that the secret of Japanese success and its remarkable development lay in its labour ethics, morale, and management capability. The Prime Minister believed that a Program enabling young Malaysians to learn in Japan would contribute to the economic and social development of Malaysia. For this purpose, Malaysia decided to send their students to Japan to study not only technical know-how but also Japanese work ethics and discipline.

The LEP Program consists of two pillars: the first is a study-abroad program which sends Malaysian students to Japanese universities and institutes of technology. The second is a training program which sends Malaysian trainees to Japanese industries and training institutes. The latter consists of several courses, including Higher Education Loan Fund Projects (HELP, HELPII and HELP III) operated by the MARA Foundation and the JPA-sponsored program.

This evaluation targets the JPA-sponsored program, focusing on the period from March 1999 - Jan. 2009 when the Program was supported by the Yen Loan. The Program is composed of 4 courses: a graduate course and a Japanese language course targeting government staff who must return their offices after completion of the course. For graduates of these courses, in the case that a position in a government office is not offered, he/she can look for job in the private sector. On the other hand, graduates of the undergraduate course and the technical education course were expected to work in the private sector, mainly Japanese firms in Japan or Malaysia.

1.2 Project Outline

The objective of this project was to develop human resources able to use advanced technology and with Japanese work ethics by providing Malaysians with academic and training opportunities in Japan, thereby, in turn, contributing to the industrialization of Malaysia.

Loan Approved Amount / Disbursed Amount	14,026 million yen/ 12,015 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 1999 / March 1999
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency(ies)	Guarantor: Government of Malaysia/JPA
Final Disbursement Date	March, 2009
Main Contractor (Over 1 billion yen)	Mitsubishi Research Institute
Main Consultant (Over 100 million yen)	N/A
Feasibility Studies, etc.	None
Related Projects	· Training program targeting employees in the industrial sector and business leaders. · Yen Loan Project: Higher Education Loan Fund Project (HELP), HELP2 and HELP 3 · Grant Aid Project (Emergency): Financial support to implement the JPA-supported LEP Program for the year of 1998.

2. Outline of the Evaluation Study

2.1 External Evaluator

Keiko Kita, OPMAC Corporation[1]

2.2 Duration of Evaluation Study

Duration of the Study: August 2011-August 2012
Duration of the Field Study: 2-15 October, 2011 and 4-10 March 2012

[1] Participated in the evaluation as a complementary member from Global Link Management, Inc..

2.3 Constraints during the Evaluation Study

1) Although beneficiary surveys as a part of the ex-post evaluation targeted a total of 100 ex-students who were sent to Japan from 1998 to 2009, the number did not reach target. It was not a random sampling either. This is because of the fact that the list of students provided by JPA, an implementing agency of the Program, was too old, making it impossible to trace a sufficient number of ex-students: only 20% of the listed students were contactable of whom 96 ex-students responded to the questionnaire for the survey. The beneficiary survey also targeted their employers (local and Japanese firms) which came from a list of employers of LEP program students obtained from the JICA Research Institute[2]. This was also not a random sampling.

2) No information on the actual local cost allocated to the Project was provided due to the fact that JPA received a lump sum for all study-abroad programs from the Ministry of Finance and not just for the LEP Program specifically. Because the portion of the local cost was very limited, the evaluator concluded that it was reasonable for the evaluation to target the yen loan only.

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance with the Development Plan of Malaysia

The Project was in line with the development policy of Malaysia at the time of the Appraisal Study (1998/1999): the 7th 5-year strategic plan (1996-2000) stated that the role of education was to develop a workforce with high quality skills and work ethics. It placed emphasis on the establishment and expansion of educational institutions in the areas of science and technology in order to increase the number of students.

The 9th 5-year strategic plan (2006-2010) and the 10th 5-year strategic plan (2011-2015) also regarded higher education as one of the most important areas. The importance of developing human resources was also addressed in the Higher Education Strategic Plan (2007-2020), with the specific target that a half of the graduates of secondary education advanced to higher education institutions and that one third of the labor forces was a graduate of higher education.

In conclusion, the policy of strengthening the industry and technology of Malaysia through human resource development has been sustained from the time of appraisal.

3.1.2 Relevance with the Development Needs of Malaysia

In Malaysia, the establishment/expansion of domestic universities was limited until the early 1990s when the country was shifting to a manufacturing and industrial economy from an agriculture-dependent economy. The Malaysian government encouraged her younger population to study abroad as human resource development in the area of higher education was urged in order to push the country from industrialization depending on a foreign investment toward domestic promotion of science and technology. In 1995, 79,330 students were enrolled in degree courses at domestic universities while the number of students studying abroad reached 50,600. Of these about 40% were government-sponsored students and the rest was students studying at their own expense.

This trend of overseas-dependent human resource development changed with economic

[2] JICA Research Institute conducted a tracer survey with support from ASIA Sheed to study an Cross-border Higher Education for Regional Integration: Analysis of the JICA^RI Survey on Leading Universities in East Asia". The tracer survey targeted ex-students of the LEP Program who were sent to Japan from 2004 to 2008 under the Yen Loan Project, as well as their employers.

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

[4] 1: High 2: Fair 3:Low

stagnancy. The 7th 5-year strategic plan (1996-2000) stated that the government would continue sponsoring graduate students studying overseas while decreasing the number of government-sponsored undergraduate students in overseas universities due to budget limitations. In turn, the number of domestic universities would be increased. This policy change accelerated the expansion of learning opportunities within the country, and accordingly resulted in an increase in the number of applicants.

Proclamations of law on private universities/institutions has contributed to an increase in enrolment at domestic (national) universities which numbered 7 in 1990 growing to 57 (20 national universities and 37 private universities) in 2009. Meanwhile, the ratio of Malaysians studying overseas declined sharply.

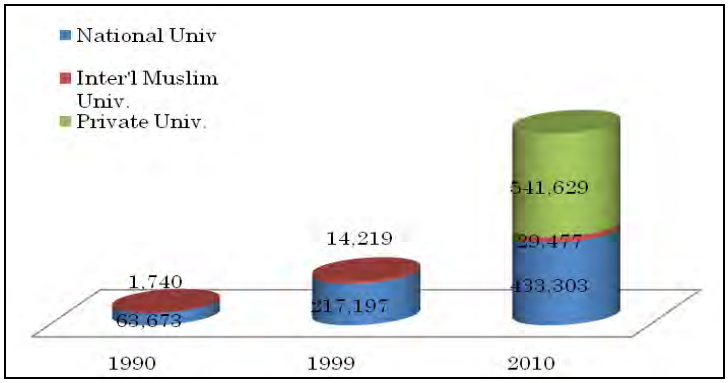


Figure 1: The number of Students Enrolled in domestic universities
(Social Statistics Bulletin Malaysia)

In addition, an increased number of universities have started adopting the Twining Program since the late 1997s when the Malaysian government approved this Program, under which Malaysian students could obtain degrees from overseas universities even though they had studied in Malaysia for all four years. The Higher Education Loan Fund Project (HELP2), which was implemented during this same period, was in line with this trend.

Meanwhile, this Project supported the Malaysian government in continuing its long-year LEP Program when implementation with its own budget became difficult due to the economic crisis in the country. With the LEP Program available through the Yen Loan (this project), along with HELP continuing during the same period, more opportunities to study in Japan were provided to Malaysian students.[5]

3.1.3 Relevance with Japan's ODA Policy

More emphasis of Japan's ODA policy has been placed on assistance to foreign students studying in Japan in line with the Cabinet decision of June 1993: that human resources development is one of the key areas for Official Development Assistance. This decision was reflected in Japan's assistance policy to Malaysia issued in February 2002, which stated that the development of human resources with advanced knowledge and skills was key for the future of Malaysia. Human resource development was also identified as a key area in Medium-Term Strategy for Overseas Economic Cooperation Operations (December, 1999), with emphasis on the provision of learning opportunities in Japan to students from Southeast Asia. The purposes of this project were in line with these Japanese assistance policies for Malaysia.

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

[5] The perspective was shared at the time of interview with an government officer in charge of the LEP Program at the Embassy of Japan in Malaysia,

3.2 Effectiveness (Rating: ②)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The total number of students who have completed each course under the LEP Program is 1308, 224 fewer students than planned (1,532 students, including an additional 105 students on the technical education program). There were 147 students (13%) fewer on the undergraduate course and 57 students (12%) fewer on the technical education course. There was no gap between actual and plan for the Japanese language course, but there were 20 students (8%) fewer on the graduate course due to the fact that the number of applications received did not reach the target. However all students who were selected to study on the preparatory study course completed the graduate course as scheduled (only one student extended the study period by one year).

On analysis of at which stage of the process ("Applications received", "Preparatory study course in Malaysia," "Studying in a Japanese university") the gap between plan and actual happened, it was found that at the application stage a lower number of applicants than the original target was received for the undergraduate course and the graduate course. Meanwhile, HELP2 received 400 applications (First batch) and 1,000 (Second batch) against a target of 60 applications each. One of the reasons why more students preferred HELP 2 to the LEP Program was, according to interviewees including Mitsubishi Research Institute (MRI) and ex-students, that the period of study in Japan for HELP 2 was shorter than that of the LEP Program. In particular, the period of the preparatory study course was much shorter under HELP 2[6].

The main reason for the gap between plan and actual from the stage of completion of the preparatory study course to entrance to a university in Japan can be attributed to failures in the entrance examinations. According to research conducted by the Mitsubishi Research Institute, a Japanese firm in charge of consulting services under this project, the students who were selected as candidates for the LEP Program had been marked "excellent" in academic performance for almost all subjects when they were in high school. Therefore, there was no correlative relationship between their academic performance at high school and at their universities One of the institutions in charge of the preparatory study course said that the curriculum of their Japanese language courses might not have been effective enough to enable all Malaysian candidates to pass the university entrance examination during the period when the type of entrance examination was changed from one which applied only to Malaysian students to one implemented by the Ministry of Science and Education of Japan, which applied to all foreign students. JPA pointed out that the level of the new entrance examination called EJU is too difficult.[7]

JPA, ALEPS and MRI pointed out that a lack of practical training in the Japanese language was also one of the main reasons why Malaysian students repeated grades or dropped out during their time studying at university in Japan.

[6] An interviewee at the MRI said that the curriculum for the Japanese language class under HELP 2 was designed to be more practical because Japanese universities supported the project were involved in the development of the curriculum.

[7] According to JPA, all students on the preparatory study course in the Republic of Korea passed the entrance examination.

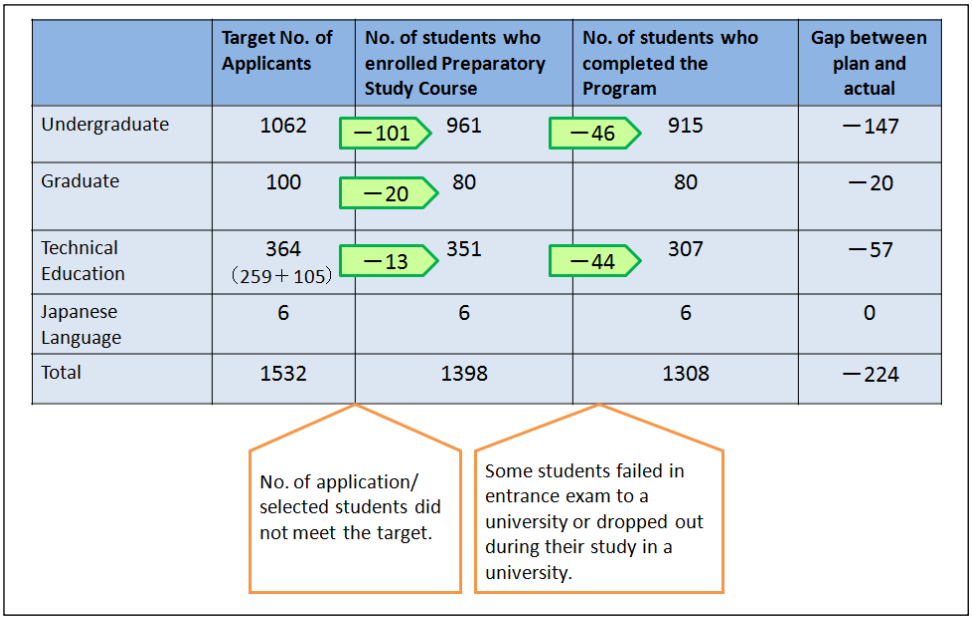


Figure 2: At which stage of the program did the gap between plan and actual occur?

3.2.2 Qualitative Effects

1) Academic Performance

According to JPA, the academic performance of ex-recipient students (excluding those who repeated a grade) was satisfactory: 80% of students enrolled in the graduate course obtained "good" (excellent/good/poor) or B (A/B/C), as was the case for more than 80% of undergraduate students. There is no such a data for the technical education course and the Japanese language course.

There was a high rate of repeating recorded in the undergraduate course (23%) and the technical education course (25%) but the rate for the PhD course was only 6.6%. Nobody repeated a grade in the master course or the Japanese language course. According to JPA, the repeating rate of the LEP Program was higher than any other overseas study programs mainly due to a poor understanding of the Japanese language. An inappropriate selection of majors/fields of study was also one of the reasons identified by some ex-students who studied under the undergraduate course.

The MRI said that the biggest contribution they made through their consulting services for the LEP Program was to grasp students' academic records through monitoring and follow-up exercises. This exercise enabled them to take quick action to prevent students with poor academic performance from repeating a grade. This tracer of academic records was also effective in identifying the students who were most likely to drop out. It was suggested therefore that they go back to Malaysia at an early stage. LEP Program students were obliged to submit their academic records to the Embassy of Malaysia in Japan, but only half of the students followed this regulation before the Project started. The reporting rate increased to almost 100%, with the support of the consulting services, during the period of this project.

2) Knowledge and Skills Acquired by LEP Program Students

JPA say that one of the Project Purposes, "Malaysian students acquire academic knowledge and skills at university in Japan" has been satisfactory achieved. The results of the beneficiary survey conducted at the time of the ex-post evaluation show that many ex-students from the undergraduate and the technical education courses identified that what they had learnt was the "application of fundamental knowledge of engineering," "competence in theory & research

engineering," and "problem identification, formulation and solving skills." Many ex-students from the graduate program responded that they learnt "problem identification, formulation and solving skills" and "research skills" in Japan.

A majority of employers of ex-students say that one of the advantages of ex-students of the LEP Program is their good skills in the management of team work. A member of the Japan Chamber of Commerce and Industry in Malaysia said that Malaysian employees can acquire advanced knowledge and skills through staff training after they have started working for a firm and that it is the Japanese style education method based on the "teacher-student relationship" applied at engineering courses in Japan that has made this staff training functional.

3) Japanese Work Ethics

It is reasonable to conclude, based on the results of the interview and beneficiary surveys with JPA, ex-students and their employers, that the majority of ex-students have mastered Japanese work ethics.

JPA said that the Project Purpose "Malaysian students acquire Japanese work ethics" has been pretty much achieved for each one of the four courses: the undergraduate course, the technical education course, the graduate course and the Japanese language course. Asked what is "Japanese work ethics?" JPA identified "discipline", "commitment," "appropriate attitude to assignments," and "loyalty to the organization." This perspective is similar to that of ex-students: ex-students responded that Japanese work ethics means "punctuality/time management and "hard-work" and say that they have practiced Japanese work ethics at their office daily. Eighty percent of employers observed that ex-students of the LEP Program have applied Japanese work ethics ("discipline," "an appropriate attitude to their assignments" and "punctuality/time management") to their routine work.

As far as the disadvantages of graduates of the LEP Program are concerned, some employers said in the interviews / beneficiary surveys that they had "less patience" or were "demanding." They said that graduates of the LPE Program tended to look for companies with better salaries and other working conditions. One of reasons for this tendency on the part of graduates of the LEP Program may be seen in the responses to the results of the interviews / beneficiary surveys: a number of ex-students felt they had not been fairly utilized

In order to ensure that Malaysian students understand and practice Japanese work ethics, an internship program was set up as a part of the consulting services provided by MRI. According to the beneficiary survey, the percentage of ex-students on the four courses who experienced the internship program was highest for the technical education course (47%), followed by the undergraduate course (28%). Few students on the graduate course experienced the internship program. In total, 203 students experienced internship programs in 50 Japanese firms between 2000 and 2006. Most of these said that the tasks assigned to them at a firm were in the same or related fields as their study at university which leads to the conclusion that the internship program satisfactorily benefited a certain group of students. On the other hand, it was pointed out that the period of the internship programs was too short (1-2 weeks).

3.3 Impact

3.3.1 Intended Impacts

The Project enabled the Malaysian government to sustain its long-continued LEP Program, and therefore the impact level of the objectives of the Project remained the same as the ultimate goal of the government-supported LEP Program. Therefore, to make sure that the evaluation of the Project was fair, the ex-post evaluation questioned whether the Project was on the right track towards the ultimate goal. The evaluation concluded that one of two impact level objectives (government capacities strengthened) has been almost achieved while the achievement of the other impact level objective (Malaysia industrialized through human resources with Japanese work ethics) has been achieved to a less extent with challenges left for the future.

A number of ex-students have taken leading positions since they returned to Malaysia, and

JPA and ALEPS (Association of Look East Program Students) have said that the objective, "government capacities strengthened through ex-students of the LEP Program" has been achieved to a highly satisfactory level. All respondents of the beneficiary survey said that they had been provided with full-time positions in government offices since they returned to Malaysia and that they are satisfied with their current position. They had been promoted after their return and their current assignments are more attractive than the ones before, or their current position is in line with their career plan.

On the other hand, JPA and ALEPS pointed out that ex-students have not fully contributed to economic development in Malaysia. This is partly because they have not been provided with opportunities to make the best use of what they learnt in Japan. There is no data on the career development of ex-students who started working in the private sector after graduation from Japanese universities, but the results of the beneficiary survey said that a majority of respondents found their jobs through job fairs or recruitment agencies and that about a half of them were employed by Japanese firms in Malaysia.

Although 80 to 90 percent of the ex-students are working as a full-time staff, one third of them are in a position which is in a completely different field to the one they studied in Japan, which indicates that the knowledge and technology acquired at Japanese universities are not linked to the development of domestic industries in Malaysia efficiently or effectively. Most of the respondents to the beneficiary survey are engaged in engineering posts.

JPA and ALEPS pointed out three reasons why the graduates of the LEP Program have contributed less to the development of domestic industries than expected:

1) The graduates are expected to support Japanese firms in Malaysia. This is the main reason why many graduates of the LEP Program are working in a field which is not related to their areas of study in Japan and why they end up to spending so much time on interpreting and translation. The results of the beneficiary survey with Japanese firms in Malaysia are consistent with this analysis: to the question of what they (Japanese firms) expect of the graduates, 21 out of 25 Japanese firms answered that they expect the graduates of the LEP Program "to be a team reader", followed by the answer "to be a bridge of communication between Japanese staff and local staff (20 firms) and "to be an interpreter/translator" (17 firms).

2) There is a problem related to accreditation: some diplomas or degrees obtained in Japan are not recognized in Malaysia.

3) Many Japanese firms in Malaysia are in the form of assembly firms and close down within a few years. Because of this tendency, employees can hardly gain a sense of security (According to ALEPS, the closing down of firms has not resulted from poor business performance caused by Japanese economic stagnancy in recent years)

The Malaysian government has described the following scenario: an increasing number of human resources in the fields of science and technology are fostered through the LEP Program. In the long run, these people take management positions at local firms, which ultimately contributes to the economic development of Malaysia. With the high retention rate in the private sector, it may not easy for the experiences and knowledge of individuals to be expanded to an institutional level in a short period of time. Although there is no information / data available to suggest whether or not the knowledge, skills and Japanese work ethics gained are practiced at an institutional level, the ex-post evaluation successfully identified some ex-students who currently have active roles in their firms as a managers or team leaders. The more ex-students who take such positions, the faster Japanese technology, knowledge and work ethics are expanded within an institution.

The Malaysian government has fully recognized that the effective use of graduates of the

LEP Program is key for the development of the country and has launched two programs to this end. One is the Talent Acceleration in Public Service (TAPS) Program with the purpose of channeling graduates of the LEP Program into the civil service. The Program is a collaborative initiative led by JPA with the Razak School of Government (RSOG) and Talent Corporation Malaysia Berhad (Talent Corp). The other program is the Scholarship Talent Attraction and Retention (STAR) Program, which is a joint initiative between JPA and Talent Corp to support graduates working for leading companies, mostly Government Linked Companies (GLC).

3.3.2 Unintended Positive / Negative Impacts

Other positive impacts are as follows:

1) Strengthening the Japan-Malaysia Network

The total number of graduates of the LEP Program, including those who were sent to Japan under the Project, has reached 14,000, and many of them currently play a leading role in government and in the private sector. More than 5,000 Malaysians have registered with either ALEPS, mainly composed of Malays, or with Japan Graduate Malaysia (JGM) mainly composed of Chinese. Both organizations have contributed to the promotion of Japan-Malaysia relations, mainly through cultural events. JPA, institutions in charge of the preparatory study course and ex-students interviewed agree that these organizations, especially ALEPS, have become key role in expanding the outcomes of the LEP Program, and therefore the functions of ALEPS have to be strengthened.

ALEPS has implemented a number of cultural events in collaboration with the Japanese Embassy in Malaysia. The most recent initiative was the establishment of the ALEPS Dream Factory, within a factory run by the ALEPS chairman, in 2010. A LEPS Dream is a NPO working on the recycling of wheelchairs imported from Japan for children with spasticity paralysis in Malaysia. These activities are supported by the Ministry of Science Technology & Investment (MOSTI) of Malaysia.

ALEPS Dream Factory

On the other hand, there was less participation by ex-students in ALEPS activities than expected. Many have either only registered or have participated once. The beneficiary survey found that the reason behind this was that 30-40 percent of the respondents said that they did not know ALEPS. Those who did know about the existence of ALEPS responded that they had little time to participate in its activities or that they did not see any benefit in joining its activities. Approximately 90% of respondents said that the purposes of ALEPS were not clear to them. These results indicate that PR activities for ALEPS should be strengthened. It also should be noted that a member list of ex-students has not yet been prepared and this prevents ALEPS from tracing ex-students after their graduation from universities in Japan.

2) Opening of MJIIT

It was a common view among the stakeholders interviewed (both Japanese and Malaysian)[8] that MJIIT is one of the impacts of the 30-year initiative of the Malaysian government, including the decade supported by this project. It can be expected that one of the two ultimate goals of the LEP Program, "learning Japanese technology," may be achieved effectively through MJIIT. However, few stakeholders are optimistic that the other goal, "learning Japanese work ethics," can achieved through MJIIT as Japanese work ethics can be mastered only by foreigners who have stayed in Japan for a sufficient amount of time. Therefore, the challenge remains for MJIIT to incorporate Japanese values into its international curriculum. One idea is to apply a mentor system to laboratory exercises, and the other idea is to send undergraduate students to Japan for a 2-month internship program and graduate students for a Joint Supervision Program of one year or less.

To provide a platform for higher education in ASEAN in the future, MJIIT aims to (i) expand networking in ASEAN through the development of a consortium of Japanese universities, (ii) strengthen cooperation with Japanese industries through JACTIM, and (iii) employ Malaysians who have experience in studying in Japan as faculty members. These strategies are reflected in this project and in HELP.[9]

MJIIT

The ex-post evaluation found no negative impacts on the environment or society as the Project provided assistance for human resource development.

In conclusion, the project has somewhat achieved its objectives, and therefore its effectiveness is fair.

3.4 Efficiency (Rating:②)

3.4.1 Project Outputs

At the time of appraisal, it was planned that a total of 1,407 students would be sent on the four courses:

- Undergraduate Program: 422 students who were already in the Government-supported LEP Program and 640 new students (160 students for each batch)
- Graduate course: 100 new students (20 students for each batch – 15 students for MAs and 5 for PhDs)

[8] Stakeholders include the Embassy of Japan in Malaysia, MJIIT staff (both Japanese and Malaysians), JPA and institutions in charge of the preparatory study course.

[9] Expanding networking through a consortium with Japanese universities is the same approach as that taken by HELP and the implementation of internship programs in collaboration with Japanese firms is the approach applied to this project.

- Technical Education course: 259 students who were already in the Government-supported LEP Program
- Japanese Language course: 6 students who were already in the Government-supported Program.

The actual number of students sent on the four courses was as follows:

Table 1: No. of students to be sent on the four programs: plan and actual

	Plan	Actual (Those who entered the preparatory study course)	Gap
Undergraduate	1,062	961	-101
Graduate	100	80	-20
Technical Education	259	351*	+ 92
Japanese Language	6	6	0
Total	1,407	1398	-29

Source: JPA
Note: *Include additional 105 students

The actual number of students who were sent on the preparatory study course was 1,398 students, 29 students lower than the plan, because the number of applicants did not meet the original target. On the other hand, the number of students who were sent on the technical education course exceeded the plan as an additional 105 students were sent (Batches 18 and 19)[10].

The Project included consulting services for the provision of information on universities in Japan, for monitoring and the follow-up of students who were studying in universities, to support internship programs and for evaluation of the Project.

3.4.2 Project Inputs

3.4.2.1 Project Cost

According to JPA, budget allocation and actual cost for the Project could not be provided to the evaluator because JPA received a total budget for the whole study-abroad program. Local costs for the Project were limited to 7.6% of the total cost, and therefore the ex-post evaluation looked at only a part of the yen loan.

The actual project cost (yen loan) was approximately 12,015 million yen, compared with 14,026 million yen approved at the time of appraisal. Disbursement was 86% of the planned amount.

Additional inputs were provided to cover an increased allowances paid to students due to changes in the exchange rate and an increase in tuition fees and to cover the cost necessary to support some students who extended their study period as a result of repeating of a grade. But what lowered the actual cost was the smaller number of students than the target who completed their study in Japan.

3.4.2.2 Project Period

The project period was slightly longer than planned (equivalent to 111% against the plan). This was because 44 students in the undergraduate course and 1 student in the graduate course extended their study period by one year.

[10] Appraisal documents shows that the Malaysian government believed that the Technical Education Course would be more effective for learning of Japanese work ethics than any other of the courses under the LEP Program. Students who studied in the Technical Education Course stayed in a dormitory and were taken care of very well.

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

Financial Internal Rate of Return

There was no estimation of the Financial Internal Rate of Return either at the time of the appraisal study or at the time of the ex-post evaluation. This was the same for the economic internal rate of return.

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

3.5 Sustainability (Rating: ③)

The LEP Program is a Malaysian government 30-year program. The Project supported the Program for a decade, but even after the end of the Project, the Malaysian government has continued to implement the LEP Program. The impact-level objectives set for this project are the ultimate goal set originally for the JPA-supported LEP Program. To achieve the ultimate goal, two stages in the process toward achievement should first be achieved: (i) graduates of the LEP Program continue to work for the same firm, being posted to a management position in the long term, (ii) the number of such graduates increases under the LEP Program and through this, individual knowledge and skills rise up through the institutional levels.

With the above in mind, the evaluation on sustainability focused on the possibility of the Malaysian government continuing the LEP Program from the viewpoint of the capability of the implementing agency (JPA) and the need for study in Japan, in addition to the sustainability of effects brought about by the Project.

3.5.1 Sustainability of the Effects of the Project

It is most likely that effects of the Project will be sustained at an individual level. Although some changes of occupation have been observed in the private sector, many ex-students have continued to work in the same company as engineers and they have applied what they have learnt in Japan to their routine work. It is a major challenge to expand individual exercises within an institution, but ex-students are expected to work in the same company long enough to achieve this.

It has been confirmed that there are a number of graduates of the JPA-supported LEP Program who have worked over a long period of time and have currently been promoted to management positions in the Japanese firms who were interviewed. It has been also confirmed that a graduate of the LEP Program supported by this project recently has worked as a team reader at a Japanese firm in Malaysia. It is expected that more graduates of the LEP Program supported by this project will develop similarly in the future.

3.5.2 Sustainability of LEP supported by the Malaysian Government

1) Management Structure

The LEP Program has been implemented by the Malaysian government using its own budget since the end of the Project. According to JPA, the purposes and components of the Program with its four courses (graduate, undergraduate, technical education and Japanese language) are as same as those under the project. This is also true for the content of each course and the application conditions. On the other hand, however, the selection criteria have become stricter. Changes in the management structure of the LEP Program are as follows:

- In March 2008, the Division of Look East Policy, which was composed of 10 staff, closed down due to the restructure of JPA. Instead, an in-service training sector was put in charge of the graduate course and a pre-service training sector was put in charge of the undergraduate course (See figure 3). The number of staff currently in charge of the Program is eight in total. According to JPA, its restructure was in line with the decision that the Program focuse more on the graduate courses whose target was government staff.

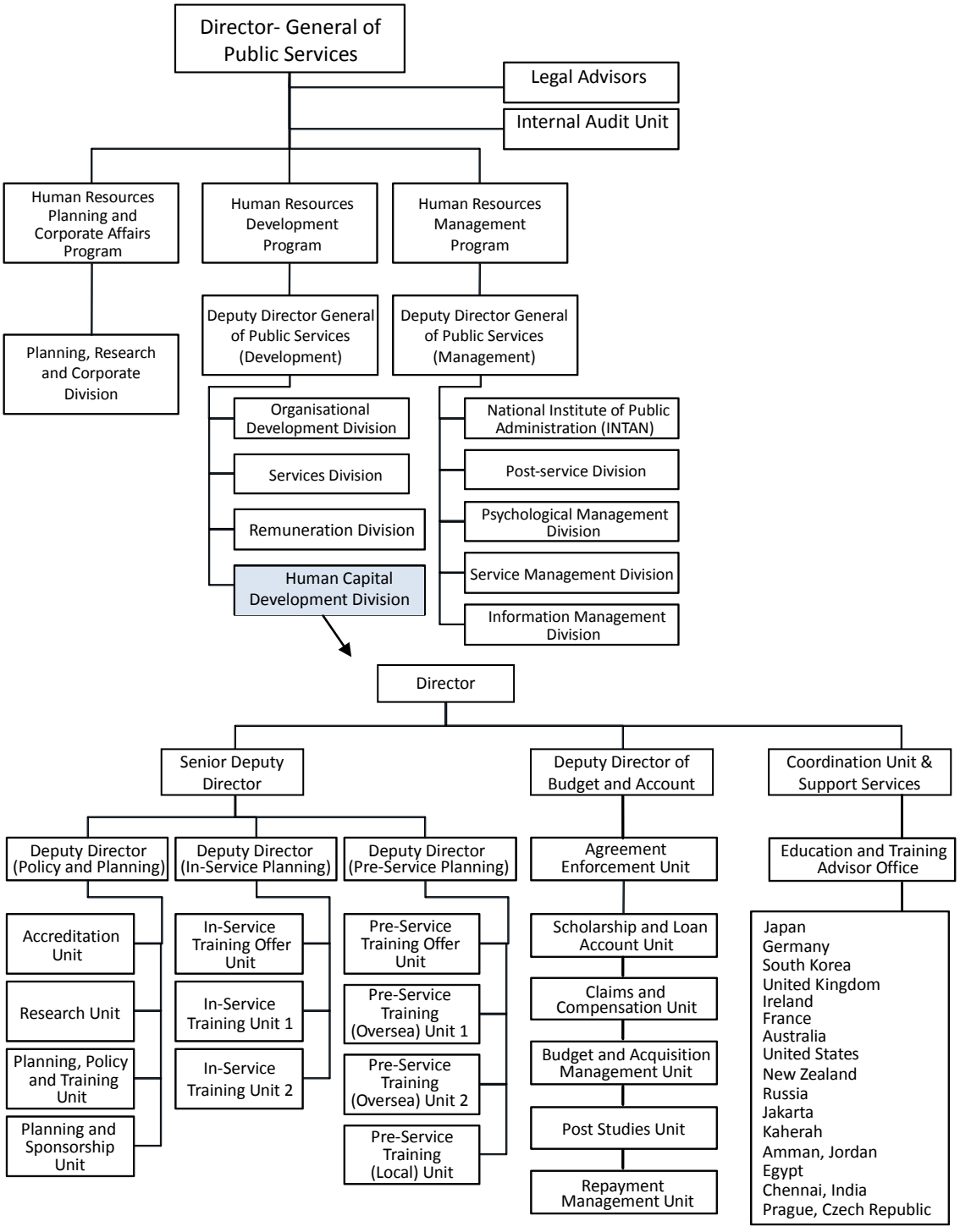
- Among the three institutions which were responsible for the preparatory study courses: the University of Malaya (Undergraduate course), the University of Technology of Malaysia (Technical education course), and the MARAUniversity of Technology (Japanese language course), the Mala University of Technology, originally in charge of the Japanese language course, is recently in charge of the technical education course. This change is due to the fact that there have been no applicants for the Japanese language course since the end of the project and that the technical education course placed within the University of Technology of Malaysia has been shifted to the MARA University of Technology.

- The Japanese language course has been implemented by the Ministry of Education since 2000. This change enabled the government to monitor the program more easily as most of the participants on the course are teachers.

2) Financial Sustainability

JPA has stated that as long as the Look East Policy is sustained, the necessary budget[11] to implement the LEP Program will be secured. Therefore, it is most likely that financial sustainability will remain for the time being.

[11] According to JPA, budget for LEP only cannot be clarified because budget allocated by the Ministry of Finance is the total budget for all study-abroad programs.



Source: JPA

Figure 3: Organizational Chart of JPA

3.5.3 Need for Study in Japan

According to the institutions in charge of the preparatory study course, the number of applicants to the LEP Program has declined since the end of the Project due to the increased number of applicants wishing to study in the Republic of Korea under the LEP Program and to

the influence of the earthquake which happened in northern Japan in March 2011. Because there have been no applicants to the Japanese language course since the end of the Project, it is obvious that the scale of the LEP Program has become smaller than it was before and during the implementation of the project.

In addition to these factors, other influences on the trends of study in Japan include[12]:

- The emergence of China as one of the target countries of the LEP Program (in addition to Japan and Republic of Korea) The first batch of students will be sent to China soon;

- Alternative study programs enabling Malaysian students to master global knowledge and skills in Malaysia, including MJIIT, the Malaysia-Indonesia-Thailand Student Mobility Program (started in 2010) and the Malaysia-China Student Mobility Program (started in 2012)[13].

Despite these changes, it is most likely that the need to study in Japan under the LEP Program will remain as the Ministry of Higher Education, as well as JPA, gives first priority to the LEP Program. JPA said that in order to ensure human resource development through the LEP Program, its focus will be on the graduate course. JPA predicted that whether or not the LEP Program can be sustained at the same scale as before will depend on the advance situation of Japanese firms in Malaysia, and accordingly, the demands of graduates of the LEP Program in Japanese firms in Malaysia. This is because those who complete the graduate course under the LEP Program are obliged to return to a government position but if no position becomes available within a year, they can work in the private sector.

Because there is no pr oblem in the management structure and financial support of the Malaysian government, the sustainability of the Project effects is high and the LEP Program can also continue to be implemented.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project was launched as a Yen Loan project. The purpose was to develop human resources able to use advanced technology and with Japanese work ethics by providing Malaysians with learning opportunities in Japan thereby, in turn, contributing to the industrialization of Malaysia. The Project was in response to the urgent need of the Malaysian government when economic crisis of 1997 presented the country with difficulties in continuing her "Look East Policy Program" undertaken since 1982. The relevance of the Project is high as the Project has been consistent with the development policies of Malaysia and with Japan's assistance policy to the country. The effectiveness and impact of the Project are satisfactory: among four courses under the LEP Program, the Project objectives were almost achieved for the Graduate course and the Japanese language course, aiming at capacity development for the government sector, while challenges remain for the Undergraduate course and the Technical education course which aim at capacity development for the private sector. Efficiency is satisfactory due to a combination of a lower project cost than planned, due to the less than expected number of student who completed for the Program, and the longer project period due to some students repeating the grade. The Look East Policy Program has been managed with more emphasis on the Graduate course since the end of this project, which suggests that the sustainability of the Project remains high.

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

[12] This information was shared in an interview with the Ministry of Higher Education/JPA

[13] A student studies in the program target country each semester. There is no problem with authorization as there is an agreement between the governments beforehand that credits obtained in the partner countries are counted as a credit required for graduation.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

1) JPA should manage the LEP Program more systematically, by extending its assistance to the whole process: the selection of students, preparatory studies in Malaysia, studying in Japan and support for graduates searching for a job. In particular, JPA is encouraged to:

a) support cooperation between ALEPS and Talent Corp to make the best use of graduates of the Program in the private sector,

b) share its list of graduates updated for the purpose of the ex-post evaluation with ALEPS to enable them to prepare/update lists in the future.

c) consider ways of disclosing information about graduates of the Program to firms which are interested in recruiting graduates of the LEP Program.

2) JPA should encourage ALEPS to consider the following so that it can make the best contribution possible to achieving the goals of the LEP Program:

a) considering preparing an ex-student list to enable members to build a human network useful for their business,

b) provide applicants for the LEP Program with opportunities to share the experiences of ex-students in collaboration with JPA and the Japanese Embassy in Malaysia. These opportunities will contribute not only in attracting potential applicants to the Program, but also in providing them with tips on how to be academically successful at Japanese universities,

c) strengthen PR activities to increase members and participants in its activities. As the first step, the purposes of the organization should be clarified and spelled out, together with the existing mission and the vision of the organization. The preparation of a business plan in line with its mission is recommended.

4.2.2 Recommendations to JICA

To increase sustainability of the project, consideration should be made of how to make the best use of graduates of the LEP Program as MJIIT faculty.

4.3 Lessons Learned

To increase the effectiveness of assistance in the area of higher education where the ultimate goal is economic and industrial development, the whole cycle should be the target of the assistance: that is, including the “selection of an area of study in the light of an chosen career path after the graduation”, “practice of internships in collaboration with the public sector” and “support for students in searching for a job searching seeking firms who are willing to receive graduates.” From this perspective, if the assistance includes consulting services, the service should cover the whole cycle.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	Total 1,407 students: a) Undergraduate: 422 students who were already in the Government-supported LEP Program and 640 new students b) Graduate: 100 new students (15 Master and 5 PhD in 5 batches) c) Technical Education: 259 students who were already in the Government-supported LEP Program d) Japanese Language: 6 students who were already in the Government-supported Program.	Total 1398 students a) Undergraduate: 961 (-101) b) Graduate: 80 (-20) c) Technical Education: 351*(+92) d) Japanese Language: 6 *Including additional batches: 105 students (Batches 18 and 19)
2. Project Period	April 1999 - March 2008 (108 months)	April 1999 - March 2009 (120 months)
3. Project Cost		
Amount paid in Foreign currency	14,026 million yen	12,015 million yen
Amount paid in Local currency	1,078 million yen (33 million RM)	Unknown*
Total	15,104 million yen	N/A
Japanese ODA loan portion	14,026 million yen	12,015 million yen
Exchange rate	1RM = 31.9 yen (As of November 1998)	

* Budget for LEP only is unknown because budget allocated by the Ministry of Finance is the total budget for all study-abroad programs.

Malaysia

Ex-Post Evaluation of Japanese ODA Loan Project
"Port Dickson Power Station Rehabilitation Project (2)"

External Evaluator: Mitsue Mishima, OPMAC Corporation

0. Summary

The Project aimed at stable electric power supply and a reduction in greenhouse gas by replacing the existing obsolete 360MW (Unit 5, 6 and 7) TNB thermal power plant with a highly efficient gas combined cycle thermal power plant in Port Dickson Power Station in the state of Negeri Sembilan. The Project required time for a re-examination of the needs of the project during its implementation due to a surplus in the reserve margin for generation capacity, which differed greatly from that predicted. Nevertheless, the needs for the Project still exist at present and the Project has been relevant to Malaysian and Japanese policies, therefore, the relevancy of the Project is high. A re-examination of the needs for the Project, however, became the main reason for the large delay in the project period, and thus the efficiency of the Project is fair. On the other hand, the operation status of the Project power generation facility has been excellent and the Project is considered to be managed most efficiently responding to the base load of power generation. Effects for improved environment were revealed in terms of reductions in CO_2 emission in comparison to the old power generation plants. The project also contributed to the stable power supply and to the avoidance of heavy dependence on one energy source. Thus, effectiveness and impact are high. In addition, sustainability is high in terms of organization and technical and financial capacity of TNB.

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

1. Project Description

Project Location

TNB Port Dickson Power Station
(Project target power plant)

1.1 Background

In 1990s, power demand in Peninsular Malaysia dramatically increased due to high economic growth and an increase in foreign companies investing in Malaysia. Peak demand increased 1.9 times and electricity sale more than doubled during 1992-1998. T hereafter, peak demand was expected to achieve to 12,000MW-14,000MW by year 2005, with a growth rate of about 5-7% per year, while the volume of electricity sales was estimated to increase to 70,000GWh-85,000GWh in the same year, with a growth rate 5-8% per year. Power system demand in Peninsular Malaysia is mainly concentrated in the Kuala Lumpur metropolitan area, in Putrajaya, southwest of Kuala Lumpur, and in areas subject to the Multimedia Super Corridor.

Power demand in these areas was expected to increase further. A mid expectations for investment in information related industries, there was great demand for a high quality power generation facility without the occurrence of power failures.

In 1998, the total capacity of power supply facilities in the Peninsula was 12,617MW, of which Tenaga Nasional Berhad (TNB), a Malaysian power utility, owned 62% with Independent Power Producers (IPP) owning the remaining 38%. Due to the influence of the currency crisis at that time, financing for IPP projects became very difficult and caused substantial delays in the project implementation. With this background, the government of Malaysia prioritized the development of TNB power sources.

1.2 Project Outline

The objective of this project is to demolish oil-fired power plant facilities which seriously deteriorated and became inefficient, and to replace them with highly efficient combined cycle gas turbine power generation facilities with low emissions of greenhouse gas at the TNB Port Dickson power station in the state of Negeri Sembilan, thereby contributing to stabilization of the power system and the diversification of energy sources in Peninsular Malaysia.

Prior to this project, the "Port Dickson Power Station Rehabilitation Project" (ODA loan agreement signed in March, 1999) had been implemented in order to demolish 240MW oil-fired power generation plants (No.1 to 4) and then to construct new 750MW gas combined cycle power plants. These power plants started to operate after June, 2005 (hereinafter referred to as "Phase 1 project"). This present project was also to demolish the remaining 360 MW gas and oil co-fired power generation plants (No.5 to7) and to construct 750 MW gas combined cycle power generation plants, which was the same output capacity as the Phase 1 project.

Loan Approved Amount/ Disbursed Amount	53,764 million yen / 48,984 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2000 / March, 2000
Terms and Conditions note)	Interest Rate: 1% Repayment Period: 40 years (Grace Period: 10 years) General Untied
Borrower / Executing Agency(ies)	Tenaga Nasional Berhad (TNB) / Guarantor: Government of Malaysia
Final Disbursement Date	March, 2010
Main Contractor (Over 1 billion yen)	Sumitomo Corporation (Japan) ・ Toshiba Corporation (Japan) ・ GE Power Systems Sdn. Bhd (GEPSM) (Malaysia) ・ General Electric Co. (United States of America) ・ General Electric Power Systems Inc. (GEPSI) (JV)
Main Consultant (Over 100 million yen)	Tokyo Electric Power Service Corporation (TEPSCO) (Japan)
Feasibility Studies, etc.	"Report to Economic Planning Unit The Federation of Malaysia: Engineering Services for Tuanku Jaafar Power Station Rehabilitation Project" TEPSCO, October, 1998
Related Projects	ODA Loan Project "Port Dickson Power Station Rehabilitation Project"

Note: The project is a Special ODA loan that usually sets the procurement condition of Japan Tied. However, as the project target country was Malaysia, which is classified as an upper-middle income country, the procurement condition was in general untied.

2. Outline of the Evaluation Study

2.1 External Evaluator

Mitsue Mishima, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2011 -August, 2012
Duration of the Field Study: October 20 - 27, 2011, March 5 - 9, 2012

2.3 Constraints during the Evaluation Study (if any)

No particular constraints

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

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance with the Development Plan of Malaysia

The Project was relevant to the Development Plan of Malaysia from the time of project appraisal to that of the ex-post evaluation. At the time of the ex-post evaluation, the promotion of power generation with less of an environmental burden and high efficiency plants is still important.

The policy objectives of the energy sector in the 7th five year plan (1996- 2000) were: (a) efficient use of energy, (b) diversification of energy sources, (c) minimization of environmental impacts. The Project was relevant to those objectives and its necessity was high. This was especially the case in the context of the diversification of energy sources. The "Four Fuel Diversification Policy", that is, avoiding heavy dependence on oil and dispersing into the four energy sources, natural gas, hydropower and coal, in addition to oil, was formulated, placing importance on the development and use of natural gas.

The 8th five year plan (2001-2005) subsequently addressed the promotion of gas and renewable energy as energy sources and improvements in the productivity and efficiency of the power supply. The 9th five year plan (2006-2010) placed importance on the reliability of the energy supply, cost effectiveness etc. The same policies were followed and the importance of environmental and social considerations has also been discussed in the current 10th five year plan (2011-2015) and the new energy policy (2011-2015). The Project is relevant to the main context of energy strategy in Malaysia because it is highly efficient and better in terms of cost-effectiveness, as well as in the reduction of negative environmental impacts, when compared to the obsolete thermal power generation plants.

After the 9th five year plan, it should be noted that coal-fired thermal power generation was emphasized in order to alleviate excessive emphasis on gas as a power generation energy source. After 2002, gas supply to the power sector was indicated as being 1,350 mmscfd[3]. As of November 2011, the actual gas supply volume was revealed to be 1,050 mmscfd and when it became 900 mmscfd and lower, the plant increased power generation by the use of DFO (Distillate Fuel Oil). Due to TNB, however, the gas supply has been again increasing during the fiscal year 2011 to 2012 and power generation by gas will be maintained at a certain level.

3.1.2 Relevance with the Development Needs of Malaysia

The Project was relevant to the development needs at the time of project appraisal and this is unchanged at present. The needs for the Project were, however, reconsidered when there was

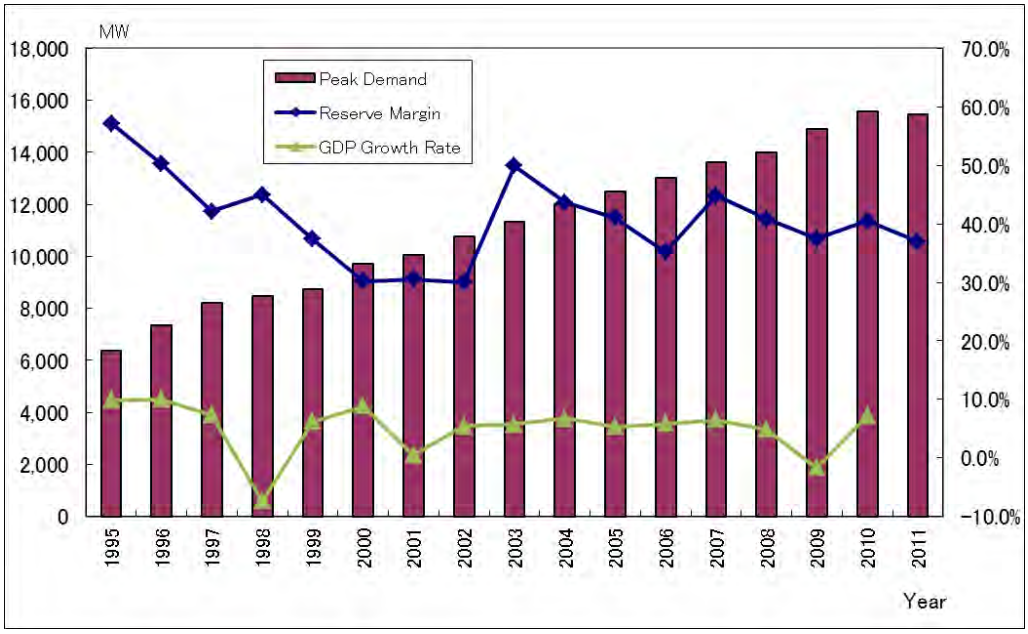
[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[2] ③: High, ② Fair, ① Low
[3] Abbreviation of "million standard cubic feet per day", a unit of gas flow volume.

a temporary surplus of reserve margins at the time of bidding by the contractor for civil works. As discussed later in "Efficiency", this was the reason for the significant delay in the commencement of civil work for the Project.

Upon project appraisal, while it was forecasted that the power demand would increase steadily, there was a delay and some uncertainty in the development plan for new power plants by IPP due to the currency crisis. Thus, the reserve margin of the power system was predicted to become lower than 30% in 2001, and then to be lower than 6% without the phase 1 project, or only 11% even with it, in 2004. It was foreseen that a stabilized power supply would be impossible, and thus reinforcement of the power supply facilities was required.

As shown in Figure 1, the actual reserve margin did not reduce to lower than 30%, in fact at one point it increased to about 50% in 2003, becoming 43% in 2004, and then remaining more or less at 40%. Peak demand has been increasing every year. The medium and long-term peak demand forecast at the time of project appraisal showed an approximate yearly average growth rate of 5 to 7%. The actual power demand increased by a yearly average of about 5% from 1999 to 2011, which was within the range of the forecast. Therefore, the main reason for the surplus of reserve margin at the time was a rapid increase in the power plant capacity of IPP. Because of this surplus of the reserve margin, after the deadline for bidding for the contractors for civil work in August 2002, the Malaysian government started examining whether or not the Project should continue, and time was required to reach a final decision. As a result, it took nearly 2 years from bidding to the contract.

At the time of ex-post evaluation, in the Tenth 5 Year Development Plan, GDP growth rate is predicted to be at a yearly average of 6% and an increase in the power demand is expected. Therefore, the necessity for the Project is clear.



Source: TNB data and Malaysia Statistic Office data.

Note: Peak Demand and reserve margin data provided by TNB is from September to August according to the TNB fiscal year. Therefore, the data for each year includes the time after September in the previous year and August in the said year. Real GDP growth rate is the calendar year.

Figure 1: Peak Demand, Reserve Margin, and GDP Growth Rate

3.1.3 Relevance with Japan's ODA Policy

The Project is considered to be relevant to the ODA policy for Malaysia at the time of project appraisal (Year 2000). Japanese Development Assistance for Malaysia by the Ministry

of Foreign Affairs (MOFA) in 1999 (Japanese ODA: ODA White Paper; the second volume) and Medium-Term Strategy for Overseas Economic Cooperation Operations (December, 1999) addressed the assistance policy for Malaysia, considering it is upper-middle income country requiring environmental protection, poverty eradication, rectification of the income gap, small and medium-size enterprise development, and human resource development. The Project contributed to environmental conservation through a reduction in the emission of CO_2 and dust by the rehabilitation of the obsolete thermal power plant. The ODA policy also placed importance on support for strengthening the base for production for recovery of the economy in the short term. The Project contributed to a strengthening of the base of production through a stabilized power supply.

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

3.2 Effectiveness (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Stabilized Power Supply

The ISO installed output of the Project power plant is 750 MW, while the tested annual available capacity (TAAC) is 694 MW under the environment of Malaysia which is affected by site conditions such as temperature and humidity. T he monthly maximum output has fluctuated from 694MW to approximately 730MW. As indicated in Table 1, the plant load factor and the availability factor have been about 80% or over, while the gross thermal efficiency has been more than 55%. The operation status of power plants has been excellent. Figure 2 shows that net electric energy production of the power station has been beyond the plan of the beginning of the fiscal year ever since its first commercial operation in January 2009

Photo 1: Panorama of TNB Port Dickson Power Station

The percentage of unplanned outage hours has been relatively small, at around 2-4%. The power station reports that unplanned outage hours by human error have been zero. There was no significant machine trouble, and thus the quantitative effect of the Project is high.

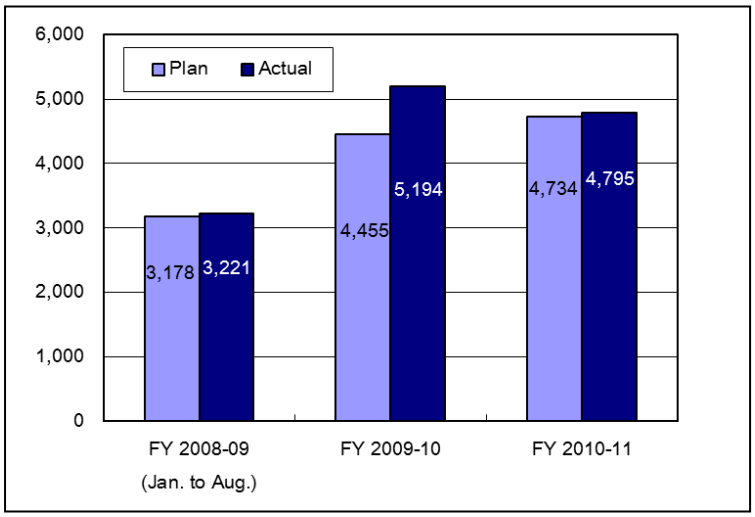
Table 1: Operation Performance of the Project Power Plant

Indicator	FY 2008-09	FY 2009-10	FY 2010-11
Plant Load Factor (%)	79.6	85.4	78.9
Availability Factor (%)	81.7	91.0	86.3
Auxiliary Power Ratio (%)	2.0	1.9	1.7
Gross Thermal Efficiency (%)	56.45	56.61	55.47
Percentage of Unplanned Outage Hours (%)	2.1	4.0	3.8

Source: TNB

Note: TNB's Fiscal Year is September to August. The plant load factor and the availability factor are calculated based on tested annual available capacity. The auxiliary power ratio is the percentage of electricity consumption of the power station to total electric energy production.

Unit: GWh



Source: TNB

Figure 2: Power Generation of the Project Power Plant

(2) Reduction of Greenhouse Gas Emission

The reduction effect of greenhouse gas (CO_2) was predicted to be 31.4% in comparison with existing gas-fired power plants, at the time of project appraisal. As a result of calculations based on the average figures of actual performance from 2009 t o 2011, greenhouse gas reduction was seen to be 37.7%, slightly beyond the predicted indicators. According to the TNB annual report in 2011, the CO_2 emission volume was 0.44 MT/MWh, the least among the thermal power stations of TNB.

3.2.2 Qualitative Effects

There was no particular qualitative effect as the main effect of the Project was quantitative. As in the evaluation of the Phase 1 pr oject, at the time of project appraisal, the expected qualitative effect was better view since the stack of the new power plant had become lower, in comparison to the one at the existing power plant. The Project power plant was constructed as planned and thus the same qualitative effect can be observed.

3.3 Impact

3.3.1 Intended Impacts

(1) Stabilization of the Power System in Peninsular Malaysia

The electricity supply volume in Peninsular Malaysia, which serves about 20 million people, was 95 thousand GWh when the Project power plant started to supply electricity. This decreased to 89 thousand GWh with the slowing down of economic growth in fiscal year 2009 -10, increasing again in 2010 - 11. As indicated in Table 2, out of the total electric power supply to Peninsular Malaysia, the share of the Project facilities was actually about 5% in 2010-11, while that of TNB Port Dickson Power Station was 10%. According to TNB, the Project Power Plant is in a position to be operated with the highest priority, even during night time, as the most efficient and reliable base load[4]. Therefore, the Project is evaluated to have contributed to the stabilization of power supply in Peninsular Malaysia to a certain level.

[4] Electric power supply is categorized as base, middle, and peak load. Base load indicates a minimum load of power source which is required during a certain period.

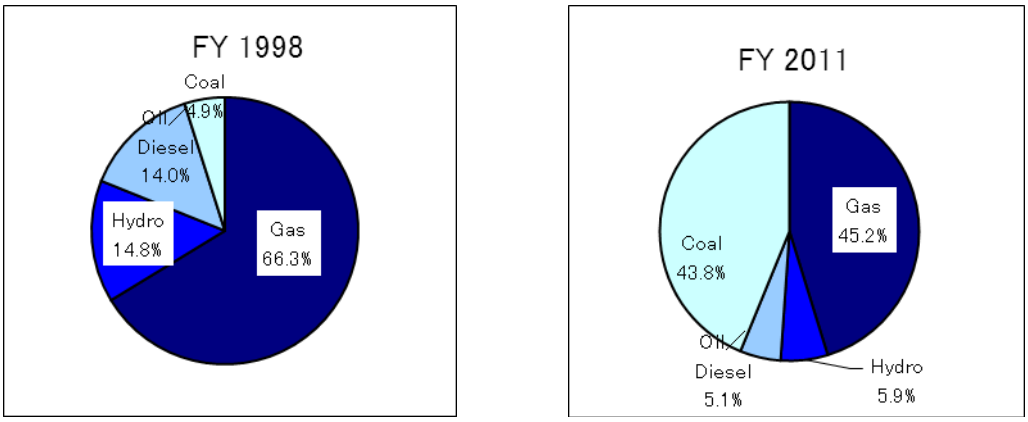
Table 2: Share of the TNB Port Dickson Power Station Electric Power Supply to the Total in Peninsular Malaysia

Indicators	FY 2007-08	FY 2008-09	FY 2009-10	FY 2010-11
Electricity Supply in the Peninsular Malaysia Power System (GWh)	82,214.80	95,331.57	89,910.80	98,112.92
Share of Electricity Supply of the TNB Port Dickson Power Station Within in the above (%)	6.3	5.8	9.7	10.0
Share of Electricity Supply of the Project Power Plant in the above (%)	-	0.04	3.6	5.3

Source: TNB

(2) Contribution to the Diversification of Energy Sources in the Peninsular Malaysia Power System

Examining the share of energy sources to the total in Peninsular Malaysia (plant capacity base), in fiscal year 2011, it can be seen that gas turbine or gas combined cycle accounted for 45.2%, while coal-fired thermal power accounted for 43.8%. While these were the main energy sources, others were oil and hydro power (Figure 3). Compared to the situation in 1998, the share of oil-fired thermal power had decreased and that of gas-fired thermal power generation had also decreased in total.



Source: TNB

Figure 3: Share of Plant Capacity by Energy Source in the Peninsular Malaysia Power System

Under these circumstances, the power generation volume by gas has been sustained at more than 20 thousand GWh for the last 5 years, with the contribution of power generation by the TNB Port Dickson Power Station. As a result of this contribution, in the fiscal year 2009, out of the total gas-fired power generation of TNB, the Project contributed 22 %, while the total power generation of TNB Port Dickson Power Station accounted for 45% of the total.

In Malaysia, while not relying on one source of energy, but at the same time promoting coal-fired thermal power generation, gas-fired power generation has been sustained to some extent, with the consideration of its environmental impact. Gas causes less of an environmental burden with lower emissions of CO_2 dust etc. The Project has contributed to sustaining more highly efficient gas-fired power generation through the replacement of existing oil and gas-fired power generation plants. In this sense, the Project has contributed to the diversification of energy.

3.3.2 Other Impacts

(1) Impacts on the natural environment

The demolished power plant was given over to the contractor, and was recycled of or disposed of appropriately. As far as impact after the beginning of operation of the Project facilities is concerned, the officer in charge of environmental monitoring was interviewed and an examination made of the monitoring reports submitted periodically to the Department of Environment (DOE) of the Negeri Sembilan State government. Results of ambient air monitoring which was conducted by a sampling method in the power station three times during the year prior to this ex-post evaluation study shows that TSP (Total Suspended Particles), PM10 (Particulate Matter equal and less than 10μm) NO_2 and SO_2 have remained under the standard indicators (refer to Table 3). As for the monitoring data submitted by the power station, there is no record that the DOE of Negeri Sembilan State have found this figure to be a problem. Neither has any problem been observed in the annual water quality monitoring data. Thus it can be judged that there has been no serious negative impact caused by the power station at the present time.

Table 3: Results of Ambient Air Monitoring (August 2010, February and May, 2011)

Item	Pollutant	Standard [1)]	Observation Result
Ambient Air Monitoring [2)]	TSP (Total Supended Particles)	260 μg/m^3 (24 hours)	≤22
	PM_{10} (Particulate Matter 10)	150 μg/m^3 (24 hours)	≤19
	NO_2	0.075 ppm (24 Hour)	<0.02 (ppm)
	SO_2	0.04 ppm (24 Hour)	<0.02 (ppm)

Source: Data provided by TNB Port Dickson Power Station
Note 1: Standard referred to in Malaysia
Note 2: Results of monitoring in three locations near to the oil tank, the administration building, and the area between PD gate and Seremban gate within the Power Station

(2) Land Acquisition and Resettlement

The Project has utilized land within the existing power station and there has been no new land acquisition. Thus, there has been no resettlement of residents.

This project has largely achieved its objectives, therefore its effectiveness and impact are high.

3.4 Efficiency (Rating:②)

3.4.1 Project Outputs

Outputs of the Project were the demolition of the existing 360MW (Unit No.5, 6 and 7) power plant and the construction of 750 MW gas combined cycle power generation facilities. These were implemented almost as planned. Changes in comparison to the original plan, were the shift in location from the area near to the fuel tank to the north of the phase 1 project site, and the addition of new constructions for the storage of waste and spare parts. There was also the addition of spare gas turbine parts and an extension of the CW intake channel. All these were deemed as appropriate revisions in accordance with necessity.



Photo 2: From the left, gas turbine, steam turbine generator and transmission facilities

3.4.2 Project Inputs

3.4.2.1 Project Cost

The project cost was lower than planned, at 90% of the plan. This was an actual total cost of 60,762 million yen (of which the ODA loan was 48,984 million yen) in comparison to 67,864 million yen (of which the ODA loan was 53,764 million yen) at the time of appraisal. While there had been additional construction costs caused by the change in project site, the main reason for the 10% or so cost reduction was that the estimated tax and tariffs at appraisal time on the Malaysian side were reduced by about 5 billion yen. Furthermore, the cost for demolition of the existing facilities, 969 million yen, was offset with the revenue gained from selling those facilities and thus no expenditure was necessary for this portion.

3.4.2.2 Project Period

The planned period was 63 months from the loan agreement to the end of warranty period of the power plant facility. The period, however, was significantly longer than planned, at 118 months, 187 % of the planned period. Accordingly, the loan implementation period of the Project was extended twice. Comparing the planned and actual period as in Figure 4, while there was a delay at each phase from the preparation period for the bidding, the most significant delay was caused by the postponement of project implementation by the Malaysian side due to the need to examine the Project needs because of the high reserve margin. In the end, the civil work contract agreement was signed around the end of 2004, about two years after the deadline for its proposal.

The demolition of the existing power generation facility was initiated after the civil work contract agreement was expected to be signed. Since the new power plant was to be constructed on the same site as the old power plant, the start of civil works was postponed for seven months, not commencing just after the loan agreement. The project period for the civil works was also extended to 39 months from 32 months due to the change of the Project site. Regarding this point, however, a TNB officer in charge of the construction work reported that although there was a large delay in the completion of the Project, the contractor made efforts to minimize the delay in the project period, and managed to coordinate the implementation of works which could be carried out earlier than scheduled. Without these efforts, the project period would have been extended even further.

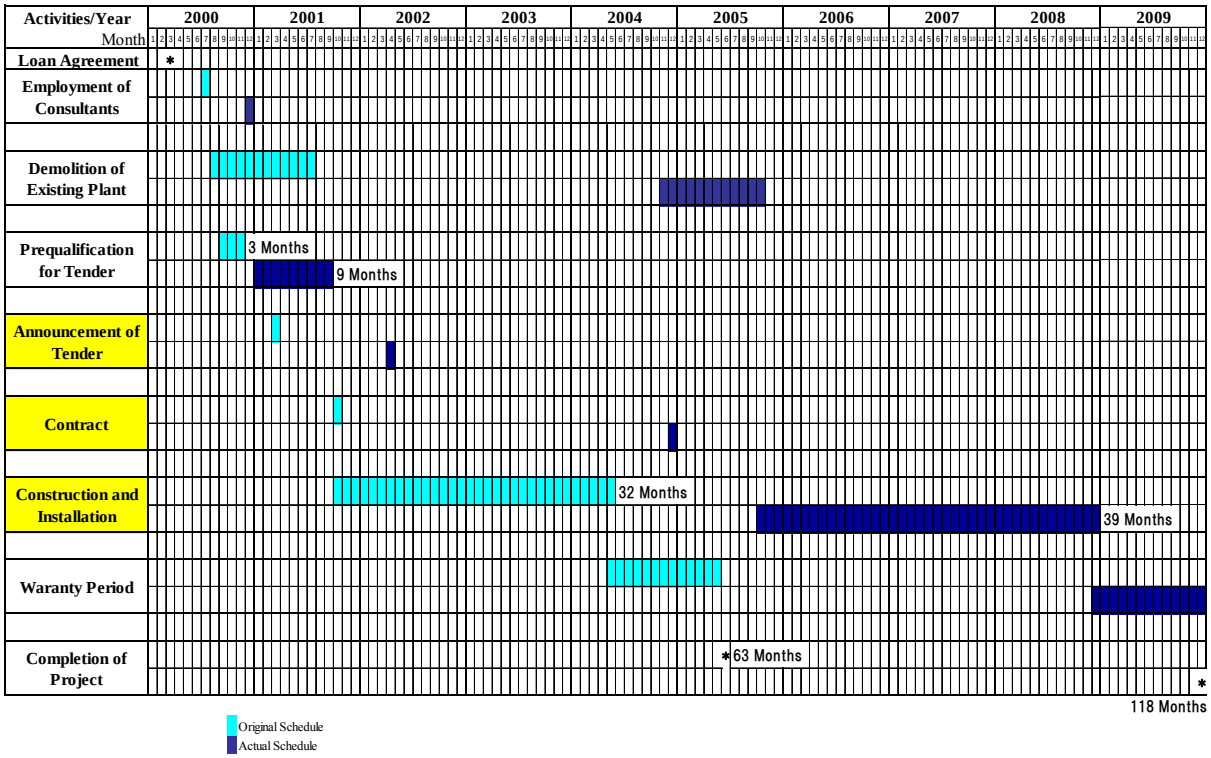


Figure 4: Comparison of the Planned and Actual Project Period

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

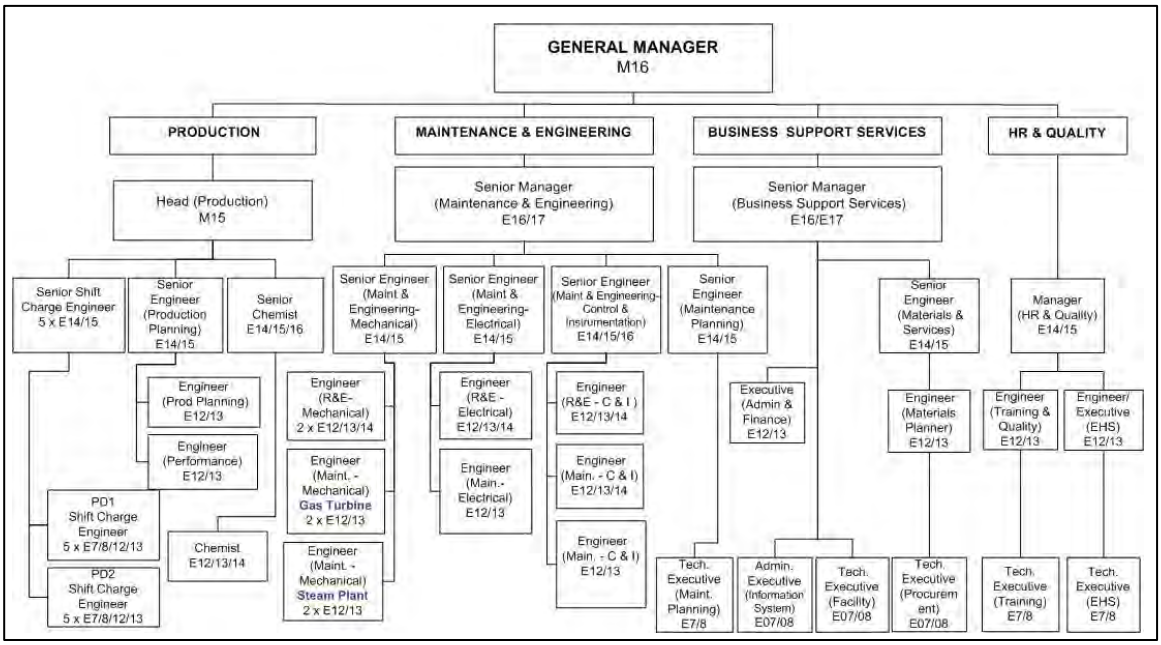
At the time of project appraisal, the economic internal rate of return (EIRR) was not calculated. However, the financial internal rate of return (FIRR) was calculated, and thus the FIRR was recalculated for the same items. The FIRR at the time of the project appraisal was estimated at 9.01%. The result of calculations based on actual figures was an estimated 12.03%, which was more than the original estimation. The reason for this is that in comparison to the estimated basis, there have been more electricity sales due to higher gross thermal efficiency, more electric power production, and less transmission and distribution loss.

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

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

The Port Dickson Power Station of TNB is directly in charge of the operation and maintenance of the Project facility. An organization chart for the Power Station is shown in Figure 5. As of October 2011, the total number of personnel was 185. There were four departments: Production, Maintenance & Engineering, Business Support Services, and Human Resources and Quality. Among these departments, those staff who are involved in operation and maintenance of the project facility include 35 personnel in the Production Department (of which 10 are engineers) and 58 personnel in the Maintenance Department (of which 17 are engineers). In total nearly 100 personnel are assigned to these departments. Daily inspections are the duty of the Maintenance and Engineering Department, and it is in this was that the organizational structure for operation and maintenance is established. Periodical maintenance such as overhauls is implemented under contracts with a subsidiary company of TNB, TNB Repair and Maintenance Sdn. Bhd: REMACO).



Source: Document provided by TNB Port Dickson Power Station

Figure 5: Organization Chart of Power Dickson Power Station

3.5.2 Technical Aspects of Operation and Maintenance

Officers trained by the contractor conduct operation and maintenance and manuals are available. As with the evaluation for the Phase 1 project, technical training for officers in the power station has been implemented according to job position every year. Periodical training has also been conducted, such as technical training for new officers in charge of maintenance and refreshers' training for experienced technicians and engineers. Other training also takes place, such as system operation training by on the job training (OJT).

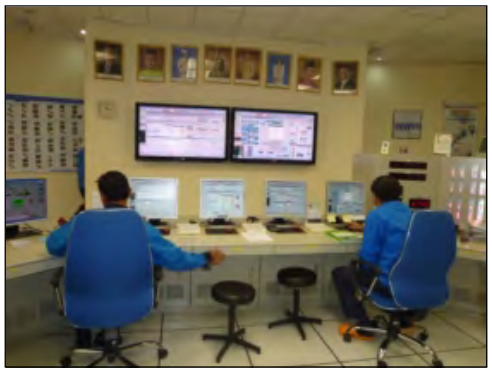


Photo 3: Control Room

The annual operation plan (maintenance and overhaul) has been implemented almost as planned. Preventive maintenance (PM) and corrective maintenance (CM) have been conducted, making efforts to prevent disorder and troubles.

TNB evaluates the performance of power station staff by key-performance indicators. Through evaluation at both power station and individual levels for technical capacity, it is envisaged that consciousness of problems will be enhanced, followed by the promotion of improvements in performance. REMACO, which is in charge of overhaul, is an organization established in 1979 and has much experience in the O&M of not only domestic, but also overseas power plants, in countries such as Indonesia, Pakistan, and Saudi Arabia. No problem was observed in the technical capacity of personnel. Technical capacity transferred through the Project is considered to be sustainable.

3.5.3 Financial Aspects of Operation and Maintenance

It was confirmed that the necessary operation and maintenance costs for the TNB Port Dickson Power Station had been allocated as planned every year. In the financial statement of TNB as a whole (excluding subsidiary companies), revenue has shown an increasing trend for the last four years and a certain level of operational profit had been sustained. In the fiscal year

2010-11, however, expenditure increased due to rising fuel costs and this resulted in a decrease in operational profit and profit before tax.

The gas supply for the TNB Port Dickson Power Station has been assured by the Malaysian Oil and Gas Company of Malaysia (PETRONAS) based on agreement. However, since the Power Station increased its use of DFO during fiscal year 2010 - 11, due to the reduction in the gas supply in recent years, then the O&M costs for the power station have increased. In the fiscal year 2009 -10 the operation cost of TNB Port Dickson Power Station itself was within the electricity sales revenue but in the fiscal year 2010 -11 the cost for TNB Port Dickson Power Station surpassed the electricity sales revenue.

However, according to the Power Station, their gas supply volume for the fiscal year 2011 - 12 has already increased again, assuring 1,050mmscfd and more. As a countermeasure for a shortage of gas to the power station, it is expected that the gas supply will be increased with the construction of the LNG import terminal and regasification system in Melaka State by PETRONAS, starting operation in 2012, and also the development of a new gas field off the west coast of Sabah state.

In terms of gas price, the Energy Commission of the Malaysian government have shown an intention to gradually decrease the subsidy for gas gradually in the long term; therefore, it can be predicted that gas prices will increase. It is difficult to forecast that how the fluctuation of fuel prices might affect to the operation of the power station. However, fuel prices are managed by the headquarters of TNB and at present there is no issue which could significantly affect the operation and maintenance of the Project in the short term.

Table 4: Main Financial Indicators of TNB

Unit: Million RM

Items	FY 2007-08	FY 2008-09	FY 2009-10	FY 2010-11
(1)Revenue	23,069.2	26,743.6	28,362.3	30,157.1
(2)Other Operating Income	1,187.4	590.7	350.5	752.9
(3)Finance Income	301.0	308.3	356.6	404.6
(4)Operating Expeses	-20,631.4	-24,250.5	-25,416.7	-30,110
Depreciation in the above	-2,595.2	-2,899.4	-3,301.1	-3,395.0
(5)Finance Cost	-811.1	-822.5	-757.6	-594.2
(6)Foreign Exchange gain/loss	-11.1	-882.9	606.9	-208.7
Operating Profit	3,625.2	3,083.8	3,296.1	800.4
Profit / Loss before Taxiation	3,104.0	1,686.7	3,502.0	402.1
Profit for the Financial Year	2,663.6	1,070.7	2,703.6	418.6

Source: TNB Annual Report 2008, 2009, 2010, 2011.
Note: Revenue is from electricity sales and goods & services.

3.5.4 Current Status of Operation and Maintenance

According to the field survey on the power station, the current state of the facilities is good. There was a requirement for the replacement of parts in the steam turbine, but the parts had already be procured and the changes were planned at the time of the periodic inspection. As evaluated at the time of the Phase 1 project, the storage of spare parts is well managed and the operation and maintenance of the project facility is excellent. Daily maintenance, checked items and frequency, was conducted according to the plan, and overhaul is conducted every 24,000 operation hours for gas turbines and every 3 years for steam turbines. .

Photo 4: Storage of Spare Parts

It should be noted that the TNB Port Dickson Power Station, as the most efficient power generation plant in Malaysia, has received many visitors both from inside the country and also from overseas (such as from neighboring countries in Asia). There were 892 visitors in 2009,

1,299 in 2010, and 488 in 2011, more than 1,000 visitors depending on the year.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project aimed at stable electric power supply and reduction in greenhouse gas by replacing the existing obsolete 360MW thermal power plant with a highly efficient combined cycle gas turbine power plant in Port Dickson Power Station in the state of Negeri Sembilan. The Project required time for a re-examination of the needs of the project during its implementation due to a surplus in the reserve margin for generation capacity, which differed greatly from that predicted. Nevertheless, the needs for the Project still exist at present and the Project has been relevant to Malaysian and Japanese policies, therefore, the relevancy of the Project is high. A re-examination of the needs for the Project, however, became the main reason for the large delay in the project period, and thus the efficiency of the Project is fair. On the other hand, the operation status of the Project power generation facility has been excellent and the Project is considered to be managed most efficiently responding to the base load of power generation. Effects for improved environment were revealed in terms of reductions in CO_2 emission in comparison to the old power generation plants. The project also contributed to the stable power supply and to the avoidance of heavy dependence on one energy source. Thus, effectiveness and impact are high. In addition, sustainability is high in terms of organization and technical and financial capacity of TNB.

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

(1) Considerations for Power Demand and Supply Forecast

The Project was delayed by the Malaysian government for two years at the point of evaluation on contractor bidding for the civil work, as it was expected that there would be a surplus in power generation capacity. This was the main reason for the significant extension of the project period. At the same time, this also meant additional coordination work for JICA, the executing agency, and the bidder companies. Generation capacity for the project was forecasted on the premise that implementation of the IPP project would not be in prospect due to large delays in progress. Thus, a very low reserve margin was predicted. However, in fact, there was a surplus which was a deviation from the predicted indicator. There was only one year difference in project appraisal between Phase 1 and the Project, there were almost no revisions in the forecast of generation capacity. Nevertheless, there is a high possibility of delay in the preparation of bidding documents, as in the case of the Project, but during such a delay, the situation may change.

In case of a country which promotes IPP, it is important to follow updates on progress constantly and to forecast total plant capacity more realistically. This should include how the implementation of IPP progresses and to show clearly the position and significance of the

Project in the power development plan from the view point of the long-term power demand. This should be fully agreed with the aid recipient country before the project and it is critical that in the future, in similar countries power sector projects are designed with ODA.

(2) Demonstration of the Technical Capacity of Japanese Companies

The TNB Port Dickson Power Station, the target of the Project, has become a model of efficiency and has a received many visitors from inside and outside the country. The construction of two power generation blocks in the power station was supported by Japanese ODA,,and Japanese companies employed Japanese technology on the Project. It can be thus said that this was a demonstration of the highly efficient thermal power technology of Japan. In addition, TNB recognized that the consultant and contractor in charge made efforts in schedule management to complete the Project as soon as possible. In this sense, support for the power station of the Project is significant as an example of Japanese assistance.

On the formation of ODA loan projects in upper-middle countries which are noted as a model for neighboring countries, it is better to select a project or to design the project's contents bearing in mind the side effect that an "extensive demonstration effect can be expected, in the case of introducing advanced technology by Japanese enterprises in power stations, which have an important position within the country".

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	(1) Demolition of existing power plant (360MW: 120MW X 3) (2) 750MW class Gas Combined Cycle Power Plant: Power Generation Plant: Gas turbine 2, Heat Recovery Steam Generator 2, Steam Turbine 1 and accessories Civil Work: Site preparation, Foundation work, Replacement of the road, Drainage work, etc. Construction Work: Main Power house building, Auxiliary building etc. (3) Transmission and Substation facilities Construction of New Transmission Line (Power Station- Olak Lempit Substation, 275kV, 2 lines, Total 70km), Olak Lempit Substation, two additional 275kV Outlet Lines) (4)Consulting Service Basic Studies and Detailed Design, Project Management, Construction Supervision, etc.	(1) As planned (2) As planned (3) As planned (some additional work due to project site change and changes in design details, etc) (4) As planed
2. Project Period	March, 2000 - May, 2005 (63 months)	March, 2000 - December, 2009 (118 months)
3. Project Cost		
Amount paid in Foreign currency	40,641 million yen	33,419 million yen
Amount paid in Local currency	27,223million yen (861 million RM)	27,344 million yen (905 million RM)
Total	67,864 million yen	60,762 million yen
Japanese ODA loan portion	53,764 million yen	48,984 million yen
Exchange rate	1 RM= 31.6 yen (As of August, 1999)	1RM = 30.2 yen (Average between January, 2001 and December, 2010)

Malaysia

Ex-Post Evaluation of Japanese ODA Loan
"Beris Dam Project"

External Evaluator: Mitsue Mishima, OPMAC Corporation

0. Summary

The project objective was to ensure a stable domestic, industrial and irrigation water supply where the water balance is tightening in the Muda river basin in Kedah and Penang State, at the Beris Dam upstream of the Muda River, Kedah State, North Malaysia. The relevance of the Project is high as it is consistent with the development policy and needs of Malaysia, and also in the context of Japanese ODA policy. In terms of effectiveness and the impact of the Project, these are high from the point of view of the stabilization of the water supply for domestic, industrial and irrigation use, particularly in response to the increasing demand for water in Penang. The efficiency of the project is high as both project cost and period were within the plan. Sustainability is also high with the evidence of a favorable condition for the structural, technical and financial aspects of operation and the current operation status.

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

1. Project Description

Project Location

Beris Dam (Main dam)

1.1 Background

In order to meet the increasing demand for domestic, industrial, and agricultural water in the country, the Malaysian Government has for some time made efforts for water resource development and management in several river basins, focusing on the balance of demand and supply. In 1995, when the Sixth 5 Year Development Plan ended, although 72 dams, with a total capacity of 25 billion m^3, were in operation in the country and more 3 d ams were under construction, there were still problems with limited water pressure and water shortages. This was especially the case, depending on the region, in the dry season as the supply volume did not meet the rapidly increasing water demand caused by population growth and industrial development.

In this situation, JICA conducted several water development studies including the "Malaysia National Water Resource Development Study (NERS)". The "Perlis-Keda-Prau-Pinang Area Water Resource Development Plan Survey" that ended year 1993 examined the water demand forecast and the comprehensive water management for integrating the water flows of rivers in the Perlis, Keda, and Muda river basin, targeting the

regions where a tightened balance in water resources had been observed (i.e., Perilis, Keda, and Prau Pinnang). After this, with the focus on the Muda river basin, the "Comprehensive Management Plan for Muda River Basin" was conducted in 1995. This survey examined the construction of Beris dam in the upper stream of the Muda river water system and the Jeniang transfer system (weir, Naok dam, transfer water conduit, Reman dam) in the middle of the Muda river, which supplies water to Keda river (refer the location to Figure1).

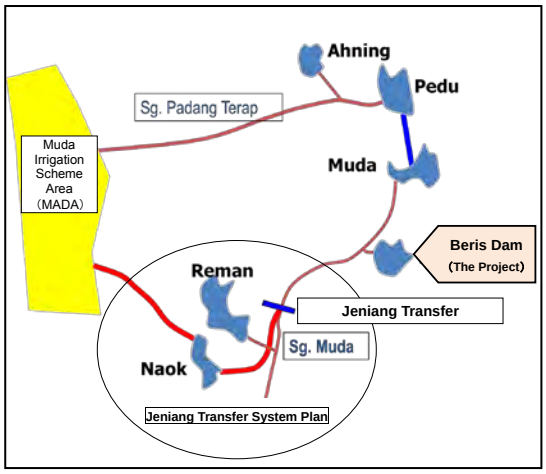


Figure 1: Beris Dam and Jeniang Transfer System

Water demand in the Muda river basin was for the purpose of irrigation, and for domestic and industrial water. The beneficiary area for irrigation water was the irrigation project area of the Muda Agricultural Development Authority (MADA) in Perlis and Kedah state, and also the Seberang Prai irrigation area in Penang State. For Domestic and industrial water, the beneficiary area was the Muda river basin in Kedah and Penang States. Penang State is the economic center of the northern part of Malaysia. A mixed economy of agriculture, industry, commerce, and tourism, together with international high technology industries such as computer-related industries is a feature of this area. At the time of the project appraisal, in Penang state, where the main water source is the Muda River, there was a shortage of domestic and industrial water due to an increase in population and rapid industrial development from 1980 to 1995. A serious water shortage occurred particularly during the dry season. In order to cope with the water shortage in Penang State, it was necessary to secure a source of water, and the construction of Beris dam was part of the dam and transfer system in a comprehensive management of the Muda river basin.

1.2 Project Outline

The objective of the project is to stabilize the water supply for urban life and irrigation in order to alleviate the water shortage by constructing a dam on the Beris River, a tributary of the Muda River in Kedah State, thereby contributing to stable living conditions and regional economic development in the Project area.

Loan Approved Amount/ Disbursed Amount	9,737 million yen / 8,578 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 1999 / March, 1999
Terms and Conditions	Civil Work : Interest Rate: 1.7%, Repayment Period: 25 years (Grace Period: 7 years) Consulting Service: Interest Rate: 0.75%, Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency(ies)	Government of Malaysia / Department of Irrigation and Drainage Malaysia (DID), Kedah State Economic Planning Unit (UPEN)
Final Disbursement Date	March, 2009

Main Contractor (Over 1 billion yen)	Shimizu Corporation (Japan) / Muhibbah Engineering Bhd.(Malaysia) / Trans Resources Corporation Sdn. Bhd. (Malaysia)
Main Consultant (Over 100 million yen)	CTI Engineering International CO.,Ltd. (Japan) / Wan Mohamed & Khoo Sdn. Bhd. (Malaysia) /Associated Consulting Engineers – ACE (Pvt.) Ltd.(Pakistan)
Feasibility Studies, etc.	・"National Water Resources Study: Malaysia" (NERS)" (JICA、1979-1982) ・"National Water Resources Study, Malaysia Perlis-Kedah-Pulau Pinang regional water resources study(PKP Study)Part 1and 2 (JICA, 1982-1985 Development Study, Beris Dam F/S) ・Detailed Design for Beris Dam (D/D) (Messrs. Wan Mohamed & Khoo Sdn Bhd, Associated Consulting Engineers (ACE), 1994) ・Comprehensive Management Plan of Muda River Basin (JICA 1995, Development Study)
Related Projects	-

2. Outline of the Evaluation Study

2.1 External Evaluator

Mitsue Mishima, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2011 -August, 2012
Duration of the Field Study: October 10 to 19, 2011 - March 5 to 9, 2012

2.3 Constraints during the Evaluation Study

For evaluation of the Project, the target operation indicator and predicted effect indicator for Beris dam only at the project appraisal were not confirmed for a simple comparison and therefore a comparative analysis of the planned and actual operation indicators could not be conducted. Accordingly, for Project evaluation, effectiveness was evaluated on the basis of actual dam operation and water intake data from the Muda River and also using an analysis of qualitative information from interviews with institutions use water from the Muda River.

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

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance with the Development Plan of Malaysia

The Project was consistent with Malaysian government policy at the time of the project appraisal, which promoted the development of water sources for increases in water supply in areas with a water shortage. The project was also consistent with that described in the 10th Five Year Development Plan, and since the construction of Beris Dam, Penang State has realized rapid economic development. Furthermore, continuing development is envisaged and therefore it has been critical in securing a water source in Penang State.

At the project appraisal, water shortages were observed in various regions in Malaysia. In Kedah and Penang State in the northern part of the country where water demand and supply was tight, water shortages were anticipated after the year 2000. Under the 7th Five Year Plan (1995-2000), water source development for the long-term was emphasized in areas facing possible water shortages, together with efficient water management.

The current 10th Five Year Plan (2011-2015) states the necessity for promoting strategies for water resource management in the long-term under the premise of accelerated economic development in the future. There is still regional unbalance in water demand and supply although potential water resources in Malaysia are rich.

3.1.2 Relevance with the Development Needs of Malaysia

At the time of the project appraisal, there was water shortage in urban areas in Penang State in the northern part of Malaysia where the population had increased from 910 thousand in 1980 to 1.23 million in 1995 and where there had been rapid industrial development. The urban water demand was predicted to increase from then by 1.8 times, from 166 million m^3/year in 1995 to 300 million m^3/year in 2010. The amount of water supplied by the Kedah river system to Penang state reached a limit 64%, but at the same time, the amount supplied by the Muda river water system was 14%, a relatively small figure. Thus an increase in water use from the Muda river water system was required. The water supply to Penang state depends on the Muda River for 70% of its total, and therefore securing water from the Muda River has been very critical. There was therefore a strong need for the Beris dam in terms of its role in supplying water to meet the future domestic and industrial water demand in the Muda river basin, particularly in Penang State.

At the time of the ex-post evaluation, Penang state still depended on the Muda River as a water source for irrigation water, and for domestic and industrial water. Also, the Beris dam has important role in providing a sufficient amount of water from the Muda River. The most recent water resource study for the northern part of Peninsular Malaysia is the "Integrated Water Resources Study for the Northern Region of Peninsular Malaysia" (August, 2009). This study estimates the water demand for 40 years from 2010 to 2050 in Penang and Kedah states. Domestic and industrial water demand will maintain an increasing trend. In Penang state, water demand will increase by nearly two times, from 925 million liters/day in 2010 to 1,763 million liters/day in 2050. In Kedah, water demand will increase by 2.5 times from 1,130 million liters/day in 2010 to 2,799 million liters/day. In this situation, the Project remains important for the urban water supply and a stable industrial supply downstream. On the other hand, the water demand forecast for irrigation water is on a slightly decreasing trend: an 18 % reduction in Penang state and 6% in Kedah state should be seen between 2010 and 2050.

As for the Jeniang transfer system which is related to the Project, according to the Ministry of Agriculture, detailed design (D/D) for the system was already implemented. However, project budget had not been secured at the time of evaluation (March 2010) and construction had not yet started.

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

[2] ③: High, ②: Fair, ①: Low

3.1.3 Relevance with Japan's ODA Policy

In its development assistance policy for Malaysia under the Ministry of Foreign Affairs (ODA white paper, second volume in 1999) and through Medium-Term Strategy for Overseas Economic Cooperation Operations (December, 1999), the ODA policy of Japan towards Malaysia is for the support of environment protection, poverty eradication, rectification of the income gap, and for the support of human resources and small and medium enterprises. This takes into consideration the position of Malaysia as an upper middle-income country in the international society. This policy emphasizes support for strengthening the production infrastructure for immediate economic recovery in the short-tem. The Project was relevant to this policy as it contributes to strengthening of the production base in terms of a stabilized urban water supply where there were water shortages.

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

3.2 Effectiveness (Rating: ③)

Although evaluation on the effectiveness of the Project suffered from the constraints stated in 2.3, this evaluation study examined the hypothesis that it could be considered that the Project had achieved its objective of securing a stabilized water supply for urban areas and irrigation, if it was proved that dam operation had been favorable and the water intake capacity had increased at the intake pumps station on the lower Muda River, then urban and irrigation water had been supplied stably in response to the demand in each area.

As quantitative effects, this evaluation study confirmed (1) data for dam operation (total volume of water reservoirs, changes in water level, the actual amount of water release[3]) and then analyzed (2) the capacity change of each intake pump station on the Muda River and the actual volume of water taken before and after dam construction.

Since data for (2) from before dam construction could not be confirmed properly, in order to reveal more clearly the stabilization of the water intake and the alleviation of water shortages, this study collected information from organizations in charge of water intake from the Muda River, with regard to changes in the conditions before and after Beris Dam construction and to the effects of dam operation. The results of the qualitative analysis based on this information were carefully taken into account in order to evaluate the project effectiveness and impacts as follows.

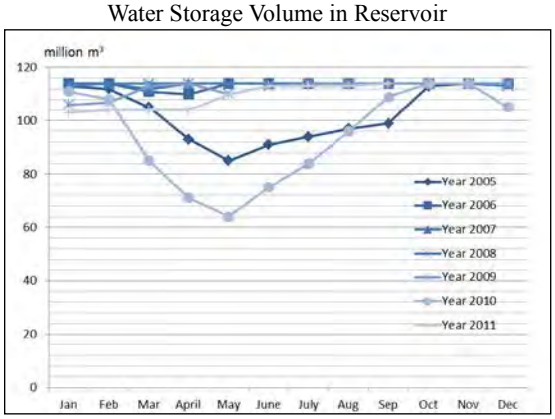
3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Actual Data of Dam Operation

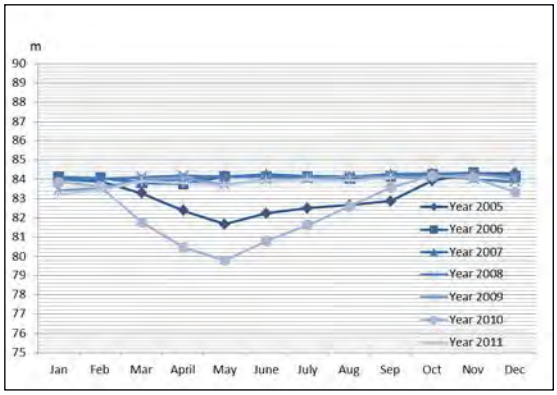
The total water storage volume in the reservoir of Beris Dam is shown as a monthly average in Figure 2. It was low between March and July in 2005 (when dam operation started) and in 2010, almost half in some months compared to the planned indicator of effective water reserve capacity, which is 114 million m^3, and to water level, which on average is 84 meters. This may have been caused by considerable shortages of rain in the dry season of those years.

[3] The data of water inflow to the dam was requested; however, the executing agency answered that there was no such data.

Water Storage Volume in Reservoir



Water Level



Source: Beris Dam Administration Office

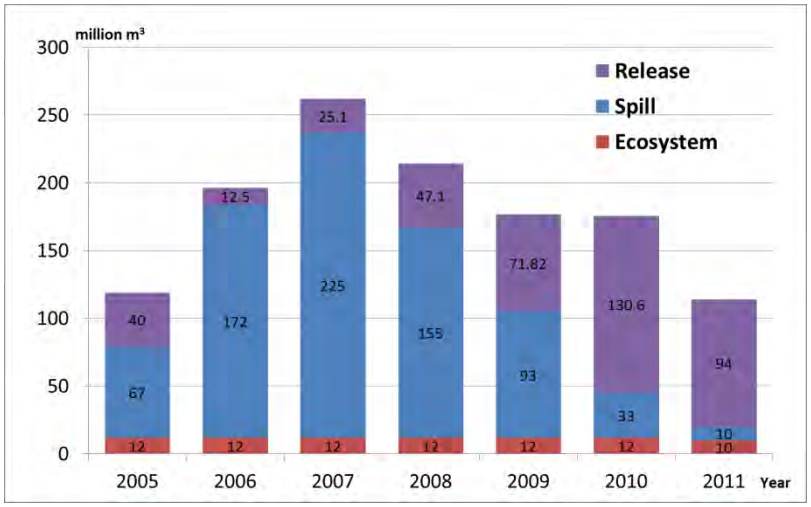
Figure 2: Beris Dam Water Storage Volume in Reservoir and Water Level
(2005 to October, 2011, Monthly Average)

Picture 1: Spillway and Water Release Canal

Figure 3 shows the annual amount of water release by spillway (facility to discharge excessive water when the water amount in the reservoir is above a certain level), release for water use or flood control by valve control, and release for maintaining the eco-system of the river. According to the Beris Dam administration office, since around September 20th when the monsoon season starts, dam water is released in order to keep water level to around 83 meters for flood control. Also, from February to May, dam water is generally released in response to water demand in the area of the lower river during the dry season. As seen in Figure 3, however, release for water use was observed in other months after the end of 2007, therefore, the total amount of the release for water use had increased.

The maximum amount of annual water release was 262 million m^3 in 2007, and the minimum amount of annual water release was 119 million m^3 in 2005. From 2005 to 2008 and in 2010 particularly, DID Kedah, DID Penang, Penang Water Corporation (Perbadanan Bekalan Air Pulau Pinang Sdn Bhd: PBA) and Kedah Water Corporation (Syarikat Air Darul Aman Sdn Bhd :SADA), which take water from the lower Muda River, requested Beris Dam for water release. Since the actual data for water release was taken in response to the requests, it can be confirmed that this is effective for these organizations.

There is no record of requests for water release in 2009 and 2011. The Beris Dam administration office explained that the amount of water in the Muda River in these two years was sufficient. It can be judged that this does not show any problem as the alleviation of water shortages in Beris Dam was designed on the assumption of a drought once in every ten years. It is also recognized that a surplus of water in the reservoir can occur sometimes as dams are located in the upper river (see Figure 1).



Source: Beris Dam Administration Office

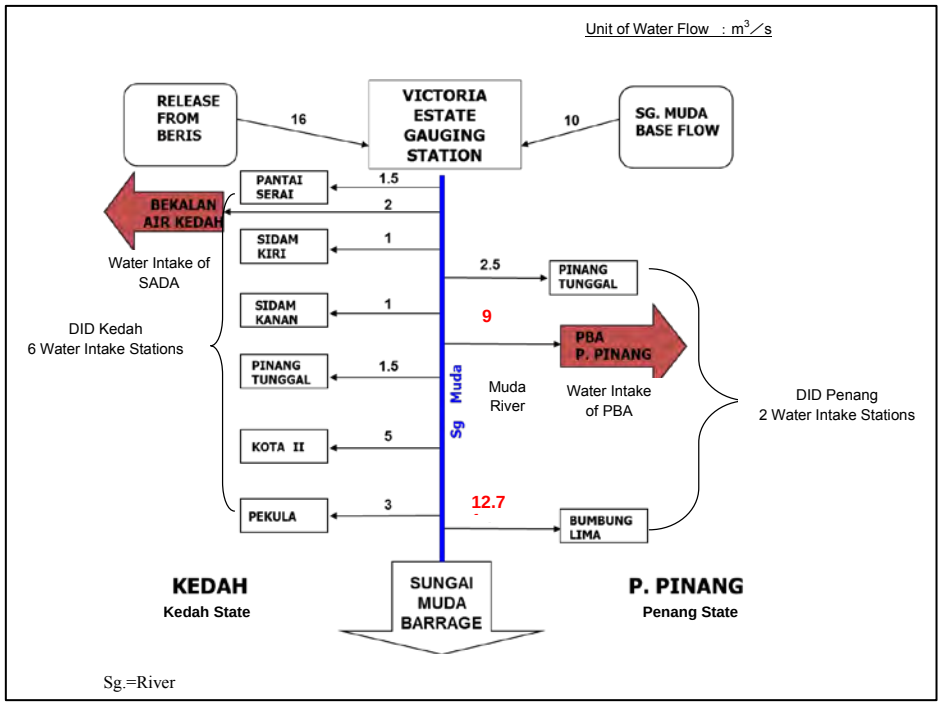
Figure 3: Annual Water Release Volume From Beris Dam
(by Release for Water Use, Water Flow from Spillway, and Release for the Ecosystem, 2005 to October, 2011)

(2) Actual Data for Water Intake from the Muda River

Water intake from the Muda River is used for irrigation, and as domestic and industry water. This project was expected to meet the demands for domestic and industrial water, particularly in Penang State. The plan at project appraisal said that after project completion, for a drought once in ten years, the water supply volume was expected to guarantee up to 22.7 m^3 per second, compared to 8.2 m^3 per second. Due to the limited availability of actual data for before and after project implementation at each water intake station, the evaluation study analyzed effectiveness by examining current water intake capacity for respective usages, comparing this to before the Project, while also taking into account actual data for water intake in recent years.

Verifying the present condition of the water intake capacity of respective organizations at the time of the ex-post evaluation, it was found that both the capacity and amount of water intake had increased in recent years. The actual data for water intake from the Muda River is shown in Figure 4. In Kedah State, water intake is 13 m^3/s in total for the 6 water intake stations for irrigation water, and the amount of water intake for SADA is 2 m^3/s. In Penang State, the amount is 15.2 m^3/s in total for the 2 water intake station for irrigation water, and the amount of water intake for PBA is 9 m^3 /s. It is confirmed that water intake capacity in total is 39.2 m^3/s.

According to actual data for recent years, it can be seen that respective organizations have pumped almost the same amount of water on an annual average. This can be considered as an effect of water release from Beris Dam in response to requests made by the organizations after 2005. According to data provided by Beris Dam, while past data for the water intake capacity of water intake stations was 6 m^3/s for PBA and 8 m^3/s for the Bumbung Lima Station of DID Penang, at the time of the ex-post evaluation these had increased to 9 m^3/s for PBA and 12.7 m^3/s for DID Penang. Comparing the increase in water intake capacity to that of the past, it can be seen that this is a significant project effect, now that almost the same amount of water intake can be achieved on an annual average. In addition, the respective organizations coordinate the water intake volume from the Muda River through mutual consultation, and there has been no dispute to date.



Source: Beris Dam Administration Office
Note: Figures in red letters are the latest based on direct interviews with the respective institutions in charge at the time of this evaluation study.

Figure 4: Water Intake Volume from the Muda River for Irrigation and Domestic & Industrial Use

3.2.2 Qualitative Effects

In terms of the alleviation of water shortages in the Muda river basin as a project effect, analysis was made based on interviews from the viewpoints of change after project completion and imagined situation as it would have been without the project. The project effects were examined based on information received from the office responsible for the operation and management of Beris Dam and also from DID Kedah, DID Penang, SADA and PBA. These organizations are responsible for the operation and maintenance of water intake facilities on the lower Muda River, and they are also expected beneficiaries (see the details in the Box).

(1) Domestic and Industrial Water Supply

With regard to water supply in Penang State, raised as a main objective of this project at the time of project appraisal, the amount of water intake has increased every year through the expansion of the water intake facilities after project implementation. From 2005 t o 2010, the amount of water intake increased by 10 pe rcent. PBA pointed out that Beris Dam had contributed to guaranteeing a stable amount of water intake. Also, there was the opinion that water supply restriction would have been conducted if this project had not implemented, although there was no water restriction before in the targeted areas. In view of the above, it can be confirmed the project has produced positive effects on the stable supply of domestic and industrial water in Penang state, which is a major effect expected for the project. Although there was no change in the amount of water supply in Kedah State, SADA indicates, as a project effect, that it has become possible to maintain the water level in order to guarantee a stable intake of water throughout the year.

Picture 2: PBA's Water Intake Pump House from the Muda River

(2) Irrigation Water Supply

Only product grown in the area where the Muda River provides irrigation water is rice. It can be seen that the irrigation water supply has become stable in irrigation areas of Kedah and Penang State. While the amount of water intake in Penang is more than that of Kedah, water level apparently became stable in Penang State after the construction of Beris Dam, as was the case for domestic and industrial water supply.

<BOX> Results of Interviews with Beneficiary Organizations on the Project Effects and Impacts

1. Water Supply

1.1 Penang Water Corporation (PBA)

- ◆ The water supply demand in Penang State in 2010 was 298 million m^3 per year. The current demand in the State, for water supply from the Muda River, is 800 thousand m^3 per day and the amount of water intake is 900 thousand m^3 per day. It is planned that water intake in the future will be 1.27 million m^3 per day after 2015. Water intake from the Muda River is sent to the Sungai Dua Water Supply Treatment Plant, which is 14 kilometers distant from the river. The amount of water supply taken from the Muda River is equivalent to 80 percent of the water supply in Penang State as a whole. Particularly, the water source for the Penang Island area is dependent on the Muda River alone.
- ◆ Since 2005, water intake facilities have continued to be extended in response to increasing water demand. Water supply treatment also increased from 720 thousand m^3 per day in 2005 to 800 thousand per day in 2010. Currently, a program to expand water intake facilities is underway up to 2015.
- ◆ Water supply restriction had not taken place before 2005 when the Beris Dam began operations. Although water pressure in the dry season was sometimes low, operation continued without restriction. Considering the increasing water supply demand after the starting of operation of the Beris Dam, however, it is believed that water supply restrictions would have been inevitable without the dam.
- ◆ When the water level of the river drops lower than 2.28 meters, a request for water release is made to Beris Dam through DID Penang. Water shortages in the dry season have not been observed since 2008.
- ◆ While the amount of water decreases from January to March in the dry season, it is sufficient in a normal season.
- ◆ Due to the water level of Muda River becoming stable, there is no change in the operation cost of the water intake pump.
- ◆ The water supply in Penang State consists of 75 percent for domestic water and 25 percent for industrial water. The number of domestic water consumers is approximately 440,000.
- ◆ Demand for the industrial water supply has continued to increase due to industrial development. In particular, firms producing semi-conductors require an extensive quantity of industrial water, and these are the main beneficiaries.

1.2 Kedah Water Corporation (SADA)

- ◆ Water taken from the Muda River has been supplied to areas from the middle to the southern part of Kedah State. There has been no change in the amount of water taken from the Muda River so far.
- ◆ Before Beris Dam started operations, when the water amount was relatively low in the dry season, it was necessary to use dry-pit pumps for drawing up water twice and/or to put sand bags into the river in order to maintain the water level necessary for water intake. Currently, the intake pump is used only once and even this has not been necessary as the required water level has been ensured throughout the year. Since using the pump requires an energy cost, decrease in pump use has resulted in a reduction of maintenance and management costs.
- ◆ There are 11 water supply treatment plants around the Muda River. There is a plan to expand the Kulim High-Tech Water Supply Treatment Plant in the future.

2. Irrigation Water Supply

2.1 Hearing with DID Penang, IADA and the State Agriculture Department Penang

- ◆ Irrigation areas in the Integrated Agriculture Development Area (IADA) are located in 4 Districts

cover a total area of 10,305 hectares. Out of these 4 districts, the Seberan Perai Utara Irrigation Area takes irrigation water from the Muda River. The size of irrigated land is 6,751.34 hectares and the number of farmers is 3,533. This area alone amounts to approximately 65 percent of the total irrigation area of Penang State. (I ADA)

- ◆ The operation and maintenance of water intake facilities for irrigation water in Penang State, including facilities in IADA, is managed by DID Penang. (IADA)
- ◆ Forty percent of water in irrigation areas is supplied from rainwater, and the remaining 60 percent from the river. Farmers conduct planting twice a year and the main season for rice production is from July to December, the off-season being from March to July. Output is 5.5 tons per hectare on average, which is more than that of Kedah State. The capacity of the water intake pump is also larger than that of Kedah. (DID Penang)
- ◆ Before the construction of Beris Dam, the water level sometimes decreased to 1 meter, in which case it was not easy to draw up water through the water intake pump. Water level needs to be maintained at above 1.5 meters for pumping water. The current water level is 2.49 meters. (DID Penang)
- ◆ While the rice crop in target areas amounted to 3 to 4 tons per hectare in the years immediately before the construction Beris Dam (up to 2005), it has since increased by 1 ton, resulting in 5 to 6 tons per hectare since 2006. There is no difference in production volume per unit between the main season and the off-season. While the rice crop has increased through improvements in rice variety, assistance for fertilizer provision, and the promotion of mechanization, the stable water supply has also contributed to the production increase. Without the Beris dam, it would have taken more than 10 years in order to achieve such an increase in rice production. Through increased production, in addition, an increase in income has also been observed. (State Agriculture Department Penang)
- ◆ While the planting schedule in dry seasons had been delayed before the start of opersations of Beris Dam, such delays have not occurred since a stable water supply has been achieved. (DID Penang, State Agriculture Department Penang)

2.2 Hearing with DID Kedah

- ◆ The area where irrigation water is taken from the Muda River in Kedah State is the Kuala Muda area in the southern part of Kedah. The size of irrigated land is approximately 5,800 hectares. Planting is made twice a year.
- ◆ Compared to before the dam was constructed, a stable supply of irrigation is now possible throughout the year, even in the dry season. Although in the past it was sometimes necessary to delay the planting schedule due to water shortages, such delays do not currently occur.
- ◆ Even though there has been no change in the size of irrigated land before and a fter the construction of Beris Dam, the rice crop has increased. While the rice crop before dam construction was 2.5 to 3.0 tons per hectare, after dam construction it increased by 3.5 to 4.5 tons per hectare on average. This may have been caused, to some extent, by the fact that the water supply has become stable. However, the impact may not have been that significant. The larger impact of the Beris Dam Project is, rather, mitigation of the situation in which the planting cannot be made due to water shortages.
- ◆ It is considered that there has been a positive impact on flood control around the Kula Muda District, lowlands in Muda river basin.

3.3 Impact

3.3.1 Intended Impacts (Contribution to the stabilization of people's livelihoods and the development of the local economy)

(1) Penang State

Through this project, a positive impact on the stabilization of people's livelihoods and the development of the local economy in Penang State has been partly achieved. At the time of project appraisal, water demand in Penang State was estimated to be 300 million m^3 per year. In 2010, PBA supplied 298 million m^3 per year as an actual amount, which was almost the same as the estimation before project implementation. Thus, it can be seen that the negative impact of water shortages in the dry season on people's livelihoods and industrial activities has been avoided after the operation of Beris Dam started.

In terms of contribution to the local economy, the real growth rate of the Gross Regional Domestic Product (GRDP) in Penang State after the completion of Beris Dam was 10.4 percent in 2006, 6.9 percent in 2007, 5.8 percent in 2008, -10.8 percent in 2009, and 10 percent in 2010. This was much higher than the economic growth of Malaysia as a w hole in the same period, which was 5.8 percent in 2006, 6.7 percent in 2007, 4.8 percent in 2008, -1.6 percent in 2009, and 7.2 percent in 2010, showing a high growth rate except in 2009. Water demand in the industrial sector has increased year by year due to the stimulation of economic activities. With this background, Beris Dam has responded specifically to the demand of firms in the area producing semi-conductors, which require an extensive quantity of industrial water.

With regard to positive effects of the project on irrigation water, it is now possible to conduct planting as scheduled. According to DID Penang and the State Agriculture Department Penang, the unit yield of the rice crop has increased by approximately 1 ton per hectare due to the stable supply of irrigation water before and after the Beris Dam began operation, although the increase can be attributed not only to the stable water supply but also to the mechanization of farming and fertilizer. The State Agriculture Department Penang pointed out that there was actually fertilizer development and promotion of agricultural machinery usage in the same period, but in addition, a stable and increased water supply also contributed to the increase in rice production. It is considered, therefore, the project has partly contributed to the increase rice production in the beneficiary areas.

Picture 3: Irrigation Water Supply from the Muda River and Paddy Fields in Penang State

(2) Kedah State

With regard to the water supply in Kedah State, according to SADA, since the completion of the Beris Dam, the water level has been ensured enough to guarantee enough water in the dry season and energy costs have also been cut by the decrease in the use of the intake pump, which also resulted in reduction in operation and maintenance costs. It is considered the fact that decrease of rice production was mitigated by ensuring stable water supply is positive impact on irrigation areas.

Also, as an other impact of the project, it has been identified that economic activities around the dam in Kedah State have been stimulated. These activities include the aquaculture implemented after dam construction as economic assistance for resettled residents, eco-tourism around the dam reservoir, and the construction of a vineyard. These newly developed private projects have contributed to the creation of jobs in the local economy.

Picture 4: Aquaculture (Left), Tourism (Middle), and Vineyard (Upper and Lower in Right) in the Surrounding Areas of Beris Dam

3.3.2 Other Positive and Negative Impacts

At project appraisal, it was planned that environmental monitoring of the project would be conducted for three years after the dam reservoir was filled with water, and that ex-post monitoring of the resettlement of residents would be implemented for five years after resettlement. It was also planned that consultants would assist the executing agency in conducting ex-post monitoring of environmental and social impacts, since as the agency was obliged to submit reports on the ex-post monitoring of the natural environment and residents' resettlement to JICA quarterly.

In fact, while monitoring by consultants had been conducted until the completion of construction works, ex-post monitoring was not implemented. However, the executing agency outsourced the ex-post monitoring for the environmental and social aspects including the situation after resettlement. At the time of the project appraisal, specifics on how to conduct environmental and social monitoring after project completion had not been clearly provided, as the current "JICA' Guidelines for Environmental and Social Considerations" were not at that time in effect. In any case, however, the submission of a quarterly report after project completion seems a somewhat unreasonable request for an executing agency in terms of its necessity and the workload involved. Thus, there was in fact little possibility that ex-post monitoring would be conducted as planned. It would be more realistic to create an opportunity to reconsider what kind of ex-post monitoring should be conducted paying attention to: 1) by whom, 2) how, and 3) on which items, while confirming the situation before and after project completion.

In the following sections, evaluation is discussed based on the results of environmental and social monitoring by the executing agency and on the field survey.

(1) Impacts on the Natural Environment

In this project, in addition to the report on environmental monitoring during dam construction and the Project Completion Report (PCR), DID confirmed before and after the project whether or not there had been a negative impact on the natural and social environment by drawing up the "Beris Dam Environmental, Health and Safety Audit" (EHS Audit, December 2005), which was outsourced under Universiti Sains Malaysia. DID also confirmed changes in water quality by conducting a survey on the water quality of the dam between 2007 and 2008, three years after dam completion. The results of this appeared in the "Beris Dam Water Quality Monitoring Report" (August 2008).

In the "Beris Dam Environmental, Health and Safety Audit" of 2005, no issues concerning the natural environment were pointed out. In the PCR made in 2010, it was reported that: (1) vegetation from the reservoir was disposed of by smokeless incineration by the Department of the Environment, and (2) endangered species were not found and some endemic species of flora discovered in the reservoir during the ex-ante study were transplanted to other places. Endemic species of bird, mammal and fish were not found. According to the results of the survey conducted in 2008, no problem was detected in the water quality of the dam.

In this evaluation study, in addition a review of the above stated reports, hearings with the executing agency and sight visits were also conducted, with any problems to be identified as a result. Water release from the dam for maintenance of the river eco-system in the lower river is currently implemented at a rate of 0.4 m^3 per second. In an interview survey at the time of evaluation, no endangered species were confirmed.

(2) Land Acquisition and Resettlement

In the project, the resettlement of 659 households in 16 villages was implemented due to the dam construction. Following resettlement, related economic and social development projects were implemented, including the construction of houses and infrastructure (water, electricity, public facilities, etc.) in resettled places, land compensation (provision of houses, farm land for cash crops and rubber, land for stores) and assistance projects for livelihood improvement (economic activities such as aquaculture). Land compensation was implemented for 1,915

residents.

Post-resettlement survey in EHS Audit as of December 2005 s tated that residents complained that there was a delay in the procedure and economic support activities. Through a comprehensive analysis of PCR submitted later in 2010 and hearings from DID and UPEN, a field survey of resettled places in the Sik District of Kedah State and interviews with 18 representatives of resettled residents (members of Village Development Committees, JKKK" in Malay), it was recognized that compensation had been provided for the most part as planned and there had been an increase in income for many residents. With regard to procedure and contents of compensation, residents answered that they were "satisfied a little" except one respondent who was "unsatisfied".

As remaining issue, residents pointed out that land titles had not yet been provided so they were unable to obtain Certificates of Fitness (CF) for their houses; notice of resettlement came at fairly short notice[4], and they were not clearly informed of the place where claims would be handled etc.

According to UPEN and the Land Office (which was in charge of the procedures for the provision of land titles) in Sik District and in the state office of Alor Setar, the state capital of Kedah, land titles has not been granted to anyone yet and the procedure would begin in March 2012. This delay in administration had been caused by the time taken transfer the land titles from the State Development Corporation to the state government. This was finally completed in 2011. The granting of land titles to residents would start from March 2012, with the present condition confirmed by staff in charge at the Sik District Land Office who will contact all the residents. It is expected that to finish the land title transfer of more than 600 households will take several years because of the limited number of staff members in charge.

UPEN is the executing agency for resettlement. However, with regard to processing claims, UPEN was not involved in the matter of land titles. UPEN felt that the procedure should be carried out by the organization in charge, and that Sik District Land Office should be responsible for land title issues. As indicated in the comments of residents, claims to organizations such as UPEN and the Land Offices about delays in the transfer of land titles took a considerable amount of time. It would be better if the organization in charge of handling claims were integrated into the one authority before and after resettlement. There should be a system whereby the representative authority is made responsible for coordination among the ministries and for follow-up, in order to speed up the response to claims.

Picture5: Resettled Area in the Sik District of Kedah State
House (Upper Left), Mosque (Upper Right),
Enterprises (Lower Left), Hospital (Lower Right)

[4] A resident pointed out notice of the resettling date was announced just prior to its date, while the implementation agency insisted that notice had been given some months before resettlement. It cannot be verified which testimony is true.

In light of the above, the project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Efficiency (Rating: ③)

3.4.1 Project Outputs

Outputs such as the construction of the main dam and the saddle dam of Beris Dam, road replacement, and land preparation for the resettlement of residents were implemented mostly as planned. After the signing of the L/A in March 1999, Special Assistance for Project Implementation (SAPI) was implemented that year, and recommendations were made, such as the expansion of the plunge pool, as a result of the SAPI review of the dam design. The change was accomplished within the project cost.

Picture 6: Overview of Beris Dam Site

3.4.2 Project Inputs

3.4.2.1 Project Cost

In comparison with the total amount of project cost at planning, 14,585 million yen (9,737 million yen for the yen Loan out of the total cost), the actual total amount of project cost was 11,825 million yen (8,578 million yen for the yen Loan out of the actual total cost). The actual project cost was 81 % of the planned cost, and thus the actual cost was lower than planned.

A breakdown of the actual cost is as follows. While the actual construction cost was 102 percent of that planned, which was slightly higher than planned, the other main project costs were lower than planned. Compensation costs for resettled residents were at 72 percent (a decrease of 1,166 million yen), consulting services were at 58 percent (a decrease of 502 million yen), and management costs were at 5 percent (a decrease of 605 million yen) compared to the planned cost. This resulted in a decrease of the actual project cost in total. The executing agency pointed out the planned cost had been estimated with some allowance, so that the actual cost might be lower than planned.

3.4.2.2 Project Period

In the project appraisal, the completion of the project was defined as “the completion of ex-post environmental monitoring by the consultant” which was June 2008. In the rating evaluation system on project period in an ex-post evaluation of a dam project, project completion is normally the completion of dam construction or when the dam reservoir is filled with water. In this project, therefore, the difference between the plan and results between the signing of the L/A and the completion of dam construction was analyzed.

Following the above stated definition, the project period was planned from March 1999 to March 2005 (73 months). The actual result was shorter than planned: from March 1999 to July 2004 (67 months). Thus, the actual project period was within the planned period (92 percent compared to planned). The dam construction period was reviewed at the time when the contract was concluded with the contractor, and efforts were made to complete the dam construction works earlier than the plan at the time of appraisal.

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

Due to the fact that the data needed for quantitative analysis was not available in order to verify the basis of the Economic Internal Rates of Return (EIRR) calculated upon pr oject

appraisal, EIRR was not recalculated in this ex-post evaluation study.

In light of the above, both project cost and project period were within the plan, therefore efficiency of the project is high.

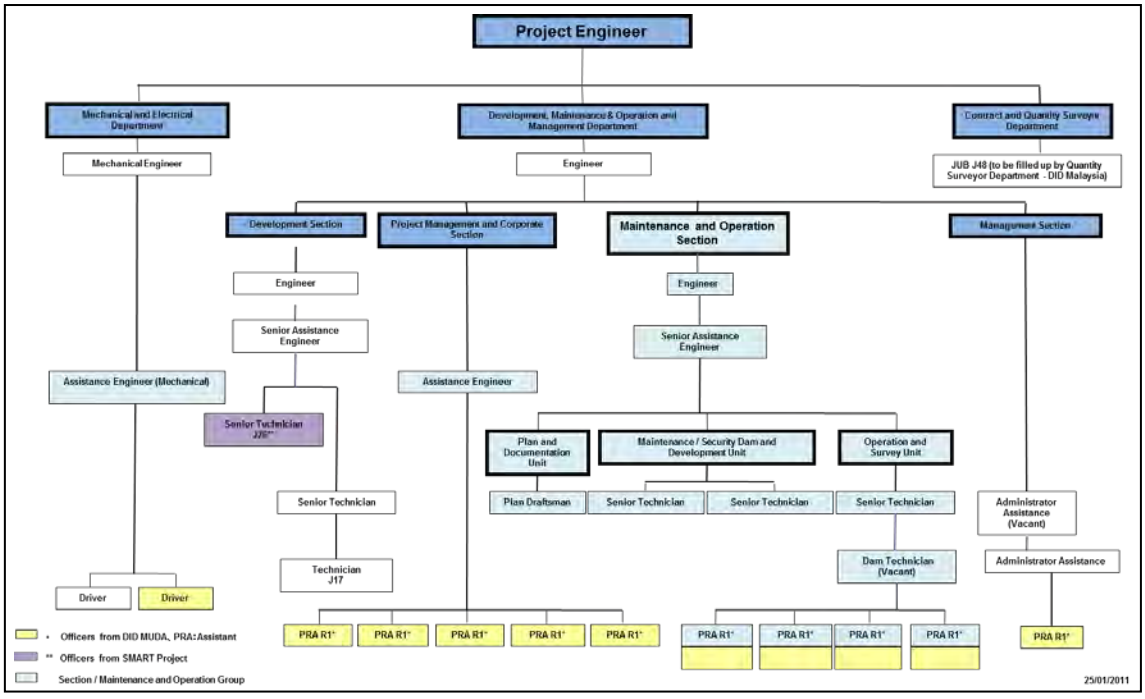
3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

After project completion, a part of the DID in the Ministry of Agriculture was divided into the DID of the Ministry of Natural Resource and Environment (NRE) as part of reorganization of the government. At the time of the ex-post evaluation, the new construction of a dam for the purpose of agriculture came under the DID in the Ministry of Agriculture while the operation and maintenance after dam construction came under the DID in NRE. In addition, the replaced road in the project has been maintained by the Public Work Department in Kedah State.

Staff belonging to the Special Project Department of the DID in NRE and also those of the Maintenance and Operation Section of the Project Engineer's Office of Water Resource Development Programs (Beris) (Pejabat Jurutera Projek Rancangan Pembanguan Sumber Air (Beris) in Malay) are in charge of operation and maintenance of Beris Dam. The office is also responsible for the operation and management of the Timah Tasoh Dam in Perlis State. (In this report, the Beris Dam administration office means the staff in charge of Beris Dam in that office.)

As seen in Figure 5, a senior engineer and 14 supporting staff under a project engineer (the head of the office) are engaged in operations of the Beris Dam Management Office. Although the dam engineer in the organization chart has actually been appointed, there have been no problems caused by staff shortages and a system to deal with requests for water release has been ensured. Thus, staff placement is considered to be mostly appropriate.



Source: Beris Dam Administration Office

Figure 5: Organization Chart of Divisions in Charge of Beris Dam (As of October, 2011)

3.5.2 Technical Aspects of Operation and Maintenance

As a result of the analysis of PCR, the Inspection Report by the Beris Dam Office, a site visit and an interview with staff in charge of dam operation, it is clear that the basic technical matters required for dam operation are implemented and that operation and maintenance have been conducted properly. Also, the staff have received training for the operation of Beris Dam and it is considered they have obtained the technical skills necessary for the operation and maintenance of the dam.

3.5.3 Financial Aspects of Operation and Maintenance

The budget for operation and maintenance has been allocated after project completion to the present through the DID headquarters of the central government. Although, at the time of project appraisal, budget allocation from Kedah State was planned for after project completion, the budget continued to be allocated from central government at the time of the ex-post evaluation. Budget allocation from the state government hereafter is not specifically scheduled, and the budget will be allocated from the central government for the time being. The budget has been assured each year.

The budget was estimated as RM600,000. It was confirmed in the filed study that on average RM1 million was allocated as the annual budget for operation and maintenance for the last seven years and that is considered that sufficient budget has been ensured.

Table 1: Actual O & M Cost for Beris Dam

Unit: 1,000RM

Fiscal Year	O & M Cost		Total
	Spare Parts and Service Cost, etc.	Personnel Cost	
2004	50.0	595.0	645.0
2005	144.0	624.8	768.8
2006	197.5	656.0	853.5
2007	319.5	688.8	1,008.3
2008	483.5	723.2	1,206.7
2009	416.0	780.0	1,196.0
2010	483.5	723.2	1,206.7
2011	416.0	780.0	1,196.0

Source: Beris Dam Administration Office

3.5.4 Current Status of Operation and Maintenance

According to the staff in charge of the operation and maintenance of Beris Dam, the structures, such as the dam, spillway, and intake tower are currently in good condition. At the time of the site survey, the dam was operating smoothly without any problem in its structure; therefore, as reported from the staff in charge, the current status of the operation and maintenance of the dam is evaluated to be satisfactory.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project objective was to ensure a stable domestic, industrial and irrigation water supply where the water balance is tightening in the Muda river basin in Kedah and Penang State, at the Beris Dam upstream of the Muda River, Kedah State, North Malaysia. The relevance of

the Project is high as it is consistent with the development policy and needs of Malaysia, and also in the context of Japanese ODA policy. In terms of effectiveness and the impact of the Project, these are high from the point of view of the stabilization of the water supply for domestic, industrial and irrigation use, particularly in response to the increasing demand for water in Penang. The efficiency of the project is high as both project cost and period were within the plan. Sustainability is also high with the evidence of a favorable condition for the structural, technical and financial aspects of operation and the current operation status.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency (UPEN) and the Land Office

Provision of Land Titles to Resettled Residents

In an interview with a representative of the resettled residents, it was pointed out that land titles had not at that point been granted. Land title provision had been delayed and it would start this year.

The Land Office is the organization in charge of handling land title transfer. However, UPEN is defined as executing agency of the project and it is thus recognized that UPEN is responsible for compensation issues regarding the resettlement of residents after project completion.

Seven years have now passed since the completion of residents' resettlement, and UPEN should support the Land Office in taking the necessary actions as soon as possible. It is also advisable that the Land Office speeds up the procedures by any measures, for example, increasing its number of staff.

4.2.2 Recommendations to JICA

JICA should follow the situation with regard to the provision of land titles to residents.

4.3 Lessons Learned

(1) Reinforcement of the Function to Handle Claims of the Environment Management /Resettlement Committee

A committee, consisted of DID, UPEN and some government organizations, was established to respond to claims from residents. However, it was not clear exactly who was to handle claims and how, and this partly caused the delay in the transfer of land titles.

Important is clearly stipulated, in advance, what the function, authority and responsibility of such a committee is, as well as the responsibility of the representative organizations in taking prompt action. One representative authority, for example, should handle claims.

(2) Environment and Resettlement Monitoring after Project Completion

Although the project placed importance on the monitoring of the natural environment and of residents' resettlement after project completion, and a monitoring schedule was planned, monitoring was not been actually implemented according to the plan.

In case a project is categorized as an "A project" in its environmental and social aspects, and ex-post monitoring is considered to be very important due to a lack of capacity of the organization in charge of environmental and social monitoring in the recipient country, it is critical that JICA and the executing agency agree in advance which section should be in charge of ex-post monitoring, the administrative structure for implementation, detailed monitoring items, and the period for monitoring, having given thorough consideration to the objectives and feasibility of the monitoring beforehand.

There may cases, however, that it is too late at the time of ex-post monitoring to effectively

take action against problems, when a negative impact is confirmed. Also, there is a high possibility that the organization in charge of ex-post monitoring has not been clearly defined due to administrative changes after project implementation. Taking the above into consideration, in the case of a Category A project that ex-post monitoring is important, it is desirable that JICA confirm, through a site visit right after project completion or at another ideal time, whether the system to conduct ex-post monitoring is ensured or not, and whether there were any problems during the survey.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	(1) Dam Construction (Concrete Face Rockfill Dam) · Catchment Area: 116 km^2 · Effective Storage Capacity: 114 million m^3 · Average Water Level: 84m · Main Dam, Saddle Dam (2) Relocation of Road 10.9km (3) Development of Resettlement Area · Construction of Houses for 575 households · Construction of Basic Infrastructure(Water system, electricity, schools, Mosques and other public utilities) · Support for Economic Activities for Resettled residents	(1) As planned (2) As planned (3)As planned (Actual number of resettled households:659)
2. Project Period	March, 1999 - March, 2005 (73 months)	March, 1999 - July, 2004 (67 months)
3. Project Cost		
Amount paid in Foreign currency	2,796 million yen	677 million yen
Amount paid in Local currency	11,789 million yen (369 million RM)	11,148 million yen (366 million RM)
Total	14,585 million yen	11,825 million yen
Japanese ODA loan portion	9,737million yen	8,578million yen
Exchange rate	1RM = 31.9 yen (As of November, 1999)	1RM = 30.4 yen (Average between 1998 to 2009)

Thailand

Ex-Post Evaluation of Japanese ODA Loan
"Transmission System and Substation Development Project (Seventh Stage Phase II)"

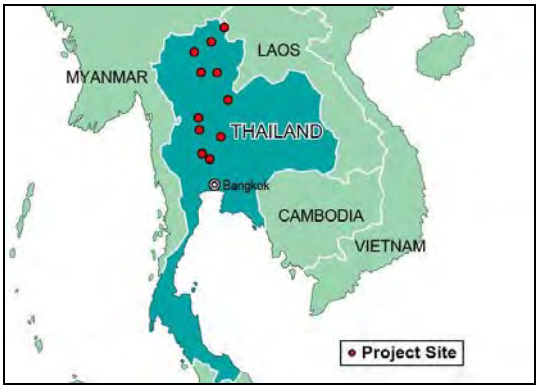
External Evaluator: Toshihisa Iida, Keishi Miyazaki, OPMAC Corporation

0. Summary

The objective of the project is to provide a stable power supply in accordance with increasing power demand and to improve power supply reliability by building distributing substations and constructing transmission lines in nine areas in the north of Thailand, thereby contributing to the promotion of regional industry and the stabilization of livelihoods in the north of Thailand. The project was sufficiently consistent with the development policy of Thailand, its development needs and with Japan's ODA policy, and thus its relevance is high. The stability of the power supply and the reliability of the power system in the north of Thailand have been improved with stable average factors for substations in the project area and with a significant improvement in the voltage drop situation. Also, other project impacts, such as a contribution to the regional economy were seen. Therefore, the effectiveness of the project is high. While the project cost was lower than planned, the project period was significantly longer than planned due to additional time required for coordination between the relevant agencies and for redesign and cost estimation related to changes in the transmission routes because of current power demand states. Thus, the efficiency of the project was fair. Lastly, the operation and maintenance of the project in terms of the structural, technical and financial aspects is good and the project's sustainability is high.

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

1. Project Description



Project Location

Substation constructed by the project
(Hang Chat substation)

1.1 Background

The power supply system in Thailand consists of 3 major institutions. The Electricity Generation Authority of Thailand (EGAT) is responsible for power generation and transmission. In the power transmission and distribution segment, the Metropolitan Electricity Authority (MEA) distributes electricity to Bangkok and to two adjoining provinces (Samut Prakan Province and Nonthaburi Province) and the Provincial Electricity Authority (PEA) distributes electricity to the other 73 provinces in Thailand. The PEA has continued to invest in the development of its transmission and distribution network aiming at ensuring a stable electricity

supply in the region, reducing electricity system losses and improving the reliability of the electricity supply system. Japan ODA loans have continually supported these kinds of PEA activity since 1970. As a result, the electrification ratio improved from less than 20% in the 1970's to nearly 99% in 1999. Therefore, the focus area of the National Economic and Social Development Plans (NESDP) shifted from quantitative aspects such as expansion of electrification, up to the Seventh Plan (1991 – 1995) to qualitative aspects of the electricity supply in the Eighth Plan (1996-2001).

Peak electricity demand in Thailand increased in line with Thailand's improving economic performance by an average rate of 10.8% per year from 1991 to 1997, marking its highest level in 2000 after a downturn due to the Asian economic crisis of 1998 and 1999. According to the National Energy Policy Office (NEPO[1]), peak electricity demand was forecasted to grow at an average rate of 6% per year from 2001. In the north of Thailand, both general household and industrial demand for electricity was expected to grow at an average of more than 6% per year from 2001. On the other hand, there have been discrepancies between the north and metropolitan areas of Thailand in power outage duration for each customer, an indicator of the reliability of the electricity supply. Therefore, it was necessary to develop efficient power system facilities in line with the increasing power demand in order to ensure a stable electricity supply, to lessen power system losses and to improve the reliability of the power supply system.

1.2 Project Outline

The objective of this project is to provide a stable power supply in accordance with demand in the north[2] and to improve power supply reliability by building substations for distributing power to nine areas in the north of Thailand (Chiang Mai, Chiang Rai, Lampang, Kamphaeng Phet, Phitsanulok, Phrae, Chai Nat, Sing Buri, and Nahkon Sawan) and by constructing transmission lines to supply power from 11 existing substations to the substations for power distribution, thereby contributing to the promotion of regional industry and the stabilization of livelihoods in the north of Thailand.

Loan Approved Amount/ Disbursed Amount	2,326 million yen /1,337 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2002/March 2002
Terms and Conditions	Interest Rate:2.2 % Repayment Period:25years (Grace Period: 7 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Provincial Electricity Authority/ Same as above Guarantor: The Royal Thai Government
Final Disbursement Date	July, 2009
Main Contractor (Over 1 billion yen)	-
Main Consultant (Over 100 million yen)	-
Feasibility Studies, etc.	None
Related Projects	None

[1] The Ministry of Energy was newly established in October 2002 under an Act for the Administrative Organization of State Affairs (No.5) BE. 2545 (2002) and the Action Organizing Ministries, Sub-ministries and Departments BE. 2545. Supervision of NEPO was transferred from the Secretariat of the Prime Minister to that of the Ministry of Energy and it has been named as the Energy Policy and Planning Office (EPPO).

[2] PEA divides its power supply area into 4 regions, the north, northeastern, central and south. The north region covers 17 administrative provinces in the north of Thailand and 3 provinces, Chai Nat, Lop Buri, and Sing Buri, a total 20 provinces.

2. Outline of the Evaluation Study

2.1 External Evaluator

Toshihisa Iida, Keishi Miyazaki, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August, 2011 – August, 2012
Duration of the Field Study: January 8th -25th, 2012 and April 1st -6th, 2012

2.3 Constraints during the Evaluation Study

None

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of Thailand

The major emphasis in the Eighth NESDP (1997-2001) was placed on the "upgrading and expansion of infrastructure provision in the regions and rural areas." The energy development plan formulated by the NEPO at the time of the project appraisal focused on four areas including "the provision of an adequate amount of energy to satisfy demand at reasonable prices while ensuring quality and security of supply" and "the promotion of efficient and economical use of energy.' As parts of the strategies to achieve the focus areas, the enhancement of the reserve capacity for power generation and the improvement of power transmission and distribution system to ensure the reliability of the power system were adopted with the specific target of improvement of power system reliability for the MEA and the PEA[5]. Corresponding to these policies, the PEA prepared its Transmission and Distribution Development Plan (1997-2001), which proposed six system development plans for implementation under the Eighth NESDP. This project was included in the "Transmission Line and Substation Construction Plan", one of the six system development plans.

At the time of the ex-post evaluation, the Tenth NESDP (2007-2011) proposed, as its principal objective, "To ensure fair competition in trade and investment for the national benefit: to create a mechanism for the fair distribution of the benefits of development to all segments of the population." As a strategy to achieve the objective, the Plan adopted "the extension of infrastructure development to the regions in a fair and balanced manner." The energy sector policy[6] under the Tenth NESDP also proposed "the promotion of energy development, production and usage simultaneously with environmental conservation." The objective of the PEA Transmission and Distribution Development Plan (2007-2011) under the Thenth NESDP included (i) provision for a standardized quality, a stable and reliable power supply system, (ii) provision for a quality supply system that is sufficient to meet the demand of customers, and (iii) the extension of electricity services to cover agricultural areas in compliance with Government Policy.

At both the time of the project appraisal and the ex-post evaluation, the Thai government

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[4] ③: High, ② Fair, ① Low
[5] In the Eighth Thai Energy Development Plan of NEPO, the target for power outage frequency per customer per year and for power outage duration per customer per year for PEA in 2001 was 17.5 frequency/year and 1,050 min/year respectively.
[6] Energy policy stated in a Policy Statement of the Government of Mr. Samak Sundaravej, Prime Minister, to the National Assembly, 18th-20th February, 2008

development policy of promoting infrastructure development in rural and agricultural area had not changed. This project, aiming at a stable electricity supply, was continuously consistent with the energy sector policy that promotes an efficient use of energy. Furthermore, the project objective is consistent with the current PEA plans as the these continue to prioritize the securement of a stable electricity supply, improvement of the reliability of the power system, and the extension of electricity services to rural area. Thus, it can be said that the project maintained its relevancy to the development policy at the time of the ex-post evaluation.

3.1.2 Relevance to the Development Needs of Thailand

Peak electricity demand in the north of Thailand was 1,457MW in 2000 and both general household and industrial demand for electricity was expected to grow at an average rate of more than 6% per annum from 2001. On the other hand, discrepancies still existed in the power outage duration for each customer between the north and metropolitan areas of Thailand, an indicator of the reliability of the electricity supply. These were 958.5 minutes/year in the north and 63.6 minute/year in the metropolitan area in 2001. Furthermore, there were overloads on the existing distribution substations and the occurrence of voltage drops was beyond the PEA permitted tolerance level, both of which were mainly caused by the increasing electricity demand in the north of Thailand. Thus, to promote the regional economy and to stabilize livelihoods, the country needed continuous reinforcement of facilities to ensure a stable electricity supply, to lessen power system losses and to improve the reliability of the power system in line with increasing power demands.

At the time of the ex-post evaluation, power demand in the north of Thailand had grown at an average rate of 6.6 % per year from 2001 to 2010, almost as forecasted. The general household and industrial demand for electricity in the 9 provinces in which the project was conducted grew at an average rate of 3.5-6.1% and 4.1-11.2% per year respectively during the same period. In particular, industrial power demand in 7 provinces out of the 9 increased by an average rate of more than 7% per year from 2001 to 2010 due to increases in production levels and the entry of new companies. Power demand in the north of Thailand is expected to grow at an average rate of 4.4% per year from 2011 to 2020 according to the PEA. Table 1 below shows the power outage frequency for each customer (time/year) and power outage duration for each customer (minutes/year) in the north and metropolitan areas of Thailand. While both the power outage frequency and duration in the north of Thailand has significantly improved since 2001, discrepancies still exist between the north and metropolitan areas. The country needs continuous reinforcement of facilities to achieve a stable power supply.

Table 1: Power Outage Frequency and Duration for each customer by region

	2001			2010		
	Total (except for metropolitan area)	North	Metropolitan area	Total (except for metropolitan area)	North	Metropolitan area
Power Outage Frequency for each customer (time/year)	16.0	17.2	2.8	8.9	8.76	1.72
Power Outage Duration for each customer (min/year)	921.5	958.5	63.6	350.1	291.7	46.9

Sources: PEA

Note: Metropolitan area includes: Bangkok, Samut Prakan Province and Nonthaburi Province

From above, it can be seen that development needs, including the continuous reinforcement of facilities to improve the stable electricity supply and to diminish regional discrepancies in the reliability of power supply remained intact at the time of the ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

Japan's ODA policy for Thailand, established in May 2000, paid special attention to rural and regional development and to the improvement of the economic infrastructure. The Medium-term Strategy for Overseas Economic Cooperation Operations for Thailand (1999-2001) placed priority on the development of the economic infrastructure on which is short due to the rapid economic growth. This project has been consistent with Japanese ODA policy as it assists in the reduction of regional discrepancies in the reliability of the electricity supply by developing the economic infrastructure of Thailand.

From above, it can be seen that this project has been highly relevant to the country's development plan and development needs, as well as to Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Average factors of the substations in the project area

The average of the substations' average factors[7] in the area where new substations were constructed by the project ranged from 32% to 73% at the completion of the substations[8]. This met the project target of less than 75% at the completion of each substation, as well as the PEA operational standard[9]. Thus it can be judged that a stable electricity supply was achieved by the project. The average of the substations' average factors in 10 out of 11 project area ranged from 38% to 64% in 2010, and so it can be considered that these substations were stably operated. The average of the substations' average factors in 1 project area was 84% since an existing substation in the project area supplied electricity to broad area, causing more than 100% of average factor for the substation. In order to reduce the average factor, a new substation was constructed in 2010 and another one is planned to be constructed by 2014. Through these measures, the average factor of the area is expected to be reduced to less than 75%.

Table 2: The average of average Factors of the Substations in the project area

	Actual (August 2001)	Target (At completion of each substation)	Actual (at completion of each substation (2005~2007))	Actual (2010)
Average of the substations' average factors in the project area	42~90%	Less than 75%	32~73%	38~84%

Source: PEA data

The average factors of the new substations constructed by this project in 2010, as shown in Table 3, were from 22% to 94%. One substation showed an extremely high factor at 94%, and one showed an extremely low factor at 22%. The other 9 substations maintained average factors ranging from 44% to 73%, which can be considered to reflect stable operation. The extremely high average factor for Rong Kwang substation resulted from the purchase of cheaper electricity from EGAT through the new substation, as much as possible within the bound of maintaining a stable power supply with the consideration of lowering the purchasing price of electricity[10].

[7] The ratio of actual maximum electricity demand to the installed load capacity of substations

[8] The completion dates of the substations of this project were from December 2005 to December 2007.

[9] The PEA standard for the average factor of substations to ensure a stable power supply is less than 75% in a normal situation. There is no minimum standard.

[10] PEA purchases electricity with 115kV and 22kV from EGAT in this area. Since the purchasing price of electricity with 115kV is cheaper than that of 22kV, PEA purchases 115kV from EGAT mainly through Rong Kwang substation which transforms it to 22 kV.

On the other hand, the extremely low average factor for Chiang Dao substation resulted from lower power demands than expected as well as the inadequate improvement of the distribution lines connected with the new substation, which meant that electricity had to be supplied through a different network to the target supply area While this was a factor that potentially limited the emergence of the project impact, the project impact in fact emerged at the time of the ex-post evaluation since the project area receives electricity from other substations. The PEA plans to expand the size of transformers in Rong Kwang substation which has an average factor of 94% and in the other two substations, Chiang Khong and Han Kha substations, through the 11th PEA Transmission and Distribution Development Plan (2012-2016).

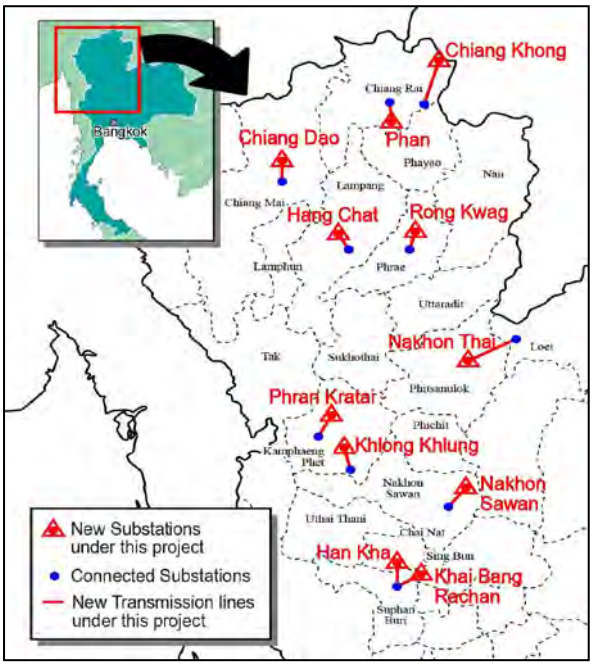


Figure 1: Locations of substations and transmission lines constructed by this project

Table 3: Average factors of substations constructed by this project

Unit: %

	2005	2006	2007	2008	2009	2010
Chiang Dao S/S (Chiang Mai Province)	-	27.96	15.29	14.93	17.11	22.44
Ching Khon S/S (Chiang Rai Province)	-	-	46.47	53.78	64.00	71.11
Phan S/S (Chiang Rai Province)	-	-	39.78	43.56	47.56	49.78
Hang Chat S/S (Lampang Province)	-	-	41.07	54.40	65.24	64.53
Khlong Khlung S/S(Kamphaeng Phet Province)	-	49.33	57.78	57.33	52.22	57.33
Phran Kratai S/S (Kamphaeng Phet Province)	-	39.11	56.89	53.78	70.67	69.33
Nakhon Thai S/S (Phitsanulok Province)	20.44	32.89	37.33	41.33	43.11	44.89
Rong Kwang S/S (Phrae Province)	51.60	78.80	86.40	87.20	83.60	94.40
Han Kha S/S (Chai Nat Province)	-	56.44	66.22	68.89	73.78	73.78
Khai Bang Rachan S/S (Sing Buri Province)	-	-	50.00	53.33	55.83	57.22
Nong Bua S/S (Nakhon Sawan Province)	-	-	29.78	59.38	68.09	69.87

Source: PEA data
Note: S/S stands for substation

(2) Voltage Drop Ratio

The situation of voltage drops in normal conditions in the project area (at end-user level) improved from 7-23% at the time of the project appraisal (August 2001) to 2-9% in February 2012, although evaluation relied only on data available at the ex-post evaluation due limitations in the availability of past data. Thus, it can be judged that the reliability of the power supply significantly improved (Table 4). The current tolerance level of voltage fluctuation in PEA and EPPO[11] in normal conditions is ±5% for 22kV and higher voltage and ±10% for the lower

[11] The current tolerance levels of voltage fluctuation of PEA and EPPO are as follows: (i) 115kv: in normal circumstances (±5%,109.25kV-120.75kV) and in emergencies (±10%, 103.5kV-126.5kV), (ii) 22kV and 33kV: in

voltage level (220V and 380V). While only one substation out of 11 substations met the target for voltage drop (less than 5%) set at the time of the project appraisal[12], the voltage drop level in all substations satisfies the current PEA and EPPO standards. Therefore, together with the distribution lines improved by other projects[13], the construction of new substations by this project has contributed to the improvement of the reliability of the power supply. A further improvement in the voltage drop level will require the improvement of distribution lines such as equipping with Automatic Voltage Regulators.

Table 4: Voltage Drop in the project area

	Actual (August 2001)	Target (at completion of each substation)	Actual (at completion of each substation (2005~2007))	Actual (February 2012)
Voltage Drop in the project area	7~23%	Less than 5%	NA	2~9%

Source: PEA data

Chiang Dao S/S

Khlong Khlung S/S

Phran Kratai S/S

3.2.2 Qualitative Effects

Interviews with 15 bulk electricity users (mainly manufacturing and agro-related businesses) which were beneficiaries of the project were carried out in the ex-post evaluation. Their responses were as follows:

- The number of power outages and short-interruptions[14] significantly declined from 2-3 times per month and 5-10 times per month 5 years ago to 1 time per month and 1-2 times per month respectively, although there are still some short interruptions in the rainy season.
- The voltage has been more stable with a decline in voltage fluctuation from 4~7 times per month 5 years ago to a few times per year at the present time.
- The current electricity supply condition is largely satisfactory.

The perception of the users can be matched to the improvement of the stabilization and the reliability of the energy supply with a more stable average factor of substations and declines in voltage drop.

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normal circumstances (±5%, 20.9kV-23.1kV, 31.35kV-34.65kV) and in emergencies (±10%, 19.8kV-24.2kV, 29.7kV-36.3kV), (iii) 220V and 330V: in normal circumstances and emergencies (±10%, 200V -240V, 342V-418V).

[12] According to the JICA appraisal documents, the permitted tolerance level of voltage fluctuation of PEA was ±5%, which was in line with that by NEPO (currently EPPO).

[13] Distribution improvement projects were implemented by the PEA in distribution networks which are connected with 9 substations out of the 11 substations constructed by this project, under the 9th (2002-2006) and the 10th (2007-2011) PEA Transmission and Distribution Development Plans.

[14] In this interview, short interruptions are defined as blackouts for a few seconds.

3.3 Impact

3.3.1 Intended Impacts

(1) Improvement of the reliability of the power supply in the north of Thailand

The number of power outages and power outage duration for each customer in the north of Thailand significantly improved by 49.0% and 69.9% respectively between 2001 and 2010 (Table 5 and Table 6). These improvement rates in the north of Thailand are higher than those for Thailand as a whole, except for the metropolitan area: 44.3% and 62.0%, while the metropolitan area was 38.8% and 26.3%. Therefore, the discrepancy in the reliability of the power supply among regions has diminished although it still remains. The main factors for the decline in the frequency and duration of power outages include: (i) improvements in the capability of the system to respond to increasing power demands and shorter distribution lines, which makes maintenance activities easier, through the construction of new substations in this project and (ii) SCADA (Supervisory Control Data Acquisition) supported by the World Bank and CSCS (Computerized System Control System) supported by this project which enable PEA to hasten the identification of problems and to dispatch the necessary repair staff. While the impact of this project on reductions in the frequency and duration of power outages in the north of Thailand is limited, as the project covers only a part of the northern area[15], it can be said that the project has contributed to the improvement of power supply reliability and the reduction regional discrepancies to some degree due to the reasons given above.

Table 5: Power Outage Frequency for each customer

Unit: frequency/year

	2001	2006	2007	2008	2009	2010	Improvement ratio (2001-2010)
Thailand (except for the metropolitan area)	16.01	11.82	11.32	10.31	9.57	8.85	44.3%
North area	17.16	11.82	10.90	10.37	9.00	8.76	49.0%
Metropolitan area	2.81	1.67	2.39	2.30	1.87	1.72	38.8%

Source: PEA data

Note: Note: Metropolitan area includes: Bangkok, Samut Prakan Province and Nonthaburi Province

Table 6: Power Outage Duration for each customer

Unit: minutes/year

	2001	2006	2007	2008	2009	2010	Improvement ratio (2001-2010)
Thailand (except for the metropolitan area)	921.51	552.74	508.27	442.64	385.93	350.06	62.0%
North area	958.51	500.16	461.85	382.03	313.99	291.27	69.6%
Metropolitan area	63.65	37.10	59.65	50.65	47.06	46.92	26.3%

Source: PEA data

Note: Note: The metropolitan area includes: Bangkok, Samut Prakan Province and Nonthaburi Province

(2) Contribution to sustainable development of the regional economy

As shown in Table 7, the general household and industrial demands for electricity grew at an average rate of 5.0% and 7.5% per year respectively between 2003 and 2010 in the 9 provinces in which this project was conducted. In particular, the industrial demands for electricity in 7 provinces showed more than 7% of the average annual growth during the same period, reflecting production expansion and the entry of new private companies in the area. The results of interviews with regional chambers of commerce and Provincial Administrative

[15] The volume of the power supply of the 11 substations constructed by this project in 2010 was 918 GWh, which accounted for about 6.4% of the total volume of power supply, 14,436GWh in the north of Thailand.

Offices (PAOs) conducted in this ex-post evaluation revealed that regional economies have become more active in recent years with the entry of new businesses/industries that has created new job opportunities in areas such as textiles, automobile parts, logistics, electronic appliances, hotels, frozen/processed food, shopping centers, restaurants, and gas stations. In addition to this, traditional industries, such as agro-related industries, have also expanded and this has partly contributed the improvements in the stability and reliability of the electricity supply in the region.

Table 7: Power Demand Growth in the 9 provinces in which this project was conducted

	Annual average growth of power demand (2003-10)			Annual average growth of power demand (2003-10)	
	Household	Industrial		Household	Industrial
Chiang Mai Province	6.1%	5.8%	Phrae Province	4.2%	7.5%
Chiang Rai Province	4.9%	10.1%	Chai Nat Province	4.2%	10.3%
Lampang Province	3.5%	4.1%	Sing Buri Province	3.9%	11.2%
Kamphaeng Phet Province	4.9%	8.2%	Nakhon Sawan Province	4.9%	8.0%
Phitsanulok Province	5.1%	7.9%	9 Provinces	5.0%	7.5%

Source: PEA data

Table 8 shows the growth rates of the real Gross Provincial Product (GPP) of the 9 provinces in which the project was conducted between 2003 and 2010. It is difficult to estimate the impact of this project on regional economic growth as growth is influenced by a number of different factors and also because this project was carried out only in a part of each province. However, as mentioned previously, staff in PAOs and regional chambers of commerce mentioned that regional economies have been quite active with the entry of new businesses, thanks to the stability of the power supply. Also, the production level in Chiang Mai, Chai Nat, and Sin Buri Provinces grew significantly in line with the significant increase in the industrial power demands in these provinces. Thus it can be said that the improvement of the stability and reliability of the power supply brought about by this project has partly supported economic growth in these provinces.

Table 8: Economic growth in the 9 provinces in which this project was conducted

	Average annual GPP growth (real) (2003-10)			Average annual GPP growth (nominal) (2003-10)
	Real GPP Growth	Manufacturing Production	Agriculture Production	
Chiang Mai Province	2.36%	3.33%	-0.14%	6.43%
Chiang Rai Province	4.08%	21.49%	0.81%	11.42%
Lampang Province	1.08%	2.36%	0.49%	7.13%
Kamphaeng Phet Province	0.17%	-2.42%	0.88%	8.12%
Phitsanulok Province	2.00%	6.29%	0.16%	8.59%
Phrae Province	1.59%	3.28%	1.92%	7.09%
Chai Nat Province	0.21%	2.40%	-2.59%	8.25%
Sing Buri Province	2.75%	5.96%	-3.14%	7.96%
Nakhon Sawan Province	1.48%	2.05%	-0.04%	8.59%
9 Provinces	1.72%	1.37%	-0.15%	
Thailand	4.15%	5.30%	0.75%	

Source: National Economic and Social Development Board

(3) Improvement of livelihoods

According to the interviews with PAOs and regional chambers of commerce conducted in the ex-post evaluation, the stable electricity supply and the improvement of power supply reliability brought about by this project have had a positive effect on the livelihoods of residents. People have started to purchase expensive electric devices such as TVs, computers, washing machines and refrigerators with less concern about damage caused by voltage fluctuation, and with income that has increased through the activation of the regional economies.

(4) Impacts on CO_2 reduction through a reduction of transmission losses

According to the PEA estimation[16], this project has reduced CO_2 emissions by 5,944 tons per year. This estimation can be utilized for reference since it uses multiple simulations due to the lack of available data such as for transmission loss of each transmission line. However, it is considered that the shortening of transmission and distribution lines by this project resulting from the construction of new substations has resulted in the reduction of transmission loss and thus, in turn, a reduction of CO_2 emission to some degree.

[Column] Interview with bulk electricity users

In this evaluation, interviews with 15 bulk electricity users (mainly manufacturing companies and agro-related businesses) were conducted in order to identify the project impact on business activities in the project area. While changes in the power supply situation in the project area are mentioned in 3.2.2, Qualitative Effects, some positive impacts of the project on business activities were identified, such as improvement in productivity, less damage of machines and improvements in product quality. Specific impacts identified in the interviews are as follows:

1. Improvement of productivity by reductions in idling and restarting time of production lines caused by power outages and short-interruptions
2. Improvement of the quality of services and products including on-time delivery and the homogenization of products by the reduction in the incidence of defective products caused by power outages, short-interruptions and voltage changes during the manufacturing process.
3. Reduction of damage of machines caused by voltage changes
4. Reduction of fuel costs by less frequent use of generators
5. Increase in production levels and expansion of sales channels through the improvement of productivity and product quality

From above, it can be seen that the project, aiming at ensuring a stable electricity supply and the improvement of the reliability of the power supply, has contributed to the development of business activities in the project area, although other factors have also contributed to that development.

3.3.2 Other Impacts

(1) Impacts on the natural environment

According to the PEA, there were no negative impacts on the natural environment. There were no complaints about noise from the substations, which are required to keep their noise level below 77 db, and there were no oil leakages from the transmission lines or the substations.

(2) Land Acquisition and Resettlement

In the project, 198,400m^2 of new land for 9 substations was acquired with a total cost of THB 43.9 million. A total of 15,200m^2 out of the whole acquisition of land was obtained from private owners while the rest was acquired from the Thai Government. The land from private

[16] Office for Climate Change, JICA Global Environment Department, "JICA Climate-FIT (Mitigation): Draft Ver1.0," June, 2011, a reference document to facilitate the consideration of policies and the formulation of projects for assisting climate change related measures in developing countries (JICA website).

owners was acquired through a bidding process where the PEA advertised for land owners who would sell land in the planned substation construction area. Thus, all land was acquired with the agreement of landowners and there were no resettlement cases The PEA did not acquire new land for the transmission lines as it has the rights to roadside lands for the construction of transmission lines on a preferential basis.

From above, it can be seen that the project has largely achieved its objectives, and therefore its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The planned project outputs included, in 9 provinces of the north of Thailand (Chiang Mai, Chiang Rai, Lampang, Kamphaeng Phet, Phitsanulok, Phrae, Chai Nat, Suing Buri, and Nahkon Sawan): (i) the construction of 115kV transmission lines (11 routes, total length of 455km) and (ii) the building of 115/22 kV distribution substations (11 substations (11 transformers), total transformer capacity of 375MVA). As for the final project outputs, while (ii) was completed as planned, the total length of the transmission lines was shortened to 362km. The main reasons for the shortening were: (a) A route change due to the construction of a new substation by EGAT close to the substation construction site for the project during the project implementation. This caused a change in the connected substation to the new substation after consideration of lower transmission losses and construction costs caused by the shorter distance of the transmission line; (b) A change of construction site for a substation and a route change due to the difficulty in laying down new transmission lines; (c) Route changes due to emergence of new electricity bulk users in the project area during project implementation; (d) Difference in distances between the estimation from maps and the actual survey.

This type of project, which involves the construction of multiple substations and transmission lines, is likely to cover the development of a power supply network system rather than the construction of a single transmission line. It is preferable that substations and transmission lines be constructed in the most efficient locations bearing in mind the whole power supply network system, and with consideration made of construction costs and transmission/distribution losses as well as the actual situation of power demands such as for new bulk electricity users. With these factors in mind, the routes and distance of transmission lines are likely changed from plan. Therefore, it is appropriate for PEA to change the total length of transmission lines in this project since the changes were caused by the reasons above.

115kV Transmission Line

50MVA Transformer

Capacitor

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual project cost amounted to 6,742 million yen, including the 1,337 million yen of the Japanese ODA loan, which was lower than the planned cost of 9,048 million yen including the 2,326 million yen of the Japanese ODA loan (75% of the planned cost) (Table 9). According to the PEA, the main reasons for this were the reduction in the material costs of transmission lines due to the shorter length and the lower contract prices with contractors due to a high level of competition.

Table 9: Planned and actual costs of the project

Unit: million JPY

	Planned						Actual					
	Foreign Currency		Local Currency		Total		Foreign Currency		Local Currency		Total	
	Sub-Total	Yen-Loan	Sub-Total	Yen-Loan	Total	Yen-Loan	Sub-Total	Yen-Loan	Sub-Total	Yen-Loan	Sub-Total	Yen-Loan
Construction Work	2,124	2,124	4,529	-	5,653	2,124	1,337	1,337	5,380	--	6,717	1,337
Price Escalation	72	72	438	-	510	72	-		-	-	-	-
Physical Contingency	130	130	611	-	741	130	-		-	-	-	-
Taxes and Duties	-	-	295	-	295	-	-		25	-	25	-
Total	2,326	2,326	6,722	-	9,048	2,326	1,337	1,337	5,405	-	6,742	1,337

Source: JICA appraisal documents and PEA data

Note: Exchange rate THB 1=2.87 (as of August 2001) (Planned), THB1=2.98 (average between March, 2002 and July, 2009) (Actual)

3.4.2.2 Project Period

The planned project period was a total of 43 months from March 2002 (the signing of the loan agreement) to September 2005 (completion of construction work). However, the actual project period was significantly longer than planned, from March 2002 to December 2007, a total of 70 months and 163% longer (a delay of 27 months) (Table 10)[17]. The main reasons for the delay were: (i) a longer time required to coordinate with and obtain the necessary approvals from the relevant agencies such as Department of Highways in the Ministry of Transport, the State Railway of Thailand and EGAT, (ii) a longer time required to obtain cabinet approval for those public entities which were required for the procurements of foreign goods due to the lack of foreign currency reserve caused by the Asian Crisis[18], (iii) a longer time required for the redesign of routes and re-cost estimations caused by route changes for transmission lines according to the current of power demands, and (iv) a delay in the bidding procedures for substation contractors.

[17] One contractor for substation construction faced a liquidity problem and could not provide the maintenance guarantee for the constructed substations after the completion of substation construction and the substation AC high voltage test. While the PEA could not make a final payment to the contractor, the contractor went into a rehabilitation process in court in December 2009. The repair costs incurred during the maintenance guarantee period (2 years from the date of AC high voltage test) were paid from the final payment to the contractor. Thus, it is judged that the completion date was the completion date of the substations (operation start date of the substation).

[18] This special measure continued until May 2007

Table 10: Planned and actual project period

	Planned	Actual
Signing of Loan Agreement	March 2002	March 2002
Procurement	March 2002 – July 2003 (17 months)	January 2002 – December 2003 (24 months)
Construction of Transmission Lines	July 2002 – March 2004 (21 months)	March 2001 – April 2006(note) (55 months)
Construction of substations	February 2003 – September 2005 (32 months)	July 2003 – December 2003 (54 months)
Project completion	September 2005	December 2007

Source: PEA data

Note: The construction of transmission lines financed by the PEA's own source prior to the signing of loan agreement was included in this project scope and the necessary costs for the construction were excluded from Yen-Loan portion.

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

On both the Financial Internal Rate of Return and the Economic Internal Rate of Return, a quantitative analysis of the internal rate of return was not conducted at the time of the project appraisal due to the nature of the project where it is not feasible to estimate the benefits attributable to it. A recalculation of IRR was thus not conducted at the time of the ex-post evaluation.

From the above, although the project cost was within the plan, the project period exceeded it and therefore the efficiency of the project is fair.

3.5 Sustainability (Rating: ③)

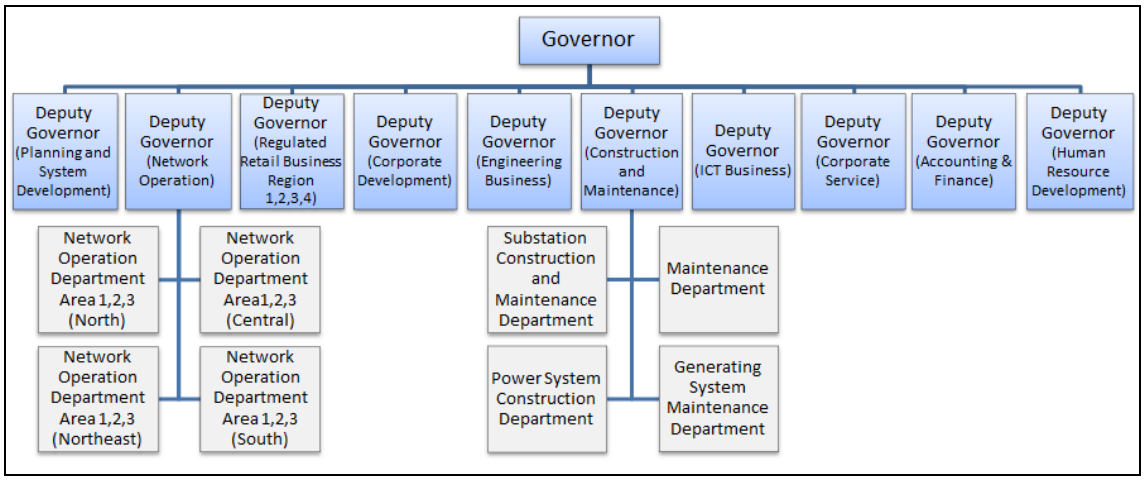
3.5.1 Structural Aspects of Operation and Maintenance

The O&M agency for the project facilities is the Provincial Electricity Authority (PEA). The PEA is a 100% state-owned enterprise. In electricity distribution in Thailand, while the MEA supplies electricity to Bangkok and two adjoining provinces (Samut Prakan Province and Nonthanburi Province), the PEA distributes electricity to the rest of the country. The Network Operation Department is responsible for the operation, preventive and corrective maintenance of the transmission lines constructed by this project. The Substation Construction and Maintenance Department is responsible for the operation, preventive and corrective maintenance of substations. These departments have 100 staff including 40 engineers, and 40 staff including 15 engineers respectively in their northern regional offices[19].

The O&M activities for the transmission lines are carried out by staff of the Network Operation Department allocated to the regional offices and the O&M activities for the substations are conducted by staff of the Substation Construction and Maintenance Department allocated to the regional offices and operators in the substations. In the case of severe damage to transmission and substation equipment, staff from the relevant department in the headquarters conduct repair works in collaboration with staff in regional offices. The PEA has undergone the testing of a un-manned substation plan by making use of SCADA system. While in normal operation, 4 operators are always in each substation, the number of operators in the 11 substations constructed by this project is 0~3 (0 operators: 1 substation, 1 operator: 1

[19] PEA has 12 regional offices in total (three each for the North, the Northeast, the Central and the South). The regional offices in the North are located in Chiang Mai, Phitsanulok and Lop Buri.

substation, 3 operators: 9 substations)[20]. No issues affecting O&M activities have been found from the institutional aspects. At the time of the ex-post evaluation, the Thai government had no policy to privatize the PEA.



Source: PEA data

Figure 1: PEA Organization Chart

3.5.2 Technical Aspects of Operation and Maintenance

Training activities for the substation operators engaged in the O&M of the substations include annual desk training conducted by the staff who are in charge of the O&M of substations in regional offices and OJT in substations, also under the instruction of such staff. Exams are conducted after desk training to identify how much technical knowledge has been acquired. The following shows the desk training courses relevant to this project:

- O&M of transmission lines: once a year, 40 staff
- Power system protection: once a year, 30 staff
- Hotlines maintenance improvement: once a year, 60 staff

Some operators in the substations constructed by this project commented that while the desk training was quite useful with a high quality of context and technical knowledge on the part of lecturers, they felt that they needed more training in order to efficiently handle newly introduced sophisticated systems such as SCADA. The O&M staff in the regional offices and in headquarters were satisfied with the technical skills of the substation operators engaged in O&M activities and had strong confidence in them.

3.5.3 Financial Aspects of Operation and Maintenance

As shown in Table 11, the PEA maintains a stable liquidity position and its debt service capacity has been improved with a decreasing debt/equity ratio in the last 5 years. With the steady increase in sales revenue, net income has also increased, except for 2008. There is thus no serious problem in its financial performance. Although the net income declined in 2007 and 2008, this was mainly the result of foreign exchange losses related to foreign currency borrowings[21].

[20] At the time of the ex-post evaluation, out of a total of 490 PEA substations, the number of substations with less than two resident operators was 117. In the case of substations at which no one resides, staff in charge of O&M can be found in the PEA provincial offices.

[21] While gains on foreign exchange in 2006 and 2007 were 1,984 THB million and 8 THB million, the PEA suffered a 1,498 THB million loss on foreign exchange in 2008. This gain (loss) on foreign exchanges mainly comes from unrealized gain (loss) of foreign currency borrowing at the end of the accounting period.

Table 11: PEA Financial Indicators

Unit: billion THB

	2006	2007	2008	2009	2010
Current ratio(time)	1.22	1.21	1.18	1.19	1.23
Quick ratio (time)	1.00	1.01	0.95	1.00	1.07
Debt/Equity ratio(time)	1.75	1.76	1.64	1.59	1.50
Return on assets (%)	5.93	4.84	4.15	5.50	5.57
Sales revenue	245.6	253.0	257.2	280.9	313.6
Net income	12.9	11.3	10.2	14.0	14.8

Source: PEA annual reports (2006-2010)

As shown in Table 12, the actual expenses for O&M exceeded the budget allocation except for 2008. This is due to the fact that the O&M budget was estimated based on preventive maintenance and corrective maintenance activities were not included in the O&M budget due to difficulties in estimation. The O&M cost accounts for 0.3-0.4% of sales revenue and 3-6% of the net income, which implies that the cost is not a significant burden. The ratio has declined since 2007. Thus, it can be concluded that there is no s erious problems in the project sustainability from the aspect of O&M expenses.

Table 12: O&M expense budget and actual for PEA

Unit: million THB

	O&M expenses		(A)/ Sales Revenue	(A)/Net Income
	Budget	Actual（A）		
2006	516.8	774.2	0.3%	6.0%
2007	540.9	1,131.4	0.4%	10.0%
2008	937.1	701.7	0.3%	6.9%
2009	581.0	597.0	0.2%	4.3%
2010	587.9	596.9	0.2%	4.0%

Source: PEA data, PEA annual reports

3.5.4 Current Status of Operation and Maintenance

The facilities constructed by this project are in a good condition. Although a new transformer installed in new substation under the project broke down due to an internal defect, the PEA immediately re-operated the substation by installing a back-up transformer from another substation. After repair work, the broken transformer could be properly operated in a different substation[22].

Substation operators conduct daily visual inspections of the substation facilities according to the O&M manual. Staff stationed in PEA provincial offices conducts visual inspection of the substation facilities weekly in a case of substation where no-one is resident. Staff from the Network Operation Department in the regional offices conduct visual inspections of transmission lines monthly. The frequency and the context of the maintenance activities for the facilities installed by this project are as follows.

[22] A 50 MVA transformer installed in Khai Bang Rachan by this project broke down due to coil arc failure in 2009. The supplier repaired it free of charge. However, since repair would take 2 years, the PEA brought and installed a transformer from another substation as a back-up in the Khai Bang Rachan substation so that operation could immediately be restarted. After repair work, the broken transformer was installed and is properly operating in another substation.

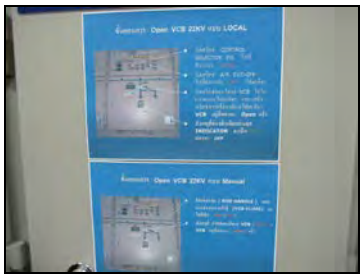
Table 13: O&M activities

Facilities	Frequency	Activities
Transmission Lines	Monthly	Visual inspection of transmission lines
	Quarterly	Single Circuit Single Conductor, Double Circuit Double Conductor
Substations	Daily	Monitoring through SCADA, visual inspection of the equipment
	Weekly	Visual inspection of the equipment (in case of unmanned substations)
	Quarterly	Maintenance of Relay
	Annually	Maintenance of power transformer, cleaning of switching substation, thermal viewer, checking of contact resistance, maintenance of circuit breaker, relay., CSCS, battery and charger

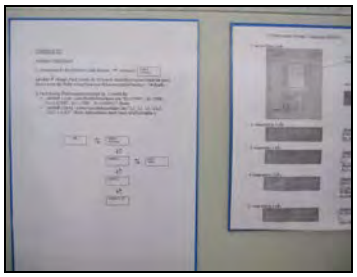
For the O&M of substation switchgear, the operators in each substation have enhanced O&M activities by establishing the best way to conduct their activities by themselves, such as attaching to O&M manuals, the distribution site and volume for each hour on the switchgear board, in addition to the instructions in the O&M manual.

From the above, it can be seen that no major problems were observed in the operation and maintenance system, therefore sustainability of the project effect is high.

Switchgear in Chiang Dao S/S



Switchgear in Khlong Khlung S/S



Switchgear in Han Kha S/S

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project was sufficiently consistent to the development policy of Thailand, its development needs and to Japan's ODA policy, and thus its relevance is high. The stability of the power supply and the reliability of the power system in the north of Thailand have been improved with stable average factors for substations in the project area and with a significant improvement in the voltage drop situation. Also, other project impacts such as a contribution to the regional economy have been seen. Therefore, the effectiveness of the project is high. While the project cost was lower than planned, the project period was significantly longer due to additional time required for coordination between the relevant agencies and for redesign and cost estimation related to changes in transmission routes because of current power demand states. Thus, the efficiency of the project was fair. Lastly, the operation and maintenance of the project in terms of the structural, technical and financial aspects is good and the project's sustainability 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

(1) SCADA/CSCS, which can control the operation of substations and transmission lines through networks from dispatch centers in regional offices, have been introduced to promote more effective and efficient operation of the transmission and distribution system. This, more sophisticated operation, has required the development of more sophisticated skills for staff. Given the ongoing plan for unmanned substations, it is desirable that PEA further develop staff skill in such areas to make effective use of infrastructure developed by this project.

(2) Operators in each substation conduct O&M activities of switchgear in an effective way which has been initiated by each substation operator themselves, although the instructions of O&M manual are also followed. These activities include the attachment of a switchgear operational manual, and a distribution volume of power by hour and distribution area, etc., on the board of switchgear. It is desirable that such O&M initiatives are shared among all substations to further strengthen current O&M activities and develop best practice.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

(1) One of the reasons for the project delay was the longer time required for the redesign and re-cost estimation of transmission line routes according to the current state of power demands. For this type of project, it is highly likely that the routes of transmission lines and locations of substations will be changed from plan in order to develop the most efficient and effective power transmission and distribution network possible in line with actual power demands, such as new bulk electricity users and the development of connected distribution networks. Therefore, it is desirable to develop a more practical implementation schedule which considers potential route and location changes for transmission lines and substations, and which relies on the PEA's long experience in implementing such projects at the appraisal stage.

(2) Another reason for project delay was the additional time required to coordinate with and obtain approval from the relevant government agencies such as the Department of Highways in the Ministry of Transport, the State Railway of Thailand and EGAT, due to the broad area of the project site. Thus, when implementing similar projects, it is desirable that the PEA closely coordinate with relevant agencies and other concerned stakeholders from the project concept and design stage by setting up a consultative group or by conducting regular meetings where the PEA and other concerned participants can regularly share information and their concerns for projects. Through these kinds of measures, the PEA can make the project implementation smoother by avoiding useless delays caused by poor coordination.

(3) Some distribution lines connected with new substations constructed by this project and/or neighbor substations were not improved, which has caused lower average factors for the substations. It is desirable that the connected distribution system is developed or improved at the same time as when new substations and transmission lines are constructed in order to maximize the potential impact of the project. Therefore, it is necessary for the PEA to exclude such potential factors that may limit the project effect by reviewing the development plan of the connected distribution network at the appraisal stages.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	Project area: 9 provinces in the north of Thailand (Chiang Mai Province, Chiang Rai Province, Lampang Province, Kamphaeng Phet Province, Phitsanulok Province, Phrae Province, Chiai Nat Province, Sing Buri Province and Nakhon Sawan Province) (1) 115kV Transmission Lines: 11 routes (single-line transmission), total length of 455km (2) 115/22kV distribution substations: 11 substations (11 transformers), total transformer capacity of 375MVA	As planned (1) 11 routes (single-line transmission), total length of 362km (2)As planned
2.Project Period	March 2002 – September 2005 (43 months)	March 2002 – December 2007 (70 months)
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 2,326 million yen 6,722 million yen (2,342 million THB) 9,048 million yen 2,326 million yen 1 THB = 3.03yen (As of March 2002)	 1,337 million yen 5,405 million yen (1,814 million THB) 6,742 million yen 1,337 million yen 1 THB = 2,98 yen (Average between March, 2002 and July 2009)

Thailand

Ex-Post Evaluation of Japanese ODA Loan
"Construction of 230 kV Underground Transmission Line
between Bangkapi and Chidlom Substation Project"

External Evaluator: Toshihisa Iida, Keishi Miyazaki, OPMAC Corporation

0. Summary

The objective of this project was to improve the reliability of the power supply central Bangkok and respond to increasing power demand by removing the existing unreliable transmission line and constructing new transmission line in a tunnel between Bangkapi and Chidlom substation, thereby contributing to the economic development of the area. This project was sufficiently consistent with the development policy of Thailand, its development needs and with Japan's ODA policy, and therefore its relevance is high. By replacing the old and unreliable transmission line with a new line, which has a larger load capacity, this project has enabled the MEA to continuously supply enough electricity with the level of quality planned to the project area, where electricity demand has increased. Also, other project impacts were observed such as contribution to the regional economy. Therefore, the effectiveness is high. While the project cost was lower than planned, the project period was longer than planned due to additional time required for coordination between the relevant agencies. Thus, the efficiency of the project was fair. Lastly, the operation and maintenance of the project, in terms of the structural, technical and financial aspects, are good and the project's sustainability is high.

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

1. Project Description

Project Location

Tunnel and underground cable constructed by this project

1.1 Background

Electricity demand in Thailand grew at an annual average rate of 9.3% between 1993 and 1997 and then marked its highest level in 2001 after declining in 1998 and 1999 due to the economic crisis. According to the demand forecast of the National Energy Policy Office (NEPO[1]), peak electricity demand in Thailand was expected to grow at an annual average rate of 5.9% from 2002 to 2011. Similarly, peak electricity demand in the area where the

[1] The Ministry of Energy was newly established in October 2002 under an Act of the Administrative Organization of State Affairs (No.5) BE. 2545 (2002) and the Action Organising Ministries, Sub-ministries and Departments BE. 2545. Supervision of NEPO was transferred from the Secretariat of the Prime Minister to the Ministry of Energy and this was named the Energy Policy and Planning Office (EPPO).

Metropolitan Electricity Authority (MEA) has supplied electricity, Bangkok and two adjoining provinces (Samut Prakan Province and Nonthaburi Province), increased by an annual average rate of 8.3% from 1993 to 1997, before the Asian currency crisis, and, according to the NEPO forecast, it was expected to grow at an annual average rate of 4.5% per year from 2002 to 2011. In order to ensure a stable electricity supply, it was necessary to continuously develop the transmission and distribution system as well as the generation system.

While electricity demand in the center of Bangkok area increased, the existing transmission lines between Bangkapi substation, owned by Electricity Generating Authority of Thailand (EGAT), and Chidlom substation, owned by MEA[2], had been in operation for more than 20 years. Operation and maintenance of the exiting lines was made difficult not only by serious wear and tear but also by difficulties in accessing manholes for O&M, some of which were located in private premises.

1.2 Project Outline

The objective of this project was to improve the level of confidence in the power supply to central Bangkok and respond to power demands which were anticipated to increase in the future. This was to be achieved by removing the existing underground transmission lines, constructing a tunnel for the underground transmission lines in the segment between Bangkapi and Chidlom substation, and laying down two circuit 230kV transmission lines, thereby contributing to the economic development of the area.

Loan Approved Amount/ Disbursed Amount	10,386million yen / 6,732million yen
Exchange of Notes Date/ Loan Agreement Signing Date	September 2002 / September 2002
Terms and Conditions	Interest Rate:2.2% (1.8% for consulting service) Repayment Period:25 years(Grace Period: 7 years) Condition for Procurement: General Untied
Borrower / Executing Agency(ies)	Metropolitan Electricity Authority/ Same as above Guarantor: the Royal Thai Government
Final Disbursement Date	January 2010
Main Contractor (Over 1 billion yen)	Obayashi Corporation (Japan)・Exsym Corporation (Japan)・Sojitz (Japan)・Nawarat Patanakarn Public Company Limited (Thailand)
Main Consultant (Over 100 million yen)	Electricite De France (French)・Tokyo Electric Power Service Co., Ltd (Japan)・ATT Consultants Co., Ltd (Thailand)
Feasibility Studies, etc.	"Construction of 230 k V underground transmission line between Bangkapi Substation and Chidlom Substation" Japan Consulting Institute, March, 2000
Related Projects (if any)	None

[2] EGAT is responsible for power generation and the transmission of power to MEA and PEA, which are responsible for power distribution and bulk electricity users. MEA distributes power to end-users in Bangkok and two adjoining provinces after bringing down the electric voltage at its distribution substations. MEA purchases power from primary substations owned by EGAT and transmits it through MEA transmission lines.

2. Outline of the Evaluation Study

2.1 External Evaluator

Toshihisa Iida, Keishi Miyazaki, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August 2011 – August 2012
Duration of the Field Study: January 8-25, 2012 and April 1-6, 2012

2.3 Constraints during the Evaluation Study

None

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of Thailand

The major emphasis in Thailand's Ninth National Economic and Social Development Plan (NESDP) (2002-2006) formulated by the National Economic and Social Development Board (NESDB) was placed on balanced development of human, social, economic, and environmental resources, and its priority strategies were (i) to accelerate economic recovery in order to establish a solid foundation, from grassroots to national level, for sustainable and quality growth in the future, and (ii) to strengthen the country's international competitiveness. Corresponding to the Ninth NESDP, the priority of the country's Energy Development Policy, through NEPO, was to conserve and develop energy as well as to promote the efficient use of energy in balance with the country's environment and natural resources. The MEA prepared a Ninth Power Distribution System Improvement and Expansion Plan (2002-2007) and this project was included in the first period (2002-3) of the Plan.

At the time of the ex-post evaluation, one of the missions of the Tenth NESDP (2007-2011) was to make the economy more efficient, stable, and equitable by reforming the structure of the economy to be a competitive foundation for the development of infrastructure and so on, and to support competitiveness and a fair distribution of benefits. Further, the energy sector policy of the Ministry of Energy under the Tenth NESDP included "Promoting the development, production and use of energy in conjunction with environmental conservation[5]." In addition, MEA's Tenth Power Distribution System Improvement and Expansion Plan (2008-2011) emphasized adequately satisfying the rising power demand with quality.

Thus, at the time of both the appraisal and the ex-post evaluation, enhancing international competitiveness through infrastructure development remained a priority area for the Thai government. The project area was the center of business and commercial activities in Bangkok and the project aimed at ensuring a stable electricity supply to the area, thus supporting the strengthening of the international competitiveness of Thailand by developing necessary infrastructure. This indicates that the project was continuously consistent with the Thai development policy. The project also supported efficient electricity usage through ensuring a stable electricity supply, which also matched energy sector policy at both the time of the appraisal and the ex-post evaluation. The MEA continuously emphasized facility

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[4] ③: High, ② Fair, ① Low
[5] Energy Policy as stated in the Policy Statement of the Government of Mr. Samak Sundaravej, Prime Minister, to the National Assembly, 18th-20th February, 2008

improvements to a provide stable electricity supply with quality, which remained consistent with this project objective.

3.1.2 Relevance to the Development Needs of Thailand

Peak electricity demand in the MEA service area was expected to grow at an average rate of 4.5% per annum from 2002 to 2011 according to the NEPO forecast at the time of project appraisal. The existing 230kV transmission lines between Bangkapi and Chidlom substation were installed with a combination of direct burial and a draw-in conduit system[6] in 1981. The lines had been in operation for more than 20 years and their reliability was significantly decreased due to unequal subsidence of the troughs and duct banks putting electrical stress on the cable. This was caused by the filling in pieces of land and the construction of local roads together with oil leakages in the direct burial segment which required the halting of the operation of the transmission lines for long periods. This forced a load capacity limit on the lines of only 300 MVA for the safety reason, compared with the original 500 MVA, which might create unstable power supply situation in the area at the peak power demand period. However, since some of manholes for O&M were in private premises such as under buildings, it was difficult to conduct repair works on the transmission lines. Therefore, MEA needed to replace the existing underground transmission line with new lines of higher reliability and larger load capacity in order to meet the increased electricity demand[7].

Table 1: Peak Electricity Demand in the MEA service area

	2002	2008	2009	2010	2011	Average growth rate p.a. (2002-2011)
Forecasted Peak Electricity Demand (at the time of appraisal) (MW)	6,555	8,629	8,936	9,314	9,695	4.5%
Actual Peak Electricity Demand (MW)	6,418	7,585	7,511	8,076	7,858	2.4%

Source: JICA appraisal documents, MEA data

Table 2: Forecasted Peak Electricity Demand in the MEA service area at ex-post evaluation

	2012	2013	2014	2015
Peak Electricity Demand Forecast (at ex-post evaluation) (MW)	8,731	9,122	9,481	9,827
Annual Growth Rate (%)	11.1	4.5	3.9	3.6

Source: MEA data

Peak electricity demand in the MEA service area grew at an average rate of 2.4 % per annum from 2002 to 2011, which was lower than forecasted at the time of appraisal. This mainly resulted from a large fluctuation in electricity demand in response to the high sensitivity of economic activities in the area to external factors such as the continuous political turmoil of Thailand and the negative impact of the subprime crisis on the Thai economy. According to the MEA, electricity demand in the MEA service area is expected to grow at an average rate of 4.1% per annum from 2011 to 2015 after a 7.5% increase in 2010 in response to the high economic growth of Thailand (7.8%), though ups and downs are expected to some degree due to external factors. Ensuring a stable electricity supply is an imperative for the economic infrastructure in the project area which is a center of business and commercial activities in Bangkok where more than 5% of the total MEA electricity supply is consumed. Therefore, the necessity to develop the facilities to supply reliable electricity at high quality has not changed from the time of project appraisal.

[6] The existing 230kV underground transmission lines were laid down in concrete cable troughs buried with sand along a railroad segment and in concrete conduits (duct banks) in a roadside segment.

[7] From JICA appraisal documents

In sum, needs to ensure a stable electricity supply to the MEA service area, including Bangkok, where the electricity demand has continuously increased, remained intact at both the time of the appraisal and of the ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

Japan's Official Development Assistance Charter, approved in 1992, focused on assisting infrastructure improvement as a priority area with a special emphasis on the Asian region. At the time of the project appraisal, Japan's ODA policy for Thailand (May 2000), as a priority area, placed special attention on a resolution to the inadequacy of economic infrastructure caused by rapid industrial and economic growth in Thailand and together with the overconcentration in Bangkok. The Medium-term Strategy for Overseas Economic Cooperation Operations for Thailand (2002-04) focused on the development of urban functions in Bangkok, including environmental improvements. The project was consistent with Japan's ODA policy since it assists in the development of the economic infrastructure of Thailand, a member of ASEAN, aiming at economic development by the establishment of a stable electricity supply.

From the above, it can be seen that this project has been highly relevant to the country's development plan and development needs, as well as to Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness (Rating: ③)

3.2.1 Quantitative Effects

3.2.1.1 Operation and Effect Indicators

(1) Received electricity at the receiving point

The received electricity at Chidlom substation, a receiving substation under this project, reached the target of 1,821GWh/year (4 years after the completion), in 2011. This was 2 years prior to the target year, as shown in Table 3, since the new transmission line constructed by this project accommodates the increased electricity demand in this area. The decrease in received electricity in 2008 and 2009 was caused by the shutting down of one circuit of the existing transmission line due to the construction work for this project.

Table 3: Received electricity at Chidlom substation

Unit: GWh/y

	2002	2008	2009 (completion)	2010	2011	Target (4 years after completion)
Forecast at the time of project appraisal	1,426	1,671	1,714	1,758	1,804	1,821
Actual	1,424	930	1,280	1,656	2,250	-

Source: MEA data

(2) Planned/Forced Outage of Transmission Line by This Project

There has been neither a single forced outage nor a planned outage of the transmission line since project completion. Thus, it can be said that the intended effect of the project was observed.

Table 4: Planned/Forced Outage of Transmission Line by the project

	Actual (2002)	Target (4 year after completion)	Actual (2011)
Planned Outage (Hour/year)	92	0	0
Forced Outage (Min/year)	10	Nil (extremely low)	0

Source: MEA data

3.2.1.2 Stabilization of Electricity Supply

(1) Power outage duration for each customer

As shown in Table 5 below, the power outage duration for each customer in the project area, commonly used as a reliability indicator, improved significantly with a decline of 45-68% between 2002 and 2010. While the reason for this reduction was mainly the improved maintenance of all connected transmission and distribution facilities, the new transmission line, for which there has been no planned/forced outrage since completion, has also contributed to the reduction of the power outage duration. because repair works after an accident for the old underground transmission line required extended periods of time. Power outage duration in the Klongtoey area increased in 2010 since this area was occupied by anti-government groups during the period of political turbulence in the spring of 2010 and the MEA could not conduct repair work during this period. The level of the power outage duration for each customer in the MEA is the second lowest among neighboring countries after Singapore (0.45 min/year: 2009[8]). It is lower than in France (62 min/year: 2007) and U.K (76 min/year: 2008), but higher than that in Japan (14 min/year: 2009[9]).

Table 5: Power Outage Duration for each customer in the project area

Unit: min/year

	2002	2008	2009	2010	Changes from 2002 to 2010
MEA Overall	51.12	50.65	47.06	46.92	▲8.2%
Bangkapi Area	155.26	79.74	57.01	50.38	▲67.6%
Klongtoey Area	59.16	16.18	16.99	25.06	▲57.6%
Samsen Area	46.45	34.09	33.16	25.77	▲44.5%
Yannawa Area	44.68	18.94	14.58	14.23	▲68.2%

Source: MEA data

(2) Transmission Losses

Transmission losses for the transmission line between Bangkapi and Chidlom substation declined from 0.28 % to 0.06 % after the completion of this project in 2009. Thus, it can be said that the project contributed to improvement of the efficiency and the stability of the electricity supply in the project area (Table 6).

Table 6: Transmission Loss Rate

	2002	2008	2009	2010	2011
MEA Overall (%)	3.97	3.14	3.46	3.39	3.60
Transmission line between Bangkapi S/S and Chidlom S/S	0.26	0.28	0.06	0.05	0.05

Source: MEA data

3.2.1.3 Response to the increasing electricity demands in the project area

Peak electricity demand at Chidlom substation, a receiving substation under this project, has surpassed the real load capacity of the old underground transmission line for safety reason, 300 MVA (about 285-294 MW[10]), since 2002, except in 2007 and 2008 as shown in Table 7. This meant that at peak periods, the old transmission line had to carry more than its real load capacity, which might create unstable power supply situation. Furthermore, the average factor

[8] Singapore Energy Market Authority Annual Report 2009-2010

[9] The Federation of Electric Power Companies of Japan, "Resilient power supply in the future", September 2011, http://www.cocn.jp/material/index.html

[10] MVA X Power Factor = MW. The Power Factor is about 0.85-0.9 for lower voltage and 0.95-0.98 for higher voltage

of the old transmission lines was 77% in 2006, which was near the maximum level (80%) in normal conditions according to the MEA operational guidelines. This project increased the maximum load capacity of the transmission line between Bagnkapi and Chidlom substation to 1,200 MVA (600 MVA X 2 circuits). This enabled it to accommodate the increasing power demand in the area into the future. In addition, the MEA operational standard requires that, in the case of underground transmission line, one circuit has to have enough load capacity to transmit the necessary electricity if another circuit is damaged. The load capacity of one circuit of the new transmission line is more than the current peak electricity demand at Chidlom substation. Thus it can be said that this project, which increased the load capacity of the transmission line between Bangkapi and Chidlom substation, has contributed to the stabilization of the power supply by satisfying the increasing electricity demand in the project area.

The decrease in the peak electricity demand and the average factor of the transmission line in 2008 and 2009 were caused by the shutting down of one circuit of the existing transmission line due to the construction work of this project.

Table 7: Peak Electricity Demand at Chidlom substation and the Average Factor of the Transmission Line between Bangkapi and Chidlom substation

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Peak Electricity Demand (MW)	354	357	368	371	386	280	285	474	375	455
Growth rate (%)	-	0.9	3.1	0.6	4.2	-27.4	1.9	66.3	-20.9	21.3
Average Factor of transmission line (%)	70.8	71.5	73.7	74.2	77.4	93.2	95.0	39.5	31.2	37.9

Source: MEA data

3.2.2 Qualitative Effects

By replacing the unreliable old transmission line, which was forced to carry electricity at a lower level than the original capacity, with a new transmission line which is more reliable and has a larger capacity, this project has contributed to the improvement of the reliability of the power supply system in the project area. Not only has the load capacity of the electricity transmission between Bangkapi and Chidlom substation increased and the transmission losses reduced, but also it is now possible to use the line as one of the MEA's main transmission lines in the area. According to MEA, in the current circumstances, where this transmission line contributes about 5% of demand in the MEA service area and while power demands in this area are increasing, the reliability of the power supply system would have been significantly reduced without the new transmission lines in the case of contingencies.

3.3 Impact

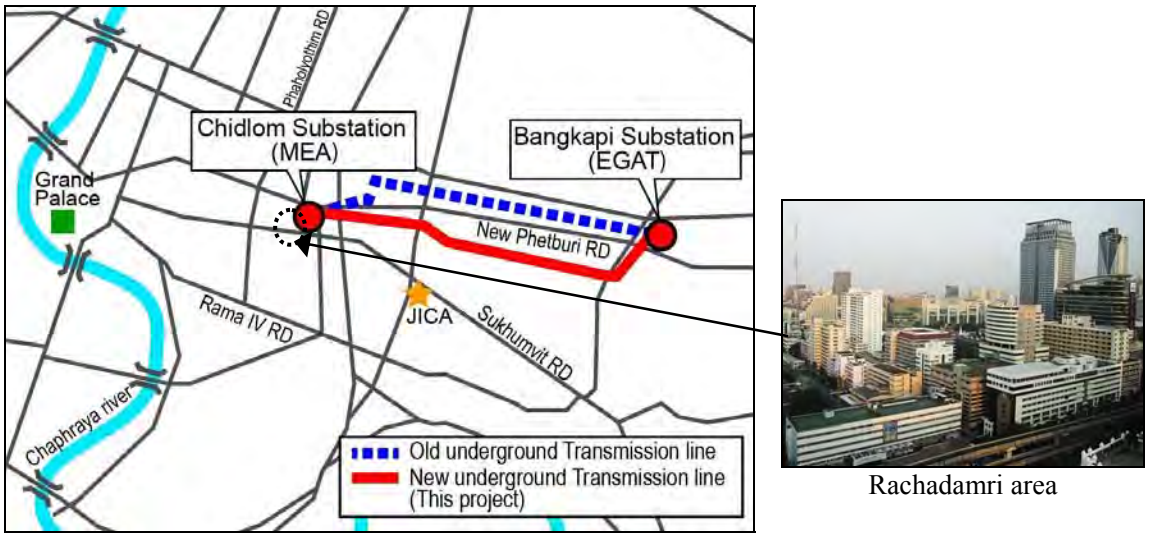
3.3.1 Intended Impacts

(1) Impact on the regional economy

The Bangkok economy accounts for about 25% of Thai GDP and the real Gross Regional Product (GRP) in Bangkok grew at an average rate of 2.2 % per annum from 2004 to 2010. While the growth rate was lower than the average real GDP growth rate of Thailand (4.2% per annum during the same period), it is expected that the Bangkok economy will continue to grow at a steady pace (Figure 1). The project area is a center of business and shopping in Bangkok where mega shopping centers, luxurious hotels and restaurants attract a n umber of foreign tourists and where there are also many commercial/office buildings, foreign embassies, offices of foreign companies and high-rise condominiums and where foreign officials and business persons reside. Therefore, the development of a stable electricity supply in the area is essential

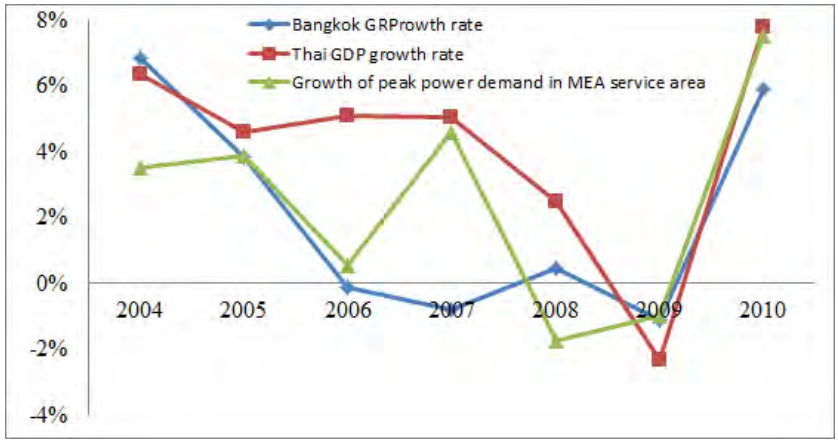
for the securement of the capabilities of the Bangkok Metropolitan area as well as for Thai economic growth.

Electricity demand in the project area accounts for about 5% of the total electricity demand in the MEA service area. Peak power demand in the project area (at Chidlom substation) increased by an average rate of 3.6% per annum between 2002 and 2010 with large fluctuations due to changes in economic conditions and political turmoil. The growth rate exceeded the average growth rate of peak power demand in the MEA service area, 3.0% per annum, during the same period. It is expected that the peak power demand in the project area will continue to grow at an average rate of 5.6% per annum from 2011 to 2015. It was in these circumstances that the project replaced the old transmission lines, where the load carrying capacity was limited and below the original due to oil leakages, with new transmission lines with a larger load carrying capacity. The project thus contributed to supporting economic development in the area by enabling a reliable electricity supply in response to the increasing electricity demand in the project area.



Map of old and new underground transmission lines

Rachadamri area



Source: NESDB, MEA

Figure 1: Thailand and Bangkok Real GDP Growth Rate

(2) Interviews with bulk electricity users

In the ex-post evaluation, interviews were conducted with three bulk electricity users (a shopping center, an office building and the Metropolitan Water Work Authority) and with 2 tenants of the shopping center, all of whom are project beneficiaries. The interviewees' responses are summarized as follows: i) they have received a sufficient electricity supply from before; ii) there have continued to be no blackouts from before; iii) the frequency of short interruptions[11] has been reduced, thereby contributing to a reduction in customer services[12]; and iv) they are largely satisfied with the current electricity supply situation in terms of both quantity and quality. As such, the project effects related to increasing the stability of the electricity supply such as the reduction of usage time and/or the installation of power generators (reduction of fuel costs) as well as the improvement of productivity due to the reduction of idling time during blackouts were not observed. This may result from the fact that these commercial buildings have installed power generation, alternative energy sources, Uninterrupted Power Supply (UPS[13]) and surge protection devices[14] to respond to blackouts and short interruptions for emergencies. Thus, while a large impact from the project on business activities in the project area cannot be identified, as the area has received a sufficient and high quality electricity supply from before, it can be said that this project has contributed to the support of business activities by providing continuous high quality electricity in this area.

3.3.2 Other Impacts

(1) Impacts on the natural environment

According to the MEA, an environmental monitoring program was conducted for air quality, noise, vibration, water quality and transportation/navigation during the construction period, and no significant negative impact caused by this project on the natural environment was found. Also, according to the Bangkok Metropolitan Administration (BMA) which is in charge of environmental issues, the BMA and the MEA fully coordinated environmental issues related to this project from the project designing stage. The MEA promptly dealt with traffic jams caused by discarded construction materials on roads as well as with the partial closures of manholes during the construction period in response to the recommendation of BMA, thereby causing no significant impact on traffic. Similarly, there was no significant negative impact on the natural environment since noise and vibration during the construction period were well managed and the old cables were properly disposed of according to the BMA guidelines. As for the construction method, a tunnel construction method was adopted for the project since an open-cut method would have caused huge road traffic disturbances[15]. As a result, it can be said that road traffic congestion during the construction period was minimized.

(2) Land acquisition and resettlement

Land acquisition and resettlement was not carried out for this project.

(3) Other Positive/Negative Impacts

The old transmission line proved a source of traffic congestion for several months to more than a year during repair work on the line (which occurred 1-2 times a year). This was because it was necessary to scarify the soil to identify points to be repaired due to the adoption of a

[11] In this interview, short interruptions were defined as blackouts for a few seconds.

[12] Interviewees from a cinema complex, a tenant of the shopping center, responded that short interruptions during movies had previously caused screening interruptions which needed recovery periods and which had damaged expensive equipment. At present, due to less frequent short interruption, there is no such damage of equipment and the level of service quality has been improved.

[13] A device that contains a battery and allows electricity to be supplied for a short period of time when the primary electricity source is lost.

[14] A device that protects electrical devices from transient exceeding voltages

[15] A shield tunneling method was used to excavate the tunnel. In the shield tunneling method, a shield tunneling machine excavates soil inside a steel shield, while constructing the tunnel in segments (steel and/or concrete blocks) at the rear end of the machine.

direct burial / draw-in conduit system. As the new transmission line was constructed by a tunnel method, the underlying causes of traffic congestion in the area during the repair work were removed as scarifying work is no longer required. The BMA also recognizes that there is no traffic congestion caused by repair work of the transmission line even though this frequently occurred before the project.

From the above, it can be seen that the project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The planned project outputs included: (i) a tunnel for the underground transmission line, (ii) the transmission line, (iii) other incidental equipment. As for the final project output, while (ii) was completed as planned, there were slight changes in the total length and the inside diameter of the tunnel for (i) and the total route length of the transmission line for (ii). It can be judged that these were suitable proper changes since these resulted from the implementation of the detailed field survey. Furthermore, while oversea training on electric and civil work was planned as part of the tasks of the consultant, this was replaced with OJT conducted by the consultant and the contractor during the construction period. The O&M manual was prepared by the contractor after consideration of the costs associated with oversea training and the MEA O&M practice outsourced the annual inspection and corrective actions to the contractor. This was an appropriate decision considering the MEA practice of O&M activities at the time of the ex-post evaluation.

Control Panel

Transmission Line Trough

Oil Room

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual project cost amounted to 8,933 million yen (including the 6,726 million yen of the Japanese ODA loan), which was lower than the planned cost of 13, 848 million yen (including the 10,386 million yen of the Japanese ODA loan) (65% of the planned cost) (Table 8). According to the MEA, the main factors for this were probably the technological advances of the tunnel construction method which brought about the same quality but with lower costs, together with the efficient competitive bidding process. The planned cost had been estimated based on the estimated construction cost of the tunnel method for the 230kV underground transmission line that MEA had previously conducted[16].

[16] A 230 kV underground transmission line between Vibhavadi and Lad Phrao substation (completed in 2002)

Table 8: Planned and Actual Project Cost

Unit: JY Million

	Planned						Actual					
	Foreign Currency		Local Currency		Total		Foreign Currency		Local Currency		Total	
	Sub-total	Yen Loan	Sub-Total	Yen Loan	Total	Yen Loan	Sub-Total	Yen Loan	Sub-Total	Yen Loan	Total	Yen Loan
Construction	6,180	6,180	5,412	2,813	11,592	8,993	6,469	6,469	2,077	-	8,546	6,469
Consulting services	177	177	55	55	232	232	257	257	-	-	257	257
Land acquisition	-	-	70	-	70	-	-	-	9	-	9	-
Detailed design	-	-	112	-	112	-	-	-	-	-	-	-
Contingency	619	619	542	542	1,161	1,161	-	-	-	-	-	-
Tax and Duty	-	-	681	-	681		-	-	121	-	121	-
Total	6,976	6,976	6,872	3,410	13,848	10,386	6,726	6,726	2,207	-	8,933	6,726

Source: JICA appraisal documents and MEA data

Note: Foreign Exchange Rate: THB1＝JPY3.03 (April, 2002) (Planned), THB1＝JPY2.95 (Daily average between September 2002 and January 2010) (Actual)

3.4.2.2 Project Period

The planned project period was a total of 63 months from September 2002 (the signing of the loan agreement) to November 2007 (completion of all work). However, the actual project period was longer than planned, from September 2002 (the signing of the loan agreement) to November 2009 (completion of all work), a total of 87 months and 138% longer (a delay of 24 months) (Table 9). The main factors for the delay were: (i) longer time was required to coordinate and obtain the necessary approval from and among the relevant agencies that owned infrastructure facilities near the construction site of the transmission lines including BMA, EGAT, the Mass Rapid Transit Authority of Thailand (MRTA), Expressway Authority of Thailand (EXAT), and the State Railway of Thailand (SRT); (ii) a longer internal process than anticipated was required inside the MEA for every design change; and (iii) a Cabinet resolution (July 2008) to extend all civil work contracts for 180 days to support construction companies suffering from price hikes in oil and other construction materials.

Table 9: Planned and Actual Project Period

	Planned	Actual
Signing of Loan Agreement	September 2002	September 2002
Conceptual Design & Tender Assistance	June 2002 – February 2004 (21 months)	June 2002 – April 2004 (23 months)
Selection of Contractor for Construction Work	November 2002 – February 2004 (16 months)	June 2003 – April 2005 (23 months)
Construction Work	March 2004 – November 2007 (45 months)	May 2005 – September 2009 (53 months)
Selection of Consultants for Construction Supervision	April 2003 – February 2004 (11 months)	July 2004 – August 2005 (14 months)
Construction Supervision	March 2004 – November 2007 (57 months)	September 2005 – November 2009 (51 months)
Project Completion	November 2007	November 2009

Source: MEA data

3.4.3 Supervisory consulting services

The planned total man/month of the consulting services of foreign consultants and local consultants was 40.82 M/M and 275.79 M/M respectively. However, the actual total man/month was 70.75 M/M and 175.5 M/M respectively. The main reason for this difference was that tasks including cable system design and tunnel design/construction that it was planned would be implemented by local consultants, were identified to require more complicated technical knowledge and, as a result, these tasks were assigned to foreign consultants. Thus it can be said that this was appropriate for the smooth implementation of the project.

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

For both the Financial Internal Rate of Return and the Economic Internal Rate of Return, due to the nature of the project, where it is not feasible to estimate the benefits attributable, a quantitative analysis of the internal rate of return was not conducted at the time of the project appraisal. Thus, a recalculation of IRR was not conducted at the time of the ex-post evaluation.

From the above, it can be seem that although the project cost was within the plan, the project period exceeded it, and therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

The O&M agency for the project facilities is the Metropolitan Electricity Authority (MEA). The MEA is a 100 % Thai government owned enterprise and the Thai government had no policy to privatize the MEA at the time of the ex-post evaluation. The MEA distributes electricity in Bangkok and in two adjoining provinces (Samut Prakan Province and Nonthaburi Province) while the Provincial Electricity Agency (PEA) distributes electricity to the rest of the country. The operation of the facilities is carried out by the Power System Control Department and maintenance and management are conducted by the Power System Maintenance Department. A total of 17 staff, including 3 engineers, have been engaged in the O&M activities of the facilities and so far no issue has arisen which affects O&M activities in the structural aspect.

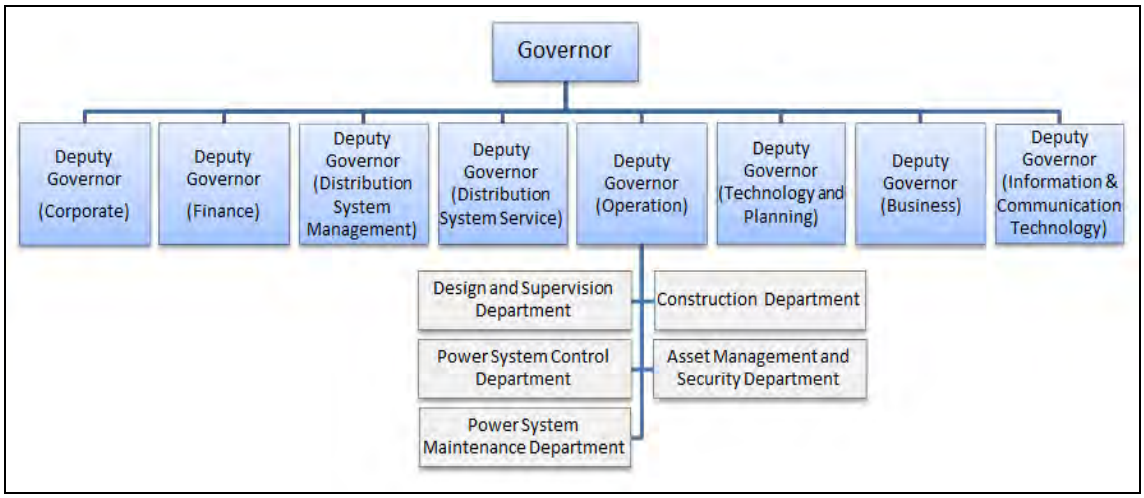


Figure 2: MEA Organization Chart

3.5.2 Technical Aspects of Operation and Maintenance

Staff have been engaged in the O&M activities in accordance with the O&M manual for underground cables and tunnels, which was prepared by the project contractors. The two

heads of the maintenance section continuously received training on preventive maintenance activities for underground cables and tunnels from the contractor during the construction period. These two heads have then provided training for other staff engaged in the O&M activities of the facilities, manly via On-the-Job Training (OJT). The training relevant to this project is as follows.

a) Twice a year, methods of checking the cable system
b) Once a year, methods of checking the cable and equipment
c) Once a year, method of correcting fundamental problems in operation

No major problems have been observed in the technical aspects of O&M since the O&M manual for underground transmission lines and tunnels has been prepared and the staff has received sufficient technical training.

3.5.3 Financial Aspects of Operation and Maintenance

Table 10 shows the financial indicators of MEA in the last 5 years. It can be seen that during this time, the MEA has had stable electricity sales and net income while improving its current ratio and debt/equity ratio. There is no issue in its liquidity nor in its debt repayment capacity as the debt-service coverage ratio indicating the repayment capacity of the debt principle and interest was more than 2 in 2010. A decline in electricity sales and the net income in 2008 resulted from a weaker electricity demand due to the Thai economic slowdown caused by the subprime crisis and electricity tariff cuts.

Table 10: Financial Indicators of MEA

	2006	2007	2008	2009	2010
Current ratio	1.07	1.07	1.14	1.06	1.23
Debt/Equity Ratio	0.66	0.66	0.65	0.60	0.50
Debt Service Coverage Ratio	1.77	1.46	1.48	1.79	2.07
Return on Assets (%)	3.90	3.74	2.71	3.93	4.53
Sales of electricity (billion THB)	131.7	130.2	130.1	139.1	149.9
Earning before financial cost (billion THB)	7.7	7.6	6.1	8.6	10.1
Net Income (billion THB)	6.3	6.3	4.8	7.3	8.7

Source: MEA Annual Report (2006-2010)

Table 11 shows the O&M budget and the actual spending for the facilities constructed by the project. Since the budget was formulated based on approximately 3% of the investment cost every year and as there has been no repair work on the facilities, actual spending has been much less than the budget. According to the MEA, the current level of the O&M budget is suitable to ensure proper maintenance of the facilities.

Table 11: O&M Budget and the Actual Spending for this project

Unit: million THB

	2009	2010	2011
Budget	125	125	125
Actual	1.64	1.64	1.64

Source: MEA data

There is no significant issue in the financial aspect of O&M since the financial condition of MEA is good in terms of its liquidity and profitability and because MEA maintains sufficient budget for O&M activities.

3.5.4 Current Status of Operation and Maintenance

The facilities constructed by this project have been well maintained and so far no troubles have arisen which require repair work in either the tunnel or the transmission line. The O&M activities are conducted in accordance with the O&M manual for the tunnel and transmission

line, and the frequency of activities are as follows in Table 12:

Table 12: O&M activities

Frequency	Activities
Daily	Visual checking for oil and water leakages from cables and tunnel, monitoring through a control panel
1 time/month	Inspection & recording of oil system information, visual inspection of the underground transmission line
3 times/year	Checking of equipment installed at Chidlom substation
2 times/year	Visual inspection and cleaning of all terminators and connectors at Bangkapi substation
1 time /year	Inspection of the Utility system in the tunnel, the alarm system, terminator & lighting arrester, inspection and function test of the oil control box, visual inspection of tunnel structure
Every 2 years	Inspection of Relay protection system
Every 5 years	Oil insulation test

Source: MEA

Currently, the annual inspection and repair works are conducted by the contractor who was in charge of the construction of the transmission line (Exsym Corporation). This is part of the maintenance guarantee that is valid until January 2017. According to the MEA, after the expiration of the maintenance guarantee period, the MEA will conduct the annual inspection by itself and outsource repair works to the contractor as is the case in another MEA 230kV underground transmission line.

From the above, it can be seen that no major problems were observed in the operation and maintenance system, and therefore the sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was sufficiently consistent with the development policy of Thailand, its development needs and with Japan's ODA policy, and thus its relevance is high. By replacing the old and low-reliable transmission line with a new line which has a larger load capacity, this project has enabled the MEA to continuously supply enough electricity with sufficient quality as planned to the project area where electricity demand has increased. Also, other project impacts such as contributions to the regional economy were observed. Therefore, the effectiveness is high. While the project cost was lower than planned, the project period was longer than planned due to additional time required for coordination between the relevant agencies. Thus, the efficiency of the project was fair. Lastly, the situation regarding the operation and maintenance of the project in terms of the structural, technical and financial aspects is good and the project's sustainability 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

One of the reasons for the delay in project implementation was the fact that a longer time than expected was required to coordinate and obtain approvals from relevant government agencies with different interest such as BMA, EGAT, MRTA, EXAT and SRT, which owned infrastructure facilities near the transmission line construction site, since the transmission line was constructed below a canal in Bangkok. When implementing similar projects which involve multiple institutions as stakeholders, it is desirable for MEA not only to keep necessary schedules for coordination, but also to closely coordinate with these institutions at the project concept and design stage by considering the setting up of a consultative meeting group where the MEA and other concerned participants can regularly share information and their concerns in order to avoid project delay caused by poor coordination.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	(1) Tunnel: Inside diameter 3m, Length 7.1km (2) Transmission Line: 230kV X 2 circuit, Length 7.5km (3) Auxiliary equipment	(1) Inside diameter 2.6m, Lenhth 7km (2) 230kV X 2 circuit, Length 7.1km (3) same
2. Consulting Service	Foreign : 40.82 M/M Local : 275.79 M/M	Foreign : 70.75M/M Local : 175.5 M/M
2.Project Period	September 2002 – November 2007 (63 months)	September 2002 – November 2009 (87 months)
3.Project Cost		
Amount paid in Foreign Currency	6,976 million yen	6,726 million yen
Amount paid in Local Currency	6,872 million yen (2,267 million THB)	2,207 million yen (748 million THB)
Total	13,848 million yen	8,933 million yen
Japanese ODA loan portion	10,386 million yen	6,726 million yen
Exchange rate	1 THB = 3.03yen (As of April 2002)	1 THB = 2.95 yen (Average between September 2002 and January 2010)

Thailand

Ex-Post Evaluation of Japanese ODA Loan
"Second Bangkok International Airport Development Project (I)(II)(III)(IV)(V)(VI)(VII)"

External Evaluator: Keishi Miyazaki, OPMAC Corporation

0. Summary

The objective of this project was to accommodate increasing passenger and cargo demands by constructing the Second Bangkok International Airport, including a passenger terminal with a capacity of 45 million passengers/year, a cargo terminal with a capacity of 2.12 million tons/year and two runways, at Nong Ngu Hao, Samut Prakan Province which was located 30 km east of Bangkok, thereby contributing to the economic development of Thailand.

The project was highly relevant to Thailand's development plan and development needs, as well as to Japan's ODA policy, and therefore its relevance is high. The operation of the Second Bangkok International Airport (Survarnabhumi Airport) is generally good. The key performance indicators such as the number of passengers, cargo volume and the number of takeoffs and landings have mostly achieved their targets, and they have been increasing constantly. The expected project effects such as improvements in airport convenience and efficiency, improvements in airport safety and in the capacity and function of the airport as an international hub-airport have been achieved. Also, the project positively contributed to commercial development near the airport, the development of transport networks between the airport and the city center of Bangkok, and the promotion of tourism sector development in Thailand. Noise issues near the airport have been a pending issue, but mitigation measures have been carried out by the Airport of Thailand Public Company Limited (AOT) and the Thai government. Thus, the effectiveness of the project is high.

The project cost exceeded the plan, and the project period exceeded it significantly, therefore the efficiency of the project is low. Project sustainability is deemed high in the structural, technical and financial aspects, the O&M condition of project facilities and equipment is good.

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

1. Project Description

Project Location

Passenger Terminal Building of Survarnabhumi Airport

1.1 Background

In 1996, there were five international airports (Bangkok, Chiang Mai, Hat Yai, Phuket, and Chiang Rai) and 21 airports in Thailand. The airport sector of the country had been developed first thorough expanding flight networks within the main five international airports with the

central focus on Bangkok, then between the five international airports and other domestic airports. As there was economic development as well as tourism sector development in Thailand, the demand for airport passengers through Bangkok was expected to increase from over 35 million in 2000 to 55 million in 2010. However, the existing passenger handling capacity of the Bangkok International Airport (Don Muang International Airport) was 30 million and expansion of Don Muang International Airport was difficult because the airport was located in a populated residential area. Therefore, the development of a new international airport in Bangkok was necessary in order to meet the future air passenger demand and to secure smooth air transportation.

1.2 Project Outline

The objective of this project was to accommodate increasing passenger and cargo demands by constructing the Second Bangkok International Airport including a passenger terminal with a capacity of 45 million passengers/year, a cargo terminal with a capacity of 2.12 million tons/year and two runways, at Nong Ngu Hao, Samut Prakan Province which was located at 30km east of Bangkok, thereby contributing to the economic development of Thailand.

Loan Approved Amount / Disbursed Amount	199,243 million yen / 194,410 million yen (Total amount from Phase I to Phase VII)
Exchange of Notes Date / Loan Agreement Signing Date	(Phase I) Sep. 1996 / Sep. 1996 (Phase II) Sep. 1997 / Sep. 1997 (Phase III) Sep. 1999 / Sep. 1999 (Phase IV) Sep. 2000 / Sep. 2000 (Phase V) Sep. 2002 / Sep. 2002 (Phase VI) Apr. 2004 / Apr. 2004 (Phase VII) May 2005 / May 2005
Terms and Conditions Interest rate Repayment period (Grace period) Condition of procurement	(Phase I) IR: 2.70%, RP: 25 years (GP: 7 years), General Untied (for consulting services: IR: 2.30%, RP: 25 years (GP: 7 years), General Untied) (Phase II) IR: 0.75%, RP: 40 years, (GP: 10 years), General Untied (Phase III) IR: 2.20%, RP: 25 years, (GP: 7 years), General Untied (for consulting services: IR: 0.75%, RP: 40 years (GP: 10 years), General Untied) (Phase IV) IR: 2.20%, RP: 25 years, (GP: 7 years), General Untied (for consulting services: IR: 0.75%, RP: 40 years, (GP: 10 years), General Untied) (Phase V) IR: 2.02%, RP: 25 years, (GP: 7 years), General Untied (for consulting services: IR: 0.75%, RP: 40 years (GP: 10 years), General Untied) (Phase VI) IR: 1.05%, RP: 20 years (GP: 6 years), General Untied (for consulting services: same as above) (Phase VII) IR: 0.90%, RP: 15 years (GP: 5 years), General Untied (for consulting services: same as above) Note: IR: Interest Rate, RP: Repayment Period, GP: Grace Period
Borrower / Executing Agency	Airport of Thailand Public Company Limited (AOT) / Airport of Thailand Public Company Limited (AOT)
Final Disbursement Date	(Phase I) January 2004, (Phase II) January 2005, (Phase III) January 2008 (Phase IV) January 2008, (Phase V) January 2010, (Phase VI) August 2010 (Phase VII) August 2010
Main Contractors (Over 1 billion yen)	• Trad Construction Ltd., Part. (Thailand) • Krung Thon Engineers Co., Ltd.(Thailand) / Vichitbhan Construction Co., Ltd. (Thailand) • Italian-Thai Development Public Company Limited (Thailand) • Obayashi Corporation (Japan) / Takenaka Corporation (Japan) / Italian-Thai Development Public Company Limited (Thailand) • Krung Thon Engineers Co., Ltd.(Thailand) / Vichitbhan Construction Co., Ltd. (Thailand) / Prayoonvisava Engineering Co., Ltd. (Thailand) • Bina Puri Holdings Berhad (Malaysia) / Kampangphetviwat Construction Co., Ltd. (Thailand)

	• Kampangphetviwat Construction Co., Ltd. (Thailand) / P.P.D. Construction Co. Ltd. (Thailand) • Shimizu Corporation (Japan) / Vichitbhan Construction Co., Ltd. (Thailand) • Nishimatsu Construction Co., Ltd. (Japan) / The Nippon Road Co. Ltd. (Japan) / Krung Thon Engineers Co., Ltd.(Thailand)
Main Consultants (Over 100 million yen)	• Pacific Consultants International (Japan) / C&C International Venture Co., Ltd. (Thailand) • Oriental Consultants Co., Ltd. (Japan) / Asian Engineering Consultants Co., Ltd. (Thailand) / Epsilon Co., Ltd. (Thailand) / Roge and Associates Co., Ltd. (Thailand) • Nippon Koei Co., Ltd. (Japan) / Thai Engineering Consultants Co., Ltd. (Thailand) / MAA Consultants Co., Ltd. (Thailand) • Norconsult International AS (Norway) / Southeast Asia Technology Co., Ltd. (Thailand) / MAA Consultants Co., Ltd. (Thailand) / Scott Wilson Kirkpatrick (Thailand) Ltd. (Thailand) / Span Co., Ltd. (Thailand) • Dorsch Consult Ingenieurgesellschaft Mbh (Germany) / Japan Transportation Consultants (Japan) / JAL Aviation Consultant (Japan) / Southeast Asia Technology Co., Ltd. (Thailand) / TEAM Consulting Engineering and Management Co., Ltd. (Thailand) / Project Planning Services Co., Ltd. (Thailand) / Santhaya & Associates Co., Ltd. (Thailand) • Nippon Koei Co., Ltd. (Japan) / Tesco Ltd. (Thailand) / MAA Consultants Co., Ltd. (Thailand) • Quatrotec Inc. (USA)
Feasibility Studies, etc.	Master Plan was prepared in 1993 by a consortium: name of General Engineering Consultant consists of NACO (Netherlands), Louis Berger International (USA) and other Thai consulting firms.
Related Projects	• Dispatch of JICA experts (Airport construction) (1997) • JICA technical cooperation "The Project on Capacity Building for Environmental Management and Airside paved Area Maintenance of Suvarnabhumi Airport" (2004- 2006) • Special Assistance for Project Implementation on the Second Bangkok International Airport Development Project (I)(II) (1998) by JICA

2. Outline of Evaluation Study

2.1 External Evaluator

Keishi Miyazaki, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: August 2011 – August 2012
Duration of the Field Study: January 8 – 21, 2012 and April 1 – 7, 2012

2.3 Constraints during the Evaluation Study

None

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

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance with the Development Plan of Thailand

At the time of the Phase I appraisal, the Thai Government's Seventh National Economic and Social Development Plan (NESDP) (1992-1996) set out its main development objectives as: (i) to maintain economic growth rates at appropriate levels to ensure sustainability, (ii) to redistribute income and decentralize development to the regions and rural areas more widely, and (iii) to accelerate the development of human resources, the upgrading quality of life, the environment and natural resource management. In order to achieve the above main development objectives, the promotion of the development of the Bangkok Metropolitan Region in order to ensure better connections and integration between the Bangkok Metropolis and the Eastern Seaboard area was highlighted as one of the principal development guidelines in the plan. This addressed the strengthening of the metropolitan region as a regional center for finance, tourism, air transport and telecommunication in the Southeast Asian region.

Figure 1: Project Site Map

The airport sector of the country had been developed through the establishment of flight networks between the main five international airports and other airports with the central focus on Bangkok. In the Thai airport sector development strategy at the time of the Phase I appraisal, the Second Bangkok International Development Project was given the highest priority as the largest national project. In the Master Plan of the Second Bangkok International Development Project (1993)[3], this project was seen as the first phase of the entire project.

At the time of the ex-post evaluation, one of the missions of the Tenth NESDP (2007-2011) was to make the economy more efficient, stable, and equitable by reforming the structure of the economy to be a competitive foundation for the development of infrastructure and so on. Also to support competitiveness and a fair distribution of benefits. At present, the Second Phase of the Master Plan is in progress for the expansion of the passenger terminal building etc. It is expected that passenger handling capacity will be expanded from the existing 45 million passengers/year to 60 million passengers/year by the Second Phase Project[4]. Furthermore, passenger handling capacity will be expanded to 80 million passengers/year by the implementation of the Third Phase Project through the construction of the third runway and the domestic passenger terminal building.

3.1.2 Relevance with the Development Needs of Thailand

At the time of the Phase I appraisal, air passenger demand in Bangkok was growing, together with economic development as well as development of the tourism sector in Thailand. For example, the number of international and domestic air passengers recorded 9-15% annual

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory.
[2] ③:High, ②:Fair, ①:Low.
[3] The master plan divided the entire development plan into five phases, and its ultimate goal was to expand the airport capacity with four runways, passenger handling capacity with 100-120 million passengers/year and cargo handling capacity with 6.4 million tons/year.
[4] The Second Phase Project obtained Cabinet approval in August 2010, and the contract for management consulting service was signed between AOT and the consultants in May 2012.

growth rates, and it was estimated that the total number of international and domestic passengers would increase to 35 million in 2000 and 55 million in 2010. Meanwhile, the passenger handling capacity of the existing Don Muang Airport (Bangkok International Airport) had been expanded to 30 million passengers/year in 1995. However, since Don Muang Airport was surrounded by main roads and a populated residential area as well as a part of the airport being utilized for a military base, it was difficult to further expand the airport in order to cope with future demands. Therefore, the construction of the Second Bangkok International Airport was urgent in order to meet future demands and secure smooth air transportation.

At the time of the ex-post evaluation, the number of passengers at Survarnabhumi Airport (in 2011) was 47.9 million, which already exceeded the existing passenger handling capacity of 45 million. It is estimated that the number of passengers at the airport will increase to 58.9 million in 2015, 72 million in 2020, and that cargo volume will increase to 1.58 million tons in 2015 and 1.97 million tons in 2020[5] (Table 1).

Table 1: Demand Forecast of Survarnabhumi Airport

	2011*	2012	2013	2014	2015	2020
1. No. of passengers (unit: 1,000/year)	**47,911**	**51,015**	**53,766**	**56,444**	**58,901**	**72,049**
- International	35,009	37,394	39,996	42,401	44,384	54,374
- Domestic	11,305	11,982	12,106	12,354	12,803	15,828
- Transit	1,597	1,639	1,664	1,689	1,714	1,847
2. Cargo volume (unit: tons/year)	**1,347,514**	**1,380,000**	**1,445,450**	**1,514,000**	**1,586,700**	**1,973,500**
- International	1,265,016	1,318,000	1,381,000	1,447,000	1,517,000	1,889,000
- Domestic	55,080	62,000	64,450	67,000	69,700	84,500
- Transit	27,418	N/A	N/A	N/A	N/A	N/A
3. No. of takeoffs and landings (unit: time/year)	**299,566**	**317,456**	**331,960**	**346,244**	**359,700**	**431,701**
- International	216,636	229,894	243,720	256,425	266,848	318,344
- Domestic	82,930	87,562	88,240	89,819	92,852	113,357

Source: AOT.
Note: The figures in 2011 are actual figures.

The total number of passengers at the six major international airports[6] in Thailand in 2010 was 58.2 million, of which 42.8 million (73.5%) were passengers at Survarnabhumi Airport[7]. At present, 105 airlines, including 101 international and 4 domestic airlines, operate in Survarnabhumi Airport with a flight network to 146 overseas cities in 61 countries and 22 cities in Thailand. Survarnabhumi Airport is ranked 17th in passenger volume in the world and is a major regional hub-airport in Asia[8]. Thailand has the biggest manufacturing base for electronics and automobile industries in the ASEAN region with a well-developed infrastructure and supporting industries. Thailand is also one of the important economic focal points for exports into the ASEAN region. In addition, since Thailand is rich in tourist resources and is located at a strategic point for transport in the region, the country attracts a great number of tourists, not only from the neighboring states, but from all over the world including Europe, U.S.A. and Australia. According to a forecast of the International Civil Aviation Organization

[5] The current cargo handling capacity of Survarnabhumi Airport is 3 million tons/year.
[6] Survarnabhumi Airport, Don Mang Airport, Chiang Mai Airport, Hat Yai Airport, Phuket Airport, and Chiang Rai Airport.
[7] Source: 2010 AOT Air Traffic Statistical Report, AOT, 2011.
[8] The survey of the Airport Council International (ACI). In the same survey, Changi Airport in Singapore is ranked in 18th place and Jakarta Airport in Indonesia is ranked in 16th place.

(ICAO), air passenger demand in the world will increase by about 6% during the period between 2012 and 2013, and in particular air passenger demand in the Asia Pacific region will increase by about 8% during the same period[9]. Under these circumstances, the necessity to expand the capacity of Survarnabhumi Airport and strengthen its function as a major international hub-airport in Asia was still valid from the view point of promoting the economic development and competitiveness of the country as well as attracting the growing air passengers in the Asia Pacific regions to visit Bangkok as their destination or transit point at the time of ex-post evaluation.

Initially it was planned that the operation of all commercial flights in Bangkok would be consolidated at Survarnabhumi Airport after its opening, but Don Muang Aiport has continued to operate as a domestic airport limited to non-connecting domestic flights through a decision of the Thai government. As previously explained, the number of passengers at Survarnabhumi Airport has exceeded the designed capacity since 2011, and it is planned that Don Muang Airport will be continuously utilized in parallel with Survarnabhumi Airport at least until the realization of the Second and Third Phase Projects.

3.1.3 Relevance with Japan's ODA Policy

Japan's Official Development Assistance Charter, approved in 1992, focused on assistance for infrastructure improvement as a priority area with a special emphasis on the Asian region. At the time of the Phase I appraisal in 1996, Japan's ODA policy for Thailand had five priority areas, which were: (i) social sector development, (ii) environmental protection, (iii) rural and agricultural development, (iv) economic infrastructure development, and (v) support for regional cooperation. Regarding (iv) economic infrastructure development, special attention was paid to the inadequacy of the economic infrastructure caused by rapid industrial and economic growth in Thailand, together with problem of overconcentration in Bangkok.

From the above, it can be seen that this project has been highly relevant to Thailand's development plan and development needs, as well as to Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness[10] (Rating: ③)

3.2.1 Quantitative Effects

(1) Operation and Effect Indicators

The number of passenger at Survarnabhumi Airport was 38.6 million in 2008, 82.1% against the target figure, and thus almost achieving the target. After 2008, the number of passengers constantly increased to 40.5 million in 2009 and 42.7 million in 2010, reaching 47.9 million in 2011. As the designed capacity of Survarnabhumi Airport was 45 million per year, passenger volume had already exceeded capacity. The number of takeoffs and landings was 245,719 in 2008 with a 102.3% achievement of the target. After 2008, this also steadily increased to 253,967 in 2009, 265,896 in 2010 and 299,566 in 2011. Cargo volume was 1,199,897 tons in 2008, an 80.7% achievement of target. Although this declined to 1,070,623 tons in 2009, the figure recovered to 1,343,533 tons in 2010 and 1,347,514 tons in 2011 (Table 2).

Possible factors behind the actual passenger and cargo volume in 2008 being about 80% against the target and the cargo volume temporarily dropping in 2009 were a slump in the of number of tourists and business persons going to Thailand, as well as a slump in exports and imports, caused by the world economic recession and financial crisis of September 2008 (the so called "Lehman Shock"), as well as an outbreak of Influenza A (H1N1) infection in 2009, and

[9] ICAO Medium-term Forecast, ICAO News Release, 19 July 2011.
[10] Sub-rating of Effectiveness is to be included in consideration of Impact.

political instability in Thailand. It was expected that passenger and cargo volume would continuously increase after 2011, and AOT, the executing agency of this project, plans to expand the passenger handling capacity to 80 million per year by implementing the Second and Third Development Projects.

Table 2: Operation and Effect Indicators of the Project

	Target (2008)	Actual				
		2008	Achievement	2009	2010	2011
1. No. of passengers (unit: 1,000/year)	**47,007**	**38,604**	**82.1%**	**40,500**	**42,785**	**47,911**
- International	32,126	30,104	93.7%	28,835	31,418	35,009
- Domestic	12,607	6,993	55.5%	10,210	9,836	11,305
- Transit	2,274	1,507	66.3%	1,455	1,531	1,597
2. Cargo volume (unit: tons/year)	**1,487,655**	**1,199,897**	**80.7%**	**1,070,623**	**1,343,533**	**1,347,514**
- International	1,295,921	1,140,300	88.0%	1,003,187	1,259,181	1,265,016
- Domestic	86,934	23,068	26.5%	38,989	49,708	55,080
- Transit	104,800	36,529	34.9%	28,447	34,644	27,418
3. No. of takeoffs and landings (unit: time/year)	**240,095**	**245,719**	**102.3%**	**253,967**	**265,896**	**299,566**
- International	154,729	188,706	122.0%	181,522	192,463	216,636
- Domestic	85,366	57,013	66.8%	72,445	73,433	82,930

Source: AOT.

As previously stated, the flight network of Survarnabhumi Airport expanded to 146 overseas cities in 61 countries. The number of regular commercial flights per month increased from 21,436 flights (14,479 international flights and 6,957 domestic flights) to 23,364 flights (17,446 international flights and 6,248 domestic flights) in a comparison of before and after the project, which indicates about 9% of growth (Table 3).

Table 3: Comparison of Flight Network before and after the Project

	Before Project Completion (2006) Don Muang Airport		At Present (2011) Suvarnabhumi Airport	
	International	Domestic	International	Domestic
No. of airlines operating	91	7	101	4
No. of cities connected	132	26	146	22
No. of regular commercial flights per month	14,479	6,957	17,446	6,248
No. of chartered flights per month	240	0	519	0

Source: AOT

3.2.2 Qualitative Effects

(1) Improvements in the Convenience and Efficiency of the Airport

The capacity of the airport facilities was substantially expanded by shifting the main airport in Bangkok from Don Muang Airport to Suvarnabhumi Airport after project implementation (Table 4). The new airport is able to accommodate more passengers through an expansion of airport facilities such as the passenger terminal area, check-in counters, boarding bridges, the baggage area, the passport control area, airline lounges, commercial and service facilities. Also the flow of transit passengers had become smoother through the consolidation of the international and domestic terminals into one at the new airport. The

maximum number of takeoffs and landings increased from 60 per hour to 76 per hour. According to AOT, flight delays caused by delays in takeoffs and landings were dramatically lessened after project implementation.

Table 4: Comparison of Airport Capacity before and after the Project

	Before Project Completion (2006) Don Muang Airport	At Present (2011) Suvarnabhumi Airport
1. Passenger handling capacity (persons/year)	33,500,000	45,000,000
2. Cargo handling capacity (tons/year)	1,000,000	3,000,000
3. No. of takeoffs and landings (times/hour)	60	76
4. No. of boarding bridges (no.)	35	51
5. No of remote parking stands (no.)	66	69

Source: AOT

In sum, the number of airlines, the number of connecting cities, and the number of regular commercial flights were all expanded, and thus the convenience of air passenger transport and cargo transport was improved at Suvarnabhumi Airport, in comparison with the situation at Don Muang Airport before project implementation. Also, transport accessibility was improved by improved accessibility between the airport and the existing road and highway network and the opening of a railway between the airport and Bangkok city center.

Meanwhile however, congestion at the airport became severe after passenger volume exceeded the designed handling capacity in 2011. As shown in the results of the beneficiary survey with airlines below, this issue may affect the positive effects of improvements in the convenience and efficiency of the airport, and thus preparation for further expansion of the capacity of the airport facilities has been in progress at present.

(2) Improvements in the Airport Safety

The airport safety and security status of Suvarnabhumi Airport has been improved by a strengthening of security facilities of the passenger terminal such as security checks, security gates and security camera systems as well as an improvement of AOT institutional aspects of airport safety, by establishing Aviation Security Standard and Quality Control Department which is responsible for conducting aviation security training and quality control activities in accordance with ICAO standards. This may be compared to the situation at Don Muang Airport. Both Suvarnabhumi Airport and Don Muang Airport fully meet the airport safety standards of ICAO.

(3) Improvements in the Capacity and Function of the Airport as an International Hub-Airport

As previously explained, Suvarnabhumi Airport expanded its flight network in and out of the country and was ranked 17th in passenger volume after project implementation. Suvarnabhumi Airport has been highly evaluated for the quality of its airport facilities and services in the major world airport ranking surveys (Table 5). Therefore, it can be judged that the project has improved the capacity and function of the airport in Bangkok as a major international hub-airport in Asia.

Table 5: World Airport Rankings of Suvarnabhumi Airport

	2008	2009	2010	2011
Airports Council International (ACI), Airport Service Quality Award	5	-	-	5
SKYTRAX, Word Airport Award	37	16	10	13
Smart Travel Asia, World Best Airport (by airport category)	-	3	3	5

Source: ACI, SKYTRAX, Smart Travel Asia.
Note 1: ACI is a non-profit global trade organization of the world's airports, consisting of 576 members operating 1,656 airports in 179 countries and territories (as of March 2011).
Note 2: Skytrax is an United Kingdom-based research service firm, which conducts airline and airport reviews and rankings across the world.
Note 3: Smart Travel Asia is an online travel magazine.

(4) Results of Beneficiary Surveys with Airlines (Beneficiary's Assessment on the Quantitative Effects of the Project)

This ex-post evaluation conducted a beneficiary survey with the airlines operating in Suvarnabhumi Airport as a part of the assessment of the project effects (the detailed survey results are provided in the Box: Summary Results of the Beneficiary Survey with Airlines below). On the one hand, about 50 to 70 percent of respondents positively evaluated the current status of the takeoff and landing functions of the runways, taxiways, and aprons, the aircraft assistance services including maintenance facilities and services, airport operation and management, and Suvarnabhumi Airport as a regional hub-airport in Asia as a whole. On the other hand, only about 30 to 40 percent of respondents gave a positive evaluation of passenger handling services, the efficiency and convenience of the airport, and airport safety and security. A common reason for this relatively low satisfaction rate was the recent severe congestion of passengers and aircrafts in the airport. The following recommendations were proposed by respondents and are expected to be taken into consideration in the on-going Second Phase Project.

Regarding efficiency and convenience of the airport, the following are recommended: (i) mitigation of the congestion of passengers in airport facilities such as the departure and arrival lobbies, the connection lobby, passport control areas, and the baggage claim area as well as the congestion of aircraft on the runways, taxiways and apron areas, (ii) expansion of toilet facilities, information signs, and car park space as well as the introduction of a free wireless internet service in the passenger terminal, and (iii) expansion of space for airline offices and airline lounges as well as a canteen for airport employees.

Regarding airport safety and security, the following recommendations are made: (i) strengthening of the security monitoring system at airside[11] by an increase in the number of monitoring cameras in risky areas, (ii) enforcement of strict staff access controls to aircraft, (iii) improvement of the capacity of staff engaged in security checks, and (iv) a modernization of the baggage matching system. Moreover, it was recommended that service fees such as airport facility service changes be revised to a reasonable price.

[11] Airside is a restricted area in the airport where only passengers who have completed the embarkation procedures at immigration and airline and airport staff are allowed to enter.

Box: Summary Results of the Beneficiary Surveys with Airlines

The ex-post evaluation conducted beneficiary surveys with airport users. Firstly, a questionnaire was sent to 84 airport users including 82 airline companies and two airport ground handling companies operating in Suvarnabhumi Airport. Out of 84 companies, 15 airline companies responded to the questionnaire including one airline from USA, four airlines from Europe, seven airlines from Asia, one airline from the Middle East, and two airlines from Australia. The collection rate for the questionnaire was 17.9%. The summary results of the beneficiary survey is as follows:

(1) Takeoff and Landing

- 67% of respondents (or 10 respondents) were either "satisfied" or "satisfied to some extent" with the capacity of the runways and touchdown areas. Regarding the capacity of the taxiways and aprons, 60% of respondents (or 9 respondents) answered that they were either "satisfied" or "satisfied to some extent".
- Respondents who answered either "unsatisfied" or "not satisfied at all" explained the reasons as recent airport congestion at peak hours caused by the number of flight delays and bad surface conditions on a part of the taxiways and apron areas.
- 80% of respondents (or 12 respondents) answered either "satisfied" or "satisfied to some extent" with the aviation safety and systems during takeoff and landing.

(2) Aircraft Assistance Service

- On the one hand, 53% of respondents (or 8 respondents) recognized that the maintenance facilities and services of Suvarnabhumi Airport had improved in comparison with those of Don Muang Airport in the past. On the other hand, 20% of respondents (or 3 respondents) answered that they had deteriorated, and the necessity for improving the the management of facility maintenance was suggested.
- Regarding fueling, catering, cabin cleaning, and ground support equipment (GSE) services, 60% of respondents (or 9 respondents) replied that they had improved.

(3) Passenger and Cargo Handling Services

- On the one hand, 40% of respondents (or 6 respondents) were either "satisfied" or "satisfied to some extent" with the capacity of the passenger handling services and passenger terminal facilities. On the other hand, 60% of respondents (or 9 respondents) were either "unsatisfied" or "not satisfied at all". The reasons for this were the congestion of airport facilities, such as the departure and arrival lobbies, the connection lobby and immigration areas, at peak hours and a lack of information signs, toilets, lighting and parking lots.
- Regarding the capacity of the cargo handling services and cargo terminal facilities, 73% of respondents (or 11 respondents) answered that they were either "satisfied" or "satisfied to some extent".

(4) Airport Operation and Management

- 67% of respondents (or 10 respondents) agreed that the services provided by AOT met the requirements and expectations of airlines. However, 53% of respondents (or 8 respondents) replied that the service charge of Suvarnabhumi Airport, such as the airport facility charge, is higher than at other major international airports.

(5) Efficiency and Convenience of the Airport

- Regarding the efficiency and convenience of Suvarnabhumi Airport, 33% of respondents (or 5 respondents) said that they were either "very good" or "good", 33% of respondents (or 5 respondents) were "neutral", and 33% of respondents (or 5 respondents) said that they were either "bad" or "very bad".
- In their opinion, Suvarnabhumi Airport is efficient and convenient in terms of the airport security system, transport accessibility, Custom Immigration Quarantine (CIQ), baggage handling, cleanliness and hygiene, and the variety of shops and restaurants. However, AOT's disadvantages are a shortage of car parking space and toilets, information signs, long walking distances in the terminal, congestion at check-in, the CIQ, the baggage claim area, and the drop-off area in front of terminal for buses and taxis, bad allocation of shops and restaurants, bad service on the part of officers, and so on.

(6) Airport Safety and Security

- Regarding airport safety and security, 33% of respondents (or 5 respondents) said they were either "very good" or "good", 27% of respondents (or 4 respondents) were "neutral", and 40% of respondents (or 6 respondents) said they were either "bad" or "very bad". Basically those who answered "neutral" recognized that there was no problem in the airport safety and security status of Suvarnabhumi Airport.
- Those who answered either "bad" or "very bad" pointed out problems in the capacity of security staff, their technical skills, professional knowledge, communication skills in foreign languages, and behavior at work.

(7) Suvarnabhumi Airport as a Regional Hub-Airport in Asia

- Regarding the status of Suvarnabhumi Airport as a regional hub-airport, 47% of respondents (or 7 respondents) answered that it was either "very good" or "good", 40% of respondents (or 6 respondents) replied "neutral", and 13% of respondents (or 2 respondents) answered "bad".
- On the one hand, those who answered either "very good" or "good" considered that Suvarnabhumi Airport satisfied the conditions for a regional hub-airport as Bangkok is in the best location with good airport facilities and public transportation infrastructure. On the other hand, those who replied "bad" pointed out several disadvantages to the airport such as congestion of airport facilities, lack of information signs, poor slots management, and complicated flight connections.

Photograph: Passenger Terminal Facilities of Suvarnabhumi Airport


Departure Lobby


Duty Free and Shopping Area


Transit Counter


Arrival Area


Immigration Area


Baggage Claim Area

3.3 Impacts

3.3.1 Intended Impacts

(1) Commercial Development near the Airport

Housing estate development projects have been in progress near Suvarnabhumi Airport. A t present, there is a master plan for the development of a commercial zone in the Northeast plot near the airport with a total area of 182.4 ha. The plan has been initiated with the target year of completion as 2030 [12]. The plan includes the development of a commercial complex containing three four star hotels, a convention center, an exhibition hall, an office park, premium factory outlets, luxury serviced apartments, a hospital, and Thai food markets. This commercial complex is expected to become a new commercial lodgment area in the Bangkok Metropolitan area.


Makkasan Station
(Airline check-in counters)

(2) Development of the Transport Network between the Airport and the City Center of Bangkok

In parallel with the implementation of this project, airport access roads were connected to the motorways and expressways, and existing local trunk roads and community roads near the airport were expanded or improved. In August 2010, an airport railway (the so called "Airport Rail Link") with a total length of 28.5km was opened between Suvarnabhumi Airport and Makkasan Station of the State Railway of Thailand (the so called "Makkasan City Air Terminal"). Makkasan Station is not only used as a conventional railway station, but also it also provides the check-in and baggage handling services of airlines as the City Air Terminal[13]. The Airport Rail Link is used as public transport for both airport passengers and airport staff as well as local residents along the line. The number of passengers using the non-stop express

[12] The project name is the Public-Private Partnership for Commercial Real Estate Development of the Land Plot No.37 in Suvarnabhumi Airport.

[13] As of 2011, only Thai Airways International provides a check-in service at Makkasan City Air Terminal.

service of the Airport Rail Link connecting the airport and Makkasan Station in 17 minutes was about 3,500 persons/day in 2011. The number of passenger using the commuter service (City Line) was 48,000 persons/day in the same year[14].

(3) Promotion of Tourism Sector Development in Thailand

The total number of passengers at the major six international airports in Thailand was 58 million in 2010, out of which 42.8 million (73.5% of the total) were accommodated at Suvarnabhumi Airport. The number of tourists visiting Thailand has shown a stable upward trend since 2006 except in the period between 2008 and 2009 when Thailand was hit by the financial crisis in September 2008, an outbreak of Influenza A (H1N1) in 2009, and political instability. A considerable number of tourists visiting Thailand use Suvarnabhumi Airport (Table 6). The tourism industry is one of the main industries in Thailand, and the tourism sector has a share of 6% in the Gross Domestic Product (GDP) of the country.

According to the Tourism Authority of Thailand (TAT), the increase in air travelers as a result of capacity improvement of the airport facilities in Bangkok has had a direct contribution to the growth in the number of tourists visiting Thailand. TAT recognized that this project also contributed to the promotion of the Thai tourism industry and the attraction of tourists. Furthermore, TAT considers that Suvarnabhumi Airport had played an important role as a gateway to the Asian market, and that this project has had a positive impact not only on the tourism industry but also on trade and investment. Therefore, it can be concluded that this project has made a contribution to the promotion of tourism sector development in Thailand to some extent.

Table 6: Number of Tourists visiting Thailand

	2006	2007	2008	2009	2010	2011
No. of Tourists visiting Thailand (Million persons)	13.82	14.46	14.20	14.15	15.90	19.10

Source: Tourism Authority of Thailand (TAT).

Note: No. of tourists visiting Thailand are those who entered Thailand via all means of transportation including air, land and ship.

3.3.2 Other Impacts

(1) Impact on the Natural Environment

The environmental impact assessment (EIA) for the original project scope acquired the approval of the National Environmental Board (NEB) of Thailand in May 2002, and the additional EIA accompanying the modification in project scope obtained the approval of NEB in March 2005.

a) Noise Pollution Compensation with Local Residents

AOT has implemented the following compensation scheme for noise pollution near the airport according to the level of noise. According to Thai government policy, the target for compensation is defined as those people who live in an area of more than NEF[15] 30 and who have been living in the location before 2001[16]. Principally, AOT purchases the land and

[14] Initially the estimated daily average number of passenger in 2007 was 8,200 persons/day for the express and 87,700 persons/day for the city line. However, the actual passenger volume in 2011 did not reach the targets. The reason for this may be the bad connection with public transport such as the subway system (MRT) and the monorail system (BTS Skytrain) at Makkasan Station, which reduces the convenience of passengers.

[15] NEF (Noise Exposure Forecast) is a measurement of the actual and forecasted aircraft noise recommended by ICAO. If NEF is converted to decibels, NEF 40-50 is equivalent to less than 75 decibels, NEF 35-40 is equivalent to less than 70 decibels, and NEF 30-35 is equivalent to less than 65 decibels.

[16] Since the Thai government officially announced the implementation of this project to the public in 2001, those who moved into the area near Suvarnabhumi Airport after 2001 are not entitled to receive compensation for noise pollution even if their houses and buildings are located in an area of more than NEF 30.

buildings of residents in areas of more than NEF 40, and AOT subsidizes the cost for improving the soundproofing of buildings. If residents in areas of more than NEF 40 are not willing to sell their property, alternatively they can receive money for building improvements.

The number of target households for compensation identified by AOT as of end of 2011 was: 644 households in areas of more than NEF 40, and 15,040 households in areas of NEF 30-40. So far, 472 households (73%) out of 644 households in areas of more than NEF 40, and 6,135 households (41%) out of 15,040 households in areas of NEF 30-40 have already completed the compensation procedures (Table 7).

Table 7: Summary of Noise Pollution Compensation (As of December 2011)

Noise level	Description	Amount
More than NEF 40	Total no. of households	644 households
	a) Prefer to sell land and buildings	208 households (110 households completed)
	b) Prefer to improve building soundproofing	436 households (362 households already paid)
NEF 30-40	Total no. of households	15,040 households
	a) Improvement of building for soundproofing	15,040 households (6,135 households already paid)
	Compensation to King Mongkut's Institute of Technology Ladkrabang (KMITL)	214 million Baht
	Compensation to sensitive public buildings such as hospitals, schools and religious places (building improvement)	21 locations (19 locations already paid for soundproofing) 293 million Baht
	Waiting for acceptance of offers form Bangkok Metropolitan Administration (BMA)	2 locations

Source: AOT

Note: Incomplete compensation cases are: (i) where the compensation process is in progress or under preparation; (ii) where corrections are being made in the estimation and appraisal of land and building value; (iii) where acceptance is being awaited by the land owners, (iv) where the year that houses were built is under investigation, (v) where the owner of land and building is unknown, and (vi) where compensation is not accepted.

The reason why compensation is an on-going process at present, five years after the opening of the airport in September 2006, is that the noise affected areas and target households for noise pollution compensation were ultimately determined and identified based upon the result of an additional noise impact study in 2006-2007[17]. The kick-off of the full-scale of compensation process was thus delayed. In addition, AOT conducted a noise pollution compensation scheme for the first time during this project and their unfamiliarity with the scheme may be another reason for the prolonged compensation process. According to the Ministry of Natural Resources and Environment (MNRE), the Bangkok Metropolitan Administration (BMA), and the two local governments where Suvarnabhumi Airport is located: Lat Krabang District of Bangkok City and Bang Phli District of Samut Prakan Province, they also recognized that a lack of information disclosure to the public and consultation with local authorities and people by AOT as well as a lack of communication and coordination between AOT, local authorities and related government organizations were another factors influencing on the delay of the compensation process. They expected AOT and concerned organizations to jointly solve the above two issues. According to AOT, it is planned that all compensation cases will be completed by the end of 2012. However, there are some households who do not

[17] The noise impact study was conducted in the EIA approved in 2002 and the additional EIA approved in 2005. Later noise simulation criteria were revised by a Cabinet Decision of Thai government, an additional noise impact study was conducted in 2006-2007 by AOT.

agree with the proposed amount of compensation by AOT and there are disputed court cases against AOT and the Thai government taken by some local residents near the airport[18]. T hese pending issues must be carefully taken into consideration when carrying forward the on-going compensation scheme.

Photograph: Compensation for Noise Pollution by AOT

Procedures for noise pollution compensation by AOT

House with Soundproofing

Interview with local residents in a noise affected area (NEF 30-40)

b) Noise

In this ex-post evaluation, an interview survey with 50 households near the airport regarding the environmental impact of the project was conducted[19]. Regarding noise pollution[20], "very severe" was returned by 100% of respondents with over NEF 40 (or 20 respondents), 80% of respondents with NEF 30-40 (or 14 respondents), and 40% of respondents below NEF 30 (or 4 respondents), and "severe to some extent" was given as an answer by 15% of respondents with NEF 30-40 (or 5 respondents) and 50% of respondents below NEF 30 (or 5 respondents). S ince Suvarnabhumi Airport is operated in 24 hours a day and the number of takeoffs and landings achieves a p eak at night time, local residents are sensitive to the noise from aircraft. According to the Ministry of Natural Resources and Environment (MNRE), the Bangkok Metropolitan Administration (BMA), Lat Krabang District, and Bang Phli District, they had received many complaints about noise pollution from residents near the airport, and they concerned about possible negative effects on the health and living conditions of people in the noise affected areas.

Meanwhile, concerning the acceptability of noise pollution, 64% of total respondents (or 32 respondents) replied that they could accept noise pollution.

[18] 359 local people near the airport appealed to a civil court in 2007 and requested that AOT, the Department of Civil Aviation, the Ministry of Transport and the Department of Pollution Control, Ministry of Natural Resource and Environment: (i) suspend takeoffs and landings during the night in Suvarnabhumi Airport, and (ii) purchase residents' houses where noise exceeded 70 decibels (i.e. NEF 30-40) while paying for the sound proofing of houses for those who were experiencing lower noise levels (i.e. lower than NEF 30). The court rejected the demand of the people in February 29, 2012.

[19] The 50 households interviewed included 20 households in an area with more than NEF 40, 20 households in an area with NEF 30-40, and 10 households in an area with less than NEF 30, and the 50 households have been living in their area before 2001. The target areas of the interview survey were eight local communities in Lat Krabang District of Bangkok City and Bang Phli District of Samut Prakan Province including Roongkij Garden Home Village, Romruedee Village, Pracharuamjai Community, Ruamjaipatana Community, Bangchalong Sub-district, Bang Pla Sub-district, Rajathayva Sub-district, and Nongprue Sub-district. In each community, approximately 5-8 households were randomly selected and interviewed. In order to make a comparison with the situation of the households who were eligible to the noise pollution compensation and who were not eligible to the compensation under the current compensation scheme, 10 households in an area with less than NEF 30 were included in the target households of this interview survey.

[20] Regarding noise pollution, 82% of total respondents (or 41 respondents) said "very severe", 16% of total respondents (or 8 respondents) said "severe to some extent", and 2% of total respondents (or one respondent) said "No problem at all".

c) Air Pollution

The results of the interview survey with 50 households near the airport indicates that regarding air pollution[21], 80% of respondents with over NEF 40 (or 15 respondents), 70% of respondents with NEF 30-40 (or 14 respondents) and 40% of respondents below NEF 30 (or 4 respondents) answered either "very severe" or "severe to some extent" when asked about forms of dust, smoke and oil slough, etc. associated with the takeoffs and landings of aircrafts.

Meanwhile, concerning the acceptability of air pollution, 80% of total respondents (or 40 respondents) replied that they could accept air pollution.

d) Vibration

Similarly, regarding vibration[22], 100% of respondents with over NEF 40 (or 20 respondents), 100% of respondents with NEF 30-40 (or 20 respondents) and 90% of respondents below NEF 30 (or 9 respondents) said it was either "very severe" or "severe to some extent". It was observed that areas with a high noise level tended to be subject to the influence of air pollution and vibration.

Meanwhile, concerning the acceptability of vibration, 72% of total respondents (or 36 respondents) replied that they could accept vibration.

e) Discharge Water and Waste Treatment

Waste water from the airport is treated at a waste water treatment plant (WWTP) with a maximum treatment capacity of 18,000m^2/day in the airport. The water quality parameters of discharged water from WWTP meet Thai environmental standards (Table 8).

In addition, 40 tons of garbage per day produced in the airport (90% general waste, 9% hazardous waste, and 1% infected waste) is sorted at the waste management building with the final disposal treatment being outsourced to contractors. The above waste management is undertaken according to ISO14001 which is the environmental management system standard.

The results of the interview survey with 50 households near the airport indicate that no problems of discharge water and waste treatment in the area near Suvarnabhumi Airport were identified.

Table 8: Monitoring Indicators for Discharged Water

		Unit	2006	2007	2008	2009	2010	2011	Thai Standards
1	pH	-	-	-	-	-	-	-	-
2	Dissolved Oxygen (DO)	mg/L	4-5	4-5	4-5	4-5	4-5	4-5	N.A.
3	Chemical Oxygen Demand (COD)	mg/L	30-40	30-40	30-40	30-40	30-40	30-40	50
4	Biochemical Oxygen Demand 5 (BOD5)	mg/L	2-4	2-4	2-4	2-4	2-4	2-4	20
5	Total Suspended Solids (TSS)	mg/L	3-5	3-5	3-5	3-5	3-5	3-5	50
6	Oil & Grease	mg/L	0.5	0.5	0.5	0.5	0.5	0.5	5
7	Coliform	MPN/ 100ml	<1	<1	<1	<1	<1	<1	N.A.
8	Total Kjeldahl Nitrogen (TKN)	mg/L	4-5	4-5	4-5	4-5	4-5	4-5	120
9	Total Nitrogen (TN)	mg/L	8-9	8-9	8-9	8-9	8-9	8-9	N.A.
10	Total Phosphorus (TP)	mg/L	1-1.5	1-1.5	1-1.5	1-1.5	1-1.5	1-1.5	N.A.

[21] Regarding air pollution, 32% of total respondents (or 16 respondents) said "very severe", 36% of total respondents (or 18 respondents) said "severe to some extent", 30% of total respondents (or 15 respondents), and 2% of total respondents (or one respondent) said "do not know".

[22] Regarding vibration, 46% of the total respondents (or 23 respondents) said it was "very severe", 36% of the total respondents (or 18 respondents) said it was "severe to some extent", 16% of the total respondents (or 8 respondents), and 2% of the total respondents (or one respondent) said that they "do not know".

		Unit	2006	2007	2008	2009	2010	2011	Thai Standards
11	Cadmium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
12	Chromium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.75
13	Lead	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.20
14	Arsenic	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.25

Source: AOT

Photograph: Site Utilities at Suvarnabhumi Airport

Water Supply Pumping Station

Waste Water Treatment Plant

Waste Management Building

f) Others

According to the results of interviews with noise affected residents of Romruedee Village located in an area with over NEF 40, the residents have often suffered from objects falling from aircrafts as the village is located directly underneath of takeoff and landing routes. Residents complained about the response of AOT, the Civil Aviation Authority, and the police such as handling of the falling objects and compensation of damages when accidents happened and the lack of feedback of investigation results to the people affected.

In addition, based upon the experience of environmental impacts near the airport, the Ministry of Natural Resources and Environment (MNRE), the Bangkok Metropolitan Administration (BMA), Lat Krabang District and Bang Phli District commonly recognized that the establishment of a coordination mechanism for land use near Suvarnabhumi Airport among the stakeholders must be seriously taken into consideration in order to bring forward the future expansion of Survarnabhumi Airport.

g) AOT Environmental Mitigation Measures

The Environmental Department of AOT is in charge of environmental monitoring and they produce an environmental monitoring report every quarter. AOT established a Tri-Party Committee[23] with representatives from local people, AOT and the Thai government agencies concerned such as the Ministry of Interior. Various issues are discussed, including the compensation scheme and complaints raised by local people. Local people have been proposing to modify the current compensation scheme so that: (i) those who migrated to near the airport by 2007 should be included as targets for compensation if their houses are located in areas with NEF 30-40 or over NEF 40, and (ii) those who live in areas with NEF 30-40 can be entitled to the same compensation as those who live in areas with over NEF 40, that is, so that land and buildings in areas with NEF 30-40 can be purchased by AOT. Currently AOT, together with local people, have been requesting that the Thai government modifies the compensation schedule and the arrangement of a necessary additional budget in order to expand the target and scope of noise pollution compensation.

[23] The Tri-Party Committee consists of one representative from the Ministry of Transport (Chairperson), one representative from AOT, seven representatives of noise affected local communities, and seven representatives from the Ministry of Finance and the Ministry of Interior. Principally the Tri-Party Committee is to meet one a month.

Regarding the damage by objects falling from aircrafts, the Civil Aviation Authority together with AOT is primarily responsible for handling this issue. AOT will closely work with the Civil Aviation Authority and strengthen the regulations and enforcement measures for aircraft with problems as well as working on accident investigations in order to minimize the risk of the damage. AOT has set up a Community Relationship Unit in the Special Affaires Department under the Administration Line of Suvarnabhumi Airport and has been making efforts to promote the local people's understanding of the project and establish a good relationship between AOT and the local people and communities through discussions, dialogue, listening complaints, provision of information, and participation in community events and activities.

Since opening of the airport, AOT has been implementing a noise abatement measure which is an introduction of noise abatement flight procedures and operating restrictions during takeoff and landing. In addition, AOT plans to implement the following technical and economic environmental mitigation measures: (i) a strengthening of the noise monitoring capacity and the enforcement of aircraft noise control by introducing an aircraft noise monitoring system[24], (ii) incentives for airlines which introduce low noise aircrafts, and (iii) a preferential airport tariff system according to the time zone. Furthermore, AOT set up an Airport Environmental Master Plan in 2006, and has been aiming for a more environmentally-friendly airport by introducing the "Green Airport" concept since 2010[25]. AOT signed a sister airport agreement with the Narita International Airport Corporation (NAA), Japan in 2010 and is establishing a cooperative relationship which will include information exchange and mutual learning about airport environmental management.

(2) Land Acquisition and Resettlement

The Thai government decided on the project site at Nong Ngu Hao, Samut Prakan Province in 1961, and the land acquisition of 3.100 ha was completed in 1973. About 2,300 households on the project site moved out with cash compensation. Only 27 households preferred to move to the resettlement area prepared by AOT, and of these 20 households had been continuously living in the area as of the end of 2011. In the resettlement area, basic infrastructure such as roads, water supply and electricity were provided. The above land acquisition and resettlement was implemented in accordance with the related domestic laws and regulations, and no problems were identified regarding the rules and regulations of the procedures.

Resettlement Area

Interview with Resettled Residents

In the ex-post evaluation, an interview survey was conducted with 10 resettled households out of the existing 20 households. Previously, most of the households interviewed possessed their own houses and land for fish farming and vegetable gardens, and earned their living from fish farming

[24] Noise monitoring stations have been set up at 19 locations inside and outside the airport.

[25] AOT has implemented the following programs for the Green Airport:
(1) Energy efficiency improvement (improvement of energy utilization, reduction of electricity use, improvement of the electricity system, reduction of fuel use, improvement in ground transport, electricity generation from renewable sources);
(2) Green operation (reduction of CO_2 emissions, green building and green areas, the utilization of natural resources such as recycle of water, environmental quality monitoring, green community: the enhancement of the quality of life in the surrounding communities); and
(3) Noise management (forecasting the aircraft noise impact areas, noise abatement procedures, aircraft noise compensation, aircraft noise monitoring).

and subsistence agriculture. However, after resettlement, they lost their livelihoods. Some are now working as employees of companies and farmers, some are migrant workers and some are unemployed. In general, their employment status is unstable, and there was a strong demand for employment. Also, many households interviewed perceived that the level of their household economy had declined in comparison to the situation before resettlement. Their satisfaction level with the maintenance condition of roads and the water supply as well as with transport accessibility and accessibility to services was not high as 50% of the households interviewed replied there were some problems. In fact, 70% of the households interviewed said that they were "not much satisfied" with living in the resettlement area. The resettlement area is located out of the noise affected area.

In order to meet the demands for employment opportunities on the part of the resettled households, as one of its CSR (Corporate Social Responsibility) activities, AOT has provided an area in one of the airport office building as an open market two days a week in order to encourage the community around the airport, including people in the resettlement area, to sell goods to support their income generation activities.

(3) Socio-Economic Impact on the Local Residents near the Airport

The results of the interview survey with 50 households near the airport indicates that regarding the socio-economic impacts[26], 85% of respondents with over NEF 40 (or 17 respondents), 70% of respondents with NEF 30-40 (or 14 respondents) and 90% of respondents below NEF 30 (or 9 respondents) answered either "Yes, very much" or "Yes, to some extent" about positive impacts. Positive socioeconomic impacts such as the establishment of new commercial and business activities, the development of land and housing zones, improvement in the accessibility of services, employment and bossiness opportunities, increases in land price, and population growth were perceived by the majority of respondents.

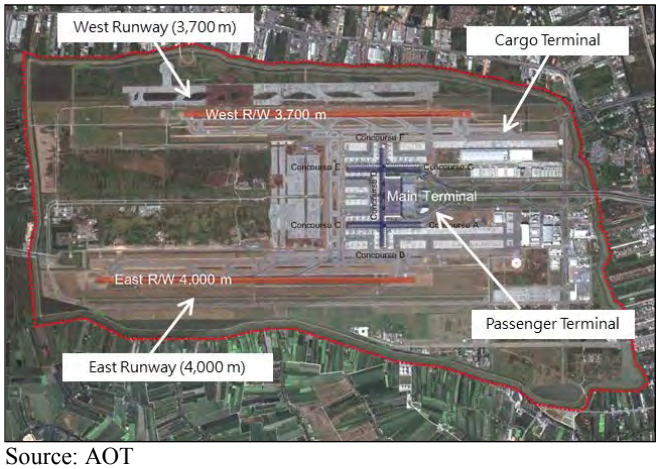
The key performance indicators such as the number of passengers, the cargo volume and the number of takeoffs and landings mostly achieved their targets in 2008, and they have been increasing constantly since then. Expected project effects such as improvements in airport convenience and efficiency, improvements in airport safety and in the capacity and function of the airport as an international hub-airport have been achieved. Also, the project has positively contributed to commercial development near the airport, the development of the transport network between the airport and the city center of Bangkok, and the promotion of tourism sector development in Thailand. Meanwhile, noise issues near the airport remain pending, but it is expected that this will be improved in the near future by the on-going mitigation measures implemented by AOT and the Thai government agencies concerned. These measures will include periodic environmental monitoring, noise abatement flight procedures and operating restrictions as well as an on-going noise pollution compensation scheme. In addition, the land acquisition and resettlement was implemented in accordance with the related domestic laws and regulations and no problems have been identified.

Thus, this project has largely achieved its objectives, and therefore its effectiveness with the impacts is high.

[26] Regarding the positive impact of the socio-economic aspects, 56% of the total respondents (or 28 respondents) said "Yes, very much", 24% of the total respondents (or 12 respondents) said "Yes, to some extent", 14% of total respondents (or 7 responses) said "No, not so much", and 6% of total respondents (or 3 respondents) said "No, not at all".

3.4 Efficiency (Rating: ①)

Photograph: Panoramic View of Survarnabhmi Airport



Source: AOT

3.4.1 Project Outputs

The planned scope of the main project outputs covered by the Japanese ODA loan portion[27] was: (i) Site improvements, including main polder and pump stations, (ii) Main airfield pavements including two runways (3,700m x 45m), a taxiway, and an airside terminal, (iii) A passenger terminal complex (total area: 500,000m^2, passenger handling capacity: 30 million passengers/year), (iv) Site utilities (water supply plant: capacity of 40,000m^3/day, wastewater treatment plant: capacity of 12,200 m^3), (v) Transformer stations, (vi) Ground access roads, (vii) Ground improvement of the east runway, and (viii) Consulting services.

Several modifications were made to the actual project outputs such as modifications to the runway design (3,700m x 60m x 1 no. and 4,000m x 60m x 1 no.), modification to the passenger terminal design (total area: 54,000m^2, passenger handling capacity 45 million passengers/year), modification to the waste water treatment plant design (capacity: 18,000m^3/day). Al so, some additions were made to the ground access roads and to ground improvement of the east runway. However, the key project outputs necessary for achieving the expected project objectives were mostly achieved as planned.

The above modifications in the project outputs were made by the Thai government in order to meet the increasing air transport demand, to accommodate large aircraft such as the Airbus 380, and to improve airport security and safety[28]. Since this project was a large-scale infrastructure project consisting of seven Japanese ODA loan agreements and the above modifications were made in response to the changing situation, the reasons for the modification of the project scope were reasonable.

Those project outputs which were not coved by the Japanese ODA loan portion, such as a cargo terminal with a handling capacity of 3 m illion tons/year, supporting facilities such as firefighting facilities and airport maintenance facilities, air navigation facilities, airline office buildings, etc. were constructed using AOT finance and private funds.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual total project cost was 382,185 million yen against the 343,641 million yen planned cost, which exceeded the planned cost[29], at 111% of planned (Table 9). As for the project cost for the Japanese ODA loan portion, the actual project cost was 217,956 million yen against the 251,930 million yen planned cost, which was within the planned cost (86% of planned).

The main reason for the extra cost was the additional scope of the passenger terminal

[27] This project was composed of seven Japanese ODA loan agreements, and after the Phase I appraisal in 1996, the project scope was modified several times. Most of the project scope coved by the Japanese ODA loan portion was identified in the Phase III appraisal in 1999. Therefore, in this ex-post evaluation, the project outputs determined in the Phase III appraisal (1999) are deemed to be the planned outputs to be compared with the actual outputs.

[28] The above modification in the project scopes was approved in the Phase VI appraisal in 2004 based upon an agreement between JICA and the Thai government.

[29] Since the project outputs approved in the Phase III appraisal in 1999 are deemed to be the planned outputs in this ex-post evaluation, the project cost approved in the Phase III appraisal was also adopted as the planned project cost for comparison.

building and site utilities caused by the modification of the project plan and design. These were mostly in the Thai financed portion.

Table 9: Comparison of Planned and Actual Total Project Cost

Item		Plan		Actual	
		Foreign Currency (mil. JPY)	Local Currency (mil. THB)	Total (mil. JPY)	Total (mil. JPY)
A	**Japanese ODA Loan financed items**				
1.	Site improvements (main polder & pump station)	589	275	1,472	1,402
2.	Ground improvement for the east runway and taxiway	1,893	2,344	9,417	0
3.	Main airfield pavement	6,954	5,842	25,707	43,294
4.	Passenger terminal complex	59,143	22,034	129,872	142,720
5.	Site utility	2,436	478	3,970	2,817
6.	Ground access facilities	1,329	5,587	19,263	19,862
7.	Price escalation and physical contingency	9,712	11,752	47,437	0
8.	Consulting services*	7,619	2,234	14,792	7,861
	Total	**89,675**	**50,546**	**251,930**	**217,956**
B	**Thai financed items**				
1.	Site improvements	353	5,442	17,822	21,525
2.	Main airfield improvements	3,789	6,688	25,258	59,425
3.	Passenger terminal complex	0	0	0	11,374
4.	Site utility	0	0	0	22,885
5.	Ground access facilities	0	0	0	931
6.	Support facilities	10,009	2,037	16,549	22,080
7.	Price escalation and physical contingency	1,588	1,176	5,361	0
8.	Consulting services*	8,106	5,799	26,721	26,009
	Total	**23,845**	**21,142**	**91,711**	**164,229**
	Ground Total (A+B)	**113,520**	**71,688**	**343,641**	**382,185**

Source: JICA appraisal document and AOT.
Note 1: The planned project cost is based on the planned project cost at the time of the Phase III appraisal (1999).
Note 2: The Cost for consulting services includes price escalation and physical contingency.
Note 3: Exchange rate used: 1 Baht=3.12 Yen in 1999 (Plan) and 1 Baht=3.114 Yen as an annual average from 1996 to 2007 (Actual).

3.4.2.2 Project Period

The actual project period was 133 months from September 1996 (signing of the loan agreement) to September 2007 (end of the consulting services) against 64 months from September 1996 to December 2001. This was significantly longer than the planned period[30], at 208% of the planned project period (Table 10).

The reasons for the delay were: (i) delay in land reclamation due to delay in pumping out of water and prolonged site improvement works, (ii) further delays in the procurements and civil works, etc. associated with the terminal building as the original design of the passenger terminal building (selected as the result of a design competition) had a large roof structure using a massive amount of glass and steel beams which caused technical and financial problems, the unique architectural design requiring major modification, ,and (iii) delays in the above terminal building package also affecting the schedule of other packages including the selection of contractors.

Survarnabhumi Airport formally started operations in September 2006.

[30] Since the definition of the start of a project is usually the date of loan agreement signing, the start of this project should be the date of the loan agreement signing for Phase I (1996) of this project. Therefore, the planned project period at the time of the Phase I appraisal (1996) was adopted as the planned project period of this project for comparison.

Table 10: Comparison of Planned and Actual Project Period

Item	Plan	Actual
1. Signing of loan agreement	September 1996	September 1996
2. Site improvement	January 1996 – January 2001 (61 months)	July 1998 – December 2001 (42 months)
3. Main airfield improvement	January 1997 – March 2001 (51 months)	December 2002 – September 2005 (34 months)
4. Passenger terminal building	April 1997 – January 2000 (34 months)	December 2001 – July 2006 (56 months)
5. Site utilities	April 1997 - January 2001 (46 months)	April 2001 – September 2006 (66 months)
6. Ground access facilities	January 1997 – December 2000 (48 months)	January 2000 – December 2006 (84 months)
7. Consulting services	January 1997 – December 2001 (60 months)	May 1998 – September 2007 (113 months)
8. Entire period	September 1996 – December 2001 (64 months)	September 1996 – September 2007 (133 months)

Source: JICA appraisal documents and AOT.
Note: The planned project period is based on the planned project period at the time of the Phase I appraisal (1996).

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

(1) Financial Internal Rate of Return (FIRR)

The result of the recalculation of FIRR for this project at the time of the ex-post evaluation was 2.9%, which was lower than the original FIRR of 6.2% at the time of the Phase III appraisal. The main reason for this was that, although on one hand the actual cost was higher than the planned cost, on the other hand the actual benefits were lower than planned because the revenue has not been increased as estimated due to price of the airport service charges such as landing and parking charge being controlled. The FIRR calculation at appraisal was based upon the preconditions below:

<Preconditions of FIRR calculation at appraisal>

- Cost: Project cost, personal expenses, operating expenses, maintenance expenses, rental expenses, depreciation expenses
- Revenue: Passenger service charge, landing and parking charge, office rental fee, concession revenues, and other service charges
- Project life: 15 years after project completion

(2) Economic Internal Rate of Return (EIRR)

The EIRR at the time of Phase VI appraisal was 16.9%. D ue to difficulties in collecting the necessary information and data for a recalculation of EIRR, the ex-post evaluation did not exercise a r ecalculation of EIRR. The EIRR calculation at appraisal was based upon the preconditions below:

<Preconditions of EIRR calculation at appraisal>

- Cost: Project cost, operation and maintenance cost
- Benefit: Additional value by increase of number of passengers and number of takeoffs and landings, Additional value by employment creation by the project
- Project life: 30 years after project completion

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

3.5 Sustainability (Rating: ③)

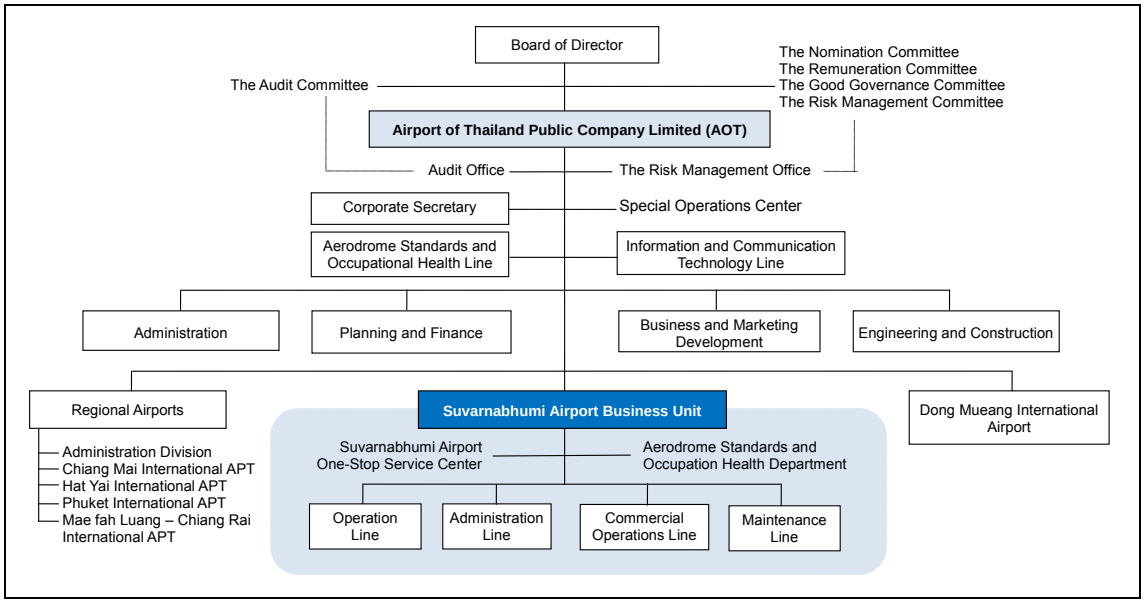
3.5.1 Structural Aspects of Operation and Maintenance

The operation and maintenance (O&M) agency of the project is the Airport of Thailand Public Company Limited (AOT). AOT was established on September 30, 2002 through the corporatization of the former Airports Authority of Thailand (AAT), which was a state-owned enterprise. At the beginning of project implementation, the New Bangkok International Airport Company (NBIA)[31] was the executing agency of the project, but it was merged with AOT in December 2004 and AOT has been acting as the executing agency of the project since 2005.

AOT is in charge of the operation and management of the six major international airports in Thailand including Survarnabhumi Airport. The total number of AOT employees is 4,570 and there were also approximately 9,156 outsource workers as of September 2010.

The O&M of the project facilities is undertaken by the following departments under the Operation Line, the Administration Line and the Maintenance Line of Survarnabhumi Airport according to the type of each facility: the Electrical and Mechanical Department, the Airfield and Building Department, the Landside Operation Department, the Airside Operation Department, the Baggage Handling System Department, and the Electronic and Security Department (Figure 2). According to AOT, the number of staff allocated to the respective O&M sections and departments is generally sufficiently. Also, AOT has introduced the "Green Airport" concept and has been developing a cooperative relationship with the Narita International Airport Corporation (NAA), Japan on the various issues, including airport environmental management, having signed a sister airport agreement with NAA in 2010.

The respective O&M sections and departments of AOT are responsible for each project facility according to the type of facilities and there are no particular problems in the structural aspects of the O&M agency.



Source: AOT

Figure 2: Organization Chart of AOT

[31] NBIA was established in April 1996 by the Thai government as the executing agency of the project.

3.5.2 Technical Aspects of Operation and Maintenance

The O&M of the project facilities are conducted based on the AOT annual maintenance plan, while the maintenance of specific facilities is outsourced to contractors and manufacturers. AOT addresses human resource development of staff, as well as various training programs, including technical training for O&M under the Annual Personnel Development Plan. In 2010, AOT organized (i) 185 Internal Training Courses with a total of 12,107 participants, (ii) 380 External Training Couse with a total of 1,016 participants, and (iii) 75 Overseas Training Course with 251 participants.

In parallel with the implementation of this project, JICA conducted a technical cooperation project "Project for Capacity Building for Environmental Management and Airside paved Area Maintenance at Suvarnabhumi Airport" (2004- 2006). In this technical cooperation project, an environmental management plan and operation manual, an airside maintenance management plan, and standard operating procedures for airport facility maintenance were established by JICA experts, and technical transfer of related technical skills and knowledge from JICA experts to AOT was conducted. O&M activities continue to be conducted by AOT based upon the above manuals and procedures. According to the results of interviews with the AOT staff engaged in O&M activities, no major problems regarding their technical capacity has been found.

Therefore, there are no particular problems in the technical aspects of the O&M agency.

3.5.3 Financial Aspects of Operation and Maintenance

Table 11 shows the operation and maintenance budget for Survarnabhumi Airport in the six years from 2006 to 2011. Since the four years from 2006 to 2009 was under the guarantee period of the manufacturers and suppliers of the facilities, the actual O&M costs in 2006-2009 were far lower than the planned O&M costs. After 2009 both the planned and actual O&M costs increased. Considering that the actual O&M costs have been lower than the planned costs, it can be assumed that the necessary amount of O&M budget has been allocated. The AOT main revenue sources are: (i) landing and parking charges of aircrafts, (ii) passenger and aircraft service charges, (iii) concession revenues and (iv) tenant fees, such as office rental fees and related service charges. The O&M budget is covered by the above revenue sources. According to AOT, there are no major problems in the O&M budget.

Table 11: Operation and Maintenance Budget of Survarnabhumi Airport

Unit: 1,000 Baht

	Plan (Budget)	Actual (Execution)
2006	50,002	15,187
2007	1,676,755	572,278
2008	1,480,303	489,946
2009	1,920,732	1,051,860
2010	1,764,790	1,376,367
2011	2,712,601	2,101,942

Source: AOT

Note: The above operation and maintenance budget does not include employment costs.

Regarding the financial status of consolidated AOT in the last three years, 2009-2011, sales have increased every year and the Return on Sales was at a stable 5-9% in 2010-2011. The sales of Suvernabhumi Airport account for more than 80% of the sales of consolidated AOT, and thus the revenue from Suvernabhumi Airport is an important financial source for AOT as a whole (Table 12).

There were no particular problems in the financial aspects of the O&M agency.

Table 12: Financial Status of AOT and Suvernabhumi Airport

Unit: Million Baht

	AOT (Consolidated)			Suvarnabhumi Airport Business Unit		
Major Operation Indicator	2009	2010	2011	2009	2010	2011
(1) Sales	21,502	24,032	28,640	18,106	19,934	23,658
(2) Operating Expenses	18,543	20,283	21,432	13,951	15,357	17,025
(3) Operating Income	7,905	8,279	7,865	6,650	7,034	7,263
(4) Depreciation	2,959	3,748	7,207	4,155	4,576	6,633
(5) Profit/Loss before Tax	637	2,177	3,666	3,016	4,915	5,172
Financial Performance	2009	2010	2011	2009	2010	2011
A. Total Assets	149,019	145,832	147,119	117,388	107,424	108,942
B. Current Assets	25,082	28,289	31,954	5,139	5,228	5,171
C. Current Liabilities	13,313	14,176	16,758	43,233	36,404	34,652
D. Total Equity	73,259	74,088	71,554	13,222	15,012	17,069
E. Net Sales	21,502	24,032	28,640	18,106	19,934	23,658
F. Net Income after Income Tax	633	1,376	2,484	734	1,789	2,057
Financial Indicator	2009	2010	2011	2009	2010	2011
Return of Total Assets (F/A)	0.42%	0.94%	1.69%	0.63%	1.67%	1.89%
Return on Sales (F/E)	2.95%	5.73%	8.67%	4.05%	8.98%	8.70%
Total Asset Turnover (E/A)	14.43%	16.48%	19.47%	15.42%	18.56%	21.72%
Current Ratio (B/C)	188.40%	199.55%	190.67%	11.89%	14.36%	14.93%
Equity to Assets Ratio (D/A)	49.16%	50.80%	48.64%	11.26%	13.97%	15.67%

Source: AOT Annual Report 2009, 2010, 2011

Note: The fiscal year of Thailand starts from October and ends in September.

3.5.4 The Current Status of Operation and Maintenance

Just after the opening of Suvernabhumi Airport in September 2006, various problems and difficulties were observed, such as damage to runways and taxiways, a lack of information signs and toilet facilities, delivery delays and missing checked luggage on arrival. To this was added with unfamiliarity of airport staff with the new airport. However, remedial measures were taken by AOT and most of the above problems and difficulties were solved.

It has been observed that parts of the runways, taxi ways and the apron area are frequently damaged during the rainy seasons. This is probably because the airport was constructed on reclaimed land which used to be a swampy area and when the rainy season comes, the groundwater level rises in proportion to the weight of planes. As a result, a differential settlement takes place in some areas of the runways, taxi ways and the apron. AOT is aware of this serious problem and has been conducting pavement maintenance on the damaged areas. At present, AOT plans to overlay the damaged areas in a two months' period from June to August 2012 in order to repair the damage.

The operational status and O&M procedures for each facility were examined, and no particular problem found.

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

4. Conclusion, Recommendations and Lessons Learned

4.1 Conclusion

The project was highly relevant to Thailand's development plan and development needs, as well as to Japan's ODA policy, and therefore its relevance is high. The operation of the Second Bangkok International Airport (Survarnabhumi Airport) is generally good. The key performance indicators such as number of passengers, the cargo volume and the number of takeoffs and landings mostly achieved their targets, and they have been continuously increasing. Expected project effects such as improvements in airport convenience and efficiency, improvements in airport safety and improvements in the capacity and function of the airport as an international hub-airport have been achieved. Also, the project has positively contributed to commercial development near the airport, the development of a transport network between the airport and the city center of Bangkok, and the promotion of tourism sector development in Thailand. Noise near the airport remains a pending issue, but mitigation measures have been carried out by AOT and the Thai government. Thus, effectiveness is high.

Project cost exceeded that planned, and the project period significantly exceeded the plan, therefore the efficiency of the project is low. Project sustainability is deemed to be high in the structural, technical and financial aspects, the O&M condition of project facilities and equipment is good.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It is expected that the noise pollution situation will be improved by the on-going noise mitigation measures of AOT and the Thai government as well as the compensation scheme for affected local residents. In order to bring forward the Second and the Third Development Projects for Survarnabhumi Airport, the following issues should be taken into consideration:

(a) AOT plans to introduce technical and economic measures for airport noise mitigation such as: (i) the strengthening of the AOT noise monitoring capacity by the introduction of a noise monitoring system in 2012 together with the promotion of noise abatement flight procedures and operating restrictions, and (ii) the introduction of economic incentives for low noise aircraft and a preferential airport tariff system according to the time zone. The above noise mitigation measures must be given a first priority.

(b) In order to minimize the risk of the damage caused by objects falling from aircraft, AOT and the Civil Aviation Authority, Ministry of Transport, must strengthen the regulations and enforcement measures for aircraft with problems as well as working on accident investigations.

(c) The issue of a lack of consultation and explanation with local authorities and people by AOT regarding the compensation scheme for noise pollution and its criteria, the environmental protection measures including the noise abatement measures conducted by AOT, and a future airport development plan was raised by the Ministry of Natural Resources and Environment (MNRE), the Bangkok Metropolitan Administration (BMA), and the two local governments near the airport. This issue may relate closely to the issue of the AOT prolonged compensation process for noise affected local residents. AOT has set up a Community Relationship Unit in the Special Affaires Department under the Administration Line of Suvarnabhumi Airport and the Unit has been making efforts to promote the people's understanding of the project through discussions, dialogue, the provision of information, and participation in community events and activities. However, since the manpower of the Unit as well as their scope of work are limited, the Unit has not yet achieved sufficient success. It is

recommended that AOT strengthen the capacity of the Community Relationship Unit including its manpower and continue to make efforts to establish a reliable mutual relationship between AOT, the local authorities and local people.

(d) It is expected that the prolonged noise pollution compensation process will be accelerated by fully utilizing the mechanism of the existing Tri-Party Committee. I n addition, considering the future possibility for reexamination of the existing compensation scheme and its criteria for eligible households to be compensated, efforts to secure an appropriate budget for sufficient compensation by AOT and the Thai government are very important.

(e) At present, no laws and regulations for land use near Suvarnabhumi Airport with consideration of environmental impacts have been established. While AOT and the Thai government are in a position to further expand Survarnabhumi Airport, the construction of a third runway may produce a new noise affected area. There have been protests by some local residents in the exiting noise affected areas and they are requesting the suspension of airport operation during the night time. It is necessary that a mechanism is to set up to discuss an appropriate land use plan for the area surrounding Suvarnabhumi Airport in consideration of future airport development plans and their potential environmental impact with the concerned government agencies including the Bangkok Metropolitan Administration (BMA), Samut Prakan Province, the Ministry of Interior, the Ministry of Transport (Department of Public Works, Civil Aviation Authority), the Ministry of Natural Resources and Environment (MNRE), and AOT.

(f) It is recommend that the experience of other foreign airports which face the same kind of issues is studied including that of Narita Airport and that exchange and sharing of useful information is carried out .

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Although land acquisition for the project site as well as the relocation of people has been planned and implemented since the 1960s, the potential future environmental impact affecting plans for land use in the surrounding area of Suvarnabhumi Airport was not seriously discussed between the Thai government and local residents, partly because their awareness of the issue was not necessarily high. The project site was swampy land with a relatively small population at the time when the land acquisition was completed in 1973, but later the area surrounding the airport became a populated residential area. The situation was further affected in the exiting of noise affected areas by many housing land development projects and the migration of the people from outside. If discussion on land use near the airport, including restrictions on the land use as well as the possible land acquisition of potential noise affected areas in the future had been made in the initial stage of project planning, the current damage by noise pollution could have been minimized to some extent.

If new airport construction or an airport development project with an expansion of runways is to be implemented, it is necessary not only to address the problem of land acquisition of the project site, but also to carefully examine the issue of land use for potential noise affected areas, including the possibility of land acquisition of such risky areas, in order that preventive measures can be taken at an early stage before the issues become serious.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
(1) Outputs		
a) Site improvements	Perimeter dikes, Interior canal Storage ponds, Pump stations	Same as planned
b) Main airfield pavements	Two runways: 3,700m x 45m	East runway: 4,000m x 60m West runway: 3,700m x 60m
c) Passenger terminal complex (main terminal, concourse building, frontage roads)	Total area: 500,000 m^2 Capacity: 30 million passengers/year	Total area: 540,000m^2 Capacity: 45 million passengers/year
d) Site utilities	Water supply plant: - Capacity: 40,000m^3/day Waste water treatment plant: - Capacity 12,200m^3/day	Water supply plant: - same as planned Waste water treatment plant: - Capacity 18,000m^3/day
e) Transformer stations	115kV/24kV	Almost same as planned
f) Ground access facilities	Landside road Elevated highway Airside road tunnel connecting East and West support zones	Some additional scope
g) Ground improvement of east runway	—	Some additional scope
h) Consulting services	• Assistance for tender and construction supervision: - Professional A: 272 M/M - Professional B: 162 M/M - Local staff: 270 M/M • Project management - Professional A: 1,374 M/M - Local staff: 1,899 M/M	Not available
Note1: The above project outputs are consolidated outputs identified at the time of Phase I appraisal (1996) and Phase III appraisal (1999). Note 2: Items such as f) ground access facilities, g) ground improvement of the east runway, and h) consulting services for project management were added to the project scope at the time of the Phase III appraisal (1999).		
(2) Project Period	September 1996 – December 2001 (64 months)	September 1996 – September 2007 (133 months)
(3) Project Cost		
Amount paid in Foreign Currency	113,520 million Yen	N.A.
Amount paid in Local Currency	230,121 million Yen (71,688 million Baht)	N.A. (N.A.)
Total	343,641 million Yen	382,185 million Yen
Japanese ODA Loan Portion	199,243 million Yen	194,410 Million Yen
Exchange Rate	1 Baht = 3.12 Yen (As of 1999)	1 Baht = 3.114 Yen (Annual Average of 1996-2007)