

**Ex-Post Project Evaluation 2015: Package III-4
(Myanmar, Mongolia, Maldives)**

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FY2015 Ex-Post Evaluation of Technical Cooperation Project
“Integrated Mangrove Rehabilitation and Management Project through Community
Participation in the Ayeyawady Delta”

External Evaluator: Asako Takimoto, Global Link Management Inc.

0. Summary

This project (hereinafter referred to as “the Project”) was implemented to contribute to sustainable management of mangrove forests and poverty alleviation of the community in the Ayeyawady Delta, Myanmar. To achieve the goal, the Project aimed to provide necessary technical cooperation to establish sustainable community forestry (CF) for local communities and officers of the Forest Department (FD). The Project’s relevance was high. The activities were highly relevant to Myanmar’s development plan, development needs, and Japan’s ODA policy. The Project mostly enabled the target communities to sustainably co-exist with their mangrove forests at the time of the Project termination. Achieved situation was maintained when the ex-post evaluation was conducted. It was clear, however, it needed more time and procedures to increase the CF communities co-existing with mangrove and to enhance income levels of the communities through CF activities. Therefore, effectiveness and impact of the project were fair. The Project was suspended for almost a year due to damages caused by a Cyclone. Its plan was, however, revised after the incident and the Project’s cost and period were both within the revised plan. Thus, efficiency of the Project was evaluated as high. At the time of the ex-post evaluation, related policy and institutional aspects and technical aspects for sustainability were high. FD was sequentially developing policies for sustainable mangrove forest management and CF promotion. Communities and FD officers targeted by the Project showed a certain amount of enhancement and they maintained their technical abilities. On the other hand, the FD budget for CF management and promotion was not sufficiently allocated. And it was not clear how the organizational mechanism inside FD to promote CF was going to be restructured by the regime change in April 2016. Consequently, sustainability of the overall project effects was considered to be fair.

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

1. Project Description



Project Location



Planting mangrove seedlings in CF by community members

1.1 Background

Mangrove forests host a highly diverse ecosystem and provide multiple benefits: fuel woods and timbers, breeding grounds for aquatic animals, non-timber forest products, protection for soil erosion, and climate change mitigation through carbon sequestration. The Ayeyawady Delta area, over 0.2 million ha at the mouth of the Ayeyawady River, holds a precious mangrove forest. Extensive part of the forest is designated as reserved forests (RFs), which is a highly unique condition in whole Indochina. Nonetheless, forest degradation was becoming a serious issue in these large RFs. The government of Myanmar established these RFs in the beginning of the 20th century but the deforestation started in the 1950s. Logging for fuel woods and timber for self-consumption, charcoal production for mainly selling, alternation to paddy fields, shrimp/fish aquaculture, and salt farming were the major drivers of deforestation. Degradation of the RFs was significant by the 1990s. As a result, Ayeyawady Division Peace and Development Council banned logging of mangroves and charcoal production from mangrove forests of the RFs in 1993. FD was planting mangroves to reforest the RFs. FD also issued “Community Forestry Instruction (CFI)” in 1995 and promoted CF practices to encourage forest management by local communities. Nevertheless, the mangrove forests kept being deforested due to societal issues such as past nation-wide logging¹, alternation to paddy fields by over 0.2 million poor illegal residents inside the RFs, shrimp farming, timber logging, and lack of management and administrative capacities (including CF extension) of local governments and FD. By the time of the Project planning, as a result, the remaining forested area was less than 40% compared with that in the 1920s. It was estimated that the remaining mangrove forests would disappear by 2010 unless this rapid deforestation were ceased². If these mangrove forests were gone, residents inside the RFs would lose most of their basis of livelihood. JICA recognized the importance of the mangrove forest management and thus

¹ Under the past military regime, the national government pressured local government to increase agricultural production, which caused large-scale alternation of mangrove forests to paddy fields and massive deforestation.

² Source: Report of a preparatory study on the Integrated Mangrove Rehabilitation and Management Project through Community Participation in the Ayeyawady Delta.

conducted a development study for three years since 2002. The study produced the Integrated Mangrove Management Plan (IMMP). The government of Myanmar requested a project to the Japanese government in May 2005, based on IMMP. The requested project was for capacity development of former FD of Ministry of Forestry (current FD of Ministry of Environmental Conservation and Forestry) and local communities in forest resource management and reforestation of the mangrove forests. IMMP consisted of Phase 1 for establishment of sustainable CF, Phase 2 for extension, and Phase 3 for maintenance and more extension. The Project was considered as a technical assistance for the Phase 1. Its Record of Discussion was signed in September 2006 and after the domestic preparation period from December 2006, the Project was implemented from April 2007 for 5 years.

1.2 Project Outline

Overall Goal		The mangrove forests are sustainably managed and poverty is alleviated among the communities in the Ayeyawady Delta ³
Project Purpose		The communities and the mangrove forests co-exist in a sustainable manner in the selected areas ⁴ where project activities were implemented within the Ayeyawady Delta
Output(s)	Output 1	The selected communities practice environmentally and economically sustainable CF ⁵
	Output 2	The management and the support system of the FD for CF is effective
	Output 3	Some silvicultural techniques for the rehabilitation and the management of the mangrove and its associated forests for the Ayeyawady Delta are established.
	Output 4	A coordination mechanism is established among key sectors to address the underlying causes of mangrove deforestation in the Ayeyawady Delta
	Output X ⁶	(Additional output to address damages by the Cyclone Nargis in May 2008) Recovery from damage of Cyclone Nargis is promoted
Total cost (Japanese Side)		705 million yen
Period of Cooperation		April, 2007 – March, 2013 (Extended period: April, 2012 – March, 2013 Suspended period due to the Cyclone: May, 2008 – December, 2008)
Implementing Agency		Ministry of Forestry, Forest Department (Ministry of Environmental Conservation and Forestry, Forest Department at the time of the Ex-Post Evaluation)

³ The mangrove forest in the Ayeyawady Delta comprises all RFs and other mangrove forests in 26 townships where there used to be forests.

⁴ The Project targeted four RFs in three townships in broader sense. But JICA experts and FD mutually agreed the project sites where actual activities were conducted were the selected CF, Action Research Plantation (ARP) area, and six CF communities.

⁵ In CFI, CF was legally defined as 1) afforestation of areas insufficient in fuelwood and other forest products for community use, and 2) planting of trees and extraction and utilization of forest products to obtain food supplies, consumer products and income. The Project recognized areas which fall under both definitions or either one of them alone as CF. Meanwhile, the actual CF mechanism was “FD provides 30 years user rights to communities without a charge and communities manage the forest to gain benefits from them and to contribute to the forest conservation.

⁶ Output X was added to the Project as emergency relief and recovery assistance for local communities who were severely hit by the Cyclone.

Other Relevant Agencies / Organizations	<Cooperating Agency> Myanmar Agriculture Service, Ministry of Agriculture and Irrigation, Department of Fisheries, Ministry of Livestock and Fisheries <Supporting Agency> Settlements and Land Records Department, Ministry of Agriculture and Irrigation
Supporting Agency/Organization in Japan	None
Related Projects	The Study on Integrated Mangrove Management through Community Participation in the Ayeyawady Delta(2002 – 2005) The Project for Mangrove Rehabilitation Plan for Enhancement of Disaster Prevention in Ayeyawady Delta(2012 – 2017)

1.3 Outline of the Terminal Evaluation

The terminal evaluation of the Project was conducted from November 18 to December 8 in 2012, before the end of the Project in March 2013.

1.3.1 Achievement Status of Project Purpose at the Time of the Terminal Evaluation

The evaluation concluded that the Project Purpose was expected to be achieved. The indicator a (see Table 1.) was mostly achieved and the indicator b was judged as “likely to be achieved” based on tentative results, interviews, and drafts of the Impact Survey and Capacity Assessment Survey that were ongoing at the time of the evaluation.

1.3.2 Achievement Status of Overall Goal at the Time of the Terminal Evaluation

The indicator a. (see Table 2.) was expected to be achieved, while the indicator b was evaluated as “Not yet clear at the moment”. The indicator was about the increase of forested area. FD’s plantation plan and an upcoming project for mangrove rehabilitation by JICA planned at the time of the terminal evaluation were proof for the positive expectation. The indicator b (see Table 2.) was about income generation of the communities. The evaluation team didn’t find an existing useful data about income generation, although the interviews to the target communities showed the sign of income increase and found prospects to continue CF activities in the target communities. Thus, Overall Goal was concluded as “partially expected to be achieved”.

1.3.3 Recommendations at the Time of the Terminal Evaluation

The terminal evaluation team recommended that the Project hold technical workshops on findings from Action Research Plantation (ARP)⁷ and from damage and recovery survey. The purpose of the workshops is to examine lessons and utilize the knowledge for relevant

⁷ In experiment level, various mangrove species were planted with using different methods and the growth patterns were recorded.

organizations. The evaluation team made various recommendations for FD (as an implementing agency) to further develop its CF promotion agenda. The recommendations include institutional, legal, and financial measures. Also, following points were mentioned: 1) extension of CF activities outside of the target area based on the experiences from the six target villages, 2) follow-up on income generation activities of which the achievements were unclear to estimate, and 3) development of technical guidelines for FD to utilize outcomes of the Project in the future. JICA was recommended to take necessary coordination actions that enabled other JICA projects and donors / NGOs such as RECOFTC (The Center for People and Forests) to use outcomes, knowledge, and experiences from the Project.

2. Outline of the Evaluation Study

2.1 External Evaluator

Asako Takimoto, Global Link Management Inc.

2.2 Duration of Evaluation Study

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

Duration of the Field Study: January 3, 2016 – January 15, 2016

March 13, 2016 – March 18, 2016

2.3 Constraints during the Evaluation Study

Six target villages of the Project were all located in a quite remote township/state from Yangon where the Project had a main office. It was difficult to cover all six villages during the field study of the ex-post evaluation. The evaluator directly visited two of the six villages to collect information on effectiveness and impact of the Project. Local consultants hired by the evaluator visited the rest of the villages and conducted a beneficiary survey and interviews to CF committees.

Financial information provided by FD was limited in amount, which made it difficult to judge financial sustainability. Also, data on mangrove forest coverage, logging, and socioeconomic data of CF communities hardly existed. Thus, it was difficult to quantitatively evaluate achievements and impacts of the Project.

3. Results of the Evaluation (Overall Rating: B⁸)

3.1 Relevance (Rating: ③⁹)

3.1.1 Relevance to the Development Plan of Myanmar

Forest resource management by communities was a core of the Project and one of the top priorities in “Myanmar Forest Policy” published in 1995. CFI, published in the same year,

⁸ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁹ ③: High, ②: Fair, ①: Low

stipulated community's usage and selling rights on timber and other forest products, provided that the communities manage the forests appropriately with CF practice. This usage right was never legally given from the state before. Also, Myanmar's National Forest Master Plan (2001-2031) listed RFs management and plantation as "activities which local communities should be involved". This was consistent with the Project purpose. None of these forest policy, CFI, and the master plan above was revised nor changed from planning stage to its completion, thus, the Project was highly relevant to Myanmar's development plan.

3.1.2 Relevance to the Development Needs of Myanmar

When the Project started, about half of the population residing in the Ayeyawady Delta area was landless poor. They were consuming mangroves unsustainably for timber and fuel wood because of their unstable incomes. FD was promoting participatory natural resource management but few officers had knowledge and experience for CF practice. FD was also solely in charge of mangrove reforestation under the Forest Policy even though the cause of the mangrove deforestation varied from timber harvesting, conversion to paddy fields, to logging for shrimp farming. No effective coordination was made with other agriculture/fisheries relevant governmental agencies. In addition, FD did not give land usage rights and planned harvesting rights for home-consumption of fuel woods to local residents at their plantation area. This caused local communities' illegal encroachment and degradation of the plantation area. All these issues suggested a strong demand for the Project's activities: capacity development in sustainable forest management and poverty alleviation of local communities.

The Delta area was also severely damaged by a Cyclone in 2008. UN/ASEAN team estimated 0.8 million houses were damaged, 0.6 million ha of agricultural land was flooded, and 138 thousand people were deceased or missing. The project sites and targeted villages were in the area where the damage was severe. Recovery from the damage was an urgent need after 2008. The damage caused by the disaster accelerated population growth and increased the need of timber for reconstruction, which led more to rapid deforestation of the mangrove. The Project aimed to address deforestation and degradation of mangrove forests and thus was consistent with Myanmar's development needs from planning to completion stage.

3.1.3 Relevance to Japan's ODA Policy

Japan's economic assistance to Myanmar had five priority areas when the Project was planned; 1) humanitarian support, 2) support for refugees and minorities, 3) counternarcotics, 4) support for democratization, and 5) economic reform. The Project tried to give more initiatives to communities to increase their incomes by managing and utilizing forest resources that used to be solely managed by the state. Thus, it fits to 4) democratization in a broad sense. Also, JICA's implementation plan for Myanmar stated "communities' participation in governmental

administration” as one of the six assistance programs and the Project was a part of it.

3.1.4 Relevance to Appropriateness of Project Planning and Approach

Started based on the outcomes from IMMP, the Project went through some modifications of the plan including three revisions of PDM. It happened because of the addition of recovery activities from the Cyclone and narrowing down the number of the pilot CF villages. The biggest change was adding Output X after the Cyclone. The military regime at that time was institutionally not flexible to promptly receive assistance from overseas. JICA improvised an ongoing activity, the Project, to promptly provide disaster relief and recovery activities to the damaged communities. This addition of an outcome not only contributed to mangrove reforestation but also enabled Japan to quickly start the disaster recovery activities. And equipment provided under the Output X was continuously in use and the shelters built were used as model facilities for disaster prevention in Myanmar. The provision also became the basis of an ongoing mangrove rehabilitation project by JICA. Thus, these modifications were considered as appropriate.

An unexpected external factor (the Cyclone) forced the Project to modify and to add an additional Output. The change was to adjust to the unique situation of Myanmar and the addition was mainly for enhancing disaster prevention function. Thus, the change in the Project plan was appropriate.

In summary, the Project was highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. And the change in planning and approaches were conducted with possible and appropriate options. Therefore, its relevance is high.

3.2 Effectiveness and Impact (Rating: ②)

3.2.1 Effectiveness

3.2.1.1 Achievement of Project Purpose

To achieve the Project Purpose “The communities and the mangrove forests co-exist in a sustainable manner in the selected areas where project activities were implemented within the Ayeyawady Delta” (Table 1), the Project set four outputs and another output was added to recover from damages to the mangrove forests after a Cyclone. Almost all five outputs except income generation activity in Output 1 were achieved at the end of the Project (see details in Annex).

Table 1 shows achievement of the Project Purpose at the end of the Project. Regarding the indicator a, “increase of forest coverage”, the Project conducted CF management in 3,542 acres (1,433 ha) for the target of 3,550 acres (1,438ha). Thus, it was mostly achieved. For the indicator b “More than 80% of CFUG members consider CF useful”, the assessment conducted by the Project found that over 80% of Community Forestry Users Group (CFUG) registered members understood functions of CF (sustainable production of forest products, legalize usage

of mangrove forests and others) and considered CF useful.

This increase of forest coverage was contributed by a reform of CF management support mechanism in FD (Output 2), an establishment of plantation techniques for mangrove forests management and extension (Output 3), and building a coordination mechanism among relevant sectors to address fundamental causes of mangrove deforestation (Output 4). These outputs made FD officers and local communities of the project target area recognize the importance of mangrove forests and led to more intensive CF management. Additionally, CFUG members understood the function and effectiveness of CF for sustainable mangrove management by practicing environmentally and economically sustainable CF (Output 1). Thus, it is confirmed that the Project largely achieved its purpose “co-existing of communities and mangrove forests in sustainable manner”.

Table 1. Achievement of Project Purpose

Project Purpose	Indicator	Actual
The communities and the mangrove forests co-exist in a sustainable manner in the selected areas where project activities were implemented within the Ayeyawady Delta	a. By the Project end, mangrove forest coverage is increased by 3,550 acres (1,438ha) ¹⁰ in the selected areas where project were implemented (i.e. CF plantation, CF-Natural Forest Improvement Operation (NFIO), and ARP sites) from the base year 2009.	The Project implemented its activities in 3,542 acres (1.433ha) of the selected area as follows. Six targeted CF forests: 1,670 Former targeted CF forests ¹¹ : 285 Action Research Plantation(ARP): 1,587
	b. At the end of the Project, among the registered members of all the target CF user groups (CFUGs) registered in 2011, more than 80% consider CF useful.	More than 80 % of registered CFUG members understood the function of CF and recognized CF useful.

3.2.1.2. Status of Outputs and Project Purpose at the Time of the Ex-Post Evaluation

Regarding Output 1 – environmentally and economically sustainable CF activities – at the time of the ex-post evaluation, some villages were conducting limited activities of their CF action plans compared with the time of the Project completion. Conditions of several CFs were worse than those at the beginning of the Project. Beneficiary survey and interviews suggested that each target village has a different CF management style and distribution of CF products, depending on its ethnic group composition and strength of social norm. Income generation activities in general did not show any significant progress at the time of the ex-post evaluation, while the plantation area seemed to be increasing. Thus, activities under Output 1 were mostly continued (Table 2).

¹⁰ Both Project Purpose and indicators did not specify the quality of mangrove forests. Thus, this evaluation defined mangrove forests as any vegetated land with existing mangrove species.

¹¹ There were seven more selected CF villages at the beginning of the Project yet they were not re-selected at the Project revision in 2011 after the Cyclone. This area was pilot plantation forests managed prior to the Cyclone.

Table 2. CF management status of Six Targeted Villages at the Ex-post Evaluation
(As of January 2016)

Targeted Village	Number of household participated in CF / Number of household in the village	CF area (in acre)	Types of CF: Supplementary plantation on existing mangrove forests / new plantation (in acre)	Survival rates of planted seedlings (%) (estimated average)	CF condition at the time of the ex-post evaluation
Kwa Kwa Ka Lay	31/157	202	Mostly new plantation	60	Most of CF area was abandoned shrimp farming pond (degraded area). Thus, the mangrove forest coverage increased as plantation took place (Details were not available since CF committee chairman had been out of town for long).
Nyaung Ta Pin	49/126	693	217/467	unknown	CF area was divided into patches and their management responsibility was distributed to each CFUG member which caused different levels of management in each member's lot. CF committee answered in its interview that the condition of CF worsened after the Project, but some patches improved its condition.
Thar Yar Kone	45/108	1051	Mostly on existing forests	60	Most of CF area was already mangrove forests. Recent illegal logging caused some part of the forests to be more degraded than those before the Project. Overall, however, the forest condition did not change much from the time before the Project.
Shwe Pyi Thar	80/120	50	20/30	50	CF condition was improved by effective conservation practices. This is because the CF committee chairman had a high organizing skill and disaster prevention function of mangrove was understood well among the community.
Gaw Du	56/183	50	36/14	80	Some neighboring community repeatedly encroached the CFs and cut mangroves for fuels to operate their large-scale fishing, which cause recent degradation. Also, CF was collectively managed which seemed to be more difficult compared with management by individuals.
Htaung Gyi Tan	37/249	157	60/97	95	

Source: Beneficiary survey to CF committee

Output 2 was about CF management and support mechanism in FD. Many FD officers who were part of the Project were transferred to other areas, but some were still involved with CF promotion in the policy level. FD officers were still using training programs and guidelines developed by the Project. Technical support from these officers based on these programs and

guidelines was essential for local communities to start CF activities. Technical guidelines for mangrove plantation technology developed from Output 3 by the end of the Project were used as training texts for local communities and FD officers (mainly field-level) at the time of the evaluation. Follow-up research on ARP plots was ongoing as well. The inter-agency coordination meetings set under Output 4 were not held after the Project because the meeting was to discuss the Project administration and relevant information exchange for CF promotion and mangrove conservation. Similar inter-agency meetings, however, were held since the Project completion to discuss land use law and revision of CFI. The democratic administration since 2011 was seeking solutions for these problems. (The democratic administration started many policy improvement and were promoting inter-agency policies compared with previous military regimes). Output X, recovery support from the Cyclone, provided various equipment and built disaster recovery shelters and seedling nurseries. These were all well maintained and continuously in use (See Annex in detail).

Two indicators of the Project Purpose were mostly achieved at the end of the Project and remained the same at the time of the ex-post evaluation. CFUG members recognized effectiveness of CF and continued CF activities within their capacities including expansion of their CFs. It was confirmed that communities and mangrove forests were somewhat co-existing even without the Project input.

3.2.2 Impact

Impact of the Project was analyzed through examining 1) updated status of the Outputs and Project Purpose, 2) achievement of Overall Goal, and 3) other impacts.

3.2.2.1 Achievement of Overall Goal

Table 3 shows the status of achievements of the Overall Goal's indicators.

Table 3. Achievement of Overall Goal

Overall Goal	Indicator	Actual
The mangrove forests are sustainably managed and poverty is alleviated among the communities in the Ayeyawady Delta	a. Mangrove forest coverage increases by 10,000acres (4,050ha) in the Target Area of the current Project (i.e. 4 RFs) within three years after the completion of the Project	There were no quantitative data available regarding mangrove forest coverage in CF area, thus it was difficult to evaluate the achievement of this indicator. FD reported 2,400 acre (approximately 971 ha) of mangrove plantation from 2013 to 2015 (Table 7). In addition, ongoing mangrove rehabilitation project by JICA planted 1,154 ha by the end of December 2015. FD recognized this plantation area as their official plantation as well. Judging from these data, the indicator was at least half achieved.

Overall Goal	Indicator	Actual
	b. Income levels of communities in the Target Area is improved than that of 2004	The beneficiary survey ¹² conducted for the ex-post evaluation found eight households (7.3% of sample size) reported the increase in their annual incomes. Although this could be called as a progress, it was insignificant to call it as a clear impact.

As mentioned in “2.3 Constraints during the Evaluation Study”, quantitative data to evaluate achievements of Overall Goal was not easy to obtain. The evaluation was based on limited data provided and results of the beneficiary surveys. The Project has achieved at a limited level of its Overall Goal because while forest coverage was in the process of achieving the target by increasing plantation by both CF and FD operation, income generation was observed at limited households.

Regarding the indicator a, given the time frame from the Project termination to the ex-post evaluation – only couple of years – was too short to recognize the impact, considering growth speed of common mangrove species. As for the indicator b, interviews at the time of the ex-post evaluation found that it was agreed by both sides at the initial stage that if CF activities were continued and planted mangroves grew well; forest products from CF would eventually contribute to the income generation of the communities. But it takes a long time for the mangrove to grow enough so that communities can harvest more than sufficient fuel woods or timber for their own consumption in order to sell them. Setting the overall goal, “achieving communities’ poverty reduction by the time of the ex-post evaluation (three years from the Project termination)”, was the expectation at the planning stage, which was evaluated as “too optimistic”.

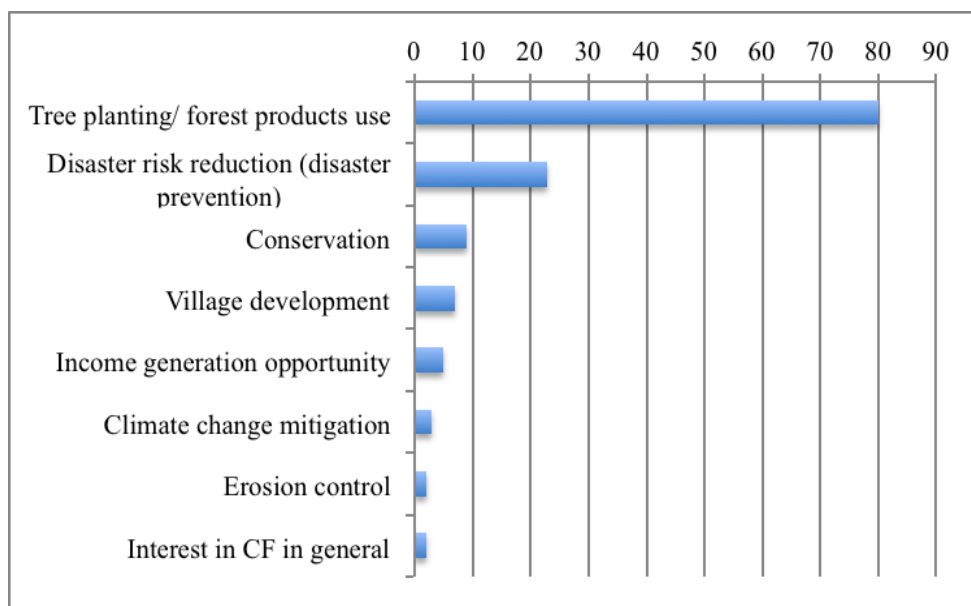
3.2.2.2 Other Impacts

The beneficiary survey found that many CFUG members thought they learned more about mangrove forests’ effects and impacts on local environment through participating in the Project. As shown in Figure 1, 21 % of CFUG members stated disaster risk reduction as a reason to participate in CF, while 8 % said environmental conservation, and 5 % for prevention of soil erosion and climate change mitigation (they could select multiple answers for the question). Interviews and the beneficiary survey also suggested that the Cyclone increased communities’

¹² The beneficiary survey was conducted to 109 individual CFUG members of the target villages and 30 non-CFUG members, 129 people participated in interviews to six CFUG committees, 17 FD officers including both CF task force members and non-members, and 8 people from relevant agencies (only from Department of Fisheries). Regarding villages, all “re-selected” six villages were surveyed to ask conditions before the Project so that the conditions after the Project could be compared and the impact of the Project could be evaluated. At the survey in the villages, on average 21.5 people (CFUG committee members and volunteers) per a village attended the group interviews. The interviews were to ask about ongoing discussion and activity plans of the CFUG. The survey sample for individuals was determined by using stratified random sampling, taking samples proportionate to the numbers of each CFUG members in six villages. The sample size was determined to gain 95% confidence interval with 10% error level significance. .

interests on mangrove forests because of its disaster relief function. Also, CFUG members recognized mangrove's positive effects such as biodiversity conservation (29 % of the members answered the increase of biodiversity was a positive effect of CF).

Unit: person



Source: Beneficiary Survey (sample size: 109)

Figure 1. CFUG members' Reasons to Participate in CF (Multiple answers)

In addition to an increase in mangrove species and forest coverage, the beneficiary study reported an increase in the number of aquatic animals (fish, crab, and shrimp). This suggested the Project was very likely to contribute to biodiversity conservation of the area. No negative impact was reported since the Project termination till the ex-post evaluation.

For the project purpose, both indicators were mostly achieved; the target amount of area was reforested and more than 80% of target community population recognized CF as useful. Overall goal, sustainable mangrove forest management and communities' poverty alleviation in the Ayeyawady Delta, has been achieved in a limited sense. This was because only about half the forest coverage target was reforested even though the increase was confirmed. Also, there were no comprehensive data about community's income level. Thus, it was impossible to quantify the scale of the Project achievement in terms of income generation. According to the beneficiary survey, eight households (7.3% of the sample) reported an average increase of approximately 8,000 yen in their annual incomes. Interviews and beneficiary survey, however, suggested that it would need more time and trials for the Project to contribute to general income generation of entire local communities. As such, since this Project has to some extent achieved the Project Purpose and Overall Goal, effectiveness and impact of the Project are fair.

3.3 Efficiency (Rating: ③)

3.3.1 Inputs

Planned inputs and actual spending were summarized as able 4 below.

Table 4. Comparison of planned and actual inputs

Inputs	Plan (June 2006)	Revised Plan (November 2008)	Actual (March 2013)
(1) Experts	Short-Term: No MM were mentioned in the planning document. Only stated one relatively longer-term expert and others with specific missions as necessary.	Budgets were allocated to nine experts and their areas of responsibilities were mentioned in the new plan	17 Short-Term (133.4 MM)
(2) Trainees received	No number mentioned	1 person to participate in Country Focused Training.	13 persons
(3) Equipment	Only a cost of car (8 million yen) was mentioned	7.7 million yen (cost of equipment for provision and equipment accompanied by expert dispatch)	21.8 million yen GIS software, satellite images and information, GPS devices, generators, boats for disaster recovery, and others.
(4) Local Activity Cost	Not mentioned	113 million yen	171 million yen (Local cost supported by the Project)
Japanese Side Total Project Cost	450 million yen	712 million yen	Total 705 million yen
Myanmar Side Operational Expenses	1. Counterpart personnel and increase of the number of CF task force members 2. Budget allocation for the project (20, 000 US dollars equivalent per year) 3. Project office	Not mentioned	1. Counterpart personnel 2. Project office 3. Local cost: 299.14 million Myanmar kyats ¹³

MM stands for man month.

Source: Information provided by JICA

3.3.1.1 Elements of Inputs

(1) Experts

Area of expertise of the short-term experts were: chief advisor (relatively long-term mission), community forestry, agroforestry, participatory community development, mangrove forestry, GIS, forest technology, land use planning, silvicultural extension, research and extension, marketing, aquaculture, and project coordination.

Because of the political situation at the time of implementation, all Japanese experts had to

¹³ About 23 million yen. At the end of the Project, 0.077 JPY = 1 Myanmar kyats, monthly average exchange rate on March 2011.

be based in Yangon. They had to file entry permits to the Project area every time for the fieldwork.

(2) Trainees Received

From FD and other relevant governmental agencies, 13 participants attended training programs in Japan and 10 attended in technical exchange program (23 in total).

Table 5. Training Programs and Participants

Training Program	Participants
Conservation and Sustainable Management of Mangrove Ecosystems	4 Range officers ¹⁴ , staff officers (field level)
Seminar on Forest Management Policy-Sustainable Forest Management with Collaboration of Local Government and Community	1 Assistant Director of Ayeyawady Division, 1 Director of Planning and Statistic Division
Environmental Education for Sustainable Development-Conservation of Coastal Eco-systems for Lives of Local Communities	4 Range officers
Roles of Forests in Natural Disaster and Revival of Forests and Forestry	1 Director of Planning and Statistics Division
Technical Exchange Program	
Technology Exchange Program 2008 “Melaleuca Plantation Technologies” (in Viet Nam)	1 Field Project Manager, 1 Staff officer, and 3 Range officers
Technology Exchange Program 2009 “CF Activities and Aquaculture in Delta Area” (in Thai)	2 officers from Department of Fishery, 1 Staff officer of FD, 1 Range officer, and 1 research center officer

Source : Information provided by JICA

(3) Counterpart from Myanmar Side

Throughout the Project, 22 management personnel (central office or division/state level) and 87 technical personnel (township level) participated in the Project activities. Only one personnel was assigned to the Project as a full-time staff and all others had their responsibilities in different works of FD. Transfer was common in FD and only four FD officers had more than two year consecutive involvement with the Project.

(4) Inputs from Myanmar Side

Myanmar side provided 299,141,000 Myanmar kyat (about 23 million yen)¹⁵ in total to the Project. The input included office spaces, facilities, lands for APR, direct cost such as seedlings for plantation (131,309,000 Myanmar kyat), and indirect cost such as salary for relevant officers (167,832,000 Myanmar kyat).

(5) Others

Baseline survey in the Project sites, CF impact study during the Project, baseline survey

¹⁴ Officers in the field level (generally called field officer or forester).

¹⁵ At the time of the Project termination. 0.077 JPY = 1 Myanmar kyat. Average exchange rate of March 2011.

and resource assessment in target villages, and impact survey and capacity assessment in target villages were subcontracted¹⁶ during the Project.

3.3.1.2 Project Cost

The original Project budget was 450 million yen. But budgets for disaster recovery activities after the Cyclone, for recovery of mangrove forests and disaster risk prevention, and for re-doing some CF activities destroyed by the Cyclone were added and the revised budget became 712 million yen. Normally the actual cost is compared with the original planned cost, but considering the additional inputs after the Cyclone, comparison was done between actual cost and the cost of the revised plan. Actual cost was 705 million yen that was lower than planned (less than 99%).

3.3.1.3 Period of Cooperation

The original Project period was 60 months (5 years) from April 2007. The Cyclone in May 2008, however, hit the Project site and caused serious damages to locals, mangrove forests, and local government agencies. It resulted in a suspension of the Project for 8 months since May 2008. In January 2009, the Project plan was revised based on a damage assessment and disaster recovery survey. Activities for livelihood recovery of local communities and for enhancing risk prevention ability of mangrove forests through supplementary plantation and reforestation were added. The project period was extended for a year, thus the Project period after the revision was 72 months, and the actual period was as planned (100%).

As above, both the project cost and project period were mostly as planned. Therefore, efficiency of the Project is high.

3.4 Sustainability (Rating: ②)

3.4.1 Related Policy and Institutional Aspects for the Sustainability of Project Effects

At the time of the ex-post evaluation, FD was developing “Integrated Coastal Resource Management Initiative” as an overall policy to manage the whole coastal area of Myanmar including the Project area. CF was a major part of the land use and going to be promoted. Political support related to CF for the Project activities included revising CFI and was getting better than expected at the time of the Project termination. This trend seemed to be continuing. Table 6 shows FD has an actual plan and specific targets for mangrove plantation.

Table 6. Plan for Plantations and Natural Regeneration¹⁷ by Forest Department in Divisions

¹⁶ Subcontract survey also included a recovery assessment after the Cyclone and satellite imaginary analysis of the project sites.

¹⁷ A process by which woodlands are restocked by trees that develop from seeds that fall and germinate in situ, not by planting.

and State Where Mangrove Forests Exist (2016-2019)

(unit: acre)

Fiscal Year	Ayeyawady Division		Taninthayi Division		Rakhine State	Total
	Mangrove Plantation	Natural Regeneration	Mangrove Plantation	Natural Regeneration	Mangrove Plantation	
2016	900	150	100	95	100	1345
2017	900	150	100	195	50	1395
2018	400	150	40	150	50	790
2019	400	150	40	150	50	790
Subtotal	2,600	600	280	590	250	4,320

Source : Information provided by FD

Meanwhile, as mentioned in the impact analysis above (Table 3), illegal logging was a serious obstacle to grow mangroves within CF. Residents of neighboring communities of CF encroached into CF and cut mangroves for their fishing boats' fuel and other consumption. This slowed down the growth of mangroves and caused delay in income generation activities which depended on forest products. Both FD and CF communities were trying to prevent the illegal logging by patrolling. But even if they captured the loggers, penalty fees for the illegal logging was so low that it did not reduce illegal logging. More than several FD officers and CFUG members shared the opinion that the current laws to control the illegal logging was not enough.

Although the illegal logging issue should be dealt at the policy level, political sustainability for CF promotion and mangrove conservation is in general high.

3.4.2 Organizational Aspects of the Implementing Agency for the Sustainability of Project Effects

FD, as an organization, needs CF support mechanisms in all levels, especially in the field level, directly supporting local communities (including controlling illegal logging). According to FD, CF National Working Group¹⁸ was formed in 2014, consisting of relevant governmental agencies, international/national NGOs, Civil Society Organization (CSO). Discussion in this group led to an establishment of CF unit, a section to promote CF inside FD. The units were set in district office level as well as central FD office in Nay Pyi Daw. More units were planned to be set in township levels. Also, according to FD's coming 5 year plan (2016-2020), Division of Mangrove Conservation are about to be established inside FD. Twelve full-time officers (Director and others) were to be assigned and about 158 FD officers would involve in the work of this new division. The 5 year plan stressed that this division would be in charge of coordination among relevant agencies, local communities, private and international organizations in terms of mangrove conservation. Promoting mangrove management by local community was emphasized as another major agenda of this division.

¹⁸ Official members of the CF National Working Group were: FD, Attorney –General Office, Department of Fisheries, General Administrative Department, Mining Department, Agriculture Land management & Statistics Department, international and international and NGOs and CSOs.

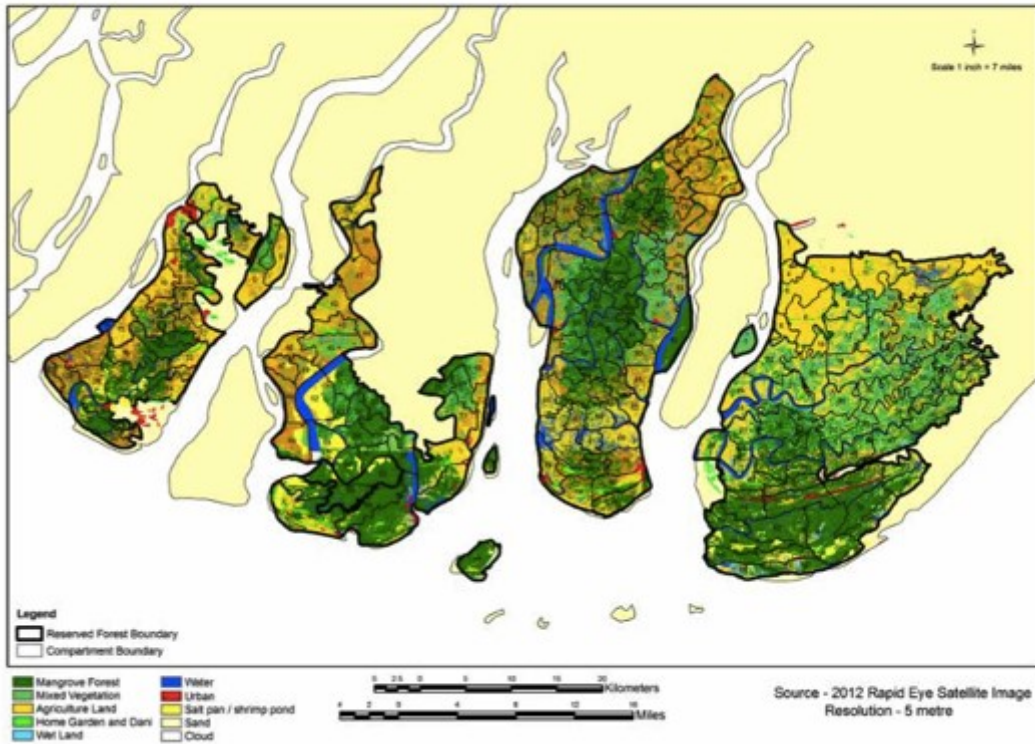
During the Project, few action were taken to prevent illegal logging because this issue involved interests of many governmental agencies such as Department of Agriculture, Fisheries agency, Development agency, and others. According to interviews to FD, more effective inter-agency coordination was expected to take a place in the near future to address cross-sectoral issues. This is because the new administration was planning to consolidate many governmental agencies which reduced inter-agency tensions and make inter-agency coordination easier.

Although an improvement in the future was expected, support to local communities and illegal logging control were both challenges for FD. Thus, organizational sustainability was evaluated to be limited.

3.4.3 Technical Aspects of the Implementing Agency for the Sustainability of Project Effects

At the time of the ex-post evaluation, it was confirmed the technical knowledge of FD officers about mangrove's silvicultural techniques and CF management were maintained through trainings and workshops. It was clear in the interviews that field level FD officers were technically confident to provide trainings on mangrove seedling production and basic plantation techniques to local community. The Project developed a silvicultural guideline summarizing the necessary techniques for this technical support. Using the guideline, FD was intermittently providing workshops for CF and mangrove management to its officers. Sustainability was thus secured to provide technical assistance to CF communities. Also, GIS section of the FD kept collecting land use data and renewing the map information based on the satellite imaginaries and relevant technical assistance provided by the Project (Figure 2.). For the target communities, CFUG members received enough technical trainings to build their own nursery and was reported to implement plantation by themselves. Thus, it is confirmed technical sustainability of the Project is secured.

Land Use and Land Cover Map 2012 (Rapideye image)



Source: Information from FD

Figure 2. Map of the Project Area (4 RFs) Produced by FD GIS Section After the Project Completion with Utilizing Satellite Imaginary and Technology

3.4.4 Financial Aspects of the Implementing Agency for the Sustainability of Project Effect

Financially, FD's budget allocation for CF management was considered to be insufficient. It was not possible to acquire detailed budgetary information of FD at the ex-post evaluation. Yet interviews to relevant FD stakeholders suggested that monitoring for CF activities and illegal logging control were under-budgeted at the time of the ex-post evaluation. Meanwhile, Deputy Director of FD referred that a new division for mangrove conservation and management were planned to be established in the fiscal year of 2016 at the first field visit of the evaluation. CF units were sequentially placed from state/division level to district and township levels. Thus, the prospects of budget increase in CF and mangrove management looked promising.

Table 7 showed the FD data in plantation from 2007 to 2015. Mangrove plantation started since 2013. The annual plantation area was largest in 2013 and gradually decreased. This is because the budget and human resources also need to be allocated to maintain the planted forests and does not mean the total budget for mangrove reforestation and conservation was decreasing. Also, Table 6 showed that FD was planning to increase the area of mangrove plantation and natural regeneration in the fiscal year of 2016. In summary, an improvement in

budget allocation for mangrove conservation was expected because FD is planning financial measures soon or in the near future. Yet there was some uncertainty since the new administration took the place during the ex-post evaluation and had not fully disclosed their financial plans at that time. Thus, the financial sustainability is evaluated to have minor problems.

Table 7. Actual Cost of Different Types of Plantation by Forest Department
(2007 – 2015)

(Budget : Million Myanmar Kyat*, Area: acre)

Fiscal year**	Commercial Plantation		Watershed Plantation		Industrial Plantation		Fuel wood Plantation		Mangrove Plantation		Total	
	Area	Cost	Area	Cost	Area	Cost	Area	Cost	Area	Cost	Area	Cost
2007	31850	1838	17200	568	4760	14	5250	260	0		59060	2679
2008	38900	2231	16150	533	11	0.03	4950	245	0		60011	3009
2009	38150	2765	12500	516	0		4550	278	0		55200	3558
2010	34250	2470	550	23	0		2265	138	0		37065	2631
2011	26500	1918	800	33	0		1700	104	0		29000	2055
2012	13550	978	850	35	0		1000	61	0		15400	1074
2013	13325	1660	575	43	0		0	0	1100	103	15000	1806
2014	7100	1112	300	29	0		0	0	600	70	8000	1211
2015	3850	659	350	37	0		0	0	700	88	4900	784
Total	207475	15630	49275	1816	4771	14	19715	1085	2400	262	283636	18807

Source : Information provided by FD

*1 Myanmar kyat = approximately 0.09 Yen (JICA exchange rate, March 2016)

**Myanmar's fiscal year starts from April 1st and ends on March 31st next year.

In total, some minor problems have been observed in terms of the organizational and financial sustainability, while technical and related policy and institutional aspects looked promising. Therefore, sustainability of the project effects was fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project was implemented to contribute to sustainable management of mangrove forests and poverty alleviation of the community in the Ayeyawady Delta, Myanmar. To achieve the goal, the Project aimed to provide necessary technical cooperation to establish sustainable CF for local communities and officers of FD. The Project's relevance was high. The activities were highly relevant to Myanmar's development plan, development needs, and Japan's ODA policy. The Project mostly enabled the target communities to sustainably co-exist with their mangrove forests at the time of the Project termination. Achieved situation was maintained when the ex-post evaluation was conducted. It was clear, however, it needed more time and procedures to increase the CF communities co-existing with mangrove and to enhance income levels of the communities through CF activities. Therefore, effectiveness and impact of the project were

fair. The Project was suspended for almost a year due to damages caused by a Cyclone. Its plan was, however, revised after the incident and the Project's cost and period were both within the revised plan. Thus, efficiency of the Project was evaluated as high. At the time of the ex-post evaluation, related policy and institutional aspects and technical aspects for sustainability were high. FD was sequentially developing policies for sustainable mangrove forest management and CF promotion. Communities and FD officers targeted by the Project showed their certain amount of enhanced and maintained technical abilities. On the other hand, the FD budget for CF management and promotion was not sufficiently allocated. And it was not clear how the organizational mechanism inside FD to promote CF was going to be restructured by regime change in April 2016. Consequently, sustainability of the overall project effects was considered to be fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

1) Control illegal logging of mangroves

Budget for field level officers to patrol more often for illegal logging such as costs for boats and fuels should be increased from next fiscal year. A cause of illegal logging is usually a complex socio-economic issue. It is important for FD to collaborate with other relevant governmental agencies to control the illegal logging.

2) Enforce penalties of illegal logging and search for alternatives

In the new land use law that was under reforming during the ex-post evaluation, prevention of illegal logging should be addressed clearly. The legislation should be realistic to cover current flaws. Also, alternatives to reduce the demand for illegal logging such as promotion of fuel-efficient stove should be explored.

3) CF promotion

To increase the area of CF, budgetary allocation in the field such as costs for technical workshops and travel budgets for officers to visit communities are imperative. This allocation led to necessary technical support for CF setting and enhancing CFUG activities (formulating management plans, conducting inventories, following-up on implementation of CF management plans, and others). The number of officers of the CF unit should be also strengthened as much as possible. Chain of command in CF units should be simple and clear and the information exchange meetings among different field offices should be held periodically.

4) Mangrove plantation and management of planted forests

Mangrove plantation needs to be continuously supported in and outside CF areas.

Management of these lands after the plantation should be strengthened. Using satellite imagery and other geographical information, it is important to understand where mangrove forests are more threatened for degradation/deforestation and to find and conduct countermeasures.

4.2.2 Recommendations to JICA

Through succeeding projects and other assistance, JICA is suggested to provide assistance to Myanmar government regarding the suggestions above to follow-up the sustainability of the Project effects including effects of the rehabilitation project conducted after this Project. Specifically, 1) policy support for complex issues such as land use and natural resource management to address deforestation and forest degradation by illegal logging, 2) technical support for geographical information collecting and processing for land use map and others, and 3) support for community's livelihood improvement and disaster prevention.

4.3 Lessons Learned

1. Setting appropriate targets and selecting appropriate inputs and approaches

When community's poverty is causing overuse of forest resources as this Project, income generation for the community could be an effective method to reduce the overuse. The communities, however, need to learn not only techniques of the income generation activities but also business skills to continue feasible business based on in-depth market research and knowledge and experience for sales. Income generation is a complex challenge which should be dealt as a project on itself. Insufficient time and inputs were spent since the Project dealt with the income generation as one of the activities of its five outputs. In addition, the Project included some unrealistic CF activities as mentioned in the analysis of the Project's impact. It was possibly because the project planning was based on a development study conducted prior to the Project, and the plan tried to cover all elements suggested in the study. If comprehensive and relevant business inputs are difficult due to the limit of the project size and concept or limits in implementing agency and target area, balancing the inputs with clear priority such as capacity building of counterparts for forest conservation is necessary.

2. Consideration for local social setting in case of using community's participatory approach

The Project took participatory approach to work with communities. As mentioned in the Impact section, however, each target village has unique CF rules and approaches. These affected the Project activities turn-outs and follow-up situations such as degree of mangrove forest conservation. For example, Shwe Pyi Thar, one of the six targeted villages shown in Table 3, had a relatively well grown mangrove forests and damages from illegal logging was minimal. This is because the CFUG had a leader with an excellent organization skill and was motivated to

promote CF. The Ayeyawady Delta hosts many emigrants from other areas who are major part of the population. In places like this, traditional social norm for natural resource use hardly exists. Consequently, it is expected that participatory approach would be more challenging and takes time to work compared with communities with more traditional common land use rules. As such, it is important to study strengths of social norms, ethnic and cultural characteristics of the communities, and social structure at the project planning stage. Then the approaches to foster ownerships should be sought after to conduct a project with community-based forest resource management.

3. Action planning with consideration of political restriction

As mentioned in the “3.3.1.1. Elements of inputs”, all Japanese experts were stationed in Yangon, while coordination and liaison meeting with FD central office and other relevant agencies were needed in the capital, Nay Pyi Daw. Also, most activities of Output 1, 2, 3, and X were field based, yet the experts had to reside in Yangon and apply for an entry permit every time. This caused great difficulty to communicate and collaborate for both Japanese experts’ team and FD counterparts in all levels of offices. This suggests that if the Japanese side’s activity area was restricted due to an existing political situation, it would be important for the experts and counterparts to have a detailed agreement of each side’s roles in field, local municipality, and central levels. Periodical revision of the agreement for further mutual understanding and modification of activities for collaboration are crucial.

4. Setting quantifiable project purpose, overall goal, and indicators

At the ex-post evaluation, most of indicators of the Project Purpose and of the Overall Goal were not monitored and the quantitative data to evaluate them were difficult to collect. “Forest coverage” and “community’s income level” were both indicators to quantify the Project effects, but the data for these indicators is hard to be measured and takes a long time to be collected and cost to be measured. It was also unclear who, when and how the data collection would be implemented. To avoid similar problems, both sides (especially the counterpart side) should set quantifiable purpose and indicators and should agree on how to gain the data when the activities were planned. Alternatively, the project plan can include activities to monitor achievements of the indicators. And technical assistance to collect relevant data can also be provided.

Annex : Achievements of the Outputs (upon the Project completion) and Follow-up Status of the Outputs (at the time of the ex-post evaluation)

Output	Indicator	Achievement Status
Output 1	1a. By September 2011, all the CF Management Plans of the CFUSGs, reselected in March 2011, are developed/updated.	Achieved : Six target villages were reselected in July 2011 and all the CF management plans were approved and certifications were issued. Status at the ex-post evaluation : No change since it was already achieved.
	1b. By the end of the Project, organizational capacity of the Management Committee of all target CFUSGs reaches the 3 rd level (meaning that they achieve more than half of the fulfillment) of the evaluation rating composing of five achievement levels set by the Project.	Achieved: Tentative results of an impact survey and a capacity assessment for CFUGs showed that all villages had technical expertise that is related to organizational ability above the target level. Status at the ex-post evaluation : Management Committees continued to show their interests in CF. The beneficiary survey found that most of the committee members considered CF as useful and wished to continue CF and their meetings were being held as often as was during the Project.
	1c. The certified CF Management Plans (i.e. CF plantation and NFIO) of all the target CGUSGs reselected in 2011 are implemented according their annual plans.	Achieved : Certified CF Management plans were implemented by each village. Status at the ex-post evaluation : Until the end of the Project, each target village was implementing activities following the management plan. Only part of the management plans were followed due to difficulties of controlling illegal logging in all villages except Shwe Pyi Thar.
	1d. By the Project end, more than 1,460 acres (591 ha) of mangrove forests are rehabilitated and managed by the CFUSGs reselected in 2011 based on the certified CF Management Plans, including CF plantation and NFIO when applicable.	Achieved : CFUG rehabilitated and managed 1,670 acre of mangrove forests from 2009 to 2012. Status at the ex-post evaluation : No quantitative data were taken after the Project. The beneficiary survey asked the condition of mangrove forests in CF – whether it's degraded, nearly same, or improved compared with the condition before the Project. Two villages among six answered the forest condition was "improved". This is because their CF lands were previously non-vegetated area such as illegal fishing pond. But mangroves were planted by the Project and it was covered by vegetation at the time of the ex-post evaluation. CF lands of other four villages were somewhat vegetated or held some mangrove trees even before the Project. Plantation and conservation of the forests were conducted there. After the Project, the frequency of FD officers' patrol and follow-up were down due to the limited budget. This led to an increase of illegal logging inside CFs, and the conditions of CF were either same or worse than those before the Project, according to the beneficiary survey (Table 3).
	1e. By the Project end, all the CFUSGs reselected in 2011 start to gain profit from CF activities determined in the certified CF Management Plans and/or income	Not yet achieved : Not all CFUGs had a prospect to gain profits from income generation activities. And the profits were not yet earned. Status at the ex-post evaluation : The beneficiary survey found that eight households, 7.3 % of the

	generation activities supported by the Project.	sample size, had increases in their incomes. Among them, six households are from Nyaung Ta Pin and a household each from Kwa Kwa Ka Lay and Thar Yar Kone. According to the survey, there were households that reported to harvest the fuelwoods from their CFs (both individual case and collective case). In two villages out of six target villages, crab and shrimp catch were reported and the CFUG members were planning to try new income generation activities with using CF (ex. crab fattening and duck breeding).
Output 2	2a. By the end of the Project, capacity of 80% of technical members of CF Task Force ¹⁹ engaged in the Project more than two years reaches the 4th level (meaning that they achieve more than 75% of full fulfillment) of the evaluation rating composing of five achievement levels set by the Project.	Achieved : Capacity of FD officers were categorized into two: technical capacity and core capacity. A study for these capacities of target officers (10 technical members) showed that more than 80% of them reached over the 4 th level in both capacities. Status at the ex-post evaluation : Most of the targeted CF task force members were transferred to other areas after the Project. It was impossible to conduct the same type of capacity assessment. The transfer issue was, however, expected already during the Project. To keep the built capacities, a Standardized Operational Procedures (SOP) as a technical manual was formulated and used for FD officers training.
	2b. On average, more than 80% of all registered members of the CFUSGs ²⁰ reselected in 2011 give the highest or medium rate on three-level rating about “degree of understanding”, “degree of applicability”, and “degree of satisfaction” of the CF extension they received.	Achieved : More than 98% households of the targeted six villages (298 households) gave more than medium rate. Status at the ex-post evaluation : Most of FD’s support for CFUG were technical support until the certification of CF, at the beginning of the process. Thus FD’s support was minimal for existing CFUG such as supply of seedlings. Yet, interviews suggested that the communities received these extension services.
	2c. By the Project end, a training program for CF for mangrove forest, including materials, is developed based on the existing ones for confirmation by the Director General (DG) for further action (in English & Myanmar).	Achieved : The training program was at the end incorporated to the SOP as a training material. Status at the ex-post evaluation : The SOP was being used extensively for CF training to FD officers (especially field level). Field officers used it to provide support for CFUG creation, inventory of the lands, and mangrove plantation.
	2d. By the Project end, Standardized Operational Procedures (SOP) for CF for mangrove forest is developed based on the existing SOP of the FD (i.e. Departmental Instructions and CFI) for confirmation by the DG for further action (in English & Myanmar) .	Achieved : The SOP was finalized in March 2013. Status at the ex-post evaluation : Same as the status in 2c above.

¹⁹ CF task force technical members were field project manager and field officers of each field (staff officers, range officers, deputy range officers, and foresters)

²⁰ Same with CFUGs member.

Output 3	3a. By the Project end, a technical report on Action Research (AR) for mangrove are prepared (in English and Myanmar).	Achieved : The technical report was finalized in March 2013 and completed as a technical report. Status at the ex-post evaluation : Each township's FD officers were in charge of management and preservation of AR test sites by the time of the ex-post evaluation. They were conducting periodical patrolling.
	3b. By the Project end, technical guidelines for field-level FD staff on rehabilitation and management of mangrove forests, which are developed based on AR findings, are published (in English and Myanmar)	Achieved : Technical guideline was finalized in March 2013. Status at the ex-post evaluation : Field foresters and target communities were using the guideline according to the interviews.
Output 4	4a. By December 2011, an inter-agency coordination meeting is organized by the FD	Achieved : The meetings were held in November 2011 and October 2012. Status at the ex-post evaluation : No change since they were achieved.
	4b. Land use information of the Target Area is updated based on the satellite images of 2007, 2009 and 2012.	Achieved : Land use map and a poster of land use information were made based on satellite imaginaries of 2007, 2009, and 2012. Status at the ex-post evaluation : Achieved. Based on this output FD was developing updated maps (Figure 2).
	4c. The updated land use information is shared at the inter-agency coordination meetings for discussion.	Achieved : Land use map and land use information were presented and distributed at the inter-agency coordination meetings held in November 2011 and October 2012. Status at the ex-post evaluation : The inter-agency coordination meeting for the Project was not held since the end of the Project. However, inter-agency Land Use Policy Committee and CF National Working Group were established around the time of the Project completion. At these meetings FD was leading discussions regarding land use and other issues that need inter-agency coordination.
	4d. Seminars to promote synergy among the relevant sectors are organized annually.	Achieved : Eight seminars for mangrove management and one technical workshop were held. Status at the ex-post evaluation : Same as the status of 4c above
	4e. A donor/NGO coordination meeting for the Target Area is organized by the FD once a year.	Achieved : In total four meetings were held at Labutta District and Pyapon District in fiscal years of 2011 and 2012. Status at the ex-post evaluation : Same as the status of 4c above
Output X	Xa. By March 2009, a hazard map of the Target Area is developed based on the latest satellite images (2009) for distribution to the local communities.	Achieved : The hazard map was completed in March 2009, and the revised version was produced in February 2013. Status at the ex-post evaluation : Utilized till the end of the Project, but no change since then.
	Xb. By March 2010, a report on damage & recovery survey on the	Achieved : The results summary of the survey was incorporated into the Project report.

	communities in the Target Area is prepared.	Status at the ex-post evaluation : Utilized till the end of the Project, but no change since then.
	Xc. By March 2010, Centre for CF Extension & Nursery in each RF is rehabilitated.	<p>Achieved : Provision and delivery of the equipment were delayed due to some external factors. Four centers for CF extension and nursery were rebuild by July 2010</p> <p>Status at the ex-post evaluation : Each township's FD office were continuously using the centers as their camps (branch offices). Field level FD officers (foresters and range officers) were stationed in these camps. The centers can be used with fees by NGOs and other organizations working with FD for mangrove conservation. This made the centers significant economic assets since FD's budget allocation to the field offices was often not enough. Although they were not yet used by communities as shelters for disaster prevention, neighboring communities recognized the shelters as refugee centers if the next natural disaster strikes such as Cyclone. When a cyclone was forecasted in 2015, it was reported that communities came around the shelters.</p>
	Xd. In 2009 & 2010, materials necessary for disaster recovery or prevention work are provided to the FD and the Cooperating Agencies based on the needs.	<p>Achieved : All the materials and equipment considered to be needed at that moment were provided within the fiscal year of 2010.</p> <p>Status at the ex-post evaluation : Utilized till the end of the Project, but no change since then.</p>
	Xe. By December 2011, a report on recovery condition of mangrove vegetation (2008-2010) is prepared.	<p>Achieved: The technical report finalized in March 2013 included this data and the analysis results.</p> <p>Status at the ex-post evaluation : Utilized till the end of the Project, but no change since then.</p>

(End of the report)

0. Summary

This Project was implemented to improve Solid Waste Management (hereafter, SWM) in Ulaanbaatar City, after the Development Study in 2004 and the Grand Aid Project that followed. The Project aimed to enhance organizational capacity and human resources of relevant organizations in the SWM sector, mainly Environmental Pollution and Waste Management Department (hereafter, EPWMD) and City Maintenance and Public Utilities Agency (hereafter, CMPUA). Relevance is high, because improvement of SWM is consistent with the City’s policy, which focused on the improvement of SWM, and development needs of the country and with Japan’s ODA policy. Through this Project, EPWMD officers in charge of SWM were able to learn methods of compiling and analysing data on the composition and amount of waste, which had previously not been accurately grasped. The results have been utilized for formulating the new SWM policy. Moreover, technical assistance to CMPUA has strengthened their capacity for operation of final disposal sites constructed by the Grand Aid Project and maintenance of waste collection vehicles and other equipment. This helped to increase the frequency of waste collection in Ulaanbaatar City. The ex-post evaluation confirmed progress in improving SWM operations, such as the establishment of new regulations aiming at creating a society with recycling system in Ulaanbaatar City. Therefore, the effectiveness and impact of this Project are high. Efficiency is fair, since the Project period was within the plan, whereas the Project cost exceeded the plan. Sustainability is also fair, because there are some concerns about organizational aspects to conduct environmental monitoring in the final disposal sites and financial aspects to secure budget for upgrading final disposal sites and aged facilities.

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

1. Project Description



Project Location¹



Waste Separation by residence and collection company

¹ Source : Ministry of Foreign Affairs (<http://www.mofa.go.jp/mofaj/area/mongolia/>) (as of May 20, 2016)

1.1 Background

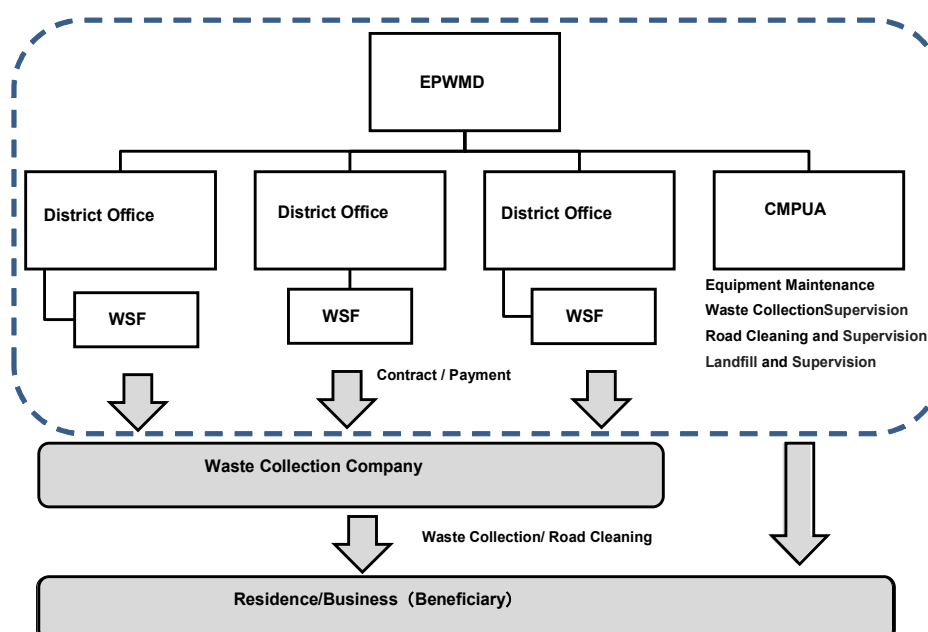
In Mongolia, approximately 40% of Mongolia's total population lived in Ulaanbaatar City, and the population was increasing. Ulaanbaatar City faced serious problems in SWM caused by an increase in the amount of waste due to the rapid growth of population. Waste collection and transportation services were unable to keep up with the increase in the amount of waste, and illegal dumping became a serious problem. It was a particularly serious issue in Ger areas¹, where nomadic people were beginning to settle after migrating from rural areas. Furthermore, it was reported that inappropriate landfill had negative impact on the surrounding environment in the final disposal site in Ulaanbaatar City. In order to address these problems, JICA implemented a Development Study for two years from 2004 and formulated a SWM Master Plan (hereafter, M/P) for Ulaanbaatar City to establish an environmentally sound SWM system by 2020. In addition, under a Japanese Grant Aid Project in 2008, the new sanitary landfill, Narangiin Enger Disposal Site (hereafter, NEDS) was constructed and related equipment such as waste collection vehicles and heavy machinery were procured. As a result, SWM system in Ulaanbaatar City improved rapidly after the Development Study. However, it was imperative to restructure SWM and enhance its human resource capacity to adopt the new system. Thus, Ulaanbaatar City requested JICA to carry out a technical assistance to improve capacities for SWM. Based on the request above, JICA implemented a technical cooperation named "Strengthening the Capacity for Solid Waste Management in Ulaanbaatar City" in the six districts of the central part of Ulaanbaatar City for three years from October 2009.

1.2 Project Outline

Overall Goal		Deteriorated urban environment and sanitary conditions caused by uncontrolled solid waste will be improved in Ulaanbaatar City.
Project Purpose		Capacity for SWM in Ulaanbaatar City is strengthened through human resource development.
Outputs	Output1	Development of human resource in EPWMD for policy making and planning for solid waste management
	Output2	Development of human resource in EPWMD and CMPUA for operation and maintenance of solid waste collection vehicles and heavy machineries.
	Output3	Development of human resource of CMPUA for proper management of Narangiin Enger Landfill
	Output4	Development of human resource in EPWMD and Waste Service Fund(hereinafter, WSF)s for administrative/financial management in SWM
	Output5	Development of human resource of EPWMD and District Officers for promoting public awareness and participation in SWM.
	Output6	Recommendation for the appropriate system of waste separation and recycling in Ulaanbaatar City
Total Cost (Japanese Side)		277 million yen
Period of Cooperation		October, 2009 – September, 2012

¹ Ger Areas' means the area where nomadic people settled with a portable house called 'Ger'. On the other hand, 'Apartment Areas' means the area where apartment buildings were constructed under the city plan.

Implementing Agencies	Plan	Ex-post Evaluation
	EPWMD	City office, Public service department (hereafter, PSD)
	Partner Agencies	
	CMPUA	Ulaanbaatar Public Service Consortium (hereafter, Consortium)
	WSF	The abolishment of WSF was decided at city council on December 2009, and it was officially abolished on May 2012.
	District Offices	Same as plan
Supporting company in Japan	Kokusai Kogyo Co.,Ltd.	
Related Projects	The study on SWM Plan for Ulaanbaatar City in Mongolia (Development Study 2004-2006) The Project for Improvement of Waste Management in Ulaanbaatar City (Grand Aid Project 2007-2008) Senior Volunteers (Automobile Maintenance 2010-2012, Waste Disposal 2012-2014)	



Note: Only three districts was shown in this figure, however, the Project covers 6 districts in Ulaanbaatar city

Note: The Project scope is shown in a dotted line

Source: Drown up by the author

Figure 1. Project Implementation Chart (at the time of planning)

1.3 Outline of the Terminal Evaluation

1.3.1 Achievement Status of Project Purpose at the Time of the Terminal Evaluation

The SWM service was steadily strengthened by implementing the Project activities aiming at human resource development. In terms of indicators for the Project Purpose, the goals for “waste collection rate” and “collection rate of service fee” were achieved. On the other hand, the goal for “people’s satisfaction level on the SWM service in Ulaanbaatar City” was not

achieved by the end of the Project. Therefore, it was concluded that the Project Purpose was partially achieved at the time of the Terminal Evaluation.

1.3.2 Achievement Status of Overall Goal at the Time of the Terminal Evaluation (including other impacts)

The indicator for the overall goal, “improve people’s satisfaction level for urban environment and sanitation,” was not fully achieved, but illegal dumping sites decreased and progress toward achieving the overall goal was confirmed. In addition, new disposal sites were in the process to be constructed and positive impacts of the Project such as technology transfers to other provincial cities were reported.

1.3.3 Recommendations at the Time of the Terminal Evaluation

The following recommendations were made at the Terminal Evaluation.

The recommendations to be implemented before the Project completion were as follows: (1) revise one of the indicators for the overall goal, “improve people’s satisfaction level on urban environment and sanitary conditions,” to an indicator that reflects the impact from the waste disposal sector more directly, since external factors tend to affect this indicator; (2) hold workshops to analyse the data obtained in public opinion surveys and waste amount and composition surveys; (3) prepare a strategy for public awareness raising that reflects the results of the Pilot Project; and (4) prepare a recommendation paper on waste separation and recycling. Furthermore, the following recommendations to be implemented after the Project completion by the Mongolian side were mentioned: (1) strengthen the organizational and institutional capacity of EPWMD and CMPUA based on the revised Law on Waste;² (2) train officers of EPWMD and CMPUA in order to enhance their capacity on operational management, financial management and public awareness raising; (3) share the Project results with other cities; and (4) strengthen coordination with JICA volunteers.

2. Outline of the Evaluation Study

2.4 External Evaluator

Yukiko Sueyoshi, Global Link Management Inc.

2.5 Duration of Evaluation Study

Duration of the Study: October, 2015 -August, 2016

Duration of the Field Study: December 7 -December 18, 2015 / March 20 - March 25, 2016

² As of the Terminal Evaluation, the Law on Waste was being revised.

3. Results of the Evaluation (Overall Rating : B³)

3.1 Relevance (Rating: ③⁴)

3.1.1. Relevance to the Development Plan of Mongolia

“The Action Plan of the Government for 2008- 2012”, the development plan for Mongolia during the Project’s planning stage, clearly specified ‘the introduction of new waste management system in city’ as one of the goals for improving the environment. In addition, “the Mayor’s Action Plan 2004-2008”, the development plan for Ulaanbaatar City, stipulated to ‘implement the series of projects covering waste collection, separation, transportation and landfill, based on the M/P on SWM, and resolve the City’s waste problems in stages’. “The Mayor’s Action Plan 2009-2012”, which was subsequently revised, listed improvements to SWM as one of the objectives. The aforementioned Action Plan of the Government and Mayor’s Action Plan were still effective at the time of the Project completion.

Accordingly, during the period from the planning stage to the completion, this Project, which aims to improve SWM, was consistent with the development plans of Mongolia and Ulaanbaatar City.

3.1.2. Relevance to the Development Needs of Mongolia

At the Project’s planning stage, 1,190,000 people, or approximately 40% of Mongolia’s total population, lived in Ulaanbaatar City (2009)⁵, and the population continued to increase. Waste collection and transportation services were unable to keep up with the increase in the amount of waste. Illegal dumping became a serious problem, particularly in Ger areas, where nomadic people were beginning to settle after migrating from rural areas. To address these issues, strengthening the SWM system by improving the organizational structure of SWM and its capacity of the human resources was urgently needed. When the Project was completed, Ulaanbaatar City still faced the problem of an increase in the amount of waste due to the population increase. However, this Project contributed to the improvements in the waste collection service. Meanwhile, new challenges emerged, namely, needs to increase the number of final disposal sites and to revise the fee collection system in accordance with the revisions of “Law on Waste”.

Accordingly, from the planning stage to completion of the Project, the Project activities to improve SWM operations were essential, and this Project was consistent with the development needs of Ulaanbaatar City.

3.1.3. Relevance to Japan’s ODA Policy

“Japan’s Country Assistance Program for Mongolia” formulated in 2004 indicated countermeasures to address environmental protection, particularly environmental problems in

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

⁴ ③: High, ②: Fair, ①: Low

⁵ Source: Ex-ante Evaluation document

Ulaanbaatar City. Inappropriate waste disposal (municipal solid waste, industrial waste) was listed as a factor behind the deterioration of the urban environment. In this sense, the Project was consistent with Japan's aid policy.

3.1.4. Relevance to Appropriateness of Project Planning and Approach

The Project plan was revised four times during the Project implementation. The main changes were to (1) set indicators for the overall goal and the Project purpose, which were not set when the Project was formulated, and (2) change activities because some of the Project counterparts were no longer functional due to political reasons. As regards to (1), after the Project started, Japanese experts and counterparts worked together on a baseline survey. They set and revised appropriate indicators. Interviews with the Project counterparts during the ex-post evaluation showed that the implementation of the survey led to the understanding of the waste problems in Ulaanbaatar City. As a result, the counterparts were more interested in participating in this Project. As regards to (2), shortly after the Project launch, the City Council⁶ received a proposal to abolish the WSF which was in charge of fee collection and payments to operators. In response, Japanese experts and the counterparts identified new challenges in the selection of waste collectors and the setting of waste collection fees as a result of the abolishment of WSF in each district. Accordingly, activities were focused to create 'Guideline on the Tender Procedure' and 'Manual on Setting Waste Collection Fees'. At the time of the ex-post evaluation, officers in PSD were using these manuals to supervise bids and to set waste collection fees, which indicate that changing the plan at that time was appropriate.

Looking back with a longer perspective, the Project was implemented when Ulaanbaatar City's SWM system was in a fluid situation, as illustrated by the changes in the operational system for SWM in Ulaanbaatar City. The waste operation was previously managed with an integrated approach by Ulaanbaatar City and districts. However, since JICA's development study in 2004, organizational and institutional reforms of SWM were conducted swiftly, such as the breakup of the waste operation system, and the establishment of CMPUA to manage waste disposal operations (2006), the establishment of WSF to manage finances (2006), the complete privatization of waste collection operators (2008) and the establishment of EPWMD as the coordinating organization for the waste sector (2009). In these circumstances, it is concluded that although the Project was affected by external factors including institutional reorganization

⁶ In accordance with an ordinance by Ulaanbaatar City Mayor issued in November 2006, WSF was established in stages as the parent organization responsible for collecting waste collection fees in each district. The waste collection operators who collected waste collection fees directly from residents and businesses up until that point signed waste collection agreements with WSF and were paid fees based on the amount of waste collected. However, the waste collection operators protested about delayed payment of waste collection fees and problems in receiving payment based on the amount of waste collected. They went on strike and blocked the entrance to the final disposal site. In December 2009, when the dispute between the waste collection operators and WSF intensified, the City Council adopted a resolution abolishing WSF (see page 13 of the terminal evaluation report). As of August 2012, just before the Project completed, WSF was about to be abolished, and administrative organizations such as district offices and khoroo collected the fees and paid the waste collection operators, or the district itself took responsibility for waste collection (from materials provided by JICA).

in Ulaanbaatar City, the Project implementation system and activities were revised appropriately to achieve the Project objective.

In light of the above, the Project was highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Moreover, the project planning and approach is considered to be appropriate. Therefore, its relevance was high.

3.2 Effectiveness and Impact⁷ (Rating:③)

3.2.1 Effectiveness

3.2.2.1 Achievement of Project Purpose

This Project was carried out to improve SWM operations overall by strengthening the capacity of the major organizations involved in Ulaanbaatar City's SWM in terms of policy formulation, financial management, operation and management of equipment, and promotion of recycling. When the Project was completed, the outputs had generally been achieved except Output 2 that aimed improving equipment operation and management (refer to the appendix for information on the achievement of each output). Output 2 was not achieved because its planned activities were delayed due to the CMPUA staff transfers during the Project, which led to various confusions within the organization. In addition, the Project plans for Output 4 and Output 5 were partially revised because the involvement of district office and WSF officers who were initially intended to be the counterparts were limited and technical transfer was also inadequate. This is because the City Council decided to abolish WSF, which was the Project counterpart, in December 2009. It was just after the Project launch and made WSF staff difficult to engage in the Project legally. As a result, activities targeting WSF and the districts could not be implemented as planned. As such, changes occurred in the external condition specified in the Project Design Matrix (PDM)—namely, “there are no changes in the measures, ordinances and organizational system related to SWM”. This prevented some outputs from being achieved and impeded the smooth implementation process. Japanese experts and EPWMD counterparts continued activities to improve SWM operations while revising the targets and activities for technical transfer as needed. The Table 1 shows the achievement status of the Project purpose at the time of Project completion. In the ex-post evaluation, the results of the organization's capacity assessment that was carried out during the Project were additionally used as a reference indicator, because these results more directly indicate an enhancement of SWM capacity.

⁷ Sub-rating for Effectiveness is to be put with consideration of Impact.

Table1 Achievement of Project Purpose by the Project Completion

	Indicator	Actual
Project Purpose	1. People's satisfaction level (more than average ⁸) for the SWM service throughout the City reaches 60%.	People's satisfaction level for SWM was decreased from 55.9 % in 2009 to 39.8% in 2012.
	2. Waste collection rate in Ger areas are increased to more than 90% . (waste collection cover rate in population)	According to baseline and end-line survey conducted under the Project, waste collection rate was about 90% in the Ger area and 100 % ⁹ in Apartment areas.
	3. Waste collection rate in Apartment areas are kept at 100% in spite of population growth.	
	4. Collection rate of waste service fee from Ger areas are increased to 30%.	Fee collection rate in Ger areas were 61% in December 2011.
	【Reference indicator】 Results from capacity assessment of EPWMD/CMPUA	Capacity assessment was carried out by the Project. The assessment was divided into three categories: 1) management capacity, 2) technical capacity, 3) and working environment. Compared to the preliminary assessment, there were significant improvements in both counterpart organizations by the end of the Project.

Source: Documents provided by JICA, interview survey with counterparts

Indicator 1: People's satisfaction level for the SWM service throughout the City reaches 60%.

The satisfaction level was about 40% in March 2012, six months before the Project was completed, and did not reach the target of 60%. According to the Japanese experts and counterparts, resident's satisfaction in Ger areas relatively decreased because (1) residents were dissatisfied with the new fee collection system¹⁰ where they had to pay waste fee across the board with an electricity fee every month in Ger areas, regardless of whether they put out waste or how much waste they had, (2) the frequency of waste collection lowered in some areas because of the waste collection operators' strikes. However, the PSD officers stated that the changes to the new collection system resulted in an increase amount of collected waste fees and contributed to improvements in waste collection services.

Table 2 People's Satisfaction Level for the SWM Service

Satisfaction level for the SWM service			
November 2009 (Base-line Survey)		March 2012 (End-line Survey)	
Apartment Areas	Ger Areas	Apartment Areas	Ger Areas
53.8%	58.1%	46.8%	33.3%
Average 55.9%		Average 39.8%	

Source: Documents provided by JICA

⁸ 5 level rating was used as follows: 1)very good, 2)good, 3)average, 4)poor, 5) very poor. The achievement of indicator means the ratio who answered between 1) and 3).

⁹ 'Waste collection rate' means ratio of households who receive periodic waste collection service in Ulaanbaatar city. It is different from Apartment areas and Ger areas. This figure was confirmed in the base-line (November 2009) and end-line (March 2012) survey conducted by the Project which covered only a part of the project target area.

¹⁰ The resident usually paid waste fee directly to the waste collection operators in the previous fee collection system.

Indicator 2, 3: Waste collection rate is kept at 100% in Apartment areas, and 90% in Ger areas

As a part of the base-line survey carried out during the Project period, a questionnaire survey was conducted to approximately 800 households in Ulaanbaatar City to confirm the waste collection rate. The results showed that the waste collection rate was almost 100% in Apartment area and 90% in Ger areas. The end-line survey confirmed that these figures had been maintained. Given that a similar survey conducted in 2007 prior to the Project estimated that the collection rate in Ger areas as 43%¹¹, this was a significant improvement. The provision of waste collection vehicles and the construction of NEDS through a Grant Aid Project, which was implemented before the Project, contributed to this improvement of waste collection rate. In addition to the above, the management structure of SWM was improved and technical support to relevant personnel was provided, so that equipment and facilities could be appropriately operated. This led to stable waste collection and transportation.

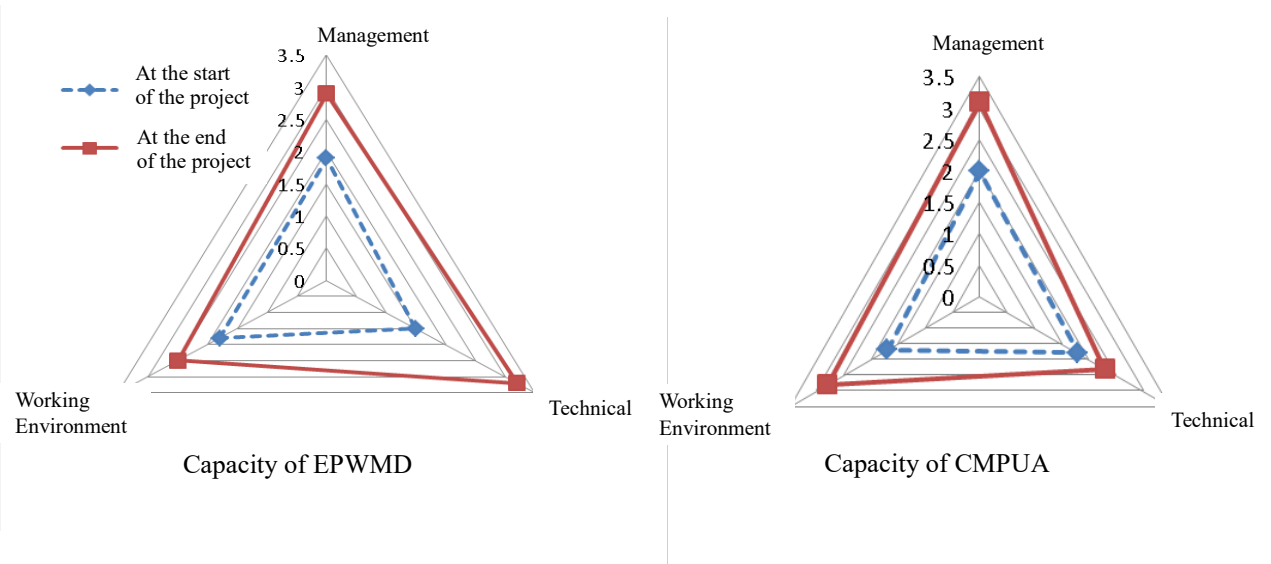
Indicator 4 : Collection rate of waste service fee from Ger areas is increased to 30%.

The waste service fee collection rate in Ger areas was estimated to be about 20% before the Project, but it ultimately improved to about 60%, far above the target of 30%. This can be attributed to the collection of electricity fees and waste collection fees together as a result of an ordinance issued by the City Mayor in July 2011.

Reference indicator: Results of Organizational Capacity Assessments

The Project carried out a total of five capacity assessments of the EPWMD and CMPUA organizations. The main assessment categories were (1) operational capacity, (2) technical capacity and (3) workplace environment, with detailed evaluation questions set for each category. Japanese experts interviewed the managers of each organization and gave its scores. Figure 2 shows changes in capacities of these organizations when the Project started (November 2009) and when the Project was completed (May 2012). There were significant improvements in both counterpart organizations by the end of the Project.

¹¹ Source : Documents provided by JICA



Source: Documents provided by JICA

Figure2 Results of Organizational Capacity Assessments

There were clear improvements in Ulaanbaatar City's waste collection service as seen by the achievements of the indicators for the waste collection rate and the fee collection rate. Moreover, the capacity assessments implemented during the Project showed improvements in organizational capacities. The indicator related to residents' satisfaction did not reach the target. It was likely to be influenced by the change of the waste fee collection system, which led to temporary discontent among the residents.

Therefore, the Project largely achieved its purpose.

3.2.2 Impact

3.2.2.3 Achievement of Overall Goal

In the ex-post evaluation, 'the amount of waste collected after the Project completion' was added as a reference indicator so that improvements in the urban environment could be assessed quantitatively. This is because ongoing waste collection and disposal are essential to achieve the Project's overall goal to improve the urban environment and public sanitation in Ulaanbaatar City. Table 3 shows the achievement of the Project's overall goal at the time of the ex-post evaluation. The overall goal was achieved because PSD (former EPWMD), which improved its capacity in terms of policy formulation and financial management through this Project, was providing good SWM services even after the Project and utilizing the Project outputs to pursue initiatives to promote recycling.

Table3 Achievement of Overall Goal

	Indicator	Actual
Overall Goal	1. People's satisfaction level (more than average ¹²) for urban environment and sanitation throughout the City reaches 50%.	According to the results of the beneficiary survey, people's satisfaction level for urban environment and sanitation of Ulaanbaatar City reached 64%.
	2. Six large scale illegal disposal sites out of 10 monitoring sites shall be eliminated.	A field visit conducted under the ex-post evaluation found that there was no further large-scale illegal dumping in the six sites out of the ten sites. As for the other four sites, interviews to PSD and Consortium confirmed there was no illegal dumping since the Project completion.
	【Reference indicator】 The annual waste collection amount of Ulaanbaatar City	The annual waste collection amount more than doubled from 478 ton in 2012 to 1,000 ton in 2014. This figure indicates that frequent waste collection and conveying to the final disposal sites were taking place even after the Project completion, which contributed to an improvement of urban environment.

Source: Interviews to PSD and beneficiary survey to residents

Indicator 1: People's satisfaction level for urban environment and sanitation throughout the City reaches 50%.

Surveys on residents' satisfaction were not carried out by the counterparts after the Project. Thus, a beneficiary survey¹³ was conducted in order to assess the achievement of each indicator of the overall goal during the ex-post evaluation. The results of the beneficiary survey showed that 64% responded that Ulaanbaatar City's urban environment was above the average level compared with other cities. When they were asked the most serious problem with Ulaanbaatar City's urban environment, only 3% of the respondents answered waste disposal while 66% pointed to air pollution, 8% for safe water supply, and 7% for soil contamination. In addition to the above, PSD and district officers reported Ulaanbaatar City bought about 160 waste collection vehicles in 2012 enabling more frequent waste collection. As a result, there are positive changes such as reducing illegal dumping, improving sanitation conditions, and improvement of landscape in Ulaanbaatar City. Therefore, Indicator 1 is deemed to be achieved.

Indicator 2 : Six large scale illegal disposal sites out of 10 monitoring sites shall be eliminated.

In the ex-post evaluation, six large-scale illegal disposal sites whose locations were identified were inspected and no large-scale illegal disposals were found there. Large-scale illegal disposal was no longer taking place because PSD and Consortium officers regularly cleaned the disposal

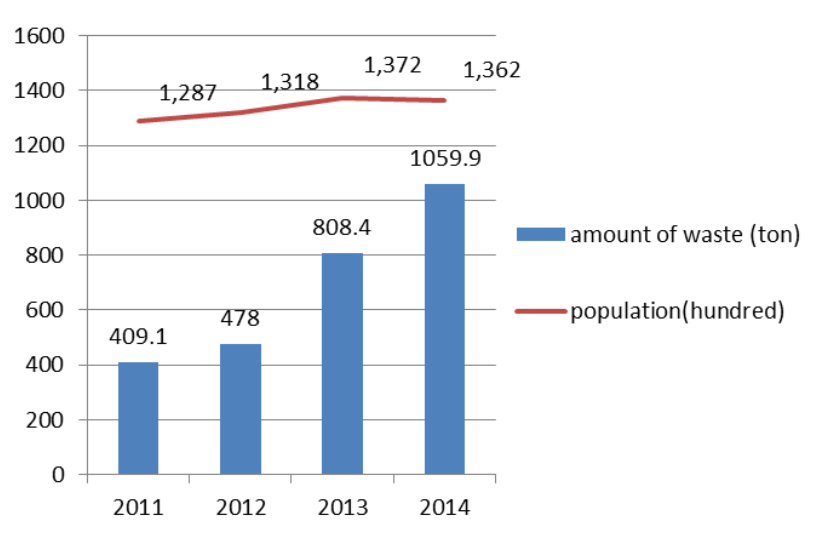
¹²5 level rating was used as follows: 1)very good, 2)good, 3)average, 4)poor, 5) very poor. The "satisfaction level" of the indicator in the overall goal is the ratio of people who answered between 1) and 3) against the total respondents.

¹³In the beneficiary survey stratified sampling based on the population in six districts was carried out in the target site, and face-to-face questionnaires were given using systematic sampling of residents whereby every fifth person who entered the district office was surveyed. The sample size was 100 and the response rate was 100% (31 men and 69 women; 40 lived in apartment area and 60 in Ger areas). No major discrepancies were confirmed by gender and by residence location.

sites and the collection frequency was improved due to an increase in the number of waste collection vehicles. Moreover, former illegal disposal sites were converted to homes, parks, roads and schools due to growing land development needs in Ger areas along with the population growth. There was only one site where waste was still being dumped, but it was not a large-scale waste dumping and khoroo¹⁴ officers and resident volunteers regularly cleaned up the waste. According to PSD and Consortium officers, the status of illegal disposal sites other than these six sites did not have any report of large-scale illegal dumping in recent years. Accordingly, Indicator 2 is achieved.

Reference indicator: Annual amount of waste collected

As shown in Figure 3, the annual amount of waste collected (amount of waste transported to the final disposal sites) in Ulaanbaatar City after the Project was increasing every year. In particular, the amount doubled between 2012 and 2013. PSD stated the increase of waste collection vehicles and the expansion of two additional final disposal sites is deemed to have improved waste collection and disposal capacity. Given this, in terms of waste disposal, the implementation of the Project and continued efforts of Mongolia counterparts contributed to the achievement of the overall goal of improving the urban environment and sanitation conditions.



Source: Data provided by Consortium

Figure3 Trend of the Waste Collection Amount of Ulaanbaatar City

Therefore, the Project has largely achieved its overall goal.

3.2.2.2 Continuation of Project outcomes after Project completion

The section below discusses (1) residents’ satisfaction with waste operations, (2) city budget

¹⁴ This refers to Mongolia’s smallest administrative unit.

for waste collection operations, (3) the nationwide dissemination of waste fee guidelines, and (4) the preparation of 3R¹⁵ Ordinance reflecting the results of the Pilot Project, as related to the continuation of the Project outcomes.

Residents' satisfaction with waste operations

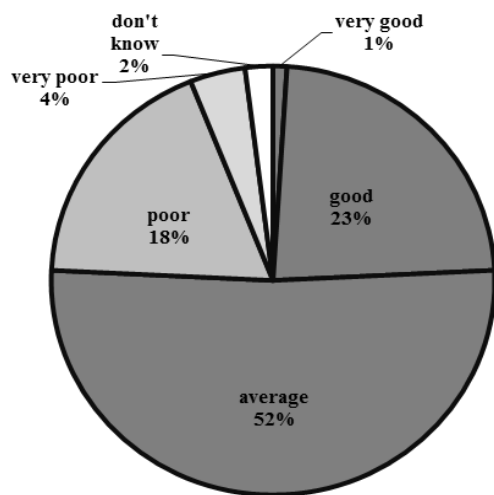
As part of this ex-post evaluation, a beneficiary survey was conducted. The survey confirmed residents' satisfaction with Ulaanbaatar City's SWM services at the time of ex-post evaluation, one of the indicators for the Project Purpose. According to the survey results, 99% of residents receive waste collection services. The 1% who responded that they did not receive waste collection services lives in the mountainous part of Ger areas where waste collection vehicles cannot reach. The respondent had to bring their wastes to collection sites on an irregular basis.

According to PSD and Consortium officers, there is no accurate data on the waste collection rate. However, the collection service covered all Apartment areas and almost all Ger areas at the time of ex-post evaluation except mountainous areas that cannot be accessed by waste collection vehicles. The results of the beneficiary survey showed that the waste collection rate within Ulaanbaatar City was 100% in Apartment areas and 99% in Ger areas, although there was limitation with the sample size in this survey. The results also confirmed that waste was collected once or twice per week in Apartment areas and once or twice per month in Ger areas.

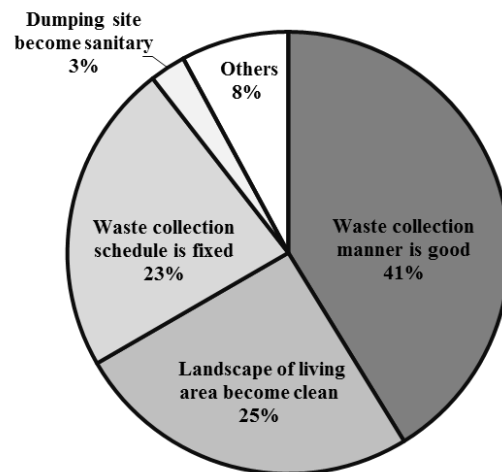
Figure 4 shows residents' satisfaction with waste collection services and their reasons. 76% of residents responded that services were above average compared to other cities. The most common reason for satisfaction with waste collection services was that "the manners of waste collectors are good" (41%), followed by "it contributes to cleaner streets" (25%) and "it has a set schedule" (23%).

The end-line survey conducted before the Project completion found that City residents' satisfaction was about 40% at that time. Since the sampling methods are different for the two surveys, a statistical comparison is not possible. However these surveys' results suggest that residents' satisfaction might have improved at the time of the ex-post evaluation.

¹⁵ "3R" refers to "reduce," "reuse" and "recycle." 3R activities aimed at reducing waste as much as possible; thereby minimizing the negative environmental impact of waste incineration and landfill disposal, and creating a society that efficiently reuses the earth's limited resources (a recycling-based society).



Satisfaction level in waste collection service (n=100)



The reasons for satisfaction(n=76)

Source: Beneficiary survey

Figure4 People’s Satisfaction with SWM Service and its Reasons

On the other hand, 22% of the beneficiary survey respondents stated that waste collection service was “poor” or “extremely poor.” Particularly in Ger areas, there were requests for waste collection sites to be cleaned and for improvements in the manners of the waste collectors.

City budget for waste collection operations

In SWM, accurate data of the amount and composition of waste in each district is essential for drafting specific plans and securing the necessary budget. According to PSD officers, they could acquire techniques and knowledge to ascertain quantitative data on waste, and this contributes greatly to improve their operation. The Project made it possible to calculate the operating costs needed for waste collection operations and to develop evidence-based plans for making budget requests. As a result, PSD succeeded in acquiring subsidies for the waste sector since 2013. These subsidies are used to supplement any shortfalls in waste collection fees.

Nationwide extension of waste collection fee guidelines

The Project aimed to improve the financial operations of SWM and supported the preparation of ‘Guideline on Calculating Appropriate Waste Collection Fees’ based on the data of collected waste amounts. After the Project, PSD and the Ministry of Environment and Green Development of Mongolia formed a working group and prepared ‘National Guideline on Calculating Appropriate Waste Collection Fees’ that could be applied nationwide based on guidelines prepared by the Project. The guideline was submitted to the Diet and is waiting for an approval.

Preparation of 3R Ordinance reflecting the result of Pilot Projects

There were Pilot Projects, which conducted waste sorting by residence and waste separation in the disposal site, implemented under the Project to establish the recycling system in Ulaanbaatar City. After the Project, PSD recognized that waste separation from recyclables at household level was essential to build a recycling society. It began to revise “Law on Waste” and regulations regarding recycling system by reflecting experience from the Pilot Projects.

3.2.2.3 Other Impacts

PSD officers who participated in the JICA Country Training or institution’s conferences had a chance to visit the Kitakyushu Eco-Town Center or Tokyo Super Eco Town¹⁶ in Japan. Based on these experiences, they started setting up an Eco Town Project in Ulaanbaatar City. The officers who were counterparts of the Project participated in the Eco Town Project by offering their knowledge on recycling in Japan. Land for the Eco Town was purchased near a final disposal site in Ulaanbaatar City. It is observed that PSD is taking an active role in planning the construction of a recycling factory and a processing plant for waste to recycle and reduce the amount of waste.

As for the impact on the natural environment, Ulaanbaatar City’s Environmental Auditor confirmed there have been no reports of negative impact from the Project. It was, however, indicated that environmental considerations based on Mongolia’s Law on the Environment were not adequate in the three current waste disposal sites in Ulaanbaatar City. For this matter, the Project assisted preparing ‘Environmental Monitoring Guideline’ for the disposal sites. NEDS was designed based on a plan that prevents leachate from seeping into the ground. The guideline stipulated that water quality testing should be undertaken regularly in the monitoring pond of NEDS and two wells downstream of NEDS in order to monitor water contamination due to unforeseen events. The site inspection at the ex-post evaluation found water quality monitoring could not be conducted because there was no seepage at the disposal site. The water quality in the wells downstream was not monitored either. The guidelines also stipulated that air pollution caused by the waste and the transportation vehicles should also be monitored. Waste disposal sites have taken measures to eliminate gas generated from waste by using a sanitary landfill approach and to prevent a fire by installing gas venting pipes. No problems have been reported, but regular monitoring has not taken place. Although no negative impact had been reported as of the ex-post evaluation, it is important that water and air quality monitoring is regularly conducted in accordance with Mongolia’s laws and regulations, in view of the medium- and long-term impacts of water or air pollution on surrounding areas.

As a result of the Project, the SWM capacity in Ulaanbaatar City has been generally enhanced

¹⁶ Eco Town Projects are carried out by corporate parks primarily in the recycling industry, and by companies and universities building experimental research areas, and aims at resolving waste problems and promoting environmental industries.

and the Project Purpose was mostly achieved. Urban environment was also improved, which was part of the overall goal and the expected effects of the project were observed. Therefore, effectiveness and impact of the Project are high.

3.3 Efficiency (Rating: ②)

3.3.1. Inputs

The plan for the Project's inputs and the actual inputs are shown in the table below.

Table4 Project Input (Plan and Actual)

Inputs	Plan	Actual
Experts	NA	8 Short Term Experts (62.28MM)
Trainees received	NA	19 trainees
Equipment	Training material, Equipment for the waste separation and recycling, Portable gas detector	Office equipment, Equipment for the waste separation and recycling, Spare parts of bulldozer, Portable gas detector, etc
Japanese Side Total Project Cost	260 million yen	277 million yen
Mongolian Side Operational Expenses	Counterpart personnel Project office Land for waste separation and recycling	Counterpart personnel Project office Operational cost for the Project (about 640 thousand yen)

* MM stands for man month.

Source: Documents provided by JICA

3.3.1.1 Elements of Inputs

There were no data on the dispatch of experts and Japanese training when the Project was planned, which makes comparisons difficult. Some equipment (ex. spare parts for a bulldozer) was purchased, which was not in the Project plan. The Mongolian side provided offices and land needed for the Project operations. At the same time, the City Council decided to abolish WSF in December 2009, when the Project just started which made the roles of WSF and the district offices in waste operations ambiguous. This resulted in limited participation in the Project by WSF and district office. Accordingly, activities targeting WSF and district offices had to be revised, which impeded the smooth implementation of the Project.

3.3.1.2 Project Cost

The planned project costs on the Japan side were about 260 million yen, but the actual costs were 277 million yen, exceeding the plan by 6%. This was due to the purchase of spare parts for a bulldozer used at NEDS, which was not anticipated at the time of project planning. This increase was essential for technical instruction in the appropriate landfill management at NEDS, planned as Output 3.

3.3.1.3 Period of Cooperation

The project period was set as three years from October 2009 to September 2012 in the plan, and the actual project period was the same (100%).

As seen above, although the project period was within the plan, the project cost exceeded the original plan. Therefore, efficiency of the Project is fair.

3.4 Sustainability (Rating : ②)

3.4.1. Related Policy and Institutional Aspects for the Sustainability of Project Effects

In the “Action Plan of the Government for 2012-2016”, the section on “ensuring a safe environment” describes comprehensive engagement with air pollution, waste, and traffic congestion in Ulaanbaatar City. It also states promoting waste sorting and recycling in the waste sector. The “Mayor’s Action Plan 2012-2016”, which outlines the policies of Ulaanbaatar City, also lists the improvements in waste collection operations, cleaning of public facilities, construction of additional disposal sites, and promotion of the 3R as targets for its SWM program.

Therefore, the direction of these policies is consistent with the establishment of a recycling society, and with the M/P revised in this Project. This indicates that it will bolster the effects of this Project going forward. Accordingly, sustainability in terms of policy is maintained.

3.4.2. Organizational Aspects of the Implementing Agency for the Sustainability of Project Effects

The local election held after the Project led to reorganization of the City’s departments. As a result, EPWMD, which was a counterpart of this Project, was consolidated with PSD that is in charge of policy and supervision of urban infrastructure in January 2013. However, EPWMD’s responsibility for managing and monitoring waste discharge, collection, and disposal remained the same. At the time of the ex-post evaluation, four out of nine officers in PSD were in charge of SWM, and all four of them were engaged in the Project. According to the interviews to PSD, current officers are able to handle the operations without problem, while PSD recognises that the number of staff should be increased so that new responsibilities such as promotion of 3R can be implemented.

In addition, CMPUA, which was responsible for the administration of the final disposal site, was merged with two public corporations that are in charge of road maintenance and water supply in September 2013. After the merger, CMPUA’s original duties were mostly transferred. However, Consortium’s responsibility on waste collection and transportation in residential areas was outsourced to private operators and cleaning operations for public facilities and roads were newly added as their duty. Waste collection vehicles previously owned by Consortium are then planned to be transferred to the districts that need a new agreement with the contracted waste

collection operators to manage the vehicles.

As for the final disposal sites in Ulaanbaatar City, NEDS was the only site in Ulaanbaatar City at the end of the Project, but two more were constructed by the time of the ex-post evaluation. According to Consortium officers, the numbers of employees at these disposal sites were below the original plan at some sites, but this is not impeding their disposal operations. At the same time, the Environmental Impact Survey implemented by the City Hall's Environmental Auditor revealed that water quality and methane gas monitoring around the disposal sites required by Mongolia's environmental laws have not been conducted. Moreover, some disposal sites had no fence to identify the sanitary zone. Consortium, which is responsible for the administration of the disposal sites, should clarify the responsible department within its organization and set up a monitoring system, including specifying the environmental-friendly operation measures and designating a person in charge at each site.

3.4.3. Technical Aspects of the Implementing Agency for the Sustainability of Project Effects

Some of the counterparts at PSD who received technical training in the Project continued working in the same office at the time of ex-post evaluation. The bidding of waste collection operators was carried out as a result of the revision of the Law on Waste after the Project 'The Tender Documents for the Selection of Waste Collection Operators' and 'the Guidelines for Administering Tender Offers' produced by the Project were used in this bidding process. These guidelines required tender documents specifying the amount of waste generated and the cost of waste collection in each district. PSD officers reported that having more specific tender documents led to a more rigorous selection of waste collection operators and resulted in improvement of collection and transportation services. Moreover, as noted in the section on impact, the level of the capacity to draft policies or regulations was high since the PSD counterparts successfully revised guidelines prepared under the Project, produced 'the National Guideline on Calculating Appropriate Waste Collection Fees' and prepared 3R Ordinance draft reflecting the results of the Pilot Project.

No problem with technical sustainability was observed with the Consortium, considering that final disposal sites were additionally built and the necessary equipment was bought after the Project. SWM operations were being carried out without major problems at the time of the ex-post evaluation, and the sanitary landfill method, which was introduced for the first time under the Grand Aid Project, were being continuously utilized at each disposal site.

3.4.4. Financial Aspects of the Implementing Agency for the Sustainability of Project Effects

The City's budget for waste operations is managed by PSD. The waste collection fees from resident, private companies and public organizations are transferred to the City's treasury first and subsequently distributed to all districts so that waste collection operators can be paid. In

addition, budgets for final disposal sites and funding to clean up wastes have been allocated to the Consortium.

Table 5 The Budget Disbursement for SWM - Ulaanbaatar City

unit : million Mongol tugrik

Items	2012	2013	2014	2015
SWM related income				
Waste collection fee	3,297	9,890	11,355	12,367
SWM related subsidy	0	576	5,800	8,700
Total income	3,297	10,466	17,155	21,067
SWM related expense				
Waste collection and transportation cost	12,310	9,270	17,053	21,010

Source : Questionnaire survey to Ulaanbaatar City

Note : Waste collection from private businesses and governmental organizations were partially collected by 2012, however, it has been fully collected by the City since 2013.

Previously, waste collection fees charged to private companies and public organizations were paid directly to the districts or waste collection operators. Thus, waste collection system was not unified in the City. However, those fees were paid together with city taxes after the reform. As a result, the amount of waste collection fees almost tripled during 2013, and tends to be increasing since then. PSD stated that the sharp rise could be due to the tax reforms in 2013. Moreover, subsidies for the waste sector were started from 2013. The Project provided technical methods to analyse the amount of the waste generated and collected and this made it possible for PSD to calculate the necessary funding and budget shortfalls for its operation. As a result, requests for subsidies to PSD based on the analysis were approved. Up until 2012, the shortfall of waste transportation and collection cost was covered using the waste collection fees from companies and public organizations by districts. After 2013, PSD began to manage the waste collection budget and use subsidies to make up for the shortfalls.

On the other hand, funds to operate the final disposal site and to clean public facilities are allocated to the Consortium from Ulaanbaatar City. According to the Consortium and disposal site officers, there are no problems in allocating the funding for daily operations, maintenance and management. However, their concern is that the final disposal sites will have to be expanded and aged equipment will have to be replaced in the near future. There is no clear plan to secure adequate funds for this.

Table 6 The Budget Disbursement for SWM - Consortium

unit : Mongol tugrik

Items	2013	2014	2015
	Actual	Actual	Plan
Total Income	9,691,181	27,510,787	26,728,243
Road Cleaning	838,920	7,363,836	7,495,425
Road Maintenance	0	5,756,434	3,000,000
Landfill Management	1,264,392	1,490,787	1,330,700
Others	7,587,869	12,899,730	14,902,118
Total Expense	10,659,366	27,479,191	25,956,937
Employment cost	3,408,573	9,179,616	10,703,199
O&M for Equipment, Fuel cost	1,469,379	2,502,429	2,440,584
Others	5,781,414	15,797,146	12,813,154
Annual Balance	-968,184	31,597	(to be confirmed)

Source : Questionnaire survey to Consortium

As seen above, some minor problems have been observed in terms of the organizational and the financial aspects of the implementing agency. Therefore, sustainability of the Project effects is fair.

4. Conclusion and Lesson Learned and Recommendations

4.1 Conclusion

This Project was implemented to improve Solid Waste Management (hereafter, SWM) in Ulaanbaatar City, followed by the Development Study and the Grand Aid Project after 2014. The Project aimed to enhance organizational capacity and human resources of relevant organizations in SWM sector, mainly Environmental Pollution and Waste Management Department (hereafter, EPWMD) and City Maintenance and Public Utilities Agency (hereafter, CMPUA). Relevance is high, because improvement of SWM is consistent with Ulaanbaatar City's policy, which focused on the improvement of SWM, and development needs of the country and with Japan's ODA policy. Through this Project, EPWMD officers in charge of SWM were able to learn methods of compiling and analysing data on the composition and amount of waste, which had previously not been accurately grasped. The results have been utilized for formulating new SWM policy. Moreover, technical assistance to CMPUA has strengthened their capacity for operation of final disposal sites constructed by the Grand Aid Project and maintenance of waste collection vehicles and other equipment. This helped to increase the frequency of waste collection in Ulaanbaatar City. The ex-post evaluation confirmed progress in improving SWM operations, such as the establishment of new regulations aiming at creating a society with recycling system in Ulaanbaatar City. Therefore, the effectiveness and impact of this Project are high. Efficiency is fair, since the Project period was within the plan, whereas the Project cost exceeded the plan. Sustainability is also fair, because

there are some concerns about organizational aspect to conduct environmental monitoring in the final disposal sites and financial aspects to secure budget for upgrading final disposal sites and aged facilities.

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

4.2 Recommendation

4.2.1 Recommendations to the Implementation Agency

To PSD;

PSD and Consortium reported that the amount of waste was increasing together with the population growth. Three disposal sites within Ulaanbaatar City are expected to reach the limits of their capacities within a few years. Plans to build new disposal sites and update existing equipment will be needed in the near future. The construction plan for the disposal sites must be based on medium- and long-term projections of the waste volume. At the same time, the target year for the current master plan is 2020, so base-line data should be updated and made to prepare for a new master plan in the next term.

To Consortium;

Results of an environmental monitoring survey conducted by Ulaanbaatar City every year showed monitoring tests on water quality and methane gas around all disposal sites in Ulaanbaatar City were never conducted and no fences were built in some of the disposal sites, required by Mongolia's environment laws. An environmental monitoring operation system should be established including specifying the environmental measures and designating a person in charge at each site to clarify the responsible department within Consortium.

4.2.2 Recommendations to JICA

JICA should follow-up to ensure that Consortium promptly and appropriately start conducting an environmental monitoring at NEDS which was built by a Japanese Grant Aid Project.

4.3 Lesson Learned

Need to analyse risks when a newly established organization becomes a counterpart

EPWMD, as a main counterpart of the Project, was just established, and its organizational and institutional capacities were to be strengthened through the Project. However, one of the Project's preconditions was that 'EPWMD continue to function appropriately as a coordinating organization'. The precondition was, however, not secured and the appropriate countermeasures were not taken. As a result, EPWMD could not adequately function as a coordinating organization and activities targeted for WSF and districts officers to strengthen their financial capacities and raise public awareness had to be modified. As such, when a newly established organization is designated as a main counterpart, a risk assessment should be carried out to analyse the organization's operating capacity at the planning stage. Activities to mitigate the

risks (for example, adding consensus-building and facilitation to the project implementation process and adding experts in contract management with private companies) should be included in the plan.

Need to consider the implementation starting point for projects included in cooperation programs

WSF, which was one of the counterpart organizations, was abolished during the Project and the implementation system and related activities were forced to be revised. In the background, Ulaanbaatar City's policies related to the SWM system were in a reforming process and the operation system was not fixed. The reform process, privatization of waste collection operators and revision of the waste collection fee system was ongoing as a result of the Development Survey carried out by JICA prior to the Project. When providing a new project in conjunction with a previous cooperation program, the timing of inputs should be carefully discussed when it is determined that the target country's policy and the organizations are not mature enough or are changing

Attachment : Achievement of Outputs at the Project Completion

Output	Indicators	Achievement
Output 1	1-1. Proposals of draft policy, draft regulation(s) and draft guideline(s) on SWM prepared by EPWMD.	Achieved : Total 13 laws, regulations and guidelines related to SWM were drafted in 2010 and 2011 by EPWMD. (Four policies for national level, 9 regulations for municipality level)
	1-2. Draft updated Master Plan prepared by EPWMD.	Achieved : The waste amount and composition surveys was implemented in 2010 and 2011 in order to revise M/P. The revision of M/P was completed in May 2012.
	1-3. Action Plan for the organizational development of EPWMD.	Achieved : The annual action plan of EPWMD had been formulated since 2010. It was personal plan in 2010, but revised to organizational plan after 2011. Finally, action plan 2013 - 2016 was formulated.
Output 2	2-1. Report on operation of SWM equipment (collection vehicles and heavy machineries) is submitted by CMPUA to EPWMD 4 times a year.	Partially Achieved : An operation reporting format of SWM equipment was formulated and shared with CMPUA and the waste collection companies through the workshop under the Project in March 2010. However, the reports were submitted twice in 2010, 6 times in 2011 and none in 2011 because of internal problem of CMPUA caused by personnel transfer.
	2-2. Report on maintenance of SWM equipment is submitted by CMPUA to EPWMD 4 times a year.	
	2-3. CMPUA and each district prepare and submit the waste collection plan to EPWMD once a year.	Not Achieved : Each Districts were expected to prepare waste collection plans, however, the participation of district officers were limited because of the decision of City Council to abolish WSFs which was part of district offices. Therefore, this indicator was not achieved.
Output 3	3-1. Landfilling monitoring committee assesses landfilling operation as sanitary landfilling.	Achieved : The first landfilling monitoring committee was conducted based on monitoring guidelines formulated under the Project in October 2010. The second committee was conducted in May 2012. The committee confirmed that sanitary landfill with consideration of environment protection was implemented in the landfill site.
	3-2. Report of waste composition survey is prepared by CMPUA.	Achieved : A waste composition survey was conducted at the waste separation factory of NEDS in August 2010. Another survey was conducted at the belt conveyor-sorting factory of NEDS from April to July 2011. CMPUA took an initiative in conducting these surveys.
	3-3. Environmental monitoring including gas emission survey at landfill site is conducted regularly by CMPUA.	Achieved : The Project gave guidance on the operation of gas detector in October 2010 and March 2011. Monitoring of underground water quality has been conducted by CMPUA since April 2012.
Output 4	4-1. Common financial management rule for all WSFs is established.	No activities with WSF were implemented.
	4-2. Financial condition of each WSFs is monitored regularly by EPWMD	No activities with WSF were implemented.
	4-3. EPWMD strengthens understanding about administrative/financial management of SWM.	Achieved : Based on recommendations of the Mid-Term Review, bi-monthly meetings were held with the directors of EPWMD and CMPUA to share the progress and effects of the Project activities. Important data was shared in order to decide policies regarding waste sorting and recycling and formulate

		a common understanding regarding SWM.
	4-4. EPWMD can design necessary waste generation fee based on the appropriate waste collection tariff to the waste collection organizations.	Achieved : After the Mid-Term Review, “Guideline on Calculating Appropriate Waste Collection Fees” was formulated using the weighbridge ¹⁷ data. This guideline enabled EPWMD to estimate costs of waste collection and transportation to be paid to waste collection companies and to do a trial calculation of waste collection fees for dischargers.
	4-5. EPWMD can prepare standard tender procedure and standard tender document for selection of waste collection organizations.	Achieved : “Standard Tender Document” was prepared by EPWMD receiving technical guidance from Japanese experts. EPWMD staff gained the knowledge on formulating waste collection plans from Japanese experts during preparation of the standard tender documents.
	4-6. Control system of selected waste collection organizations will be developed.	Partially Achieved: “Guideline on the Tender Procedure” was prepared by the Project, although a tender to select waste collection companies was never conducted before the Project completion.
Output 5	5-1. Personnel who are in charge of Public Awareness in EPWMD and District offices are able to conduct the public awareness activities by taking initiatives.	Achieved (Except District offices) : A guideline on Public Awareness was formulated through the Pilot Projects. Based on knowledge gained through the Pilot Project, EPWMD staff took initiative in planning, implementation, monitoring, and coordination with relevant organizations during the 2 nd phase of the Pilot Project. The district officers partially participated in the Pilot Projects.
	5-2. Public awareness campaign will be conducted in 4 khorooos through Pilot Project and another 4 khorooos by the Counterpart.	Partially Achieved : Public awareness campaign was implemented in total of seven khorooos while the target number of khorooos was eight. To disseminate information on the current waste situation and 3R promotion efficiently, the public awareness campaign was carried out through various ways, such as resident meeting household visiting, calendar and brochure, TV programs.
	5-3. Awareness of residents on waste separation and discharging manner is improved at the Pilot Projects sites	Achieved : According to the results of the Public Opinion Survey conducted at the beginning and end of Pilot Project, the proportion of the residents who answered ‘always sorting their waste’ and ‘not always, but sorting their waste’ increased from 38.0% in 2010 to 64.7% in average.
Output 6	6-1. Waste separation facility is examined in NEDS and report on necessary extra cost, efficiency, sanitary conditions of separation operation is submitted.	Achieved : A waste separation factory was constructed in NEDS in July 2010, and waste pickers were hired for sorting and recycling operation. The operation started from August 2010, and the straight conveyor was installed in April 2011.
	6-2. Valuable collectors (former waste pickers) will cooperate for sorting operation at sorting yard according to the manual and guidelines.	Achieved : About 20 waste pickers had contracts with CMPUA for sorting operation, and demonstrated that they were able to work at the waste separation factory.
	6-3. Recommendation paper on waste separation and recycling system is officially submitted to Ulaanbaatar City authority.	Achieved : Based on the Pilot Project, the Project summarized a recommendation paper on 3R. Also, the paper was compiled in the Project completion report by EPWMD.

(End of the report)

¹⁷ Facility to measure the weight of waste collection trucks.

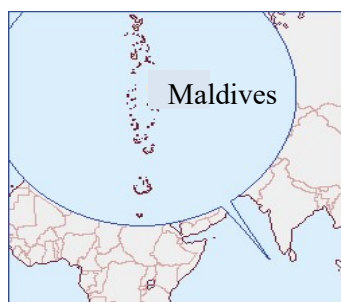
0. Summary

The objective of this project was to improve the power generating capacity, diversify energy supply sources, and build awareness among the citizens on renewable energy through installation of solar Photovoltaic (PV) equipment at five sites in Malé and Hulumalé and training of technicians, thereby contributing to promote joint efforts of Japan and Republic of Maldives (Maldives) to address climate change.

The project has been relevant to development policies and development needs of Maldives both at times of the project planning and the ex-post evaluation. The project was also highly consistent with Japanese ODA policy toward Maldives at the project planning stage. Therefore, its relevance is high. Although the project cost was within the planned budget, the project period exceeded its original plan because of two additional procurements of solar PV equipment. Therefore, efficiency of the project is fair. Quantitative indicators of the project’s objective including electric power generation, diesel displacement, and reduction of carbon dioxide (CO₂) surpassed their targets at the time of the ex-post evaluation. In addition, at the project sites where the solar PV systems were installed, building users showed their increased awareness on solar and renewable energy. Ministry of Environment and Energy (MEE) and State Electric Company (STELCO) successfully installed their domestic solar PV systems using the knowledge and experiences from the project. The data and knowledge of the project were also utilized in the implementation of subsequent solar PV projects by other donors in Maldives. Thus, the project produced most of the expected effects. Therefore, the effectiveness and impact of the project are high. No major problems have been observed in the institutional, technical and financial aspects of operation and maintenance of the PV systems. Therefore, sustainability of the project effects is high.

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

1. Project Description



Project Location

(Source: Ministry of Foreign Affairs, Japan)



Solar PV Panels on the President Office

1.1 Background

In Maldives, electricity is supplied by two state-run utility companies. One is STELCO that serves 27 islands including Malé, the capital island of Maldives. Another is FENAKA (initials from *Fen Narudhamaa Karant*, meaning water, sewage and electricity in *Dhivehi*¹) that covers 149 outer atolls. Electricity demand in Malé was already high as the island was densely populated at the time the project planning. Rapid population growth was also expected in Hulumalé, an artificial island constructed as a commuter town about 15-minute ferry ride northeast of Malé. Further boost of electricity demand was expected there. On the other hand, remote atolls where electrification was promoted rapidly suffered from high cost of electricity generation because unit cost of generation increased as a scale and capacity of generation became smaller. In Maldives, almost all the energy sources were imported, thus electrification of the country meant increased expenditure on fuel import and more pressure on the national budget.

Many islands and atolls of Maldives rise little more than one meter above mean sea level, which makes the country extremely vulnerable to sea-level rise caused by climate change. The government of Maldives stressed the importance of reducing emission of greenhouse gases and was actively involved in international efforts by ratifying UN Framework Convention on Climate Change and Kyoto Protocol and becoming a member of Cool Earth Partnership² which was established by the government of Japan.

In response to the above situation, the government of Maldives made a request to the government of Japan to conduct The Feasibility Study for Application of Photovoltaic Power on Malé and Hulumalé Islands (January to November, 2009). This study was conducted as a Technical Cooperation Project on Development Planning for introduction of solar PV system in Malé and Hulumalé with an aim to stabilize power supply and promote the use of renewable energy in the mid to long term. Based on the feasibility study, five sites were identified in Malé as potential project sites for the project. The feasibility study also identified the needs of technical transfer of operation and maintenance skills to STELCO staff because they had few technicians with sufficient experiences in operating and maintaining PV system.

1.2 Project Outline

The objective of this project was to improve the power generating capacity, diversify energy supply sources, and build awareness among the citizens on renewable energy through installation of solar PV equipment at five sites in Malé and Hulumalé and training of technicians, thereby contributing to promote joint efforts of Japan and Maldives to address climate change.

¹ Official Language of Maldives

² Cool Earth Partnership is a financial mechanism to assist developing countries that are working to contribute to climate stability. It was presented by then Japanese prime minister Fukuda at Davos Forum in January 2008. It is part of the Cool Earth Promotion Programme that was proposed to implement Cool Earth 50 (Japan's initiative on climate change to cut the global emission by half by 2050.)

<Grant Aid Project>

E/N Grant Limit or G/A Grant Amount / Actual Grant Amount	1,000 million yen / 1,000 million yen
Exchange of Notes Date (/Grant Agreement Date)	March, 2010 / March, 2010
Implementing Agency	Ministry of Environment and Energy (MEE) (Ministry of Housing, Transportation and Environment until May 2012) / State Electric Company Limited (STELCO)
Project Completion Date	March, 2014
Main Contractor(s)	Toyota Tsusho Corporation (Japan)
Main Consultant(s)	Yachiyo Engineering Co., Ltd. (Japan) / Shikoku Electric Power Co., Inc. (Japan)
Procurement Agent	Japan International Cooperation System (JICS)
Outline Design	<JICA Feasibility Study> Application of Photovoltaic Power on Malé and Hulumaléé Islands in the Republic of Maldives (January to November, 2009)
Related Projects	<Projects by Other Donors> Solar PV projects are carried out by United Nations Industrial Development Organization (UNIDO), United Nations Development Programme (UNDP) & Global Environmental Facility (GEF), German Agency for International Cooperation (GIZ), World Bank, Asian Development Bank (ADB) etc. See main text for the details.

2. Outline of the Evaluation Study

2.1 External Evaluator

Makiko Soma, Global Link Management Inc.

2.2 Duration of Evaluation Study

Duration of the Study: October, 2015 - August, 2016

Duration of the Field Study: December 7-17, 2015, March 4-8, 2016

2.3 Constraints during the Evaluation Study

There was remaining fund from the first bidding of the project because the price of solar battery panels³ dropped sharply after the feasibility study. In order to consume the entire

³ Packaged cells of panel designed to absorb the sun's rays as a source of energy to get voltage and current for generating electricity. They are also called solar battery module, solar panel, or solar module etc.

amount, the project fund was stretched to conduct two additional biddings⁴. Thus, the project period was extended significantly. The solar battery panels procured in the third bidding was installed in 2014, only one and a half years after the project completion at the ex-post evaluation. It should be noted that it might be too early to evaluate the sustainability of the installed solar PV systems considering most ex-post evaluations are conducted three years after project completion.

3. Results of the Evaluation (Overall Rating: A⁵)

3.1 Relevance (Rating: ③⁶)

3.1.1 Relevance to the Development Plan of Maldives

Securing reliable energy supplies and promotion the utilization of renewable energy were prioritized in The Seventh National Development Plan (2006-2010) at the time of the project planning. The above development plan was not renewed at the time of the ex-post evaluation. The priorities remained the same in the Progressive Party's manifest (entered into force on November, 2013) where the President of Maldives serves as the party leader.

The policy of Maldives' energy sector, National Energy Policy and Strategy (2010) has been effective since the project planning until the ex-post evaluation. This strategy aimed at stabilizing energy supply and promoting the use of renewable energy. The government of Maldives formulated the Scaling-up Renewable Energy in Low Income Countries Investment Program (SREP-IP) (2013-2017) along the above sectoral strategy. SREP-IP intends to leverage the financing of the World Bank, ADB, and Islamic Development Bank (IDB) to generate a total of 30 megawatts (MW) of renewable energy by the end of 2017. The main objectives of SREP-IP include the following: 1) creating an enabling environment for the growth of a reliable and sustainable energy sector, 2) providing electricity to every inhabited island at a reasonable rate, 3) reducing over-reliance of the energy sector and the national economy on fossil fuels through the diversification of energy supplies, 4) improving energy efficiency and conserving energy, 5) encouraging the adoption of low-carbon technologies, 6) promotion of renewable energy, and 7) engaging private sector in the development of energy sector. Under SREP-IP, two major programs are planned and implemented. One is the Accelerating Sustainable Private Investment in Renewable Energy (ASPIRE) that encourages private investment for the integration of solar and waste power generation. Another program is the Preparing Outer Islands for Sustainable Energy Development (POISED) that aims to promote the use of renewable

⁴ This project belongs to the Japan's Programme Grant Aid for Environment and Climate Change. The projects under this programme are required to use procurement agent services. In the services, unbiased non-profit organizations who have professional knowledge and skills in international procurement serve as procurement agents to provide services including management and supervision on overall processes of selection and procurement of goods and services as well as fund management. The procurement agent should have high expertise to carry out procurement in a fair and transparent manner to ensure the efficient and smooth implementation the projects. (Source: website of Japan International Cooperation System, accessed on April 11, 2016. <http://www.jics.or.jp/soshiki/about.html>)

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

⁶ ③: High, ② Fair, ① Low

energy on outer atolls using funds of the government of Maldives and foreign donors.

In short, renewable energy promotion has been a key priority of the government of Maldives and energy sector policy of the Maldives both at times of planning and ex-post evaluation. Thus, the project has been consistent with the development policy and energy sector policy of the Maldives.

3.1.2 Relevance to the Development Needs of Maldives

The demand for electricity was increasing as the population was rapidly growing on Malé island at the time of the project planning. The demand became especially prominent after the tsunami disaster in December 2004 because many victims emigrated to Malé from their home islands. However, shortage of lands prevented further expansion of electric power facilities in Malé. Almost all the country's electricity generation depended on imported diesel fuel in Maldives and the steep rise in fuel prices around 2004 worsened financial situation of STELCO. This became a serious issue of national energy security. In addition, Maldives has been one of the most vulnerable countries to sea level rise induced by climate change. Thus, it was necessary to lessen dependence on diesel fuel to reduce emissions of greenhouse gases.

At the time of the ex-post evaluation, population concentration to Malé island is continuing and electricity demand is steadily increasing. Energy security remains to be an important issue in Maldives. Also, Maldives continues its effort to reduce greenhouse gas emissions by lessening dependence on fossil fuel because it is still important to address climate change. Therefore, both at times of the project planning and the ex-post evaluation, there have been great needs for energy security and promoting renewable energy use to reduce greenhouse gases in Maldives.

3.1.3 Relevance to Japan's ODA Policy

In June, 2008, Maldives expressed its support for Japanese government's initiative, the Cool Earth Promotion Programme and established the Cool Earth Partnership with Japan. The program was proposed to promote the long-term plan, Cool Earth 50 to prevent global warming. In response to this, Japan's Country Assistance Policy for Maldives (June, 2009) listed supports in the field of climate change as a top priority. This justifies the Project's consistency with Japan's aid policy.

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

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The project's original plan was to install solar PV equipment with total capacity of 395 kWp

at five sites in Malé. However, as mentioned above, due to the price plunge of solar panels in the market, the project fund was not fully consumed at the initial bidding. This resulted in two additional biddings and procurements of PV equipment. As a result, process of bidding and procurement for installation was repeated three times. The total capacity of the procured solar PV equipment reached 740 kWp, approximately 1.9 times the initial target and was installed at 12 sites including Hulumalé. The site-specific output capacity of the three phases (the first, second and third biddings and procurements will be referred to as Phase 1, Phase 2, and Phase 3, respectively) of installation is shown in Table 1.

Table 1 Output Capacity of Electricity Generation at 12 Sites

	Sites (11 sites in Malé, 1 site in Hulumalé)	Output Capacity (kWp)	Total Output Capacity (kWp)
Phase 1	1) STELCO Building	45	395
	2) Maldives Center for Social Education (Social Center)	100	
	3) Thaajuddeen School	130	
	4) New Secondary School (Hiriya school)	100	
	5) The President Office	20	
Phase 2	6) Velaanaage Building	40	280
	7) Giyaasudheen School	80	
	8) Kalaafaanu School	85	
	9) Central Administrative Building (University)	40	
	10) Faculty of Health Science-FHS (University)	35	
Phase 3	11) Ministry of Finance and Treasury	20	65
	12) Hulumalé Hospital	45	
		Total	740

Sources: JICA documents, response to questionnaire from STELCO

As a soft component of the Project, trainings were conducted on fundamental knowledge, operation and maintenance and emergency response procedures of solar PV systems during the first and second phases. Input for the trainings was 11.5 man-months, which was same as the plan.

MEE and STELCO were expected to provide necessary support for procurement and smooth implementation of the project. Although detailed responsibilities were not mentioned in the project plan, MEE and STELCO carried out the following.

<MEE>

- Processed exemption of customs duty for procured materials
- Assigned one project manager and two coordinators for the project
- Provided an office space
- Paid consumption tax charged during the project amounting to 119,234.91 MRV⁷

<STELCO>

Monitored power network during PV systems installation in Phase 1.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The project cost was same as the budget. The procurement agent services were employed, thus all of the project fund was granted to the government of Maldives and no reversal was made at the project completion. Total project cost of the Japanese side was 1,000 million yen, same as the Grant Limit, therefore the consumption rate was exactly 100%. The evaluation was made only on Japanese side budget because the budget and expenditure of the Maldivian side for the project were unknown.

3.2.2.2 Project Period

The project period was significantly longer than planned. The planned period was 19 months from April 2010 to October 2011. Instead, the project was 49 month-long from March 25, 2010 to April 30, 2014, which was 254% of the planned period. The delay, as mentioned earlier, was due to additional biddings and procurements in order to consume the entire project fund.

The first installation period ended on February 8, 2012. It was 22.4 month-long and 118% of the planned period. According to the procurement agent and the documents provided by JICA, delivery of the equipment from Japan was delayed about three months due to the Great East Japan Earthquake that occurred on March 11, 2011. This extension can be considered unavoidable and still minimal considering the significance of the earthquake disaster.

While the duration of the entire project was 2.5 times longer than the plan, the produced output was almost twice the original plan. Also, the number of sites has increased from 5 to 12, 2.4 times the initial plan. The phase 1 was extended by 18%, which is considered unavoidable and minimal. The project would have certainly exceeded the planned period even without the influences of the earthquake. Nonetheless, the above circumstances can justify that the extension of the project was mostly proportionate to the outputs increase. Interviews with STELCO confirmed that the extension was officially agreed by both Japanese and Maldivian sides.

Although the project cost was within the plan, the project period exceeded the plan. Therefore,

⁷ Maldivian Rufiyaa, currency of Maldives. 1 MVR \approx 7.37 Japanese yen (at OANDA rate in April, 2016).

efficiency of the project is fair.

3.3 Effectiveness⁸ (Rating:③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

For quantitative indicators 1) to 3), the evaluation was made on the inter-annual changes from the year of installation until the ex-post evaluation for each of the three phases. As indicated in Tables 2 to 4, Phase 1 to 3 largely achieved the expected targets. Phase 2 showed a little downturn between 2013 and 2015 and slightly missed the target in 2015 because the solar cell panels on the roof-top of Administrative Building of the National University were covered by plastic sheets during the construction of the adjacent building from late 2013 to early 2015. The construction was completed and power generation has recovered at the time of the ex-post evaluation, therefore, the annual target is likely to be achieved in 2016.

Table 2 Electricity supplied, Diesel saved, CO₂ Reduced of Phase 1

	Baseline	Target	Actual	Actual	Actual
	2010	2014	2013	2014	2015
	Base Year	3 years after completion	1 year after completion	2 years after completion (Note 1)	3 years after completion
1)Electricity supplied (kWh/day)	0	1202.4	1601.30 (133%) (Note: 2)	1606.41 (134%)	1618.91 (135%)
2)Diesel saved (ℓ/day)	0	312.62	416.40 (133%)	417.67 (134%)	420.92 (135%)
3)CO ₂ Reduced (kg/day)	0	819	1090.90 (133%)	1094.30 (134%)	1102.80 (135%)

Sources: : JICA documents and data provided by STELCO

Note 1: Target year (2014) was set as three years after completion, but due to 3-month delay, 2014 was two years after completion.

Note 2: The percentage shows ratios against the target.

Table 3 Electricity supplied, Diesel saved, CO₂ Reduced of Phase 2

	Baseline	Target	Actual	Actual	Actual
	2011	2014	2013	2014	2015
	Base Year	1 years after completion	Year of completion	1 year after completion	2 years after completion
1)Electricity supplied (kWh/day)	0	930.1	1088.20 (117%)	974.63 (105%)	895.41 (96%)
2)Diesel saved (ℓ/day)	0	241.8	282.93 (117%)	253.40 (105%)	232.81 (96%)
3)CO ₂ Reduced (kg/day)	0	633.5	741.30 (117%)	663.92 (105%)	609.95 (96%)

Sources: JICA documents and data provided by STELCO

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

Table 4 Electricity supplied, Diesel saved, CO₂ Reduced of Phase 3

	Baseline	Target	Actual	Actual
	2013	2015	2014	2015
	Base Year	1 year after completion	Year of completion	1 year after completion
1)Electricity supplied (kWh/day)	0	215.4	250.37 (116%)	280.54 (130%)
2)Diesel saved (ℓ/day)	0	59.0	68.47 (116%)	76.80 (130%)
3)CO ₂ Reduced (kg/day)	0	154.5	179.39 (116%)	201.22 (130%)

Sources: JICA documents and data provided by STELCO

For the quantitative effect 4) Diversification of Energy, breakdown of the energy supply sources was set as an indicator. As shown in Table 5⁹, dependence on diesel fuel was reduced while the proportion of jet fuel¹⁰ increased. This still indicates a very high dependence on imported fuel overall. Supply of solar PV energy was 0.07% of the total energy supply in 2010, and increased by ten-fold to 0.7% in 2013 and twenty-fold to 1.4% in 2014. The project installed solar PV systems with capacity of 740 kWp. This accounts for almost 20% of the total solar PV electricity generation in the entire Maldives (4 MWp) at the time of the ex-post evaluation (December, 2015), showing a certain contribution of the project to the increased proportion of solar-derived energy.

Table 5 Proportion of Energy Supply Sources

	Unit: %				
	2010 (Actual)	2011 (Actual)	2012 (Actual)	2013 (Actual)	2014 (Actual)
Diesel	81.2	83.4	82.9	62.1	57.6
Gasoline	9.1	8.8	9.5	8.6	6.6
LPG	3.3	3.3	2.9	2.5	2.0
Solar PV	0.07	0.07	0.06	0.7	1.4
Kerosene	0.06	0.09	0.07	No data	No data
Jet fuel	5.7	4.3	5.5	26.7	33.4

Sources: Data provided by MEE

Note: No baseline or target set for this indicator. The sum of the ratio would not be 100% as each figure is rounded to one decimal place.

3.3.2 Qualitative Effects

For the soft component of the Project, expected outputs 1) to 5) identified in the Soft

⁹ Table 5 includes jet fuel and other energies that are not intended for electricity generation. Thus it should be noted that the dependency on diesel and the ratio of renewable energy supply in the table do not exactly explain the trends of the energy used for electricity generation.

¹⁰ Fuel used for jet engine of the aircrafts. It is obtained by refining the natural crude oil.

Component Plan were largely achieved by the end of the project and the effects are still observed at the time of the ex-post evaluation as shown in Table 6. (See 3.5 Sustainability for details.) Under the Output 4), the Renewable Energy Development Fund (RED fund) was established as planned and the rough outline of the fund usage, i.e., businesses and projects development as well as research and development on renewable energy, was identified. However, specific activity plan or financial plan was not yet prepared. In order to materialize the contents of the above memorandum, MEE should prepare an activity plan and budget to come up with a financial plan. The Output 5) Facilitation of Smooth Communication between MEE and STELCO seems to be largely achieved. It is difficult to objectively evaluate the smoothness of communication, but the two agencies have obviously gained more opportunities for close communication by working together during the project implementation. Also, STELCO regularly reports the operation and maintenance status of the solar PV systems to MEE based on the Operation and Management (O&M) Agreement signed between the two agencies during the project. Such monthly exchange should have increased their communication opportunities.

Table 6 Achievements of Soft Components

Expected Output (2010)	Achievements at Ex-Post Evaluation (2015)
1) Manual of the PV system is drafted	Maintenance manual of the installed PV systems has been utilized.
2) Basic structure of PV system is understood by the trainees and O&M of the PV system is carried out in a sustainable manner	Patrol inspections are carried out along the manual at time of the ex-post evaluation.
3) O&M records are well kept and reported, and the necessary expenditures are made in line with the budget identified in the O&M Agreement	In all 12 sites, records on power generation and problems in operations are reported monthly from STELCO to MEE. Monthly maintenance costs are spent as budgeted in the O&M Agreement.
4) Renewable energy fund (RED fund) is established and the income generated by the Project's PV systems is pooled in the fund	The RED fund was established and funds are transferred to MEE from STELCO regularly (every month).
5) Communication and information sharing between the owner of the equipment (MEE) and manager (STELCO) become smooth through increased communication opportunities	MEE and STELCO are communicating better than the time before the project through implementation of the project, monitoring report based on the O&M Agreement, and managing the RED fund.

Sources: Interview with STELCO and MEE

3.4 Impacts

3.4.1 Intended Impacts

Two qualitative effects of the project were expected at the time of planning. One is raising awareness of the public on renewable energy promotion of utilization and the other is presenting Japan's initiative in addressing climate change. They are considered and evaluated as *impacts* rather than *effectiveness* of the project in this report for two reasons. First, it would take some time until these effects can be felt after achieving the project objective. Second, they are considered as *impacts* based on their causal relationship with the output of the project.

(1) Raising Awareness of the Public on Promotion of Utilization of Renewable Energy

The solar PV systems were installed on the rooftops of public buildings. The 12 sites were strategically selected to attract attention of the public. The sites include the busiest places in Malé such as the President's Office and Velaanaage building, the highest building in Maldives, and public schools. At every site, a display board was installed near the ground floor entrance to show the amounts of the power generated, diesel fuel saved, and CO₂ reduced by the solar PV systems mounted on the rooftop. At STELCO head office, a display board was installed next to a bill payment window, catching attention of the visitors and customers waiting to pay the bill. According to STELCO staff, right after the installation, many people showed interests and asked questions about the information shown on the display board. Such strategic site selection and installation of easy-to-understand display have certainly aroused people's interests on solar PV and possibly on renewable energy.

Interviews with the building users were conducted on their awareness on renewable energy use. At each site, at least one person was interviewed except the site at STELCO (11 people from 11 sites in total). The interviews found that all 11 people knew the presence of the installed solar PV systems. They also understood that promoting renewable energy use through solar PV energy generation was an action against climate change. Ten out of the 11 respondents said they never saw a solar panel before the project. The interviews were conducted to only 11 people, thus the result cannot be statistically significant to represent the entire nationals. However, this project has at least helped to sensitized the interviewees and possibly other building users on renewable energy to some extent by making them familiarized with solar PV.

As mentioned above, strategic site selection for effective promotion and installation of easy-to-understand display boards showing the status of power generation enabled the project to contribute to making the Maldivian citizens more aware of renewable energy to a certain extent. Meanwhile, the project planned or conducted no activities on awareness raising although it was intended as a qualitative effect of the project. MEE stated that they carried out some public relation activities for the project originally. However, they did not have the records and reports that showed the results or details of such activities. Workshops and seminars should have been

held at each site within the framework of the project to enhance understanding of the public on how PV panels generate electricity and contribute to reduction of fossil fuel consumption.

(2) Presentation of Japan's Initiative in Addressing Climate Change

No indicators were set for this effect at the planning stage. Therefore, its evaluation was conducted by setting the following three indicators: a) Installation of solar PV systems by the government of Maldives after the project, b) Utilization of Japanese PV technology in the PV systems mentioned above, and c) Advantages of this project in comparison to renewable energy projects by other donors.

a) Installation of solar PV systems by the government of Maldives after the project

MEE installed a 25kWp solar PV system in 2014 on its building after the project. MEE carried out all steps from planning, procurement, and designing using its own budget. Installation work was outsourced to a domestic company of Maldives. Though it was a small scale system, MEE reported it was the first PV system fully funded and established solely by Maldivians. MEE staff also acknowledged that the knowledge and experience gained from the project were very useful for installation of the PV system. STELCO also installed their PV systems in three atolls in 2015. The total power generation capacity of the three sites is 120 kWp for grid-tied PV system¹¹ and 240 kWp for stand-alone PV system with batteries¹². STELCO staff also revealed in the interview that they utilized the technical knowledge learned from the project for establishing the above PV systems. These examples of MEE and STELCO indicate that this project contributed to installation of country-led PV systems.

b) Utilization of Japanese PV Technology

The solar panels and inverters of the above PV systems installed by MEE and STELCO were made in China and Germany respectively. Therefore, the project did not contribute to dissemination of Japanese technology and products. In Maldives, the solar panels from Germany or China are widely spread because of their cost competitiveness. Although both MEE and STELCO acknowledged that the quality of Japanese solar PV equipment is better than those of other countries, higher price seemed to be the reason why Japan-made equipment was not chosen.

c) Advantages of the project in comparison to renewable energy projects by other donors

Strengths of the project compared with similar projects are: 1) large power generation capacity, 2) intensiveness of the technical trainings on operation and maintenance, 3) high quality of solar panels with highly presentable installation work, and 4) effective showcasing of the PV systems by strategic site selection. Many projects and programs for promotion of renewable energy were conducted by various donors as shown in Table 7. Generation capacity of this project (740 kWp) has been the largest as of December 2015, at the time of the ex-post evaluation. Also, in-depth

¹¹ An electricity generating solar PV system that is connected to the utility grid. The PV systems deployed in the project are all this grid-tied system.

¹² A system where the generated electricity is charged in the batteries. The project did not use this system.

trainings were conducted to cover the topics from basic skills of solar PV system to actual maintenance in this project. According to STELCO technicians, these trainings were more intense than any other PV related trainings they had ever received and they recognized the trainings as a very important experience. In addition, the solar PV systems were installed in the most visible locations in Malé and Hulumalé for awareness raising of the Maldivian people and effective exhibition while most of other foreign donors' projects took place on remote atolls.

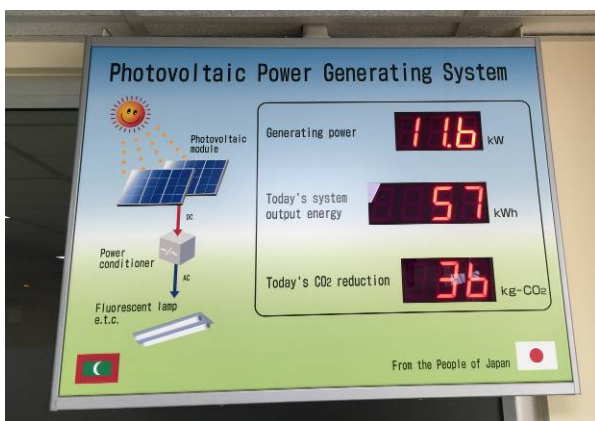
Table 7 Major Renewable Energy Projects by Other Donors in Maldives

Donor	UNIDO	UNDP/GEF	GSEP ¹³ / Government of Japan (GoJ)	GIZ	World Bank
Project Name	Renewable Energy Based Economic Development	Renewable Energy Technology Development and Application Project	Dhiffusi Solar-Ice Project/ The Project for Provision of a Solar Power Generation System to Dhiffushi	Support for Climate Neutrality Strategy of the Maldives	Clean Energy for Climate Mitigation Project
Project Site	Raa Atoll Faninu and Baa Atoll Goidhoo	Alif Dhaalu Atoll Mandhoo	Kaafu Atoll Diffushi	Raa Atoll Ungoofaru, Dhaalu Atoll Kuduhuvadhoo	Thinadhoo
Project Cost	0.27 Million USD	Not known	Grassroots Grant Aid: 361,254USD)	3 Million Euro	2.6 Million USD
Project Period	Not known	2005 - 2008	2014 - 2015	2011 - 2015	2012 - 2014
Generation Capacity	5kW(solar), 3.5kW (wind)	12.8kW(solar)	40kW(solar)	328kW(solar)	558kW(solar)
Purpose/ Characteristics	Promotion of renewable energy etc.	Promotion of renewable energy and sea water desalination.	Promotion of renewable energy and provision of ice-maker for fishery	Capacity development on devising comprehensive strategies for renewable energy promotion.	Promotion of renewable energy and capacity development of public sector

Sources: Prepared by the author based on the data and information provided by MEE and STELCO

¹³ Global Sustainable Electricity Partnership.

As mentioned in (1), MEE and STELCO are using the solar PV systems installed by the project to advertise their solar PV promotion to Maldivians and to visitors from overseas. High-quality Japanese solar PV systems are attracting people’s attention at visible places in Malé and Hulumalé. Also, the photos and data of the project’s PV system were used for the handouts and presentation materials of MEE and STELCO. These publicity opportunities contributed to showing Japanese initiative on promotion of solar PV power generation as part of the measures against climate change.



**Display Board Showing Power Generation etc.
(Entrance of Ministry of Finance)**



**MEE's Self-Financed Solar Panels
(Building of MEE)**

3.4.1 Other Impacts

(1) Impacts on the Natural Environment

MEE confirmed that there were no negative impacts on natural environment by the project.

(2) Land Acquisition and Resettlement

Installation of the equipment was done inside the existing public facilities. Therefore, MEE confirmed that there was no resettlement or land acquisition by the project.

(3) Unintended Positive/Negative Impact

As mentioned in the section of relevance, the government of Maldives was implementing two programs called ASPIRE and POISED with assistance of ADB and the World Bank respectively under the umbrella of the SREP-IP (2012-2017) as shown in Table 8. In these programs, some of the site-specific power generation data from the project was used as a benchmark. This also shows the project’s certain contribution to Maldives’ promotion of PV energy.

Table 8 Program of Renewable Energy led by Government of Maldives

Program	Project Amount	Donor	Solar PV Generation Target	Outline
Accelerating Sustainable Private Investments in Renewable Energy (ASPIRE)	About 69.5 million USD	World Bank etc.	20 MW until 2019 in and around Malé	Promotion of private sector investment for renewable energy in and around Malé
Preparing Outer Islands for Sustainable Energy Development Program (POISED)	About 62 million USD	ADB, European Investment Bank, IDB etc.	21 MW in all inhabited isolated atolls by 2019	Promotion of government investment and donor supported renewable energy introduction to isolated atolls

Sources: Interview with implementing agencies, JICA documents

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

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The name of MEE was formerly Ministry of Housing, Transportation and Environment (MHTE). In May 2012 MHTE was restructured to be MEE. The same minister took over the position and no change was made on organizational structure and decision making processes within the organization. In STELCO, a division called Distribution Unit is in charge of monitoring and maintenance of the solar PV systems. In the unit, 15 staff (all male) underwent the trainings conducted by the project. Fourteen out of the 15 staff were technicians or engineers. At the time of the ex-post evaluation, one of the 15 technicians has resigned but the tasks were taken over by the successor.

As shown in Figure 1, the ex-post evaluation finds that STELCO staff are conducting the maintenance work along the O&M Agreement signed under output 5) of the soft component. MEE, as an owner of the PV equipment, watches over the maintenance works by STELCO through monthly reports. Generated electricity of the PV systems is also managed in the RED fund in line with the O&M Agreement. The details of the management of the RED fund will be described in 3.5.3.

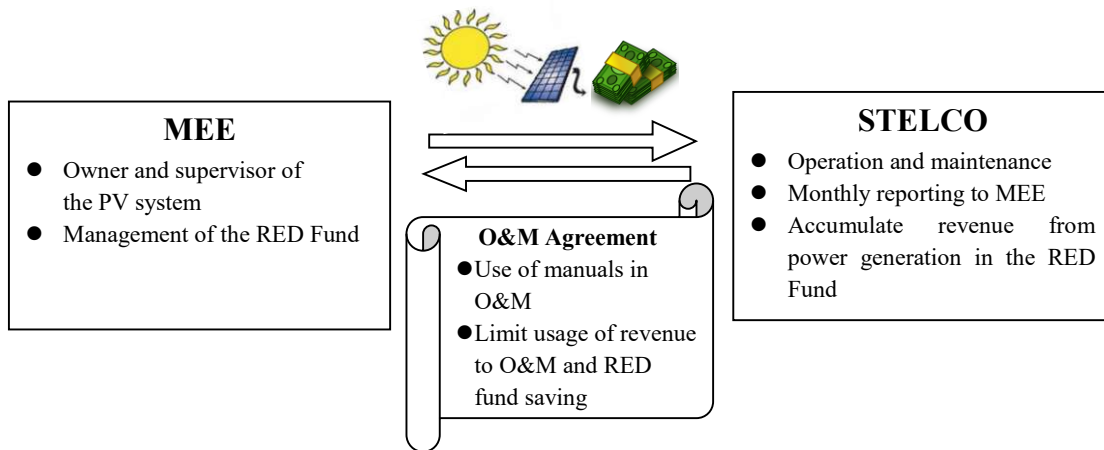


Figure 1 Operation and Maintenance Structure of the PV System

Source: Prepared by the author

It should be noted that Maldives Energy Authority (MEA) was at the final stage of revising policies on net-metering¹⁴ and legal system development related to renewable energy in March, 2016 at the time of the ex-post evaluation. Therefore, O&M Agreement has been in the process of being updated in order to reflect the new policies on power purchasing price.

As seen above, the project should not have problems in the institutional aspects of operation and maintenance.

3.5.2 Technical Aspects of Operation and Maintenance

STELCO is in charge of operation and maintenance of the PV systems installed by the project. The status of technical aspects of operation and maintenance at STELCO's is as follows. Technical level of the 15 technicians at STELCO's Distribution Unit is considered sufficient at the time of the ex-post evaluation. This is because they acquired enough knowledge and skills to conduct the operation and maintenance of the current PV system through the trainings conducted by the project. STELCO is conducting periodic inspection every six months. During the inspection, young staff are trained through On the Job Training (OJT) on maintenance work. Although no additional trainings on operation and maintenance were conducted by external agencies etc. after the project, STELCO has not encountered problems in maintaining the current PV system with the skills and techniques acquired through the project. STELCO technicians are following the manuals developed by the project to do the maintenance work because the O&M Agreement mandates the use of these manuals in their maintenance work.

The technical level of STELCO staff is sufficient, technical guidance within the organization are adequately conducted, and the manuals are developed and utilized for O&M work. Therefore, no particular problems are found in the technical aspect of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The RED fund was established by MEE in order to accumulate the revenue from solar PV

¹⁴ A grant mechanism that credits solar PV system owners for the electricity they add to the grid by setting power purchasing prices by law. It is usually intended for promotion of renewable energy.

power generation. Memorandum of Agreement and Articles of Incorporation were also formulated for the management of the fund.

Records of MEE and STELCO reveal that the revenue from PV power generation has been enough to cover the maintenance cost the records also show that the maintenance cost is disbursed as identified in the O&M Agreement. Therefore, there is a sufficient financial source for operating and maintaining the solar PV systems deployed in the project. After subtracting the maintenance cost from the revenue, STELCO sends the remaining balance to the RED fund every month.

Table 9 Balance of RED Fund

Unit: MVR

	2012 (Oct to Dec)	2013 (Jan to Dec)	2014 (Jan to Dec)	2015 (Jan to Aug)
Revenue from PV power generation	191,166	2,219,977	2,392,423	1,530,922
O&M Cost	41,647	1,069,325	980,552	544,885
Balance of the above sent to MEE from STELCO	149,519	1,150,652	1,411,871	986,037

Sources: Provided by STELCO

STELCO's administrative performance was not possible to evaluate because they did not disclose their financial statements. However, STELCO finance division revealed that the general and administrative expenses of the organization had been 6 to 8 % of their total revenue. From 2010 to 2015, regular maintenance work was done using this allocated budget. In the same period, STELCO also allocated 18 to 20 % of the total revenue as maintenance expense that covers occasional and large scale repair and maintenance. In 2016, allocation for general administrative and maintenance expenses are expected to be almost the same as past years. Also, in case STELCO's revenues could not cover the cost of power generation, Ministry of Finance (MoF) would provide subsidies to compensate the negative balance. Therefore, although financial statements were not available, there has been stable allocation for general administrative and maintenance expenses in the past six years. Also, STELCO is a 100% government funded company and there is a mechanism of compensation from the MoF, thus, STELCO is unlikely to have an immediate financial problem.

From the above, the financial sources are secured for operating and maintaining the solar PV systems deployed in the project, thus, there is no particular problems in the financial aspects.

3.5.4 Current Status of Operation and Maintenance

No major problems were reported on the operation and maintenance of the following equipment at the 12 sites by the time of the ex-post evaluation except some slight problems with telecommunication and computer system of the measuring devices.

- 1) Solar cell panel
- 2) Installation stand
- 3) Junction box, Collector box
- 4) Power conditioner
- 5) Transformer
- 6) Power generation display device etc.
- 7) Measuring device
- 8) Power distribution material
- 9) Spare parts
- 10) Tools for maintenance and test equipment

The computer system of the measuring devices has the following malfunctions:

- Failure of telecommunication line: Communication line failure is reported between a personal computer (PC) for monitoring at Social Center to STELCO. STELCO is not able to receive data from Social Center and a staff is making a regular visit to check the operational status. STELCO has asked the service provider to fix the problem but the same problem reoccurred. STELCO plans to request a periodic check to the service provider.
- Problem with software: A software installed to STELCO's computer for remote monitoring and data uploading at the 12 sites encounters occasional errors. The errors can be solved when the program is restarted but the STELCO staff may not be able to handle the problems when they have to install the software to new PCs or some serious problems occur. STELCO communicated with the distributor for a possible solution before it develops into a serious problem.
- Minor problems of PC: PC was installed for monitoring and sending the data of the generated electricity to STELCO at each site. Operation of some PCs becomes occasionally unstable. STELCO is planning to contact a distributor in Maldives to conduct tune-up for the PCs.

The above minor issues would not directly affect the power generating performance and sustainability of the solar PV systems and STELCO has a plan to address these issues. Overall, the solar PV systems at 12 sites are operational and well maintained without a serious problem.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to improve the power generating capacity, diversify energy supply sources, and build awareness among the citizens on renewable energy through installation of PV equipment at five sites in Malé and Hulumalé and training of technicians, thereby contributing to promote joint efforts of Japan and Maldives to address climate change.

The project has been highly relevant to development policies and development needs of Maldives both at times of the project planning and the ex-post evaluation. The project was consistent with Japanese ODA policy toward Maldives at the time of its planning stage. Therefore, its relevance is high. Although the project cost was within the planned budget, the project period exceeded its original plan because of two additional procurements of solar PV equipment. Therefore, efficiency of the project is fair. Quantitative indicators of the project's objective including electric power generation, diesel displacement, and reduction of CO₂ surpassed their targets at the time of the ex-post evaluation. In addition, at the project sites where the solar PV systems were installed, building users showed their increased awareness on solar and renewable energy. MEE and STELCO successfully installed their domestic solar PV systems using the knowledge and experiences from the project. The data and knowledge of the project were also utilized in the implementation of subsequent solar PV projects by other donors in Maldives. Thus, the project produced most of the expected effects. Therefore, the effectiveness and impact of the project are high. No major problems have been observed in the institutional, technical and financial aspects of operation and maintenance of the PV systems. Therefore, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agencies

- MEE and STELCO should update the O&M Agreement as soon as MEA officially revises the policies on feed-in tariff.
- MEE should prepare concrete financial and activities plans for utilization of the RED fund to promote renewable energy and its R&D activities projects as well as research and development on renewable energy.
- STELCO should make sure to prevent any technical deficiency in telecommunication for the monitoring PC at Social Center through periodic monitoring by the provider. Regarding the software of the monitoring PC, STELCO should keep communicating with the distributor to fix its malfunction. For the malfunctions of the PCs at each site, STELCO should also contact the distributor for tune-up to improve the unstable operations.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

(1) Importance of Using Solar PV System sites as an Environmental Education Material for Awareness Raising of the Public and Promotion of the project.

Two qualitative effects were set for the project at the planning stage. One was raising awareness among the public of promoting the use of renewable energy and the other was presenting Japan's initiative in addressing climate change. However, there were no activities implemented to directly contribute to these effects except the exhibition effects of the solar PV systems. MEE stated that they carried out video making and other public awareness building activities. However, the evaluator was not able to obtain the records and reports of such activities. Thus, the consequences of MEE's activities remain unknown. For these qualitative effects, the concrete activity plans and verifiable indicators should have been set in the project design. For example, the project plan could have included activities such as an exposure to mass media i.e., newspaper and TV, environmental education at schools using the education materials and promotional video explaining the mechanism of power generation of solar PV, and public relations events by collaborating with local private companies to advertise Japanese PV products. Through these promotional activities, the project could have further contributed to raise awareness of Maldivian citizens on renewable energy and to advertising Japan's assistance. It would also be important to conduct questionnaire survey for the participants to examine the effects of such campaign and promotional activities.

Solar PV system is an environment-friendly facility that can serve as an environmental education material. When a similar project is implemented in the future, solar PV system should be utilized to the maximum to sensitize both children and adults on environment and energy conservation and to familiarize them with Japanese assistance, technology, and products.

(2) Securing O&M Budget and Motivating the Implementing Agencies for Sustainable Maintenance of the Solar PV System

The solar PV systems installed by the project are maintained by STELCO and MEE in a good condition even after the project. Many factors contributed to such sustainable maintenance: sufficient trainings provided by the project, availability of capable staff at STECO, and high prioritization of solar PV introduction both at MEE and STELCO. There are, among others, two unique factors that contributed to the satisfactory maintenance status of the solar PV systems. First, establishment of the RED fund succeeded in securing financial source of the operation and maintenance. Second, strategic site selection enabled the solar PV systems to catch people's attention and to motivate STELCO and MEE to maintain the equipment in a good condition. The details are elaborated as follows.

<Contributing Factor 1: Revenue from PV Power Generation to Cover the Maintenance Cost>

In this project, Japan and Maldives sides agreed that the revenue from power generation of the PV systems would be calculated using the metered data. The calculated revenue was expected to cover the maintenance cost. This enabled STELCO to secure budget for maintenance monthly. After subtracting the maintenance cost from the revenue, the remaining balance is sent to the RED fund as set forth in the O&M Agreement signed between MEE and STELCO. Such way of securing maintenance cost would be useful for other renewable energy promotion projects.

<Contributing Factor 2: Installation of Solar PV systems at Prominent Locations>

The solar PV systems were installed at busy, prominent locations such as the President's Office and Velaanaage Building, the highest building in Maldives, to attract people's attention. The PV systems are also a popular destination for important guests to MEE. These situations might have put STELCO and MEE under some pressure, which in turn motivated them to maintain the equipment in a good condition. STELCO uses the photos and data of the solar PV systems for presentation materials at foreign conferences and investors' forums etc. Selecting strategic locations to catch people's attention would be useful not only for promotion and exhibition purposes but also for motivating the implementing agencies to maintain the equipment in a good condition.

(End of the report)