Output 4: Institutional testing system for PV equipment is developed.

Table 3-5: Achievements under Output 4 as per the indicators

Objectively Verifiable Indicators	Achievement
4-1: No. of tested PV system components (more than 10 models of panels, 5 models of controllers, 5 models of batteries & 3 models of inverters)	Panel 3 Controller 2 Battery 1 PV Lantern 4
4-2: Maintenance condition of testing machines	Trainers do not feel comfortable using the PV testing machine, and concerned about its maintenance.
Additional Indicators 1.Developed Material	PV Testing Manual
2.Targeting group and no. of participants on PV testing	15 (7 from 3 educational institutions, 6 from GSB, 2 from MOEn)

Achievement of Output 4 is limited, since the scope of work was narrowed down at the time of the Monitoring Mission in July 2010.

As regards to the PV testing training for the GSB, it requires a huge investment for both the Project and the Ghana Standard Board (GSB) to establish the proper testing system of PV equipment. Therefore, using a simpler method, the Project demonstrated the procedure of how to conduct the testing of PV components to the resource persons of the GSB.

On the other, with regard to the training for the educational institutions, the resource persons selected from KNUST, the Tamale and Korofidua polytechnics were trained (the GSB staff also participated in the training as observers). The testing method demonstrated by the JICA experts was quite new knowledge to them and contributed to their good understanding of PV testing system.

The components used for the training are shown in the indicator 4-1.

Although PV testing equipment was provided to KNUST and Tamale Polytechnic by the project, it was difficult for them to understand the method of how to use it[24]. They are also not confident in teaching PV testing procedure to the students using the equipment. In addition, according to the interview with the trainers from the institutions, we found that the software, i.e., LabView, was not fully utilized, although it was requested by the institutions.

In the initial stage of the Project, it aimed to establish the accreditation system for the certification of PV equipment. However, the establishment of the national accreditation system requires the dubious process. In light of this circumstance, it was difficult for the project to pursue the task due to the limited financial and manpower capacity. As a result, at the time of Monitoring Mission, the JICA and the Ghanaian sides agreed that the Project changed the scope of work and focused on the technology

[24] The equipment suitable for the level of national testing requires large investment. On the other hand, the equipment for educational purpose requires a simpler model. Since the provision of PV testing equipment at GSB was initially requested to set up the PV testing mechanism in Ghana, the Project had to compromise by providing models which can serve the defacto testing level, ending up much more sophisticated than ones for educational purpose. Furthermore, some of the short-term experts (i.e., the one dispatched by the manufacturer) were not the suitable person to provide PV testing training.

transfer of only PV lantern testing, whose needs were growing in the Ghanaian market.

In 2010 and 2011, the PV lantern test was conducted based on the PV GAP. A review workshop for the PV testing is planned to be conducted in the GSB during the evaluation period.

Output 5: The roles of the respective stakeholders are clarified and the collaboration among the stakeholders is strengthened.

Table 3-6: Achievements under Output 5 as per the indicators

Objectively Verifiable Indicators	Achievement
5-1: No. of conducted JCC and stakeholders' meetings (seminars/workshops which shared project achievement)	JCC: 5 (2008 July, 2008 November, 2009 September, 2010 March, 2010 October) Seminar "Report on project impact" (2010 October)
5-2: The minutes of JCC and stakeholders' meetings	5 minutes of JCC meeting, PPT at the time of seminar
5-3: No. and Quality of public relations (Kinds and no. of PR material developed)	1 Brochure 500, 3 kinds of Posters 500, Stickers for PV lantern 200, Video 500 (under development).
Additional Indicators 1.Developed TOR of each respective stakeholder	Brief role of each stakeholder was indicated in the Project report.
2.Positive/negative changes in relationships between MOEn, MOED and other actors through the Project	Through TOT, three educational institutions developed their network to share their ideas.
3. No. of MOU signed	None[25]

Achievement of Output 5 is partial at the time of the Terminal Evaluation.

Original idea of Output 5 was based on the motivation to establish a new scheme for developing human resources. To do so, the role sharing of the stakeholders must be clarified. This was most likely the premise for the set-up of Output 5.

Although the project tried to clarify the roles of individual stakeholders and prepared a draft document in the early stage of the project, common understanding was not shared among the stakeholders.

When the Project introduced CSS business model in 2010, needs for clarifying the role of each stakeholder (i.e., MOEn, DA and concessionaire) suddenly emerged. The Project formulated the model MOU for the implementation of the CSS pilot project. At the time of terminal evaluation, most MOUs were still in the stage of verbal agreement and have not yet been signed. On the other hand, the MOU developed by the project was highly appreciated by MOEn. The MOEn incorporated the concept of MOU in the operation of the Spanish project.

The materials for promoting the use of PV systems developed by the project were also accepted among stakeholders. The materials were well designed, they said. The pictorial explanation was praised, because it facilitated the understanding of readers who did not have any high educational background.

[25] MOEn is waiting for the signatures of other parties (i.e., DAs and concessionaires) in all MOUs before appending his signature. The no. of MOU which has been signed by DA and concessionaires but not by MOEn is 11 out of 24 sites.

Three educational institutions developed the network among them to share the ideas related to PV and the CSS business model. In addition, the PV testing training was a good opportunity for them to interact with GSB. However, the collaboration with and among other stakeholders seems limited.

3.4 Achievement of the Project Purpose

Project Purpose: The bases for the human resource development for PV rural electrification are prepared.

Table 3-7: Achievements under Project Purpose as per the assigned indicators

Objectively Verifiable Indicators	Achievement
No. of conducted training	・CA Training: 16 (including 3 conducted by educational institutions) ・Trainer Training: 3 ・PV Testing: 3 ・LED Practice Training: 1[26] ・AGSI Joint Training :2 ・Lantern Test Training: 1
Developed materials	Technical Service Guideline Technical Guideline for PV Rural Electrification PV Testing Manual CA Manual CS Manual (Practice Board) Brochure "Solar Energy is good for you!" 3 kinds of Posters Stickers for PV Lantern Video (under development)
No. of tested PV system components (more than 10 models of panels, 5 models of controllers, 5 models of batteries, 3 models of inverters)	Panel 3 Controller 2 Battery 1 PV Lantern 4
No. of trained PVA and CA	No. of trained PVA:36 (AGSI joint training) No. of trained CA: 59
Lectures and developed materials in educational institutes	N/A

The evaluation team found that the Japanese and the Ghanaian sides had different views of the Project purpose. The Japanese side recognized that the Project purpose was to develop human resources for the promotion of rural electrification using the PV system and establish the necessary institutional and organizational mechanisms. On the other, the Ghanaian side understood that the purpose was to establish sustainable pilot models of the PV system.

The above indicators for the Project purpose are the duplication of Output indicators, some of which were missing targets. Due to the inappropriate indicators shown in the Project purpose, the two sides

[26] Following training was repeated for each group. PV testing: (1)2 groups, (2)1 group, (3)2 groups; LED Practice: 3 groups

might have different images of the Project purpose.

Based on the understanding of the Japanese side, achievement of the Project purpose is less than expected at the time of Terminal Evaluation, mainly because the core component of the PVA training faded out from the scope of the Project.

In light of the above indicators, which are the same as Output level, 9 kinds of developed materials were appreciated, more than the targeted number of CAs were trained, and 36 PVAs were trained to implement the CSS business model. However, only less than half of the targeted number of PV components was tested.

Conversely, based on the understanding of the Ghanaian side, achievement of Project purpose would not meet the target at the time of Terminal Evaluation, if their target were to make the CSS business at 24 sites sustainably operational. The operation of the CSS business model is still fragile, and it is still early to examine the sustainability of the CSS pilot project.

3.5 Implementation Process of the Project

(1) Inhibiting factors

The communication and decision-making was not always smooth between JICA Project team and the counterparts. This situation deteriorated their sentiment for mutual trust and the project ownership, and resulted in the delay of the scheduled activities. The main causes, which affected on the communication, were as follows:

1) The needs of Ghanaian side were not sufficiently reflected in the project formulation.
2) The Japanese side did not involve the Ghanaian counterparts effectively.
3) The role of the Joint Coordination Committee meeting did not function properly.

Another crucial point was that common understanding of the Project purpose was not formulated. This situation made the Project difficult to set up the clear direction. It took almost half of the initial Project duration to formulate the Human Resource Development Plan (HRDP), which was supposed to be the foundation of the Project. The delay of the formulation of the HRDP caused various negative effects. An example could be the selection of unsuitable PV testing equipment. To avoid the delay in starting the activities, the Project procured the equipment before finalizing HRDP. Without having the clear objective and the targeting users of PV testing equipment, the Project compromised on the selection of equipment provided at two educational institutions. It was lower level for what GSB required, but too sophisticated for the educational purpose.

The delay of formulating HRDP caused another delay in the progress of the Project. The CSS pilot project was only started in the latter part of the Project duration, and MOEn was less eager to be involved in the initial implementation of the CSS pilot project. The selection of the CSS project sites and the installation work were also delayed. As a result, the Project could not have sufficient monitoring period to examine the sustainability of the CSS business model. Furthermore, the budget shortage of the MOEn side became another constraint when the monitoring activity started[27].

The weak implementation structure of the Project also affected on the establishment of the official

[27] JICA covered some monitoring cost of MOEn staff.

relationship between the Project and some counterpart institutions. In the beginning, the communication was not conducted by the official channel, but by channels of individual staff. Management of some counterpart institutions was not aware of the involvement in the JICA project.

The PDM was not revised, when Monitoring Mission visited Ghana, although some components of the Project were changed. This became a constraint for the terminal evaluation, since the PDM did not reflect the current status of the Project holistically. This could be stemmed from the insufficient understanding on the role of PDM, as the evaluation team found that PDM and PO were not fully utilized as management and monitoring tools.

Lastly, it was the first experience for most of the counterpart institutions to participate in a JICA technical cooperation project. Unfamiliarity of JICA management step could have affected on the development of decision-making consensus and the relationship of the Japanese and Ghanaian parties. At the initial stage of the Project, the common understanding on JICA management procedure could have been developed.

(2) Promoting Factors

The commencement of the CSS pilot project enhanced the involvement and the ownership of MOEn, since the sustainable O&M scheme for the PV projects was what MOEn had been seeking.

The dispatch of the Monitoring Mission by JICA created a good opportunity to assess the progress of the activities and provide the recommendations to sort out the issues. However, the timing of the mission, which also played the role of the mid-evaluation, was five months before the end of the original Project duration.

4. Result of Evaluation

4.1 Evaluation by Five Criteria

4.1.1 Relevance

Relevance of the Project is high in terms of the needs and the policies of the governments of Ghana (GoG) and Japan (GoJ), but relatively low in terms of the selection of target group and the Project approach.

(1) The needs and policies of GoG and GoJ

The Project is coherent with the needs and policy priorities of GoG as expressed in the Ghana Shared Growth and Development Agenda (GSGDA) and the National Energy Policy, as well as the Energy Sector Strategy and Development Plan, which promotes rural electrification, targeting the universal access to electricity by 2020. The project is also relevant to the JICA's priority areas of development assistance for Ghana (i.e., rural development and private sector development).

(2) Selection of target group

Selection of the target group for the Project activities was not focused clearly[28]. The Project contained

[28] In the Project, the definition of counterpart, stakeholder and target group were not clearly differentiated.

various target groups, in which officials of concerned ministries were selected. However, the most of the activities targeted the trainers of the educational institutions. Even though MOEn was selected as one of the target groups, the officials were not much benefited in the respect of the capacity building until the introduction of the CSS pilot project. Another target group of the Project was MOEd, but their role was not clearly defined in the Project.

Furthermore, the Project also targeted GSB. However, the feasibility of establishing the PV testing and accreditation systems was not much taken into the consideration.

(3) The approach of the Project

The MOEn was seeking a pilot project scheme, which secured the sustainable operation of the PV system, after facing the difficulties in maintaining the PV facilities installed in the RESPRO project. However, the Project was formulated focusing only on human resource development.

Co-existence of AGSI's PVA training was not taken seriously into account as the pre-condition, which affected the effectiveness and the efficiency of the Project[29].

Lastly, the exit strategy was not considered in the project design, which was an important step to ensure the project sustainability.

(4) Scope of the Project compared to the size of inputs

The average input of short-term experts in Ghana was 11.88MM one year, and the initial duration of the Project was three years.[30] Based on the size of this input, the scope of work of the Project was too broad, since the level of the scope was equivalent to that of a large programme.

4.1.2 Effectiveness

The effectiveness of the Project found lower than expected. Most Outputs have not produced the expected effects; as a result, the level of the achievement of the project purpose was less than expected at the time of the Terminal Evaluation.

The issues, which affected the effectiveness of the Project, are as follows.

The core of the Project was to establish the mechanism for training local technicians in rural areas but the mechanism, in other words, PV-technician training had been conducted by AGSI. For this reason, the Project phased out the PVA training (Output 1). The roles of TOT became in limbo, and the activities of TOT were lapse in 2009. This major setback reduced the effectiveness and the efficiency of the Project.

One of the most crucial factors, which delayed the progress of activities and lowered the effectiveness of the Project, was the lack of common understanding of the Project purpose between the Japanese and the Ghanaian sides. This situation stemmed from the not-well-designed project formulation. During the first two-year period, the project did not function effectively; instead, most of the time was consumed for the discussion of the project direction. Another factor was the counterparts' weak

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[29] At the time of ex-ante evaluation, Deng was interviewed and raised their concerns if JICA Project was to come into PVA training, seeking some measures to avoid competition.

[30] Average duration is during the 2nd ~ 5th year of Japanese calendar which is during 2008~2011 in western calendar.

ownership of the Project due mainly to the insufficient involvement of the Ghanaian side. As a result, the Ghanaian side was not motivated enough to proactively lead the Project.

The scope of the Project was far larger than the inputs. As a result, the effect of most activities could not be produced as expected, ending the diffusion of the efforts.

4.1.3 Efficiency

The efficiency of the Project was not satisfactory.

The scope of the Project was designed too broad as compared to the size of inputs. At the time of the visit of the Monitoring Mission, it was found that it was impossible to address the project scope with the available resources. As a result, the scope of the Output 1 and 4 was narrowed down and the duration of the Project was extended for another one year. Considering the narrowing down of the scope, the input already made for PVA training was a compromise in the resource efficiency.

Launching 24 CSS pilot projects in eight scattered regions was not efficient, especially from the viewpoint of logistics required for monitoring. The stage of launching pilot project requires intensive follow-up on the progress of activities to establish the model. It would be more efficient to extract the lessons learnt from small number of pilot sites in limited areas and then disseminate the selected pilot models in other regions.

The efficiency of human resource management by the Project was not satisfactory. The Project employed one local staff, who was a national service (not a regular staff) assigned to the Project by MOEn. Still, this was not sufficient to cover the numerous tasks, which the Japanese expert had to handle. Moreover, the Japanese expert himself had to travel throughout the country to discuss with DAs and supervise the installation of PV system. This could have been done by the staff of MOEn. If they were not available, a local consultant could have been hired.

Simultaneously targeting various agencies as well as educational agencies appeared to reduce efficiency. The involvement of a number of agencies made the Project team difficult especially to build consensus among the parties, and it also took long time[31].

4.1.4 Impact

Overall Goal: PV systems are in sustainable use.

The impact of this project as per the Overall Goal could not be assessed at this stage due to the lack of obtainable set of data. Although PV system was not defined specifically, nor the no. is obtainable, it is reported that the no. of PV systems in general has been significantly growing during the Project period; it was not by the effect of the Project, but mainly with the other assistance of GEDAP, Cocoa Board, Cadbury Cocoa Partnership and NGOs etc.

This evaluation did not assess the impact of the project as per the Super Goal "The PV industry develops," since the impact by the Project at this stage is likely to be minimal[3233].

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[31] MOEn, MOEd, KNUST, Tamale and Koforidua Polytehcnic, GSB, PVA and CA were set as target groups in PDM1.

[32] According to the current JICA evaluation guidelines, Super Goal is not set, nor assessed.

Other positive effects produced by the Project are as follows:

1. MOEn has incorporated the CSS business model developed by the JICA Project into the Spanish Project which plans to install 1,284 PV systems in 8 Districts of 4 Regions. The MOEn under Spanish Project planned to seek the maintenance cost to relevant ministries which are currently covering the electricity cost at public facilities (i.e. health centre, school). With the recent introduction of CSS business model, the maintenance cost of some PV facilities is to be covered by the revenue generated from BCS at 173 sites.[34]. MOEn has also incorporated the concept of the MOU into the Spanish Project. Training of local technicians is also planned. This can be deduced that MOEn realized the importance of O&M and financial aspects as well as the capacity building of local people to keep their project sustainable. In the past, however, their focus was more geared towards the provision of equipment and the number of PV systems installed.
2. Both technical and promotional materials developed by the Project were well-accepted and utilized in the Spanish Project and GEDAP. These materials contribute to the dissemination of the PV systems in Ghana.
3. Trained trainers of the educational institutions and PVAs involved in the Project have been inspired by the PV BCS business model. They are expected to be centres for disseminating the PV BCS business.
4. Under the CSS business model, local employment is expected to be created if CAs is properly paid their fees.
5. Community people benefit from the CSS business model. For example, those who used to bicycle or take transportation to nearby town to charge their mobile phone can now utilize their time and transportation cost for other purpose. More appreciated impact is that the midwives at the health centre can conduct delivery operation more easily at night.
6. Three educational institutions developed the network among them to share ideas related to PV system. This was unforeseen positive impact.
7. The study tour in Bangladesh broadened the insight of the participants in PV industry. Although MOEn has been implementing CA training under the Project, MOEn deepened their understanding on the importance of capacity developing and the involvement of local communities. MOEn incorporated these aspects in the Spanish Project, in which local technicians would also be trained as PVAs or CAs. MOEn also incorporated the financial scheme similar to the micro finance applied in Grameen Shakti under GEDAP Project. In addition, participants are exposed to the local assembling of PV equipment. This cannot be implemented at this stage since Grameen Shakti has much more favourable political and financial supports which do not lie in Ghana. However, the participants has future plan on exploring the possibility to establish the local assembling capacity and mechanism.

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[33] At the time of Terminal Evaluation, the set indicators for Super Goal under PDM1 were 1) the sale of the PV industry was not obtainable; 2) the no. of companies and entrepreneurs belonging to AGSI was 18.

[34] At the time of terminal evaluation, actual no. of PV system installed 818; actual no. of BCS installed 55 in 7 Districts.

4.1.5 Sustainability

Policy Environment

Political sustainability is high. Dissemination of the PV system is one of the strategic priorities of MOEn. Currently, the Renewable Energy Bill (REB) is under the formulation, and many foreign companies have already expressed their interests in investment in the favourable environment of the PV sector. In addition, the development of Energy Master Plan (EMP), mapping the areas to be covered by the rural electrification plan, recently started with the assistance of GEDAP. EMP is expected to be completed by 2012 and to provide good guidance for donors assisting PV dissemination. Passage of the Renewable Energy Bill and the completion of the Energy Master Plan are expected to enhance donors' assistance for PV dissemination in Ghana.

Institutional aspects

The operational scheme for the CSS business model is still fragile. At most of the CSS sites in the Project, relevant parties, such as DAs, concessionaires and PVAs, have not yet decided the details of business management, and in some sites, discussion between DA and concessionaires have not started[35]. Moreover, prior to the initiation of CSS operation, MOUs must be signed among relevant three parties. However, in reality, signing of MOU has not been completed in any site[36].

MOEn has already replicated the business CSS business model in the Spanish Project. However, the concern remains on the two-tier mechanism of CSS monitoring: MOEn requires DAs to supervise the CSS operation, and DAs require the concessionaire to report the status of the CSS operation. Since there is no independent implementing agency at this moment, MOEn is covering both policy formulation and the implementation of the Project. Thus, the concerns are that the monitoring of numerous DAs might become a burden on MOEn. Currently the establishment of the implementation agency, Renewable Energy Authority, is proposed at the Parliament. This clause is to be included under Renewable Energy Bill. However, its establishment is still uncertain. In the meantime, some measures may need to be considered to support the tasks of MOEn[37].

Financial Sustainability

In light of the current financial and organizational situations up to now, the Project has paid for the monitoring cost of MOEn. Therefore, MOEn's financial sustainability is a challenge after the termination of the Project period. Because somebody must pay the necessary cost for the continuation of the initiatives started by the Project (i.e., TOT and CA trainings, provision and installation/transfer

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[35] In CSS business model under JICA project, details of operational business management need to be decided between DA and concessionaires, such as amount of revenue to be paid to DA, concessionaires, CAs and amount to be saved for the future replacement of butteries and maintenance. According to MOEn, in CSS business model under Spanish project, all of operational details are to be decided by DA.

[36] See footnote 24.

[37] Under JICA Project scheme, the provided equipment can be transferred only to the public agencies. Therefore, DA was assigned as the owner of equipment and the responsible agency for monitoring CSS operation. However, another possibility could be explored if the condition differs

of the CSS facilities), a new funding mechanism must be explored.

Technical aspects

Technical sustainability needs to be further strengthened.

The tools and manuals produced by the Project continue to contribute greatly to the technical sustainability, if anybody can easily obtain them at any time. At least, it is needed for the Project to clarify the copyright of the materials or conditions for reprint and modification by MOEn.

Although the CA training method was established by the Project, whether PV dealers (i.e., PVAs in the Project) utilize the CA training method properly at the site, is not guaranteed without having any supervision.

As regards the sustainability of CSS business model in the educational institutions, the ownership level of the CSS business model seems relatively high. Two out of three are eager to expand their business sites so that more educational practical sites will be available. However, their skill of project management is still weak; installation work at one site has not yet completed, and details of site operation at two sites have also not yet decided.

As far as the skills of PV testing is concerned, it is still questionable as to whether they have capacity enough to use the whole functions of the provided PV testing equipment and can continue to maintain the equipment.

4.2 Conclusion

Regarding the relevance, the needs and the policies of GoG and GoJ were met, while it was less in terms of the selection of the target group and the approach of the Project. The latter issue became the main causes for reducing the effectiveness and the efficiency. The Project produced various positive effects, which have contributed to the capacity development of human resource in the PV sector. GoG is expected to make further efforts to secure the sustainability of the initiatives started by the Project. Overall, the impact of the Project is found high, although the Project seems difficult to achieve the expected level of the Project purpose.

The Project went through the struggles of phasing out one of the planned core activities, i.e., the PVA training. The Project has enhanced skills of individuals especially in the three educational institutions at the personal level. The institutionalisation of the development of skills and knowledge of PV technicians has not yet been established. The Project highlighted the importance of the maintenance by introducing the business concept. In addition, the Project developed a new scheme for a sustainable PV operation and materialized the scheme as the CSS business model. This model produced the positive impacts, although its sustainability needs to be examined. Tangible outputs of the Project are the developed technical and promotional materials, which are expected to be used widely, contributing to the development of the PV sector in Ghana.

5. Recommendations and Lessons Learnt

5.1 Recommendations

For the Project and MOEn

(1) To guide DA and educational institutions on the operational details of CSS business models

- Business management: to provide several options and good practices from already functional sites so that DA and concessionaires can decide on the details, MOUs can be signed, and CSs can be paid their fees.
- Monitoring: to advise DA to assign (a) person(s) in charge (possibly including a DA technician) and decide frequency of monitoring and items to be monitored.
- Annual report: to design a model form to make DAs easy to write the report and also support MOEn to compile collected data from DAs.

(2) To involve DAs more on the CSS business model and facilitate the development of their capacity (e.g., inviting DAs to the CA training, showing promotion videos) so that DA understands the basic mechanism of PV system, recognizes their ownership of CSS business and monitors CSS sites properly.

(3) To consider the inclusion of other options such as teacher's quarters and secondary schools when selecting the site for installing PV systems at public facilities in communities where CSS are yet to be installed,;

(4) To solve the issues (i.e. inappropriate usage of BCS) and prepare for the transfer of CSS equipment in several sites[38];

(5) To continue MOEn's monitoring at the CSS sites, where the Project installed facilities, and to have MOEn submit the report which compiles data from DA to the JICA office, if requested. By doing so, the sustainability of the CSS business model can be secured.

(6) To establish the common understanding of the required capacity level of CA so that the measures can be explored to ensure CAs achieve the necessary level after receiving the CA training.

(7) To discuss the possible management structure of MOEn for supervising numerous DAs, if MOEn continues to expand CSS sites after the termination of the Project[39].

(8) To clarify the copyright and other conditions in order to make MOEn and other parties easy to reprint and modify the materials developed by the Project.

(9) To hold a seminar or workshop to share the outcome of the Project with other relevant agencies and NGOs in the PV sector.

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[38] (1) To discuss on the proper utilisation of electricity in Kul Kurni (2) To reconsider the necessity of nominating replacement site of Kelegan (3) To decide on the detail plan on transferring CSS in Belmezado, Azanu, Tekporkope, Kodorkope to other sites (transfer plan before/after the termination of Project, nomination of new sites, cost for installation and CA training to be budgeted in MOEn if the transfer is after the termination of Project)

[39] See footnote 34.

For the Project and KNUST, the Tamale and Koforidua polytechnics

(1) To submit proposals on the weekend PV course, which is expected to start in October, to the JICA experts.

(2) To provide an opportunity to re-train on how to use PV testing equipment so that their skills can be well-established.

5.2 Lessons Learnt

Project Design

(1) After taking a necessary step to clarify the role of each stakeholder, it is important to focus the targeting group so that the effect of Project can be produced effectively on the target group. Furthermore, it is necessary to balance the scope of the Project by considering the amount and the quality of inputs so that the resources can be utilized efficiently to produce the expected outcome;

(2) It is necessary to establish the common understanding of the Project by sufficient discussion, survey of the situation and the feasibility on the ground, and consideration of the needs of the country and the necessary pre-conditions, so that the effective Project can be designed.

(3) Limitation of the number and the area of pilot project sites is more effective and efficient way at the time of starting so that the close monitoring and follow-up survey can be provided. Once the model is formulated in a concrete manner, the number of sites can be increased by taking into account of the lessons learnt from the initial projects.

Project Management

(1) It is effective to start the training that addresses the counterparts' immediate needs for raising the level of motivation of and ownership by the counterparts, since the effects of capacity development are often intangible and difficult to feel.

(2) It is recommended to utilise PDM and PO sufficiently as management and monitoring tools by building common understanding of the Project purpose, and to establish joint monitoring mechanism on indicators. It is also effective to conduct a joint mid-term evaluation in an appropriate timing so that the achievement degree of each output can be assessed, challenges can be addressed, and the direction of the Project can be adjusted, if necessary;

CSS business model

(1) It is important to set the site selection criteria to secure the fairness and the sustainability of business, such as the plan of electrification, the feasible site location of monitoring, the closeness to markets, and the possibility of competition with existing BCS, etc[40].

(2) Capacity building regarding business management is essential to secure the sustainability of the CSS business model in addition to the technical aspect.

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[40] See footnote 13 for the site criteria set by the Project.

ANNEX 1. Schedule of the evaluation team

		Leader Mr. Kito	PV Advisor Mr. Ogawa	Study Coordination Ms. Okusa	Evaluation Analyst 1 Ms. Iseki	Evaluation Analyst 2 Mr. Nagino
18-Jul	Mon				Leave Tokyo	
19-Jul	Tue				Arrive at Ghana	
20-Jul	Wed	AM: JICA Ghana Office		9:00 JICA Ghana Office 14:00 Interview to JICA Experts & Project Management Team		
21-Jul	Thu	-		-	9:00 MOEn (Wisdom) 10:00 GSB PM: Leave for Kumasi	
22-Jul	Fri	-		-	Kumasi (Akyerekyerecrom)	
23-Jul	Sat	-		-	CA Training & Interview (KNUST)	
24-Jul	Sun	-		-	Kumasi→Wa	
25-Jul	Mon	-		-	Wa (Wa Poly, Piisi & Tampala)	
26-Jul	Tue	Accra→Tamale (by land)		Accra→Tamale (by land)	Wa→Bolgatanga (Kul Karni and Lambussi DA)	
27-Jul	Wed	Loagri via Bolgatanga		Loagri via Bolgatanga		
28-Jul	Thu	Tamale		Tamale (Tamale Poly & Kpalbe)		
29-Jul	Fri	Paga		Paga	Documentation in Tamale	
30-Jul	Sat	Tamale→Accra (by land)		Tamale→Accra (by land)	AM: Tamale→Accra PM: Documentation	Tamale→Volta (Danladi)
31-Jul	Sun	Documentation		Documentation	Documentation	Volta (Kabiti) & back to Accra
1-Aug	Mon	Accra	Leave Tokyo	Accra	11:00 Koforidua Poly (Mampong Nkwanta) 16:00 MOEn (Wisdom)	16:00 MOEn (Wisdom)
2-Aug	Tue	1600 Internal Mtg	Arrive Ghana	1600: Internal Mtg	10:00 Mtg with AGSI 1600 Internal Mtg	
3-Aug	Wed	9:30 Mtg at JICA Ghana Office 13:00 Mtg with MOEd (Yvonne) 14:00 Courtesy Call to MOEn (Chief Director)				
4-Aug	Thu	Documentation	Accra→Western (Ayawara)	Documentation		
5-Aug	Fri	Documentation	Western→Accra	Documentation	AM: Documentation PM: MOEn	
6-Aug	Sat	Documentation				
7-Aug	Sun	15:00 Mtg at JICA Ghana Office				
8-Aug	Mon	Preparation for MM				
9-Aug	Tue	8:30 Mtg with MOEn (Wisdom) PM: Preparation for MM				
10-Aug	Wed	Prepare the M/M, Discussion on M/M with Management Team	AM: GSB PM: Prepare the M/M, Discussion on M/M with Management Team	Prepare the M/M, Discussion on M/M with Management Team	AM: GSB Prepare the M/M, Discussion on M/M with Management Team	Prepare the M/M, Discussion on M/M with Management Team
11-Aug	Thu	-	11:00 interview with Deng 16:00 Interview with MoEn (Wisdom)	16:00 Interview with MoEn (Wisdom)	11:00 interview with Deng 16:00 Interview with MoEn (Wisdom)	
12-Aug	Fri	Report to EOJ (12:00) & JICA Ghana Office (14:00) Leave Accra (Mr. Ogawa, and Ms Iseki)				
13-Aug	Sat	-				
14-Aug	Sun	Arrive in Japan				

ANNEX 2. Project Design Matrix (PDM1)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Super Goal: The PV (Photovoltaic) industry develops.	- The sales of the PV industry - The number of companies and enterprisers belonging to AGSI (Association of Ghana Solar Industries)	- The AGSI reports	
Overall Goal: PV systems are in sustainable use.	- The number of PV systems in use, the years of operation - The number of PV systems in use at public facilities more than five years after installation.	- The reports of concerned Ministries and Agencies, - The AGSI reports	-AGSI continuously exists. - Appropriate regulation is enforced.
Project Purpose: The bases for the human resource development for PV rural electrification are prepared.	- The number of conducted training (more than 20 times) - Developed materials - The number of tested PV system components (more than 10 models of panels, 5 models of controllers, 5 models of batteries & 3 models of inverter) - The number of trained PV Agent and Community Agent - Lectures and developed materials in educational institutes	- The Project reports	- Necessary budget will be allocated.
Outputs: 1. Institutional training system for PV Agent with a business mind is developed 2. Training method for Community Agent are established 3. Students with basic knowledge for PV systems are trained 4. Institutional testing system for PV equipment is developed 5. The roles of the respective stakeholders are clarified and the collaboration among the stakeholders is strengthened	(1) - Developed training materials - Contents of training curriculum - The number of trained resource persons and PV Agent (2) -The number of conducted training (more than 20 times) - The rate of operation and failure on installed PV systems (3) - Developed materials - Quality of conducted lecture - Score of lectured students (4) -The number of tested PV system components (more than 10 models of panels, 5 models of controllers, 5 models of batteries & 3 models of inverters) - Maintenance condition of testing machines (5) -The number of conducted JCC and stakeholders' meetings - The minutes of JCC and stakeholders' meetings - The number and quality of public relations	- The Project reports	- Trained people will continue to work for dissemination of PV systems - MOE/EC provides institutional and financial assistance to the stakeholders concerned.

Activities: 1-1. Actual situation of using PV systems in Ghana is studied 1-2. Resource persons are selected 1-3. Human Resource Development Plan is developed 1-4. The technical standards and the code of practice for the PV	**Input (Japanese side)** 1.Dispatch of experts (Long term and/or short term) - PV dissemination advisor - PV system technology experts	**Input (Ghanaian side)** 1. Assignment of counterparts and administrative personnel	-The trainers trained in the Project continuously take parts in the Project.

systems are prepared 1-5. The technical service guideline is drawn up 1-6. The training materials and manuals for PV Agent are developed 1-7. Pilot project sites for Community Solar and PV Rehabilitation are identified 1-8. Community Agents are trained through installation of Community Solar and PV Rehabilitation 1-9. Lessons learnt from pilot activities are fed back to institutional training system and training materials are modified 1-10. Requirements for PV Agent training are clarified and reflected to industrial activities on PV system dissemination 2-1. Pilot project sites are selected 2-2. Training materials for Community Agent are developed 2-3. Community Agent trainings are conducted through installation of Community Solar and PV Rehabilitation 2-4. Installed PV systems are monitored and maintained 2-5. Lessons learnt from pilot activities are fed back to institutional training system and training materials are modified 3-1. Educational facilities for pilot activities are identified 3-2. Resource persons are selected 3-3. Training curriculum are developed and modified 3-4. Training materials are developed 3-5. Lectures on PV systems are conducted 3-6. Training materials are modified based on lessons learnt 4-1. Facility Development Plan are drawn up 4-2. Resource persons are selected 4-3. Testing machines for PV components are installed and testing facilities are set up 4-4. Manuals for PV components test are developed 4-5. PV components for testing are selected 4-6. PV component test is conducted along the developed manuals 5-1. The roles between PV Agent and Community Agent are clarified 5-2. The roles among related organizations (MOEn, MOEd, EC, GSB, University, Polytechnics, Industrial Sector) are clarified 5-3. The roles between the Government and Industrial sector is clarified 5-4. PR materials for disseminating PV systems are developed and distributed 5-5. Relationship among the stakeholders for sharing and exchanging information are strengthened	- PV equipment test expert 2. Provision of machinery and equipment The expected machinery and equipment are as follows: a) Equipment for training facilities b) Equipment for testing facilities c) Vehicles	2. Arrangement of land, building and facilities 3. Sharing of expenses for project implementation	

ANNEX 3. Brief Outline of JICA Project Evaluation Guideline

1. Purpose of Evaluation

The aims of JICA's evaluation of Technical Cooperation Projects are as follows:

(1) to assess the outcome of projects in order to achieve accountability to the general public of recipient country and Japan,

(2) to extract lessons learned that can be reflected in future projects, and

(3) to make recommendations to the executing agency and JICA to enhance their operations.

2. Evaluation Criteria

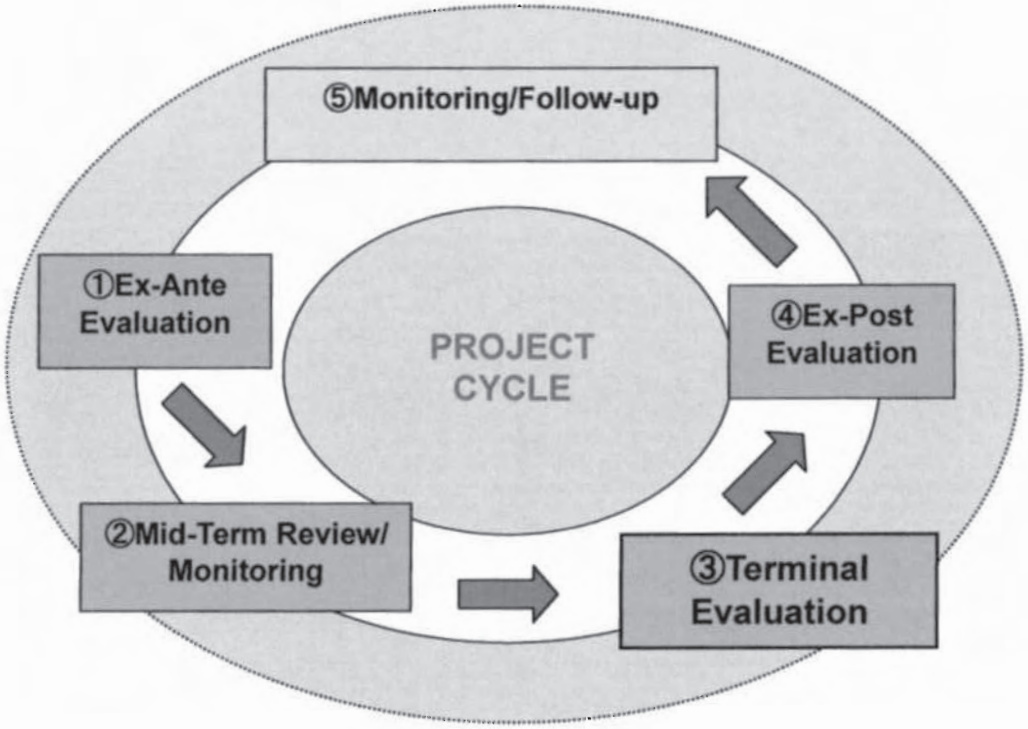
In evaluation procedures, JICA uses the five evaluation criteria established by the Development Assistance Committee of the Organization for Economic Co-operation and Development (OECD-DAC), which are internationally recognized. Projects are assessed from the following standpoints: whether they are consistent with the policies and priorities of both of the recipient and Japan (relevance); how efficient the planned input has been converted to the expected output (efficiency); whether the effects are being realized as planned (effectiveness and impacts); and whether the effects continue in the future (sustainability).

The Five DAC Evaluation Criteria

Item	Content
Relevance	To examine the relevance of project objectives and plans both at appraisal and at the time of project completion, taking into consideration changes in background factors and presumed conditions;
Efficiency	To compare plans for outputs, terms and costs with the results and analyze the efficiency of project implementation;
Effectiveness	To compare planned and actual figures using operational and effect indicators to examine the extent to which project objectives have been achieved;
Impact	To examine the direct and indirect effects of the project set as an overall goal from economic, social and the environmental perspectives;
Sustainability	To examine the medium and long-term sustainability of project effects, and consider what countermeasures are required to resolve them if problems exist.

3. Evaluation and Monitoring System

(1) JICA undertakes "Ex-Ante Evaluations" during the preparatory stages of projects and "Ex-Post Evaluations" three years after project completion in principle. With a view to enhancing the consistency of its evaluation system, JICA conducts "Mid-Term Reviews" and "Terminal Evaluation" during the project terms.



(2) Evaluation and Monitoring System for each Project Stage

(a) Ex-ante Evaluation

"Ex-Ante Evaluations" are undertaken for all projects, with a view to ensuring full accountability and transparency and to facilitating the effective and efficient implementation of ODA projects. Ex-ante evaluations verify the necessity and relevance of JICA assistance and set evaluation indicators. They are published in the form of "Ex-Ante Evaluation Reports"

(b) Mid-term Review, **Terminal Evaluation**

"Mid-Term Reviews" and "Terminal Evaluations" are undertaken to monitor the progress and achievement level of the project during the implementation stage. Terminal evaluation is performed upon the completion of a project, focusing on its efficiency, effectiveness, and sustainability. Evaluation results, lessons learned, and recommendations are shared extensively with the recipient countries and are used to improve development projects.

(c) Ex-post Evaluation

Ex-post evaluations are conducted for all projects with the designated scale after project completion so as to ensure full accountability and enhance the effectiveness and efficiency of Projects. Ex-Post Evaluations assess the Relevance, Effectiveness, Efficiency, Impacts, and Sustainability. Evaluation results, lessons learned, as well as recommendations are shared extensively with the recipient countries and are used to improve development projects.

(d) Monitoring/Follow up

In addition to JICA's routine monitoring, the Ex-post survey assesses the present situation of some projects with concerns and recommendations from the Ex-post Evaluation and so on.

The five DAC evaluation criteria assessed in each evaluation

	Evaluation Criteria	Ex-ante Evaluation	Mid-term Review	Terminal Evaluation	Ex-post Evaluation
1	**Relevance:**	●	●	●	●
2	**Efficiency:**	○	●/○	●/○	●
3	**Effectiveness:**	○	○	●/○	●
4	**Impact:**	○	●/○	●/○	●/○
5	**Sustainability:**	○	●/○	●/○	●/○

●: Examination based on the actual situation and performance
○: Examination based on forecasts and prospects

ANNEX 4. Additional indicators agreed for the Terminal Evaluation

Item	Narrative Summary	Original Objectively Verifiable Indicators	Additional/Alternative Indicators	Remark
Super Goal	The PV industry develops.	(1) The sales of the PV industry (2) No. of companies and enterprises belonging to AGSI		
Overall Goal	PV systems are in sustainable use.	(1) No. of PV systems in use, the years of operation (2) No. of PV systems in use at public facilities more than five years after installations.		Need to define "PV system." Data not obtainable, could not set the agreed alternative indicator
Project Purpose	The bases for the human resource development for PV rural electrification are prepared.	~~(1) No. of conducted training (more than 20 times)~~ ~~(2) Developed materials~~ ~~(3) No. of tested PV system components (more than 10 models of panels, 5 models of controllers, 5 models of batteries & 3 models of inverter)~~ ~~(4)No. of trained PV Agent and CA~~ ~~(5) lectures and developed materials in educational institutes~~		Set indicators are the level of Output, thus alternative indicator need to be set. However, common understanding of Project purpose was not established. Thus not possible.
Outputs	Output 1: "Institutional training system for PV Agent with a business mind is developed."	1-1: Developed training materials	(1) Agreed Human Resource Development Plan (2) No. of joint PVA training with AGSI	Usefulness of materials developed, utilization status to be assessed.
		1-2: Contents of training curriculum (CA training feedback reflected in PVA training by AGSI)		Possibility of AGSI deploying the training model of Project to be assessed
		1-3: No. of trained resource persons and PV Agent		
	Output 2: "Training method for CA are established."	2-1: No. of conducted training (more than 20 times)(and no. of trained CA)	(1) Developed CA training curriculum (2) Developed CA training material (3) How much of CSS models in the original plan start functioning	Usefulness, utilization status of developed material to be assessed.
		2-2: The rate of operation and failure on installed PV systems		
	Output 3: "Students with basic knowledge for PV systems are trained."	3-1: Developed materials		Usefulness, utilization status of developed material to be assessed.
		3-2: Quality of conducted lecture (No. of lectures and no. of participants)		
		3-3: Score of lectured students		
	Output 4: "Institutional testing system for PV equipment is developed."	4-1: No. of tested PV system components (more than 10 models of panels, 5 models of controllers, 5 models of batteries & 3 models of inverters)	(1) Developed Material (2) Targeting group and no. of participants on PV testing	
		4-2: maintenance condition of testing machines		
	Output 5: "The roles of the respective stakeholders are clarified and the collaboration among the stakeholders is strengthened."	5-1: No. of conducted JCC and stakeholders' meetings (seminars/workshops which shared project achievement)	(1)Developed TOR of each respective stakeholder	
		5-2: The minutes of JCC and stakeholders' meetings	(2)Positive/negative changes in relationships between MOEn, MOESS and other actors through the Project	
		5-3: No. and Quality of public relations (Kinds and no. of PR material developed)	(3) No. of MOU signed (CSS business model)	Reputation of developed promotional materials to be assessed.