Republic of Tunisia

Ex-Post Evaluation of Japanese ODA Loan

"Photovoltaic Rural Electrification and Water Supply Project"

External Evaluator: Machi Kaneko, Earth & Human Corporation

0. Summary

This project has aimed to improve livelihood in rural communities and promote development in the livestock industry in Tunisia by installing equipment such as solar photovoltaic systems, thereby contributing to the improvement of overall living standards in target areas.[1]

At the time of the project appraisal and ex-post evaluation there was a change in political power in Tunisia due to the Jasmine Revolution in 2011 and the shift to democratization took about four years to complete. The new government, formed in February 2015, has indicated its plan to address social and regional inequalities. At both the time of the project appraisal and ex-post evaluation, electrification of remote rural communities through solar energy and supplying of water were regarded as important developmental needs that would contribute to reducing regional inequalities in Tunisia. In addition, this project is consistent with Japan's ODA policy at the time of the project appraisal. Therefore, this project has been deemed highly relevant due to its consistency with Tunisia's Development Plan, development needs, and Japan's ODA policy.

This project consisted of two parts: (1) rural electrification by installing decentralized Solar Home Systems (SHS) at each household in remote rural communities, and (2) water supply by installing desalination equipment and solar photovoltaic systems at wells in southern rural communities. Implemented as planned, the rural electrification portion of the project contributed to electrifying 500 households in remote rural communities. SHS installed in this project are expected to aid in improving the lives of people in target households for years to come. In contrast, the water supply portion of this project, which comprised a larger portion of the project's total budget than the rural electrification portion, was not implemented during the loan period. For this reason, operation and effect indicators fell far short of the set targets as outputs for the water supply portion of the project, which accounted for numerous project targets, could not be observed in the ex-post evaluation. Comprehensively considering the above, the project has achieved limited effectiveness compared to its plan. Therefore the effectiveness and impact of the project are low.

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

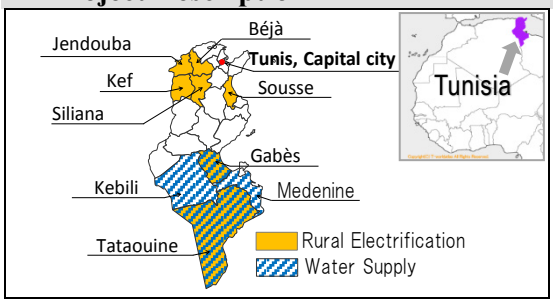
[1] The targeted region for water supply portion of the project was southern Tunisia, which relies heavily on groundwater as a water source. The plan set out to promote livestock raising by providing assistance intended to ensure drinking water (human and livestock use) to be used in the livestock trade which nomadic people of this region are engaged in.

Therefore, efficiency of the project is fair. Primary reasons for delay in the project include a significant delay in the bidding procedure of selecting consultants related to the water supply portion of the project, and in addition, considerable time was needed for coordination between relevant ministries debating the administrative structure for operation and maintenance of desalination equipment, hence, resolution could not be reached even when the loan disbursement deadline was closed.

In terms of sustainability, under the supervision of the National Agency for Energy Conservation (ANME), the SHS installed in the rural electrification portion of the project were operated and maintained with the mutual cooperation of ANME local offices, fitting contractors, and beneficiary households. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

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

1. Project Description



Project locations

Solar panels installed in the project (Siliana Governorate)

1.1 Background

Based on government-led five-year plans, the Tunisian government has aimed to improve household electrification rates since the 1980s. By the end of the Eighth Five-Year Development Plan (1992-1996), almost 100% of urban areas achieved electrification. Even nationwide, household electrification rates have steadily improved; in 1994 the average nationwide electrification rate was 86.8% but reached 96% by 2002, and the Tenth Five-Year Development Plan (2002-2006) set forth a goal to raise the average nationwide electrification rate to 97.7% by 2006.

However, because the Tunisian government has set upper limits on investment cost for electrification through development of the distribution network, rural communities, which are located far from existing distribution networks, exceed the upper limit and thus have had no distribution lines constructed. This has resulted in non-electrified settlements scattered across the remote rural regions and is a factor that causes regional inequalities

in living conditions between urban and rural areas.

Meanwhile rural communities in southern Tunisia, which receive extremely little rainfall of 100 to 200 mm annually, are dependent on the groundwater water resources. In order to secure drinking water (for humans and livestock) for the livestock raising, which is one of the major livelihoods in the region, electric power is needed to operate desalination equipment to convert saline well water to fresh water, and also needed to power pumps to pump water from deep wells. However, it is impossible to supply power through the existing distribution network since livestock wells are scattered in pastures located far from cities. It is for this reason most wells have a diesel generator set up. For diesel power, however, fuel must be transported for tens to hundreds of kilometers along unpaved roads and then stored. Maintenance has also become a huge burden due to the frequency of generator breakdowns, which occur because equipment operates in such a harsh natural environment.

Under these circumstances, this project has been planned to install independent power sources that utilize solar energy in non-electrified remote rural communities, and at water-wells in southern rural areas.

1.2 Project Outline

The objective of this project is to improve living standards in rural communities and promote development in the livestock industry in Tunisia by installing solar photovoltaic systems as alternative sources of energy, thereby contributing to the improvement of livelihood in target areas.

Loan Approved Amount / Disbursed Amount	1731 million yen / 257 million yen
Exchange of Notes Date / Loan Agreement Signing Date	June 2005 / June 2005
Terms and Conditions	Interest Rate: 0.4% Repayment Period: 40 years (of which, Grace Period is 10 years) Main Contracts: Tied (Special Terms for Economic Partnerships (STEP))
Borrower / Executing Agency(ies)	Government of the Republic of Tunisia / National Agency for Energy Conservation
Final Disbursement Date	December 2012
Main Consultant	Nihon Techno Co., Ltd. (Japan) / ALCOR (Tunisia) (joint venture)
Related Studies (Feasibility Studies, etc.)	Special Assistance for Project Formation (SAPROF) "Republic of Tunisia Photovoltaic Power Generation Project" (JICA, November 2004)

2. Outline of the Evaluation Study

2.1 External Evaluator

Machi Kaneko, Earth and Human Corporation

2.2 Duration of Evaluation Study

This ex-post evaluation study was carried out in the following schedule.

Duration of the Study: August 2014 - November 2015

Duration of Field Study: January 29 - February 27, 2015, and May 27 - June 16, 2015

2.3 Constraints during the Evaluation Study

For reasons related to safety measures in Tunisia, field studies were not performed in any parts of Kef and Jendouba Governorates, or in certain parts of Gafsa, Kebili, Medenine, and Tataouine Governorates.

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

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance to the Development Plan of Tunisia

National Development Plan

At the time of the project appraisal, the Tunisian government was promoting an economic policy intended to improve international competitiveness, address inequalities between regions, and improve productivity in the private sector through its Tenth Five-Year Plan (2002-2006), the country's national policy for socioeconomic development. The use of solar power and other renewable energy was encouraged in this plan, and in May 2003 a "presidential decree" was promulgated which encouraged the use of renewable energy, established relevant laws, and promoted public awareness in citizens. Emphasis has also been placed on rural electrification using solar energy as well as rural development and through the development of water supply facilities.

Democratization of Tunisia took about four years from the Jasmine Revolution which broke out in January 2011. At the time of the ex-post evaluation, this democratization process was complete and a new political power was finally established in February 2015. Although a national development plan has not been developed since the revolution, the new government plans to begin deliberations in Parliament for a 2016–2020 national Five-Year Plan that would start in January of 2016. One of the central themes in the plan development process is continued effort towards addressing social and regional inequalities. Consequently, based on the new government's policy, preparations to draw

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

[3] ③: High, ② Fair, ① Low

up sector development plans and regional development plans have been progressing concurrently.

Renewable Energy-Related Policies

At the time of the project appraisal, the Tunisian Electricity and Gas Company (hereinafter "STEG"), which is under the umbrella of the Ministry of Industry, Energy and Small and Middle Enterprises, had received the Tenth Five-Year Plan and was working towards electrification through the expansion of the power distribution network. Meanwhile for electrification of remote rural areas, which are difficult to connect to the power grid, a plan to use solar energy was being promoted under the National Agency for Energy Conservation (hereinafter "ANME"), who also operates under the same umbrella. Specifically, in order to achieve 100% electrification nationwide by 2010, a goal was set to cover about 97% percent of the population through the power distribution network, and install renewable energy-powered generation equipment as independent power sources for the remaining 3%.

At the time of the ex-post evaluation, it was confirmed that even after the revolution, nationwide dialog continued among the energy sector and working groups of relevant ministries centered on the Ministry of Industry, Energy and Mines. This is because the renewable energy sector continues to be an important issue in Tunisia. Recommendations made through this work have been adopted, such as the need for long-term vision, decentralization of energy policies, and the gradual elimination of energy related subsidies in order to reduce the financial burden on the government, and by June 2014 the "Strategie Nationale de Maîtrise de l'Energie" (National Energy Management Strategy)[4] was announced, which set forth the goal of 30% of power deriving from renewable energy by the year 2030. Implementing the same strategy, the energy transfer fund "Fonds de Transition Energétique" (hereinafter "FTE")[5] established through the 2014 Budget Act, designating ANME to act as the operating entity of the fund. In addition, energy transfer legislation (NO.12 1105-2015) was adopted in May 2015, which is positioned as a collection of several operations related to energy transfer.

The decentralization of energy policies will continue in the future, while rural electrification plans will be handled within the framework of governorate development plans. FTE will not only be utilized as an assistance system to facilitate SHS installation, but will also implement the PROSOL program ("Promotion du Solaire en Tunisie"),

[4] Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) provided support for the Strategie Nationale de Maîtrise de l'Energie.

[5] Fonds de Transition Energétique (FTE) : An energy efficiency action plan for the years 2015 to 2020 is formulated with the estimated budget for this period at 663 million TD (Tunisian Dinar). According to ANME, FTE capital participation places emphasis on investment from the private sector and ANME is positioned as the operating entity of the fund.

which links STEG and ANME together in order to promote individual purchases of solar water heaters. As shown in Table 1 below, behind this promotion trend is the fact that the nationwide electrification rate in 2014 was already 99.8% with even rural areas reaching 99.4%, and so in order to expand electrification and the use of renewable energy past this, and under a continuing reduction of financial burden on the government, the Tunisian government decided that plans should be implemented based on actual conditions in each governorate.

Table 1 Nationwide Average Electrification Rates

Units: %

Year / Region	2004	2005	2010	2012	2013	2014
Nationwide	99.0	99.3	99.5	99.6	99.7	99.8
Urban areas	99.7	99.7	99.8	99.8	99.8	99.9
Rural areas	97.3	98.2	98.9	99.1	99.2	99.4

Source: Documents provided by ANME

Rural Water Supply in Southern Rural Areas

At the time of the project appraisal, efforts to improve livelihood of residents engaged in the agriculture and livestock trades and supply of water to remote areas, as well as other efforts were underway in response to the Tenth socioeconomic Five-Year Plan.

At the time of the ex-post evaluation, we confirmed that research of water resource strategies was underway based on the long-term vision to develop water resources and in preparation for the 2030 goal. The strategy research found that although the population growth rate of Tunisia is only expected to grow within 1% from 2010 to 2030, GNP is expected to double, and thus an increase in drinking, agricultural, and industrial water demand is forecast as a result. According to the same research, Tunisia's water resources (surface water and groundwater) are presumed to be 4,760 Mm^3/year and not expected to increase to 2030. Accordingly, additional costs are also expected to be incurred to improve water quality. Groundwater is heavily relied on particularly in southern Tunisia due to the scarce amount of surface water, and given that most of the groundwater is high in salinity, it has been indicated that there will be a need to respond to increased demand by desalinating the groundwater.

Political power changed between the time of appraisal and the ex-post evaluation. And although an environment of uncertainty has continued due to a lack of formal national policies, the democratization process, which took about four years from the Jasmine Revolution, is complete and a new government was established in February 2015. This

new government plans to announce a national Five-Year Plan by the latter half of 2015 and has indicated policy to address social and regional inequalities. With respect to this project's goal of improving the living standards of remote rural communities, the government is considered to have been aligned with this aim both during the appraisal period and ex-post evaluation period.

3.1.2 Relevance to the Development Needs of Tunisia

Solar power

At the time of the project appraisal, Tunisia's national average electrification rate grew to 96% (2003). However, because the Tunisian government set an upper limit (3000 TD per household) on investment cost for electrification through power distribution network development, rural communities, which are located far from existing distribution networks, exceed the upper limit and thus have had no distribution lines constructed. This has resulted in non-electrified settlements scattered across the remote rural regions and is a factor that causes regional inequalities in living conditions between urban and rural areas.

On the other hand, Tunisia has one of the world's highest number of sunshine hours (2,500 hrs annually in the North; 3,200 hrs annually in the South), and since solar power is easier to operate and maintain than other renewable energies such as wind power, ANME has been engaged in installing decentralized Solar Home Systems (hereinafter "SHS") at non-electrified households since the first half of the 1990s.

At the time of the ex-post evaluation, the length of sunshine hours in Tunisia was recognized as having potential to generate solar powered energy while development progressed on large-scale solar powered facilities mainly utilizing European companies. SHS installed by ANME, which targeted non-electrified households in remote communities until around 2011, also contributed to raising electrification rates in rural areas. Although ANME-led SHS installation has finished now, the introduction of the new subsidy system (FTE) operated through ANME continues to assist with some costs of purchasing and installing SHS with private sector work.

An SHS set up through this project at a home in the mountainous region of Siliana

Rural Water Supply in Southern Regions

The southern region receives extremely little rainfall of 100 to 200 mm annually. At the time of the project appraisal water resources depended on groundwater, yet the water from most wells is saline. For this reason, electric power is needed to operate water

pumps and desalination equipment[6] installed at wells in order to secure drinking water (for humans and livestock) in the livestock industry, which is one of the major livelihoods in the region. However, because these wells are located in remote pastures not covered by the power distribution network, diesel generators have been used as power sources. The operation and maintenance of these, including transporting and storing fuel, are great burdens on residents.

At the time of the ex-post evaluation, the per capita renewable freshwater resources of Tunisia were 433 m^3 per person per year (2011)[7], which is roughly half the amount it was in 1972. Reasons for this include an increased population as well as the impact of a variety of factors such as climate change in recent years. Although severe water shortage is a common challenge shared across Africa, the water shortage in Tunisia is a pressing problem. Especially in the southern region, there is little choice but to continue relying on groundwater, since, despite the vast land area, there is scarce surface water. This groundwater, however, consists of just 0.3% freshwater, while salt water makes up the vast majority. For this reason, in order to supply water in the southern region there is a need to increase the use of high salinity concentration saltwater or seawater, or to reuse drainage water.

In addition, in southern regions, where there is little rainfall and limited livestock feed crops, goat production is thriving and nearly half of all of Tunisia's goats are raised there. Goats and sheep are a valuable source of income for farmers in the southern region, thus drinking water for grazing periods are regarded as an ongoing high need. It should be noted that in the field study we observed cases of high salinity groundwater and freshwater being mixed for use as drinking water for the livestock.

At the time of the project appraisal, electrification of remote rural communities through solar energy and supplying of water were considered to be meaningful development needs that would contribute to reducing regional inequalities.

At the time of the ex-post evaluation, expansion of the power distribution network by STEG combined with the installation of SHS at non-electrified households by ANME had achieved a nationwide electrification rate of 99.8% in 2014 with a 99.4% electrification rate in rural areas. Some non-electrified households still remain, however, and many are located in remote areas, thus the private sector-led system which utilizes FTE to subsidize a portion of expenses to purchase and install SHS continues on an ongoing basis. Due to

[6] Many of the wells in the southern region have salinity. Typically, salinity concentration is 3.0 g/l, though some wells have a higher salinity of 7 to 9 g/l.

[7] According to Falkenmark water stress indicator standards, countries or regions with per capita annual water volume of 1700 m^3 or less are designated "water stress," 1000 m^3 or less are "water scarcity," and 500 m^3 or less are "absolute scarcity."

these conditions it is regarded that development will continue.

With regard to water supply, there is extremely high need to desalinate high salinity water due to the limited availability of freshwater in southern Tunisia. Needs are expected to further increase in the future due to the anticipated increase in water demand in years to come.

3.1.3 Relevance to Japan's ODA policy

At the time of the project appraisal, the Japan Bank for International Cooperation (JBIC)'s Medium-Term Strategy for Overseas Economic Cooperation Operations (2002 to 2004, policy in force at the time) set forth the following policies concerning assistance: to provide assistance intended to promote economic growth by establishing economic and social infrastructure that serves as "infrastructure development for economic growth"; to proactively support the introduction of renewable energy as part of a "response to global issues"; and to support "strengthening of measures to reduce poverty" through electrification of rural communities.

Further, in order to support efforts to improve Tunisia's environment, the 2002 Tunisia Assistance Plan set out a policy to promote cooperation in line with government policies in Tunisia in such areas as effective utilization of groundwater resources and the introduction of renewable energy. Implementation of this project conforms to such policies.

Seeing that it has been judged appropriate to make use of Japanese technology, which held the top spot in the solar cell market worldwide at the time of appraisal, a requirement to use Japanese technology (STEP: Special Terms for Economic Partnership) for solar photovoltaic systems has been applied in this project.

Based on the above, the implementation of this project is considered to be relevant with Japan's ODA policy.

3.1.4 Relevance of the Project Plan and Approach

As mentioned in upcoming sections that discuss efficiency, effectiveness and impact, the water supply portion of the project was not undertaken and thus could not realize its anticipated outputs. Causes for this included prolonged coordination between relevant ministries primarily concerning the revenue source and administrative structure to operate and maintain equipment after project completion. Based on this, it is conceivable that the water supply portion of the project may have had project design problems at the planning stage, particularly in terms of addressing the administrative structure to oversee operation and maintenance as well as verification of costs. It should be noted that, although this matter is not reflected in the relevance rating as there were also outside factors that

contributed to water supply work not being undertaken, it will be appended as an issue at the planning stage.

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

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Plans in this project involved (1) a rural electrification portion: to electrify 500 households in remote rural communities, and (2) a water supply portion: to install solar photovoltaic systems and other equipment at 63 wells in southern rural communities. However, only the rural electrification portion was implemented according to the initial plan. Work was not undertaken on the water supply portion of the project despite creating a detailed design. Table 2 below shows the scope of this project.

Table 2 Scope of this Project

Classification	Plan	Actual
1) Rural Electrification Portion	【Project Site】 All of Tunisia, Target beneficiaries: 500 households in remote rural communities (non-electrified homes) 【Equipment】 Photovoltaic modules (100W × 500 units), regulators, batteries, fluorescent lamps	【Project Site】 Northern Tunisia (Siliana, Béjà, Jendouba, Kef) Central Tunisia (Sousse), Southern Tunisia (Gabès, Tataouine), Target beneficiaries: 500 households in remote rural communities (non-electrified homes) 【Equipment】 Photovoltaic modules (108W × 500 units), regulators, batteries, fluorescent lamps
2) Water Supply Portion	【Project Site】 4 Southern Governorates (Tataouine, Kebili, Medenine, Gabès), Deep public wells in pasture land (63 locations) 【Equipment】 Install solar photovoltaic systems at approximately 60 wells (photovoltaic modules, regulators, batteries, etc.), water pumps, desalination equipment, etc.	There are no outputs for this portion of the project as no work has been undertaken.

Classification	Plan	Actual
3) Consulting Services	Consulting services for the water portion Breakdown: Bidding assistance Construction supervision Operation and maintenance (O&M) assistance Social impact research Environmental monitoring assistance	Partial consulting services for the water portion Breakdown: Some tendering assistance (implementation/preliminary review of tenders/creation of tender documents, etc., for " Study of Operation and Maintenance Methods for Solar Water Pumping Systems and Solar photovoltaic Systems for desalination ")

(1) Rural Electrification Portion

As shown in Table 3 below, in the rural electrification portion of this project SHS were installed in all 500 households in all targeted seven governorates. The selection criterion for all 500 households was to be located in a remote rural community that is difficult to connect to the power distribution network. According to ANME, as the project was in the final stage of SHS installation work, which began in the 1990s, the homes selected were those bypassed in previous work, especially homes in remote areas.

Table 3 Breakdown of 500 Targeted Households in Electrification Portion of the Project

Units: Households

Region	North				Central	South		Total
Governorate	Siliana	Béjà	Jendouba	Kef	Sousse	Gabès	Tataouine	
SHS Units Installed	110	38	7	25	20	150	150	500

Source: Documents provided by ANME

(2) Water Supply Portion

Although a detailed design was created for the water supply portion of this project, the work was never carried out. It should be noted that although ANME was the implementing agency in this project, after completion of the water supply portion of the project the Agricultural Regional Development Office (CRDA), which is the local office of the Ministry of Agriculture, Water Resources and Fisheries (hereinafter "Ministry of Agriculture"), was responsible for operation and maintenance of water pumps installed at wells, desalination equipment, and solar photovoltaic systems attached to all equipment.

The reasons for work in this portion of the project not being carried out are complex; however, for the most part it was due to the following reasons: a long time was taken for the process of selecting consultants; consultant efforts were discontinued in January 2011

due to the Jasmine Revolution; and great deal of time was taken to coordinate views within the Tunisian government regarding the administrative structure for operation and maintenance of desalination and other equipment.

Consultant Selection

Table 4 below summarizes the consultant selection process for the water supply portion of the project from the selection procedure to project completion. Despite beginning the consultant selection process in October 2005, it took over four years (1489 days) until the order was given to begin work in November 2009. In the initial plan, consultant contracts were to be entered by November 2007, construction to take place between December 2007 and March 2010, and the project to be concluded by June 2011. According to a Survey Report (2010) outsourced by the JICA Tunisia office, the factors listed below are cited as factors for the delay. The first bid ended in failure due to Tunisia's procurement system, while the subsequent procurement process also was unable to proceed smoothly.

- The first bid was declared unsatisfactory by the Senior Procurement Committee[8] due to the lack of bidding companies (only three applicants).
- It took over nine months to select the consultant for the second round.
- It took over nine months to examine paperwork. Of this, ANME took four months to conduct technical review and JICA approval took two months.
- It took over 17 months of contract negotiations between ANME and the selected consultant.

Table 4 Planned and Actual Each Process in the Water Supply Portion (from consultant contracting to project completion)

	Plan	Actual
Start of consultant selection process	October 2005	October 2005
Creation of selection documents by ANME		657 days
Procedural formalities by Senior Procurement Committee		340 days
Approval by JICA		235 days
Briefing by selected consultant		171 days
Other procedural delays by ANME		86 days
Total days		1489 days
Conclusion of consultant contract	November 2007	November 2009
D/D Implementation	December 2007 － March 2010	November 2009 － Not started
Tendering process		
Construction work		
Project completion	June 2011	Not started

Source: Documents provided by ANME and JICA

[8] Senior Procurement Committee: An organization which supervises public competitive bidding in Tunisia

Jasmine Revolution

Although the consultant began work in December 2009, work was interrupted due to worsening public safety caused by the Jasmine Revolution which broke out in January 2011.

Prolonged Coordination of Views between Relevant Ministries in Tunisia Concerning the Administrative Structure for Operation and Maintenance of Desalination Equipment

As summarized in Table 5 below, after receiving study results from the consultant, the Tunisian government took considerable time to coordinate between relevant ministries concerning the administrative structure for operation and maintenance of the equipment, as well as for deliberation over revenue sources, which led to a prolonged time period without a forthcoming solution. As a result, ANME was requested by the relevant ministries to postpone evaluation of project bids for the water supply portion of the project and rethink the plan. After this, ANME submitted to JICA a scope change proposal that greatly reduced the number of desalination units to install. JICA, however, determined that the administrative structure and budget for operation and maintenance of the equipment were insufficient, and in addition, Japanese companies'[9] level of interest in bidding would be extremely low due to both civil unrest in southern regions and reduced scale of the project. As a result JICA notified the Tunisian side that the loan would be closed as per the original loan deadline.

[9] Due to being a STEP project, participants in this project are limited to Japanese companies.

Table 5 Chronicle of Events in the Water Supply Portion of the Project - From Reconsideration of the Administrative Structure for Operating Solar Water Pumping and Desalination Systems to Project Conclusion

Time Period	Chronicle of Events
December 2009 to October 2011	The consultant began work in December 2009. Later, civil unrest broke out due to the Jasmine Revolution in January 2011 and work was suspended for approximately six months.
November 2011 to June 2012	In November 2011 ANME submitted a written report entitled "Study of Operation and Maintenance Methods for Solar Water Pumping Systems and Solar photovoltaic Systems for desalination," which was prepared by the consultant, to the National Piloting Committee (Comité National du Pilotage). Whereupon debate concerning the administrative structure responsible for operation and maintenance, income sources, etc., deteriorated into a state of discord within the Tunisian government. This resulted in a delay of the bidding process of the water portion of the project. Of particular note, the points below were identified as problems based on findings in this study. (1) Increased cost of desalinated water and of the administration, operation and maintenance for the equipment: Depending on user population and geographic conditions, the production cost of desalinated water, including investment and operation cost, was calculated at 11 TD/m^3 to 52 TD/m^3. Meanwhile, the cost of water delivered by tanker lorries in the designated project region was, again depending on user population geographic conditions, 6 TD/m^3 to 12 TD/m^3. For this reason the desalination cost in remote areas with a low user population (at 52 TD/m^3) greatly exceeds the cost of water delivered by tanker lorry (at 12 TD/m^3). (2) The administrative system for maintaining facilities and its revenue sources: Since there is no agricultural development cooperative for beneficiaries (GDA) in the desert region of southern Tunisia, which is populated mainly by nomadic people, assistance for establishing a GDA is required. In addition, as it is difficult to cover expenses and facility maintenance with the material and human resources of nomadic people, the Ministry of Agriculture needs to prepare revenue sources to do so at the same time as CRDA provides assistance to set up the GDA. In response to the above issues, committee members expressed cautious and diverse opinions regarding implementation of the water supply portion of the project as originally planned, and ANME had no choice but to postpone the bidding process for an extended period until the committee could declare a solution to the issues.
June 2012 to December 2012	ANME raised two issues for debate in an inter-ministerial meeting on June 12, 2012: (1) Project scope changes. (Initially the plan was to install desalination equipment at 45 of the 63 wells, which changed to only 2 wells in densely user-populated areas); (2) a summary of changes to the loan agreement in order to extend the loan disbursement deadline. According to the Ministry of Agriculture, the ministry had agreed to bear the cost to set up a GDA at each well resulting from changes in the project scope, as well as the cost for operation and maintenance. As a result, ANME was to negotiate with the Japanese side regarding the changes. Meanwhile, amid the approaching the loan disbursement deadline of December 15, 2012, JICA confirmed with ANME several times on the progress of Tunisian government debates concerning the operation and maintenance of desalination equipment. After this, JICA considered the scope change proposal submitted by the Tunisian side. As a result, based on the above-mentioned reasons it was determined that there was a high risk that the bidding process would not be completed, and thus JICA notified the Tunisian side that the loan would be closed as per the original loan deadline, specifically noting: ・ The project scope was significantly reduced as a result of scope changes due to issues in settling the operation and maintenance system matters, etc. ・ It is expected that Japanese companies will be concerned about safety after the revolution since the target sites (wells) are dispersed around the southern region. ・ Almost no Japanese companies expressed interest in tendering bids. Tunisian government agreed following this.

Source: Documents provided by ANME and JICA

Based on the above, although unforeseen events occurred due to the Jasmine Revolution for the water supply portion of the project, it has been determined that reasons for work not being undertaken in the project were extensive delays in the procurement process of the consultant; considerable time taken to coordinate between relevant ministries concerning the administrative structure for operation and maintenance of desalination equipment; and failure to reach a resolution until just before the loan disbursement deadline.

3.2.2 Project Inputs

3.2.2.1 Project Cost

No inputs were implemented in the water supply portion of the project. For this reason, evaluation of project expenses will only cover portions of the project excluding water supply.

As shown in Table 6 below, total cost of the project excluding the water supply portion was planned to be 725 million yen. Of this 329 million yen comprises the ODA loan covered amount. In the "Actual" column total project cost was 274 million yen (excluding the water supply portion). Of this 257 million yen comprises the ODA loan covered amount, which is 38% of the planned amount (also excluding the water supply portion). For this reason it is deemed that project costs were kept within the plan.

Table 6 Planned and Actual Total Project Cost

Units: Millions of yen

	Plan		Actual	
	Overall	ODA Loan	Overall	ODA Loan
Rural Electrification	309	289	142	142
Water Supply	1,402	1,312		
Consulting Services	130	130	115	115
Land costs	0	0		
Administrative costs	54	0		
Tax and duties	142	0	17	0
Total	2,037	1,731	274	257

Note: Exchange rate at the time of the project appraisal, 1 Tunisian Dinar (TD) =86.2 yen
Exchange rate during actual implementation: 1 Tunisian Dinar (TD) =85.4 yen

3.2.2.2 Project Period

The actual project period was 116 months (159% of the planned period) from June 2005 (L/A signing) to January 2015 (ex-post evaluation), which exceeded significantly than the planned period of 73 months from June 2005 (L/A signing) to June 2011 (Ex-post Evaluation).

With regard to the fact that the rural electrification portion of the project was

implemented as planned, while the water supply portion was not, as mentioned in section (2) of 3.2.1 Project Outputs, the primary reasons for project delay included a significant delay in the procurement process for selecting consultants for the water supply portion of the project, and in addition, considerable time was needed for coordination between relevant ministries over the administrative structure to operate and maintain desalination equipment, hence, resolution could not be reached even when the loan disbursement deadline was closed. This resulted in no work on the water supply portion of the project being undertaken, and this situation continued past the time of the ex-post evaluation.

3.2.3 Internal Rates of Return (reference only)

Due to difficulty in monetizing and quantifying benefits, the Financial Internal Rate of Return (FIRR) was not calculated.

Due to opinions given from ANME that there are strong social welfare connotations when a project such as this conducts SHS installation targeting residents in non-electrified remote regions, the Economic Internal Rate of Return (EIRR) was not calculated. Recalculation was also not performed due to a lack of a clear calculation basis at the time of the project appraisal.

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

3.3 Effectiveness (Rating: ①)[10]

3.3.1 Quantitative Effects (Operation and effect indicators)

This project was broadly comprised of (1) a rural electrification portion: to electrify 500 households in remote rural communities, and (2) a water supply portion: to install solar photovoltaic systems and desalination equipment at 63 wells in southern rural communities. Of these, the water supply portion of the project accounted for the largest portion of the overall project cost. Nevertheless, as mentioned in 3.2 Efficiency, the rural electrification portion was implemented according to plan while the water supply portion of the project was not undertaken during the loan period. Because of this, outputs for the project's goals could not be observed for the water supply portion, which accounted for a great deal of project goals. This resulted in a failure to realize project outcomes and impacts.

Consequently, it was possible to check the actual values for (1) Maximum Power Output and (2) Household Electrification Rates, which comprise the rural electrification of operation and effect indicators set at the time the project appraisal. For the water

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

supply portion, however, (3) Well Usage (residents, livestock) and (4) Volume of Groundwater Pumped could not be observed since this portion of the project was not implemented.

The achievement status of each indicator is shown below.

(1) Maximum Power Output

Table 7 shows targeted and actual maximum power outputs. Compared with the project's overall target value of 630 kW, the actual value in 2014 was 54 kW, falling dramatically short of the target. The reason for falling short of the target was that the water supply portion of the project was not implemented. In contrast, in the rural electrification portion of the project SHS were installed at 500 households in remote rural communities as per the initial plan. And because all households made use of the SHS, the actual maximum power output was 54 kW against the target of 50 kW, meeting its set target.

Table 7 Maximum Power Output in the Project

Units: kW

Indicator	Baseline 2004 Assessment year	Target 2014 3 Years After Completion	Actual 2014 3 Years After Completion
Maximum power (theoretical value)	0	630	54
[BREAKDOWN] Rural Electrification		50	54
Water Supply		580	0

Source: Target values from documents provided by JICA / Actual values from documents provided by ANME

(2) Household Electrification Rate in Rural Areas

Table 8 shows targeted and actual household electrification rate in rural areas. Compared with the target of 100%, the actual value for FY 2014 was 99.4%. This is considered to have generally achieved the target. As mentioned in the section on Relevance, the primary factors responsible for improving rural electrification rates were the advancement of electrification measures, which were accomplished by STEG's expansion of the power distribution network, and ANME's installation of SHS and other independent power sources (power that does not rely on STEG's distribution network).

Table 8 Household Electrification Rate in Rural Areas

Units: %

Indicator	Baseline (2004)	Target (2014)	Actual (2014)
Household Electrification Rate in Rural Areas (Rural Electrification Portion)	97.3 [1)]	100	99.4

Source: Target values from documents provided by JICA / Actual values from documents provided by ANME

Note 1: Although the Baseline Year (2004) "Household Electrification Rate in Rural Areas" is 0% in the preliminary evaluation table, the reference value of 97.3% was used as this was the rural household electrification rate in Tunisia in 2004.

It is worth noting that although SHS installed in this project are helpful for using electrical appliances such as TVs, radios, and mobile phones, many households that had SHS installed actually still wished to be connected to the STEG power distribution network due to the low 100 W power output capacity of these systems.

During the most recent inspection tour, instances were seen, particularly in northern settlements, where homes were able to connect to STEG in response to strong requests from residents to local authorities. By effectively using power from both SHS and STEG, these households were able to save on electricity bills from STEG. According to ANME, however, generally when an SHS-installed home connects to STEG's power grid, the SHS is to be moved to a non-electrified household. Nevertheless, based on the current energy policies and utilization at households, it is believed that there is a need to officially approve continued use in cases where the SHS is being used effectively. It should be noted that a local official from ANME has suggested that there is a need for a system that allows a household that no longer needs an SHS to voluntarily transfer ownership (O&M handled by ANME) to a home that needs the system.

SHS installed in this project.
Top: Solar panels installed on the roof of a home.
Middle: Fluorescent lighting in the home.
Bottom: TV in the home (owner purchased).

Considering the prospect of an increasing number of future cases where an SHS–installed household is connected to STEG's power grid, it is considered necessary to create a system that suits present conditions.

(3) Well Usage (Drinking Water for Residents and Livestock)

Table 9 below shows targeted and actual well usage. The initial plan set out to install solar photovoltaic systems, water pumps, desalination equipment, etc., at 63 deep public wells in Tataouine, Kebili, Medenine, and Gabès Governorates. However, the effectiveness of these indicators was not demonstrated since the water supply portion of the project was not implemented.

Note that primary factors for this part of the project not being carried out are detailed in 3.2 Efficiency.

Table 9 Utilization of Wells in the Project

Indicator	Baseline (2004)	Target (2014)	Actual (2014)
Number of people using wells (Water Supply Portion)	4,980 people	7,850 people	Not implemented
Number of livestock using wells (Water Supply Portion)	355, 100 animals	667,000 animals	Not implemented

Source: Target values from documents provided by JICA / Actual values from documents provided by ANME

(4) Volume of Groundwater Pumped

Table 10 below shows targeted and actual volume of pumped groundwater. For the same reason as (4) above, the effectiveness of these indicators was not demonstrated since the water supply portion of the project was not implemented.

Table 10 Volume of Groundwater Pumped in the Project

Units: m^3/month

Indicator	Baseline (2004)	Target (2014)	Actual (2014)
Volume of Groundwater Pumped (Water Supply)	36,000	67,500	Not implemented

Based on the above, each operational and effectiveness indicator set in this project fell significantly short of its target due to the water supply portion of the project not being implemented. The rural electrification portion of the project, however, was implemented as planned and for the most part reached its targets. Thus it was instrumental in the electrification of 500 households in remote rural communities. Due to the above reasons, in the next section, 3.4 Project Impacts, only impacts demonstrated by the rural electrification of the project were analyzed.

3.3.2 Qualitative Effects

As qualitative effects of this project, the following benefits were expected: an improvement in living standards by promoting development of the livestock industry and enhancing local infrastructure for residents through electrification; an improvement in living standards for the poor; and a reduction in regional inequalities. These will be inspected in further detail in the Project Impacts section based on the assumption that they should be treated as impacts of this project.

3.4 Impacts

3.4.1 Intended Impacts

In terms of impacts of the project, it was primarily expected that it would improve living standards for local residents and contribute to reducing regional inequalities through electrification. As mentioned in the previous section on Effectiveness, however, due to not implementing the water supply portion of the project, which accounted for 64% of the total project cost, project outcomes and impacts were not realized.

In contrast, the rural electrification portion of the project, which accounted for 15% of total project cost, was found to demonstrate impacts as initially hoped for households where solar photovoltaic systems were installed. Shown below in Tables 10 to 13 are the results of the beneficiary study[11] of the rural electrification portion of the project.

Current Electrification Status

As seen in Table 11 below, approximately 80% of households that had an SHS installed in the project were located far from the STEG power distribution network, and thus responded that it would have been unlikely that they could be connected to the power distribution network, even in the future. For this reason, many of the targeted households in the project use the SHS as their principal source of power. Hence, this project is considered to have improved living conditions and reduced regional inequalities through electrification.

[11] Local consultants were utilized to conduct a Beneficiary Survey on 79 households that had SHS installed through this project (8 in Siliana, 23 in Tataouine, 48 in Gabès). Note that significant time was required to visit the SHS-installed households due to being in locations difficult to access by car, such as mountainous regions and desert areas. As a result, although the initial target was to visit 100 households to collect questionnaires, valid responses were collected from 79 households.

Table 11 Connection Status to the STEG Power Distribution Network in Households that had SHS Installed in the Project.

Unit: Households

Item	Households	(%)
1.Already connected to the existing grid	3	(4 %)
2. Plan to connect to the existing grid in the future	10	(13 %)
3. Believe it difficult to be connected to the existing grid even in the future because it is too far	64	(81 %)
4. Don't know	2	(2 %)
Total	79	(100 %)

Source: Beneficiary study

Changes in Lives Associated with Power Use

In Table 12 below, residents were asked questions about how their lives changed after the SHS was installed. In response to the question "(a) Did your daily energy use increase or decrease after SHS installation?" 80% of people responded that energy use increased. According to site visits and interviews, previously power could only be used temporarily by running diesel generators and such, but SHS installation carried out in this project has made it possible to use lights at night, watch/listen to TV or radio, charge mobile phones, and other such everyday uses.

At an SHS-installed home in Gabès, a woman weaves a rug in a room with fluorescent light and a TV

In response to the next question, "(b) Did use of electricity to make handicrafts or other goods increase your cash income?" 23% of people responded that cash income increased. However, realization of this benefit is limited since only certain areas in the southern region are involved in making handicrafts and the women involved in this work are advancing in age.

In response to "(c) Did use of electricity increase daily study time for your children?" 42% of people responded that study time increased. While being a somewhat low figure, interviewed children were delighted to be able to do their homework, read, draw pictures, and play at night indoors.

A fluorescent light is installed in the kitchen of an SHS-installed home in Tataouine

In response to "(d) Did use of energy increase time to spend with your family?" 90% of people responded that it did increase family time. Light provided through installation of SHS is deemed to have contributed to improving quality of life by helping provide family time for people living in rural communities.

Table 12 Changes in Lives Brought About by SHS

Units: Households

	(a) Did your daily energy use increase or decrease after SHS installation?		(b) Did use of electricity to make handicrafts or other goods increase or decrease your cash income?		(c) Did use of electricity increase or decrease daily study time for your children?		(d) Did use of energy increase or decrease time to spend with your family?	
1. Increased	63	(80%)	18	(23%)	33	(42%)	71	(90%)
2. No noticeable change	16	(20%)	55	(70%)	41	(52%)	6	(8%)
3. Decreased	0	(0%)	5	(6%)	4	(5%)	1	(1%)
4. Don't know	0	(0%)	1	(1%)	1	(1%)	1	(1%)
Total	79	(100%)	79	(100%)	79	(100%)	79	(100%)

Source: Beneficiary Study

Life improvement and Women's Housekeeping Chores

According to Table 13, over 90% of SHS-installed households feel that energy use has improved their lives. Also, as shown in Table 14, in response to the question "Did use of energy decrease the burden of household chores?" over 60% of people responded that it reduced the burden. It is worth noting that several homes had fluorescent lights installed in their kitchen which made it possible to cook indoors at night, and during site visits many people commented on how it was now possible to cook safely indoors.

Based on the above facts, SHS has provided positive benefits in the lives of people living in rural communities and is deemed to have made a contribution to improving their lives.

Table 13 "Do you feel that energy use has improved your life?"

Units: Households

Item	Households	(%)
1. Feel that it has improved	72	(91%)
2. No noticeable change	5	(6%)
3. Do not feel that it has improved	0	(0%)
4. Don't know	2	(3%)
Total	79	(100%)

Table 14 "Did use of energy decrease the burden of household chores?"

Units: Households

Item	Households	(%)
1. Decreased	50	(63%)
2. No noticeable change	22	(28%)
3. Increased	3	(4%)
4. Don't know	4	(5%)
Total	79	(100%)

Source: Beneficiary study

Based on the above, SHS installed through this project are expected to continue being used at installed homes in the future and will be useful in improving people's lives.

3.4.2 Other Impacts

(1) Impact on the Natural Environment

According to ANME, there have been no impacts on the natural environment. In addition, no negative impacts were observed during the site visit.

(2) Land Acquisition and Resettlement

No resettlement or land acquisition occurred since the rural electrification portion of this project installed equipment on roofs or inside homes.

Based on the above, although the rural electrification portion of this project demonstrated improvements to people's lives through electrification, due to not implementing the water supply portion of the project, which accounted for 64% of the total project cost, project outcomes such as improvement to the lives of residents in southern regions and development of the livestock industry were not realized. Likewise, project impacts such as contribution to the betterment of livelihood in targeted regions also were not realized.

In light of the above, benefits of implementing this project were limited in comparison with its plan. This project has not achieved its objectives. Therefore effectiveness and impact of the project are low.

3.5 Sustainability (Rating: ③)

Evaluation of sustainability will only cover the rural electrification portion of this project in which outputs can be confirmed.

3.5.1 Institutional Aspects of Operation and Maintenance

ANME employed 187 staff at the end of 2014, and this has remained unchanged since the time of appraisal. Hence, no particular problems are seen concerning staffing levels. ANME's Gabès Office has jurisdiction over southern governorates of Gabès, Tataouine, and Sousse targeted in this project, while ANME's Kef Office has jurisdiction over northern governorates of Siliana, Kef, Jendouba, and Béjà targeted in this project. Both offices deployed experienced technicians for the operation and maintenance of SHS and it was found that the local operation and maintenance system was appropriate.

Since the time of appraisal, there have also been no changes in the system that SHS-installed households to request repair persons under. There have been a few instances of repairs and no problems have been observed at this point in time. However, since it is expected that the frequency of repairs will increase as equipment degrades over time, it is important that ANME shares contact numbers of repair persons and other

pertinent information again.

Based on the above, no problems have been observed in the administrative system for operation and maintenance.

3.5.2 Technical Aspects of Operation and Maintenance

Primarily technicians from ANME's Gabès and Kef offices managed operation and maintenance at sites and work was carried out appropriately. Likewise, no particular problems were observed in skill levels or the number of technicians.

Interviews conducted with beneficiaries while visiting SHS-installed households indicated that ANME technicians had visited three times[12] after SHS installation to inspect operation of the equipment. Installed households have also been performing daily inspections while verifying with the manual distributed at the time of installation. ANME technicians have also offered advice when requested by beneficiaries. Through a field study at the time of the ex-post evaluation it was determined that ANME technicians are well aware of the location of installed households, which are dotted across a vast target area, and they also communicate appropriately with beneficiaries.

Instruction manual distributed to homes with SHS-installed (Arabic)

Also note that inspections and repairs conducted by ANME technicians and repair persons were carried out according to the manual, and no outstanding technical problems or issues were observed with regard to operation and maintenance system for SHS.

Based on the above, no problems have been observed in the technical aspects of the operation and maintenance system.

3.5.3 Financial Aspects of Operation and Maintenance

Table 15 below shows changes in ANME government subsidies. Although there was some decline the year following the Jasmine Revolution (2012), from 2013 onward subsidies maintained 6,000,000 TD levels. It has been determined that there are no problems with the financial situation.

[12] Breakdown of the three time inspection is as follows: provisional acceptance (within 1 to 6 months); preventive maintenance visits (within nine months); final acceptance (within one year).

Table 15 Government Subsidies to ANME

Units: 1,000 TD

	2008	2009	2010	2011	2012	2013	2014
Subsidy amount	5,253	5,109	5,562	5,138	4,443	6,120	6,000

Source: Documents provided by ANME

Beneficiaries are only responsible for the cost of parts when an SHS is repaired (equivalent to 30% of the entire repair cost). Costs are 100 TD for a battery, 50 TD for regulator, 35 TD for lamination repair, and 50 TD for the adapter. According to ANME, they have been able to cover repair costs within the budget each year without problem.

SHS projects through ANME ended with this project. Currently, the subsidy program available to households who want to install solar power generation is continued through the FTE energy transfer fund. That being said, operation and maintenance costs for the SHS project will continue to be borne by ANME, and the budget will be secured in such a way that required expenses can be covered.

Based on the above, no problems have been observed in the financial aspects of operation and maintenance.

3.5.4 Current Status of Operation and Maintenance

Table 16 below shows results of the beneficiary study. Of the 79 modules installed at households, only 1 Japanese-made solar module required repair. In addition, only one household reported a one-time breakdown. The installed SHS are regarded as having a generally favorable operation and maintenance system.

Table 16 SHS Operating Status and Frequency of Breakdowns

Units: Households

	Photovoltaic module (made in Japan)		Regulator		Battery	
Operating Status						
1. Operating	77	(97%)	70	(89%)	74	(94%)
2. Needs repair	1	(1%)	3	(4%)	4	(5%)
3. Unanswered	1	(1%)	6	(8%)	1	(1%)
Total	79	(100%)	79	(100%)	79	(100%)
Number of breakdowns since installation						
1 Time	1		5		11	
2 Times	0		2		3	

Source: Beneficiary study

Routine inspection is also been conducted satisfactorily. At the same time, in some cases repair costs were saved for batteries, regulators, and other accessory hardware by performing early maintenance. Also note that some residents (especially the elderly) do not sufficiently understand how to deal with SHS breakdowns, wiring extensions, etc., and so it is necessary that ANME local technicians make visits to provide advice in order to support the continued long-term use of SHS.

In light of the above, no problems have been observed in the current status of operation and maintenance system of the project.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to improve livelihood in rural communities and promote development in the livestock industry in Tunisia by installing equipment such as solar photovoltaic systems, thereby contributing to the improvement of overall living standards in target areas.

At the time of the project appraisal and ex-post evaluation there was a change in political power in Tunisia due to the 2011 Jasmine Revolution and the shift to democratization took about four years to complete. The new government, formed in February 2015, has indicated its plan to address social and regional inequalities. At both the time of the project appraisal and ex-post evaluation, electrification of remote rural communities through solar energy and supplying of water were regarded as important developmental needs that would contribute to reducing regional inequalities in Tunisia. In addition, this project is consistent with Japan's ODA policy at the time of the project appraisal. In light of this, this project has been deemed highly relevant due to its consistency with Tunisia's Development Plan, development needs, and Japan's ODA policy.

This project consisted of two parts: (1) rural electrification by installing SHS at each household in remote rural communities, and (2) water supply by installing desalination equipment or solar photovoltaic systems at wells in southern rural communities. Implemented as planned, the rural electrification portion of the project contributed to electrifying 500 households in remote rural communities. SHS installed in this project are expected to aid in improving the lives of people in target households for years to come. In contrast, the water supply portion of this project, which comprised a larger portion of the

project's total budget than the rural electrification portion, was not undertaken during the loan period. For this reason, operation and effect indicators fell far short of the set targets as outputs for the water supply portion of the project, which accounted for numerous project targets, could not be observed in the ex-post evaluation. Comprehensively considering the above, the project has achieved limited effectiveness compared to its plan. Therefore the effectiveness and impact of the project are low.

Although project cost was within the plan, the project period significantly exceeded the plan. Therefore efficiency of the project is fair. Primary reasons for delay in the project include a significant delay in the procurement process of selecting consultants related to the water supply portion of the project, and in addition, considerable time was needed for coordination between relevant ministries debating the administrative structure for operation and maintenance of desalination equipment, hence, resolution could not be reached even when the loan disbursement deadline was closed.

In terms of sustainability, under the supervision of ANME, SHS installed in the rural electrification portion of the project were operated and maintained with the mutual cooperation of ANME local offices, fitting contractors, and beneficiary households. Therefore no systematic, technical, or financial problems were observed and sustainability of rural electrification portion of the project is high.

In light of the above, however, evaluation of the project overall is low.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

ANME had set a general rule wherein, when an SHS-installed home connects to STEG's power distribution system, the SHS is to be moved to a non-electrified household. However, at the time of the ex-post evaluation, the Tunisian government was recommending parallel usage of STEG's power distribution system with solar power in order to promote energy efficiency. This is thought to be a possible catalyst for confusion in the field. For this reason, it is important that, based on the current energy policies, ANME review the provisions to be applied when an SHS-installed household connects to STEG's power distribution system, and then clearly announce the revised provision to SHS-installed households and local authorities. It is believed that this will both eliminate confusion in the field and lead to more efficient use of energy.

4.2.2 Recommendations to JICA

Even now, there is an urgent need to utilize the high-salinity water in southern Tunisia as a water supply, and such needs are expected to further increase due to increased water demand in the years to come. For this reason, with regard to addressing the water supply

portion of the project which was not undertaken, the consultant recommends deliberating this matter with the Tunisian side, including such matters as assistance methods.

4.3 Lessons Learned

Formulation of highly feasible project design that includes countermeasures against delay factors

This project required the participation of not only an execution agency to oversee operation and maintenance of the facilities, but also multiple government ministries. Further, due to the target area being located in a remote desert region and the anticipated beneficiaries were nomadic people, it is assumed that the project had high degree of difficulty as a STEP project. Although from the time of appraisal, possible delay factors were recognized among project stakeholders and efforts were made to mitigate and eliminate them, in the end, and also in light of external factors compounding issues, only so much could be done.

While it is difficult to eliminate every factor of delay at the planning stage, it is important to incorporate a resolution mechanism into the project's design that will accurately identify and analyze risks of delay when formulating a project with similar factors. In doing so, it is of paramount importance to hold thorough discussions with the executing agency and relevant ministries, so as to place due consideration on ensuring that the design of the project is highly feasible for all parties involved.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	1) Rural Electrification Portion Installation of solar photovoltaic systems (photovoltaic modules, (100 W x 500 units), regulators, batteries, etc.) and fluorescent lights in non-electrified households (500 homes) in remote rural communities. 2) Water Supply Portion Installation of solar photovoltaic systems (photovoltaic modules, regulators, batteries, etc.), water pumps, and desalination equipment at deep public wells (63 locations) in pasture lands of four southern governorates (Tataouine, Kebili, Medenine, and Gabès governorates) 3) Consulting Services Comprehensive consulting services for the water supply	1) Rural Electrification Portion According to plan 2) Water Supply Portion There are no outputs for this portion of the project as no work has been undertaken. 3) Consulting Services Although some consulting services were conducted, due to the reason listed in 2) above, work was not implemented.
2. Project Period	June 2005 - June 2011 (73 months)	June 2005 - January 2015 (116 months)
3. Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 1,426 million yen 611 million yen (7,088,000 TD) 2,037 million yen 1,731 million yen 1 TD＝86.2 yen (As of November 2004)	 213 million yen 61 million yen (720,000 TD) 274 million yen 257 million yen 1 TD=85.4 yen (Average between August 2008 and December 2012)

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