

Country Name	The Project for Integrated Master Plan on Mozambique Power System Development in the Republic of Mozambique
Republic of Mozambique	

I. Project Outline

Background	<p>In Mozambique, power demand rapidly increased by 11.1% on average in a year in the late 2010s, and power outages often occurred due to insufficient power generation capacity. To deal with the situation, the government of Mozambique increased power imports from the Southern African Power Pool (SAPP)¹ increasing the cost burden on the national treasury. Furthermore, because two power systems in the country, the southern power system and the central and northern power system, were not interconnected, power could not be exchanged between the two systems. In addition, high transmission and distribution loss and unstable power supply caused by prevalent overload and long-distance transmission had been serious problems. To overcome the problems, a power system development master plan based on reliable demand forecast and power supply plan was needed. However, the master plan developed in 2014 was imperfect as a medium- to long-term national master plan without having the optimal power development plans.</p>										
Objectives of the Project	<p>This project aims at strengthening planning capacity of the staff of the Electricity of Mozambique (EDM) through formulation of the national power system development master plan, thereby contributing to stable power supply in Mozambique.</p> <p>1. Expected Goals through the proposed plan²: Priority projects proposed in the master plan will be smoothly implemented.</p>										
Activities of the Project	<p>1. Project Site: Maputo 2. Main Activities: 1) power sector survey on current situation, 2) power demand forecast, 3) primary energy supply and demand analysis, 4) power generation development planning, 5) power transmission development planning, 6) power distribution development planning, 7) power system management capacity improvement, 8) long-term investment planning, 9) economic and financial analysis, 10) environmental and social considerations, 11) integrated power system development master planning, 12) technical transfer. 3. Inputs (to carry out above activities)</p> <table border="0"> <tr> <td>Japanese Side</td> <td>Mozambican Side</td> </tr> <tr> <td>1) Mission members: 10 persons</td> <td>1) Staff allocated: 39 persons</td> </tr> <tr> <td>2) Trainees received: 11 persons</td> <td>2) Land and Facilities: project office</td> </tr> <tr> <td></td> <td>3) Local cost: cost for utility of offices (electricity, water and telephone)</td> </tr> </table>			Japanese Side	Mozambican Side	1) Mission members: 10 persons	1) Staff allocated: 39 persons	2) Trainees received: 11 persons	2) Land and Facilities: project office		3) Local cost: cost for utility of offices (electricity, water and telephone)
Japanese Side	Mozambican Side										
1) Mission members: 10 persons	1) Staff allocated: 39 persons										
2) Trainees received: 11 persons	2) Land and Facilities: project office										
	3) Local cost: cost for utility of offices (electricity, water and telephone)										
Project Period	(ex-ante) October 2016 - November 2017 (actual) December 2016 - November 2018	Project Cost	(ex-ante) 190 million yen (actual) 204 million yen								
Implementing Agency	Electricity of Mozambique (EDM)										
Cooperation Agency in Japan	JERA Co., Inc.										

II. Result of the Evaluation

1 Relevance/Coherence
<p>[Relevance]</p> <p><Consistency with the Development Policy of Mozambique at the Time of Ex-Ante Evaluation></p> <p>The project was consistent with the development policy of Mozambique at the time of ex-ante evaluation. The “Five-year National Development Plan 2015-2019” planned to improve employment, productivity, competitiveness, and livelihood of the people under the objective of national economic and social development. The power sector was positioned in the “economic and social infrastructure development,” which was one of the five priority areas of the Plan, and higher accessibility to power and energy was set as the strategic target for it. The “Strategy for the Energy Sector 2015-2024” was the national development policy for energy sector development, and it emphasized the importance of energy sector for the sake of social and economic development.</p> <p><Consistency with the Development Needs of Mozambique at the Time of Ex-Ante Evaluation></p> <p>The project was consistent with the development needs of Mozambique at the time of ex-ante evaluation. In Mozambique, the government and people faced electrical power issues such as outages and financial burden of power import. Those issues were caused by the national scale imbalance of power demand and supply due to insufficient power infrastructure, inefficient power interchange, and others. In order to address those issues, an updated and technically appropriate power system development master plan was highly needed. However, the master plan prepared in 2014 had become outdated and imperfect particularly from the viewpoint of medium- to long-term optimal power development plans.</p> <p><Appropriateness of Project Design/Approach></p> <p>The project design/approach was appropriate. The project was designed to include electrification plans in the master plan with consideration for vulnerable and equality. The electrification rate in Mozambique at the time of ex-ante evaluation was 26% that was lower than the neighboring countries. Although EDM had tried to increase the electrification rate, it was not technically and financially realistic</p>

¹ A cooperation mechanism of the electricity companies in Southern Africa. The vision of SAPP includes a development of free competitive power market in the region and to increase the accessibility of electricity to rural communities.

² The degree of achievement of expected goals is not to be assessed in principle at the time of ex-post evaluation, since it is defined as the medium-to-long-term goals which will be attained as a result of crystallizing the proposed plan (“output” of the project).

to realize it by on-grid systems connecting households with power systems. Therefore, the project planned in the master plan two major electrification strategies of light-up (electrification of lights plus alpha) by off-grid, and power-up (full electrification) by on-grid. No problem attributed to the project design/approach was confirmed.

<Evaluation Result>

In light of the above, the relevance of the project is ③³.

[Coherence]

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with the Japan's ODA policy to Mozambique at the time of ex-ante evaluation. In the "Country Assistance Policy for the Republic of Mozambique" (March 2013), one of the three priority areas was regional economy vitalization including corridors development. Special focus was given on the development of Nacala corridor and Maputo corridor through infrastructure development of roads, bridges, transportation networks, and power supply facilities including power plants.

<Collaboration/Coordination with other JICA's interventions>

Although the collaboration/coordination between a project of JICA was planned at the time of ex-ante evaluation and was implemented, any effects were not confirmed at the time of ex-post evaluation. As a means of emergency response for power supply shortage in northern areas, JICA was preparing to implement a grant aid of the "Project for the Development of Nacala Emergency Power Plant" (2019-2025) at the time of ex-ante evaluation. Corresponding to the grant aid project, the project planned to make recommendations in the master plan for medium- to long-term effective utilization of the Plant as an emergency power source. Although the recommendations were made as planned in the master plan, specific effects by the collaboration/coordination between the Plant and the master plan were not confirmed at the time of ex-post evaluation.

<Cooperation with other institutions/ Coordination with international framework>

Although the cooperation/coordination with the World Bank was planned at the time of ex-ante evaluation and was implemented, any effects were not confirmed at the time of ex-post evaluation. At the time of ex-ante evaluation, the World Bank planned to make policy recommendations for power system development and assist the formulation of comprehensive plan including electrification, power system management, investment plans, and others by technical assistances. Corresponding to the World Bank's technical assistances, the project planned to share the information with the World Bank. Although the information was shared as planned, specific effects by the information sharing were not confirmed at the time of ex-post evaluation.

<Evaluation Result>

In light of the above, the coherence of the project is ②.

[Evaluation Result of Relevance/Coherence]

In the light above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

<Status of Achievement for the Objectives at the Time of Project Completion>

The objectives of the project were partially achieved by the time of project completion. The national power system development master plan (Master Plan) was formulated by the time of project completion. In the process of formulation, planning capacity of the staff of EDM has been strengthened to a certain extent through on-the-job training (OJT). However, according to the Ministry of Mineral Resource and Energy (MIREME) and EDM, the capacity improvement was not sufficient to make the staff to be able to update the Master Plan by themselves because it took time more than expected.

<Utilization Status of the Proposed Plan at the Time of Ex-post Evaluation>

The proposed plan has been partially utilized by the time of ex-post evaluation. While the Master Plan was approved by the Council of Ministers of Mozambique in October 2018 (Indicator 1), it has not been updated due to insufficient capacity improvement of the staff of EDM (Indicator 2). At the time of ex-post evaluation, EDM is preparing to procure consulting services to update the Master Plan.

<Status of Achievement for Expected Goals through the Proposed Plan at the Time of Ex-post Evaluation>

The expected goals through the proposed plan have not been achieved at the time of ex-post evaluation.

(1) Generation development: All of the generation development projects planned to be commissioned by 2022 have been completed and started their operations before 2022. However, all of the projects planned to be commissioned by 2023 have not been commenced at the time of ex-post evaluation in 2022.

(2) Power system development: Implementation of power system development projects has significantly delayed due to various reasons including financial situation of EDM, national economic situation, and the pandemic of COVID 19.

(3) Power system operation: While none of the actions planned to improve power system operation has been implemented, some projects including improvement of skill training center and introduction of SCADA/EMS⁴ are in process with the assistance of development partners including Agence Française de Développement (AFD), African Development Bank (AfDB), and others.

(4) Distribution development: Although no specific data are available, some distribution development projects are ongoing installing additional power transformers, upgrading underground cables, and reconstructing damaged substations and distribution lines.

(5) Electrification development: The electrification rate has been steady increasing in all provinces in the county.

<Other Impacts at the Time of Ex-post Evaluation>

The project was classified as Category B according to JICA's "Guidelines for Environmental and Social Considerations" (April 2010). No involuntary resettlement and other negative impact were caused by the project. In the implementation stage of the projects mentioned in the Master Plan and implemented by the government of Mozambique, there were inevitable negative environmental and social impacts such as soil erosion, tree cuts, dust, noise caused by the construction works and land acquisition and resettlements. EDM applied appropriate measures to mitigate the magnitude of impacts complying with related laws and regulations such as the Land Law (Law 19/1997), Environmental Framework Act (Act 20/1997), and others. Environmental impact assessment (EIA) is conducted according to the Regulations for Environmental Impact Assessment (Decree 54/2015). Land acquisition and resettlement have been accordingly conducted

³ ④ : very high, ③ : high, ② : moderately low, ① : low * To be the same afterwards.

⁴ Supervisory control and data acquisition (SCADA)/ energy management system (EMS). SCADA/EMS is a package software for centralized supervision and control of power system.

following the Land Law (Law 19/1997) and Regulations for the Resettlement Process Resulting from Economic Activities (Decree 31/2012). For the projects, which were mentioned in the Master Plan but not financed by JICA, resulting in involuntary resettlement, Resettlement Action Plans (RAPs) have been prepared and applied to compensate for affected residents. Environmental and social consideration plans prepared by the contractors are to be approved in accordance with the World Bank's standards including the World Bank Safeguard Policy, OP 4.12, Annex A. According to EDM, no particular environmental and social issues have been reported. As for positive impacts, construction works of the Master Plan projects have created job opportunities to the local population.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ②.

Status of Achievement of Utilization Status of the Proposed Plan and Expected Goals through the Proposed Plan

Aim	Indicators	Results	Source
Utilization Status of the Proposed Plan: (1) The master plan formulated by the project will be approved as the national long-term power system development plan.	Indicator 1: The master plan will be approved by the government of Mozambique.	Status of Utilization: Mostly utilized. (Ex-post Evaluation) The Master Plan was approved by the Council of Ministers of Mozambique in October 2018.	MIREME, EDM
(2) The staff of EDM are able to update the master plan periodically and efficiently.	Indicator 2: The master plan will be updated by EDM.	Status of Utilization: Not utilized. (Ex-post Evaluation) The Master Plan has not been updated. EDM is drafting the terms of reference for consulting services to update the Master Plan at the time of ex-post evaluation. The timetable of the update is not fixed. According to MIREME and EDM, the capacity improvement of EDM's staff took time more than expected, and they have not been able to update the Master Plan periodically and efficiently by themselves despite two times extension of the project period.	MIREME, EDM
Expected Goals through the Proposed Plan: Priority projects in the master plan will be smoothly implemented.	Indicator: Implementation situation of the priority projects planned in the master plan.	Status of Achievement: Not achieved. (Ex-post Evaluation) (1) Generation Development: Four projects were planned to be commissioned by 2022 and all of them started their operations before 2022. However, although six projects were planned to be commissioned by 2023, all of the six projects are not commenced at the time of ex-post evaluation in 2022. (2) Power System Development: While the total number of 247 projects were planned to be commissioned by 2022, seventeen projects have completed their construction works and some others are under construction at the time of ex-post evaluation in 2022. (3) Power System Operation: Three actions were planned to be implemented as follows. 1) Establishment of EDM's internal guidelines and formulation of formal rules for power system operation, 2) Analysis of internal business process, creation of relevant skill training curricula and their implementations, and 3) Determination of functions of SCADA/EMS and their effectuations. Action 2 and 3 were planned to be implemented utilizing the results of Action 1. However, since Action 1 was not implemented, Action 2 and 3 were not implemented. Improvement of skill training center and SCADA/EMS are in process with the assistance of other development partners. (4) Distribution Development: Some projects are ongoing. The data of the number of the projects were not available. (5) Electrification: The electrification rate has been steadily increasing in all provinces in the county. The nationwide electrification rate improved from 31% in 2018 to 42% in 2022.	MIREME, EDM

3 Efficiency

The project cost slightly exceeded the plan (the ratio against the plan: 107%) and the project period considerably exceeded the plan (the ratio against the plan: 183%). The first extension was made to facilitate understanding of related agencies mainly on financing for implementing the Master Plan. The second extension was made to support the launching of the Master Plan Implementation Unit and to add technical transfer activities on generation plan, distribution loss reduction, and economic and financial analysis. Outputs were produced as planned. In the light above, the efficiency of the project is ②.

4 Sustainability

<Policy Aspect>

"The Government's Five-year Plan 2020-2024" (PQG) places high priority on the investment in economic and social infrastructures including energy sector that facilitates economic activity, reduces transaction cost, creates jobs, promotes national and regional integration, and improves the living conditions of the people. In line with PQG, the New Electricity Law was enacted in July 2022. One of the objectives of the law is to strengthen the security of energy supply inviting investment and participation by the private sector in power supply activities on fair and competitive terms.

<Institutional/Organizational Aspect>

The action plan for monitoring the implementation of the projects planned in the Master Plan including environmental issues was formulated. The action plan defined responsibilities of entities involved and appointed EDM as a focal organization under the supervision of MIREME. According to MIREME and EDM, the number of staff in MIREME and EDM involved in the implementation of the projects

has not been sufficient for the volume of work.

<Technical Aspect>

The staff who learned and experienced master plan formulation in the project has been decreasing due to transfer and turnover. Besides, training system including OJT has not been properly functioning in MIREME and EDM due to the pandemic of COVID 19. A technical cooperation project with the assistance of JICA, the “Project for Improvement of Energy Loss Reduction on Distribution Network” (2020-2023), is ongoing at the time of ex-post evaluation to improve the financial situation of EDM through technical capacity improvement of the staff of EDM to reduce energy loss on distribution network.

<Financial Aspect>

Financial condition of EDM was not stable before the project in term of profit margin, utilization and turnover of assets, and debt repayment. The condition has not been largely changed after the completion of the project. However, the number of customers and sales of electricity have been increasing, and the solid growing of sales is expected to continue given the solid demand increase. MIREME and EDM, with support from the World Bank, have developed the Financial Strengthening Plan (FSP) for EDM aiming at strengthening of financial sustainability of the sector. JICA dispatched a financial analysis expert from 2019 to 2022 to improve EDM’s financial status expecting to contribute to the implementation of the projects planned in the Master Plan. In addition, it is expected that the technical cooperation project assisted by JICA “Project for Improvement of Energy Loss Reduction on Distribution Network” (2020-2023) improves the financial situation of EDM by reducing energy loss on distribution network. Besides, for implementing the projects planned in the Master Plan, a various investment strategies have been employed including Public Private Partnership (PPP) and joint ventures of the government organizations.

<Environmental and Social Aspect>

Due regard has been given to environmental and social considerations for implementing the projects planned in the Master Plan as stated above in <Other Impacts at the Time of Ex-post Evaluation>. No particular environmental and social issues have been reported by the time of ex-post evaluation.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the institutional/organizational, technical, and financial aspects of the implementing agency. Therefore, the sustainability of the project effects is ②.

5 Summary of the Evaluation

While the project prepared the Master Plan, the capacity improvement of the staff of EDM was not sufficient. After the project completion, the proposed plan has been partially utilized for improving the generation development and electrification. As for sustainability, some problems have been observed in terms of the institutional/organizational, technical, and financial aspects. As for efficiency, the project period considerably exceeded the plan. Considering all of the above points, this project is evaluated to be partially satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

- As a comprehensive means to improve financial situation of power sector, it is recommended that EDM and MIREME take initiative to execute the recommendations on financial strategy made in the Master Plan. The recommendations included power tariff adjustment, formulation of the implementation framework for private investments and joint projects with HCB⁵/Motraco⁶, improvement and creation of laws and regulations to facilitate private sector participation, and other various short-, mid-, and long-term strategies for EDM, MIREME, HCB, and Motraco.

Lessons Learned for JICA:

- The project planned to achieve two objectives in one year. One of the objectives was to formulate a master plan for the power sector, and the other was to improve capacity of the staff of implementing agency to be able to update the master plan by themselves. However, the capacity improvement could not achieve the satisfactory level of the implementing agency, thus, the project period was extended twice for further technology transfer and some other reasons. However, despite the extension, at the time of ex-post evaluation, the capacity of the implementing agency is not high enough to update the master plan, and they are preparing to procure consultant’s services to the update. Capacity improvement through technology transfer generally takes time. The experience of the project indicates that it could be too ambitious to strive for double objectives of master plan formulation and capacity improvement at a high level in one year or even in two years. Therefore, it is recommended that a development planning project sets a realistically achievable level of capacity improvement or ensures long enough project period for capacity improvement. A program consists of a development planning project for master plan formulation and a technical cooperation project for capacity improvement may be another alternative.

⁵ Hidroeléctrica de Cahora Bassa

⁶ Mozambique Transmission Company



Maputo Gas Fired Combined Cycle Power Plant Development Project assisted by JICA (2013-2023)



Project for Reinforcement of Transmission Network in Nacala Corridor assisted by JICA (2013-2018) (Namialo substation)