

Ex-Ante Evaluation

1. Name of the Project

Country: Jamaica

Project: Energy Management and Efficiency Programme

Date of Loan Agreement: November 23, 2017

Loan Amount: 15 million US dollars

(Approximately equivalent to 1,520 million Japanese yen)

Borrower: The Government of Jamaica

2. Background and Rationale of the Project

(1) Current State and Issues of the Energy Sector in Jamaica

Jamaica lacks domestic resources of fossil fuels and is limited in the application of renewable energy. The resulting dependence on fossil fuel imports, which makes up more than 90% of the Jamaica's energy demands, places an enormous financial burden on the country. In 2014, the country spent a total of roughly 1,759 million US dollars on fossil fuel imports, 13% of its Gross Domestic Product (GDP). The improvement of energy efficiency is necessary for reducing fossil fuel imports and achieving fiscal soundness.

(2) Development Policies for Developing the Energy Sector in Jamaica and the Priority of the Project

In 2009, the Government of Jamaica (GOJ) created the Vision 2030 Jamaica-National Development Plan. One of the 15 outcomes set forth in this plan is the achievement of energy security and efficiency. In order to achieve those goals, the National Energy Policy (NEP) was instituted in 2009 in order to inter alia significantly cut energy consumption in the public sector, as well as encouraging energy efficiency in key energy-consuming sectors with the use of energy-efficient devices and studies on the application of new technologies.

In 2015, the public sector accounted for 13% of the country's total energy consumption, and its annual growth rate of 4% is higher than that of other sectors. The energy consumed by the public sector can be broken down into water supply and irrigation facilities (50%); health, education, and other public facilities (22.5%), and streetlights (13%–17%). Inverter air-conditioners, Light Emitting Diode (LED) lighting, and other energy-efficient devices have yet to be installed in the majority of public facilities. Their introduction is essential for promoting energy efficiency in the public sector.

The NEP is also pursuing energy efficiency in the transport sector to curb fossil fuel imports, given that the sector consumes 46% of imported fuel. The Project Profile of

the Inter-American Development Bank (IDB)¹ points out that the design of the existing road traffic system in Kingston does not consider the actual volume of traffic on the road. The study goes on to estimate that improving the urban traffic control system by installing or upgrading to, for example, optical fiber cables or traffic lights on key roads, will reduce fuel consumption by 40% as cars can travel on these roads at an average speed of 28 km/h, instead of the current average speed of 22 km/h.

In addition, the Electricity Act enacted in 2015 stipulates that the Ministry of Science, Energy and Technology (MSET) must develop an integrated resource plan (IRP) to facilitate efforts for achieving energy efficiency targets, with the help of key indicators. Accordingly, the MSET is considering the establishment of an internal energy efficiency planning unit to serve as a focal point for data collection under the IRP, as well as a monitoring and evaluation agency for both public and private energy efficiency initiatives.

(3) Japan and JICA's Policy and Operations in the Energy Sector

The Country Assistance Policy for Jamaica (April 2014) formulated by the Government of Japan sets disaster management and the environment as priority areas. The Rolling Plan states in its strategy that it will "help overcome the unique vulnerabilities faced by developing small island states by cultivating human resources and enhancing the management capacity of organizations in order to encourage energy efficiency and transition to renewable sources of energy." The policy bears in mind the "need for the development of renewable sources of energy and energy efficiency in response to the current dependence on imported fossil fuels as a source of electricity and other forms of energy."

(4) Other Donors' Activity

In 2011, the IDB implemented the Energy Efficiency and Conservation Programme (EECP), a loan in the sum of 3.6 million US dollars to retrofit 26 public facilities with energy efficient systems. In total over a 2.5 year period, the programme lowered annual power consumption by 1,076 Gigawatt hours (GWhs) and saved the equivalent of 341,516 US dollars/year in electricity bills.

(5) Rationale of the EMEP

The Energy Management and Efficiency Programme (EMEP) is aligned with Jamaica's NEP and Japan's aid policy. It contributes to energy efficiency which is one of Jamaica's priority areas, in addition to achieving Goal 7 "Affordable and Clean Energy" and Goal 13 "Climate Action" of the Sustainable Development Goals (SDGs). Therefore, there is great support for JICA's assistance in cooperation with the IDB under the Co-financing for Renewable Energy and Energy Efficiency (CORE) scheme.

¹ <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40320099>

3. Project Description

(1) Project Objective

In this Project, public facilities, mainly in Kingston will be retrofitted to introduce energy efficient technologies and devices. It will also make changes to reduce fuel consumption in the transport sector in Kingston, as well as strengthen the capacity of the MSET. In this manner, the Project facilitates energy efficiency in both the public and private sectors in Jamaica, and thereby will assist the country in overcoming its environmental vulnerabilities while mitigating the impact of climate change.

(2) Project Sites/Target Area

Whole area in Jamaica, mainly in Kingston. There are three (3) Project Components:

- 1) **Component 1:** Retrofitting of public facilities, mainly in Kingston, but also in other parts of Jamaica to introduce energy efficiency technologies and devices
 - Retrofitting of hospitals, schools, and government buildings for greater energy efficiency (upgrade and introduce air-conditioners, boilers, LED lighting, photovoltaic panels and so forth); and
 - A study to select target facilities (consulting services).
- 2) **Component 2:** Reduce fuel consumption in the transport sector in the Kingston Metropolitan Area (KMA)
 - Installation of devices (optical fiber cables, traffic lights, cameras, sensors, software, communication devices, etc.) and the relevant training for implementing a Urban Traffic Management System (UTMS) throughout KMA.
- 3) **Component 3:** Increasing the capacity of the MSET for further energy efficiency in the public and private sectors
 - Technical assistance for strengthening the planning and supervision capacity of the MSET energy efficiency planning unit (consulting services); and
 - Development of an information system, including the introduction of software for developing an IRP.

(4) Estimated Programme Financing

40.0million US dollars *excluding JICA's front end fee and interest during construction

(JICA loan amount: 15 million US dollars, roughly equivalent to 1,520 million yen)

(5) Schedule

The expected duration of the Project should be from November 2017 to October 2023 (72 months in total). In coordination with the IDB as a co-financier, project completion is defined when all loans are fully disbursed for project activities, including consulting services, in October 2023.

(6) Project Implementation Structure

- 1) Borrower: The Government of Jamaica

- 2) Guarantor: None
 - 3) Executing Agency: The Petroleum Corporation of Jamaica (PCJ) under the portfolio of the MSET (National Works Agency (NWA) and the MSET take roles as operators for Components 2 and 3 respectively)
 - 4) Operation and Maintenance System:
 - (1) Component 1: PCJ and each public facility
 - (2) Component 2: NWA
 - (3) Component 3: MSET
- (7) Environmental and Social Considerations/Poverty Reduction/Social Development
- 1) Environmental and Social Considerations
 - (1) Category: B
 - (2) Reason for Categorization: In light of JICA's Guidelines for Environmental and Social Considerations (proclaimed in April 2010), the project is not located in a sensitive area, nor has sensitive characteristics, nor falls into sensitive sectors under the JICA guidelines for environmental and social considerations (April 2010), and its potential adverse impacts on the environment are not likely to be significant.
 - (3) Environmental Permit: No permit is required by Jamaican law for the EMEP. Note that an environmental impact assessment was carried out with IDB funding to develop a plan with environmental and social considerations in August, 2016. These considerations will be reflected in the project activities, along with monitoring and so forth.
 - (4) Anti-Pollution Measures: Mercury, coolant, and asbestos that may appear when the devices are being upgraded will be treated by applying regulations in force in the United States or other accepted international regulations. The impact on air quality from civil engineering work, such as the attachment of ducts and drilling under roads, will be mitigated by covering transport trucks with anti-dust materials and sprinkling of water on the affected roads. The impact from noise and vibration will be limited by restricting construction work done during the night, notifying residents beforehand, etc.
 - (5) Natural Environment: The Project sites are not located in national parks or other environmentally vulnerable places. There will be minimal undesirable impact on the natural environment.
 - (6) Social Environment: This EMEP will not entail any involuntary relocation by residents or land acquisition.
 - (7) Other/Monitoring: The PCJ, as the Executing Agency for the EMEP, will monitor waste management, air quality, noise, and other negative sources of impact during the construction work.
 - 2) Promotion of Poverty Reduction: None in particular

3) Promotion of Social Development: At least 25% of the intended trainees under the EMEP are women. Thus, the EMEP aims to create jobs for women in the relatively new industry of energy efficiency. Therefore, it is classified as a Gender Integrated Project.

(8) Collaboration with Other Donors

In addition to the 15 million US dollars being provided by JICA, the EMEP is co-financed with the IDB under the CORE scheme. The IDB has decided to loan 15 million US dollars. The European Union by way of the European Union-Caribbean Investment Facility (EU-CIF) has provided a grant of approximately 10 million US dollars to be allocated mainly to Component 1².

4. Targeted Outcomes

(1) Quantitative Effects

1) Outcomes (Operation and Effect Indicators)

Indicator	Baseline (Actual value in 2015)	Target (2023) [Expected value at project completion]
Electricity consumption of the 73 facilities to be retrofitted for energy efficiency (kWh/year)	31,377,402	16,004,807
Green-house gas (GHG) emissions from the 73 facilities to be retrofitted for energy efficiency (tons of CO ₂ equivalent/year)	52,401	26,729
Fuel consumption of vehicles using the roads to be upgraded in the Kingston Metropolitan Area (KMA) (million liters/year)	296.8	192.7
GHG emissions from vehicles using the roads to be upgraded in KMA (tons of CO ₂ equivalent/year)	579,203	376,044
Required travel time for vehicles using the roads to be upgraded in the KMA (million hours/year)	155.2	99.96
Number of IRPs updated by the MSET	-	1

² The Grant Agreement for the EU-CIF Energy Management and Efficiency Investment Grant Operation (JA-G1003) was signed between the IDB and GOJ on January 31, 2018.

(Note) • The operation and effect indicators for this project will be identical to the ones applied by the IDB. In keeping with the practices at the IDB, the targets are defined the moment the project is completed by using the same indicators.

- The number of facilities to be retrofitted for energy efficiency is according to the current plan, which may change depending on the result of the study for selecting investment target facilities.

(2) Qualitative Effects

- Promotion of energy efficiency initiatives by increasing the capacity of the MSET; and
- Promotion of economic and social development by easing traffic congestion on specific roadways.

(3) Internal Rate of Return

Considering the distinct nature of each component of this project, the economic internal rate of return (EIRR) is derived for three different categories. Based on the following assumptions, the resulting EIRRs are A) 19%, B) 67% and C) 43%.

[EIRR]

A) Component 1: Retrofit for energy efficiency (upgrade and introduction of air conditioners, boilers, photovoltaic panels, etc.)

Cost: Project cost (excluding tax) without taking into account the marginal amount of maintenance costs

Benefit: Reduced expense on electricity used by target facilities

Project Life: 20 years

B) Component 1: Replacement with LED lighting

Cost: Project cost (excluding tax) without taking into account the marginal amount of maintenance costs

Benefit: Reduced expense on electricity used by target facilities

Project Life: 20 years

C) Component 2

Cost: Project cost (excluding tax) without taking into account the maintenance costs because there will be no change in staff assignments and there are already spare parts for devices

Benefit: Reduced expense on fuel for traveling target roads

Project Life: 10 years

[FIRR]

The Financial Internal Rate of Return (FIRR) is not calculated because this project does not expect to collect fees from its users.

* Note that the expected outcome described above only concerns the parts of the project financed by loans from JICA and the IDB. Parts to be financed by the EU-CIF grant are not included.

5. External Factors and Risk Control

None in particular

6. Lessons Learned from Past Projects and Their Application to the Project

(1) Lessons Learned from Past Projects

- 1) The ex-post evaluation for the Promotion of Electricity Energy Efficiency Project in Thailand (evaluated in fiscal year 2006) offered a lesson that a reduction in GHG emissions can be sustained with advertising, using a project involving public awareness campaigns to promote the application of energy efficient products. Additionally, the ex-post evaluation of Micro, Small and Medium Enterprises Energy Saving Project in India (evaluated in fiscal year 2012) found that efforts to become energy efficient by micro, small and medium enterprises were encouraged by presenting specific examples of practices and benefits as a part of awareness campaigns addressing energy efficiency.
- 2) The ex-post evaluation of the Project for the Improvement of Traffic Flow in Kampala City in the Republic of Uganda (evaluated in fiscal year 2011) also offered the following lessons. First, a closer partnership between traffic police officers and the relevant organizations led to enhanced awareness of traffic safety and ensured compliance with traffic laws and regulations. Second, technical guidance must be provided to multiple counterparts and multiple copies of manuals should be provided for newly recruited or assigned personnel to be able to continue the maintenance of the devices introduced without any loss of critical knowledge, which occurs when the person in charge leaves the organization.

(2) Lessons for the Project

- 1) The LED lighting will be introduced at 73 facilities³ as a part of the retrofits in Component 1 of the EMEP (financed by the IDB and JICA). The selection of these many facilities is intended to raise awareness to a wider audience. The public relations campaign to demonstrate the effect of these retrofits for energy efficiency beyond the circle of stakeholders involved in the selected facilities will be conducted as a part of the consulting services offered in this project.

³ The currently planned number may change depending on the study to select investment facilities. Under the EMEP, retrofitting for seven (7) other facilities to become Energy efficient will be financed by the EU-CIF Energy Management and Efficiency Non-Reimbursable Financing Operation.

2) In Component 2, in order for new technologies to take root, multiple representatives of Project counterparts will be chosen to build capacity throughout the period from when the equipment is installed to the testing, adjustment, and full introduction of traffic control systems.

7. Plan for Future Evaluation

(1) Indicators to be Used

Both (1) Operation and effect indicators in (1) Quantitative Effect and (3) EIRR from 4 Targeted Outcomes, as described above

(2) Timing

At project completion