

Ex-Ante Evaluation

1. Name of the Project

Country: Republic of Senegal

Project: Mamelles Sea Water Desalination Project

Loan Agreement: November 15, 2016

Loan Amount: 27,463 million yen

Borrower: Le Gouvernement de la République du Sénégal (The Government of the Republic of Senegal)

2. Background and Necessity of the Project

(1) Present State of Development and Problems of the Water Supply Sector in Senegal

The Dakar Region, home to the capital of the Republic of Senegal, has recently seen a rapid population growth (increased about 1.4 times between 2002 and 2013). Approximately 3,100,000 people, or over 20% of the national population, live in this region, occupying 0.3% of the nation's land area (according to the 2013 census). This region is also home to some 80% of the nation's industrial activities. In this metropolitan area, the urban infrastructure was developed in the early 1980s based on the assumption that the population would grow to 300,000 people; therefore, it cannot meet the increasing demand resulted from this quick population growth. In fact, the daily maximum demand for drinking water (316,943 m³ per day) had already outgrown the daily water supply capacity (311,310 m³ per day) in 2010. The demand is estimated to exceed 600,000 m³ per day by 2025 (according to the 2015 JICA study report).

The water sources of the Dakar Region consist half of surface water and half of groundwater. The region's two surface water purification plants take water from Guiers Lake, located some 250 km away from Dakar. When the water pipeline connecting these plants to the Dakar Region burst in September 2013, their water supply was suspended for almost three weeks, causing a significant impact on people's lives and economic activities. As for the groundwater, restrictions will be required in the medium and long run as it is being overused. Therefore, it is urgent to diversify water sources to enhance the water supply capacity.

Another serious problem is water leakage due to the deterioration of water distribution pipes. In particular, Dakar Zone I, which is located at the center of the Dakar Region, has the highest non-revenue water rate (approx. 27%) in the region because around 40% of the water pipes in the zone have been used for over 40 years. Thus, the improvement of the water distribution capacity is as urgent as the development of water resources.

(2) Senegal's Development Policies for the Water Supply Sector and the Role of this

Project

In order to catch up with the increasing water demand in the medium to long term, the National Water Company of Senegal (Société Nationale des Eaux du Sénégal; SONES) formulated the Master Plan for the Mobilization of Water Resources in the Dakar Region and Petite Côte in 2010 and the Plan for the Mobilization of Water Resources in the Dakar Region in 2014. These water resources development plans consist of the extension of an existing water purification plant and the construction of new sea water desalination plants. Based on these plans, the Government of Senegal requested the Government of Japan to provide loan assistance for the Mamelles Sea Water Desalination Project (hereinafter referred to as “this Project”) in July 2013. This Project is also listed in the Priority Action Plan 2014-2018 in the Senegal Emergent Plan (Plan Sénégal Émergent; PSE), which constitutes the national development strategy published in February 2014.

(3) Japan and JICA’s Policy and Operations in the Power Sector in Senegal

JICA’s Country Analysis Paper for the Republic of Senegal identifies “economic infrastructure development” as a priority issue. Japan’s Country Assistance Policy for the Republic of Senegal also focuses on the development of urban infrastructure under the “economic infrastructure development program” related to the development issue of “reinforcement of the base of economic development” under the priority area of “support for sustainable economic growth.” Thus, this Project is in line with these policy and analysis documents as it is designed to develop water supply infrastructure that constitutes a foundation for the lives of urban residents.

(4) Other Donors’ Activities

The major development partners in the water supply sector in the Republic of Senegal include France, the World Bank, and the European Investment Bank (EIB). The extension of the existing Keur Momar Sarr Purification Plant (KMS3) mentioned above in the Plan for the Mobilization of Water Resources in the Dakar Region is to be financed by the French Development Agency (AFD) and the EIB, among others.

(5) Necessity of the Project

The Government of Senegal is being engaged in water resource development to meet the growing water demand in the Dakar Metropolitan Area, giving urgent priority to this Project. Thus, this Project is consistent with the development issues and policies of Senegal as well as the assistance policies of Japan and JICA; therefore, it is highly necessary and relevant for JICA to implement this Project.

3. Project Description

(1) Project Objective

To increase water production capacity, to diversify water resources, and to improve access to safe water by constructing desalination plant and the related

facilities in the seaside area of Mamelles, as well as improving distribution networks, thereby contributing to better living conditions of the people, and sustainable economic growth in the Dakar Region.

(2) Project Site/Target Area

Dakar Department, Dakar Region

(3) Project Components

- 1) Construction of a sea water desalination plant (using reverse osmosis technology and having a capacity of 50,000 m³ per day) and associated facilities (international competitive bidding)
- 2) Improvement of the water distribution network (in Dakar Zone I): installation of water distribution mains and improvement of existing water distribution networks (international competitive bidding)
- 3) Consulting services (conceptual design, bidding assistance, construction supervision, capacity development, etc.) (single source selection)

(4) Project Cost

31,445 million yen (Loan Amount: 27,463 million yen)

(5) Project Implementation Schedule

November 2016 to December (74 months in total) with the completion of all facility constructions (desalination plant will be constructed in December 2020 while water distribution networks will be improved in December 2021)

(6) Project Implementation Structure

- 1) Borrower: Le Gouvernement de la République du Sénégal (The Government of the Republic of Senegal)
- 2) Guarantor: None
- 3) Executing Agency: National Water Company of Senegal (SONES: La Société Nationale des Eaux du Sénégal)
- 4) Operation and Maintenance System
 - Sea water desalination plant: operated and maintained by the EPC contractor under the design, build, and operation (DBO) contract for a given period (at least 8 years) after the commencement of the service. Electricity is to be supplied from a high-voltage distribution line (90kV) by the National Electricity Company of Senegal (Société Nationale d'Electricité du Sénégal; SENELEC).
 - Water distribution network: operated and maintained by an agency entering into an affermage contract with the SONES for the operation of water supply services. The contract has been awarded to Water Senegal (Sénégalaise des Eaux; SDE). In 2018, however, the operator will be appointed through competitive tender.

(7) Environmental and Social Considerations/Poverty Reduction/Social Development

1) Environmental and Social Considerations

- (i) Category: B

(ii) Reason for Categorization

This project is not likely to have significant adverse impact on the environment due to the fact that the project sector and project characteristics are not likely to exert impact nor the project is located in a sensitive area under the Japan International Cooperation Agency Guidelines for Confirmation of Environmental and Social Considerations (established in April 2002).

(iii) Environmental Permit

The Environmental and Social Impact Assessment (ESIA) report for this Project will be approved by the Ministry of Environment and Sustainable Development (MEDER) by the end of 2016.

(iv) Anti-Pollution Measures

After the commencement of the service, necessary measures (e.g. conducting the aeration process before discharge and installing equipment to determine the direction of water discharge) will be taken to ensure that the concentrated sea water discharged from the desalination plant can meet the legal standards of Senegal as well as the International Finance Corporation's Environmental, Health, and Safety Guidelines (IFC EHS Guidelines). During the construction period, necessary measures will also be taken to minimize the dust and noise pollution (e.g. using water sprinkler trucks and installing sound barriers).

(v) Natural Environment

The project site is not located in or around sensitive areas such as national parks; therefore, this Project is unlikely to have any adverse impact on the natural environment.

(vi) Social Environment

The target area of this Project consists of 2.56 ha of privately-owned land and 2.41 ha of state-owned land, but this Project will not involve involuntary resettlement. In the land acquisition process, compensation will be made at full replacement cost in accordance with the laws and regulations of Senegal as well as JICA Guidelines for Environmental and Social Considerations. Discussions are being held with the stakeholders that could be affected by this Project in order to obtain their consent to this Project. The adverse impact on fisheries in and around the project area is likely to be limited because the waste water of the desalination plant will be treated before discharged.

(vii) Other/Monitoring

The SONES will take main responsibility for monitoring the impact of the concentrated sea water discharged from the plant on the quality of surrounding waters after the commencement of the service as well as the dust, noise pollution, and other impacts on the ecosystem (including fisheries) during the construction process in accordance with the Environment Monitoring Plan (EMoP) to be finalized

through the Environmental and Social Impact Assessment (ESIA) Study. The land acquisition process will be monitored mainly by the Land Acquisition Committee.

2) Promotion of Poverty Reduction: N/A

3) Promotion of Social Development: N/A

(8) Collaboration with Other Donors

The major development partners in the water supply sector in the Republic of Senegal include France, the World Bank, and the European Investment Bank (EIB).

(9) Other Important Issues

This Project is expected to utilize the knowledge and technology of Japanese companies and local governments, such as energy-efficient reverse osmosis technology (RO filtration), ultrafiltration (UF) pretreatment technology, and improvements in water distribution networks (e.g. reducing the non-revenue water volume through distribution control).

4. Targeted Outcomes

(1) Quantitative Effects

Indicator	Baseline (Actual value in 2014)	Target (2023) [Two years after project completion]
Indicators for the entire region of Dakar (reference) ^{*1}		
(1) Number of households connected to the water supply network (households)	312,558	418,652
(2) Annual water production capacity of the Dakar Region (million m ³ / year)	104.6	138.8
(3) Annual revenue water volume (million m ³ / year)	82.5	108.3
Indicators for the Mamelles Sea Water Desalination Plant		
(4) Average water production capacity of the Mamelles Sea Water Desalination Plant (m ³ / day)	-	23,151
(5) Maximum water production capacity of the Mamelles Sea Water Desalination Plant (m ³ / day)	-	50,000
Indicators for the improvement of the water distribution network in Dakar Zone I		
(6) Non-revenue water rate (%)	26.9	20.0
(7) Annual non-revenue water volume (million m ³ / year)	15.2	13.1
(8) 24-hour water supply (%) *2	68.3	100.0
(9) Water supply with adequate water pressure (%) *2	80.3	100.0

^{*1}They are referred to as operation indicators because this Project is designed to contribute to the improvement of water services in the entire region of Dakar.

^{*2}It will be assessed through the customer satisfaction survey to be conducted by the implementation agency.

(2) Qualitative Effects

Improvement of the living environment and promotion of economic and social development through stable water supply services

(3) Internal Rate of Return

Based on the conditions below, the Economic Internal Rate of Return (EIRR) of this project was calculated as 8.5% and the financial internal rate of return (FIRR) will be 5.6%

【EIRR】

Cost: Project cost, maintenance expenses (tax excluded)

Benefit: Increase in the use of water (attributable to the increased water production resulting from the construction of the desalination plant and the conservation of water through the improvement of the distribution network; depending on the willingness to pay), decreasing the cost of transporting household water, and reducing economic loss from water cut-off.

Project life: 30 years

【FIRR】

Cost: Project cost, maintenance expenses

Benefit: Increase in the revenue from water tariff (attributable to the increased water production resulting from the construction of the desalination plant and the conservation of water through the improvement of the distribution network)

Project life: 30 years

5. External Risk Factors and Control

The following are prerequisites for the success of this Project: (i) ensuring stable power supply from the electricity supplier (SENELEC); and (ii) taking financial measures, including increase in water tariff, to secure sustainable water supply services.

6. Lessons Learned from Past Projects

(1) Findings of Similar Projects

The results of the ex-post evaluation of the Nadi-Lautoka Regional Water Supply Project in the Republic of Fiji (in 1997) indicate that consideration should be given at the project formulation stage to prevent external factors (e.g. leakage from aged distribution pipes) from reducing the effects of the project.

(2) Lessons Learned to the Project

Based on the comprehensive examination of the water supply process, from production to distribution, the scope of this Project is set to include the rehabilitation and improvement of the water distribution network in Dakar Zone I, which has a particularly high non-revenue water rate.

7. Plans for Future Evaluation

(1) Indicators for Future Evaluation

As described in (1) Quantitative Effects in 4. Targeted Outcomes.

(1) Timing of Next Evaluation

Two years after the project completion.