

Ex-Ante Evaluation (for Japanese ODA Loan)

South Asia Division 1, South Asia Department, JICA

1. Name of the Project

Country: India

Project: Bengaluru Water Supply and Sewerage Project (Phase 3) (I)

Loan Agreement: January 24, 2018

2. Background and Necessity of the Project

(1) Current State and Issues of the Water Supply and Sewerage Sector in India

In India, the percentage of households able to secure an adequate amount of drinking water has reached nearly 90% in urban areas (according to the Ministry of Statistics and Programme Implementation's 69th round of National Sample Survey report of 2012). However, the development of water resources and water supply/sewerage facilities has not kept up with the increased demand for water caused by population growth and economic development. In terms of operation and maintenance of the water supply and sewerage, some areas face financial problems related to sluggish collection rates for water charges caused by a high rate of non-revenue water and insufficient capacity for customer management and public relations activities. There are also areas where the deterioration of facilities has advanced due to a shortage of financial resources for maintenance management.

In Bruhat Bengaluru Mahanagara Palike (Bengaluru metropolitan area, hereinafter referred to as "BBMP"), which is the target area of the Bengaluru Water Supply and Sewerage Project (Phase 3) (hereinafter referred to as the "Project"), comprises Bengaluru City (the state capital of Karnataka in the southern region of India), its surrounding Urban Local Bodies (hereinafter referred to as "ULB"), and 110 villages where development has been progressing in recent years. According to the 2011 National Census, the population of BBMP is approximately 8.5 million people. BBMP has experienced rapid growth as the center of India's computer software industry. Often called the Silicon Valley of India, many Japanese companies have expanded into the area (90 companies as of March 2017, according to the Japan Chamber of Commerce and Industry Bangalore¹). Until now, water supply and sewerage facilities in Bengaluru City and ULB have been developed by the Bangalore Water Supply and Sewerage Board (hereinafter referred to as "BWSSB," who are in charge of water supply and sewerage services in these areas, through the implementation of the Cauvery Water Supply Scheme (hereinafter referred to as "CWSS")). However, water supply and sewerage facilities have not yet been developed in the 110 villages. As of 2016, water demand (excluding groundwater) in BBMP has risen to 1,550 million liters/day (MLD). In contrast, the capacity of BWSSB to supply water has stagnated at 1,310 MLD, thus creating the need for developing water supply and sewerage facilities in response to the population increase and economic growth expected for the future. Additionally, sewerage for Bengaluru City and ULB is also continuing to be developed with the growth of the CWSS. The

¹ Although the name of the city changed from Bangalore to Bengaluru in 2006, some organizations retain the name "Bangalore."

sewerage coverage rate in Bengaluru City is 93.5%, but no sewerage services exist in the 110 villages; thus, solving problems pertaining to hygiene and the water environment is a pressing issue.

In the national water policy formulated by the Ministry of Water Resources in 2012, the Government of India has put forth the goals of developing water supply and sewerage services in various regions and ensuring that the central government, states, and local bodies secure drinking water for the entire population. Additionally, in the Three Year Action Agenda 2017/18 to 2019/20 announced in 2017 by the National Institute for Transforming India (hereinafter referred to as “NITI Aayog”) established by the Modi administration in 2015, the inadequacy of water supply and sewerage services was addressed as an issue in urban development. Furthermore, the state government of Karnataka’s 2003 Urban Drinking Water and Sanitation Policy aims to provide water supply and sewerage services to the entire population of the state. The Project will develop water supply and sewerage services in order to provide a stable water supply and wastewater treatment for the 110 villages and other areas where rapid development and population growth is expected for the future; this is consistent with the Government of India’s development policies for the water supply and sewerage sectors.

(2) Japan and JICA’s Policy in the Water Supply and Sewerage Sector and Priority of the Project

The Country Assistance Policy for India (March 2016) identifies the provision of “support for sustainable and inclusive growth” as a priority area, with support for water supply and sewerage as a part of its “response to environmental problems and climate change.” Additionally, JICA’s Country Analysis Paper for India identifies the development of industry and urban infrastructure as a priority area for assistance, further stating the necessity of enhancing the standard of living by providing support for the improvement of poor public hygiene conditions and the provision of a safe and stable supply of water, while taking the rapidly increasing population into consideration. As of November 2017, Japan has committed to 31 ODA loans to India for the water supply and sewerage sector in the amount of 592.6 billion yen. In BBMP, two projects have been previously implemented: the Bangalore Water Supply and Sewerage Project (hereinafter referred to as “Phase 1”) and the Bangalore Water Supply and Sewerage Project (Phase 2 (Stage 1/Stage 2)), in which water supply and sewerage services were developed in Bengaluru City and ULB. Phase 1 and Phase 2 (Stage 1) have been completed, with Phase 2 (Stage 2) loan completion scheduled for January 2018.

(3) Other Donors’ Activities

The World Bank has identified urbanization reform as one of its priority areas, focusing on changes due to population growth in medium-sized cities and the abandonment of agriculture, with a policy to support the development of water supply and sewerage services to contribute to these reforms. The Asian Development Bank is promoting the development of public infrastructure, including water supply and sewerage as one of their priority areas, also placing focus on the administration of an operation and maintenance system with international standards, organizational structure strengthening and capacity building, and the advancement of PPPs using lessons learned from other countries.

3. Project Description

(1) Project Objectives

By developing water supply facilities (using the Cauvery River as the water source) and sewerage facilities, the Project will provide safe and stable water supply and sewerage services in response to the rapidly increasing demand for water in BBMP of the state of Karnataka in the southern region of India. This will contribute to the development of a sanitary living environment in this region, as well as to the stimulation of its industry.

(2) Project Site/Target Area

BBMP, Karnataka State

(3) Project Components

[Water supply facilities]

- 1) Construction of a water treatment plant and pumping stations, installation of water transmission pipes and city trunk mains
- 2) Construction of distribution reservoirs
- 3) Installation of a centralized SCADA system (integrated system for both water supply and sewerage)
- 4) Installation of raw water conveyance pipes (currently being executed by the implementing agency)
- 5) Installation of branch feeding pipes from new water conveyance facilities to the distribution reservoirs in Bengaluru City (to be executed by the implementing agency)
- 6) Construction of overhead water tanks and booster pumps, installation of water distribution pipes (to be executed by the implementing agency)
- 7) Installation of the 110 villages' water distribution pipe network (currently being executed by the implementing agency)

[Sewerage facilities]

- 8) Construction of sewage treatment plants for the 110 villages
- 9) Installation of sewer mains for the 110 villages
- 10) Installation of sewer lateral lines for the 110 villages (to be executed by the implementing agency)

[Consulting services]

- 11) Consulting services: detailed design, design review, tender assistance, construction supervision, etc.

(4) Estimated Project Cost (Loan Amount)

153,837 million yen (Of this, total loan amount is 81,060 million yen, with 45,000 million yen as the tranche 1 loan amount)

(5) Schedule

January 2018 to February 2026 (98 months in total). The Project is considered complete when all facilities are placed in service (November 2024).

(6) Project Implementation Structure

- 1) Borrower: President of India

2) Guarantor: None

3) Executing Agency: Bangalore Water Supply and Sewerage Board (BWSSB)

4) Operation and Maintenance Management Organization: For the main facilities built for the Project, operation and maintenance management will be outsourced by BWSSB to a subcontractor with a Design-Build-Operate (DBO) contract that includes operation and maintenance for a period of seven years after completion. After seven years have passed, operation and maintenance will be performed through a new outsourcing contract.

(7) Collaboration with Other Schemes and Donors

1) Japan's Assistance Activities: None in particular.

2) Other Donors' Assistance Activities: None in particular.

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

1) Environmental and Social Considerations

(i) Category: B

(ii) Reason for Categorization: The Project does not include any sectors or characteristics likely to cause impact, nor does it fall in a region susceptible to impact as specified in the Japan International Cooperation Agency Guidelines for Environmental and Social Consideration (issued in April 2010), and has thus been deemed as not having a significant negative impact on the environment.

(iii) Environmental Permits: Indian law does not require the creation of an Environmental Impact Assessment (EIA) for the Project. Prior to the start of tendering for the Project, clearance by the Karnataka State Pollution Control Board is expected to be obtained for the sewage treatment plant design and effluent standards.

(iv) Anti-Pollution Measures: Mitigation measures for air pollution, water pollution, noise, and waste disposal will be taken; therefore, any negative impact on the environment is expected to be minimal. Following Indian law, these measures put in place by the contractor will include periodic water sprinkling, imposing speed limits on transport vehicles, regular waste disposal collection, and the prohibition of construction machinery repair facilities and earth/sand dumping near water areas. After the sewage treatment facilities are placed in service, wastewater and sludge will be processed in a manner that meets Indian environmental and emissions standards; no particular negative impacts are foreseen.

(v) Natural Environment: The target region of the Project is not in a sensitive area such as a national park, nor in the surrounding area of such; therefore, negative impacts on the natural environment are expected to be minimal.

(vi) Social Environment: Since the water treatment plant will be built in conjunction with existing facilities, and land for other facilities will be secured through the transfer of ownership rights from other government agencies, no land acquisition or resident resettlement is necessary for the Project.

(vii) Other/Monitoring: Air pollution, noise, and waste materials, etc. generated during construction work, and water pollution, waste materials, etc. generated after the

facilities are placed in service will be monitored by the respective contractors.

2) Cross-cutting Items

Project Related to Climate Change Measures: In their national water policy, the Government of India has set the order of priority for water resource distribution as: drinking water, irrigation, and power generation. Thus, water can be taken with priority for these items, even during periods of drought. Additionally, since a stable water supply can be expected through the development of water supply facilities (using the Cauvery River as its water source) and sewerage facilities, the Project will contribute to climate change (adaptation) measures.

Project Related to Poverty Measures/Poverty Considerations: To assist the urban poor, water supply and sewerage is planned for development in the target areas of the Project, including residential districts of poor populations. Additionally, a tariff level for poor populations has been set, thus this Project corresponds to a project for poverty measures.

3) Gender Classification: Gender Informed (Significant)

Activity Content and Reason for Classification: For public relations and awareness activities related to water conservation, etc., activities are planned based on gender perspectives, which will use location and timing as a means to promote involvement by female residents.

(9) Other Important Issues: None

4. Target Outcomes

(1) Quantitative Effects

1) Outcomes (Operation and Effect Indicators)

Indicator	Baseline (2016)	Target (2026, 2 years after completion)
Water supply		
Water supply volume (110 villages) (m ³ /day)	0	280,000
Water supply volume (BBMP) (m ³ /day)	1,310,000 * ¹	1,710,000
Water treatment plant utilization rate* ² (%)	—	52
Sewerage		
Treated sewage volume (110 villages) (m ³ /day)	0	160,000 * ³
Sewage treatment plant utilization rate* ⁴ (%)	—	37
Concentration of released BOD ₅ (mg/l)	—	not more than 10
Concentration of released TSS (mg/l)	—	not more than 20
Reference values* ⁵		

Population served by water supply (110 villages) (persons)	0	1,570,000
Population served by water supply (BBMP) (persons)	5,840,000	9,060,000
Population treated by sewage treatment facilities (110 villages) (persons)	0	1,210,000

*1 The baseline for water supply volume uses the total nominal capacity of the existing water treatment plants.

*2 Assuming increased demand for a piped water supply with population growth, the water treatment plant utilization rate should reach 100% by 2035.

*3 The volume of treated sewage includes the amount processed at the sewage treatment plants to be constructed for the Project, as well as the sewage treatment plants, etc. constructed during past phases, which will be connected through sewer lines installed during the Project.

*4 After installation of sewer pipes in the 110 villages, taking into consideration that connection to each household will require a certain amount of time, the sewage treatment plant utilization rate should reach 100% by 2034.

*5 The number of connections can be assessed, but since the number of users per connection cannot be determined, these values are for reference purposes.

(2) Qualitative Effects

Improvement of residents' living environment and the water environment, stimulation of industry through investment promotion and the expansion of foreign companies (including Japanese companies) into the area.

(3) Internal Rate of Return

Based on the following preconditions, the Economic Internal Rate of Return (EIRR) is 21.3%. Since the water tariff levels are currently low, the calculated Financial Internal Rate of Return (FIRR) was a negative number.

[EIRR]

Cost: Project cost (excluding tax), operation and maintenance expenses

Benefit: Reduction of costs for households in securing water, reduction of medical costs, and reduction of human waste treatment costs

Project life: 30 years

[FIRR]

Cost: Project cost (including tax), operation and maintenance expenses

Benefit: Revenue from water supply and sewerage service users

Project life: 30 years

5. External Factors and Risk Control

(1) Preconditions: None

(2) External Factors: None

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

The ex-post evaluation of the Urban Water Supply and Sanitation Improvement Program in India and other findings show it is necessary to study realistic plans for establishing a water supply and sewerage tariff system that imposes maximum possible fees on users and the dissemination of using water meters by accurately assessing the demand for services, as well as residents' willingness and ability to pay the charges. It is also necessary to provide continuing support to enhance the operation

and maintenance skills of implementing agencies. Additionally, in the ex-post evaluation results of the preceding Phase 1, it was pointed out that route changes of sewer lines required more time. In Phase 2, delays were experienced when changes were made to the processing volume and method of the sewage treatment plants, showing the necessity of setting a construction schedule with extra time for the sewerage portions. For the Project, financial improvement including a revised tariff system will be conducted by BWSSB and the mandatory individual household connections and installation of water meters has been confirmed. Monitoring will also be performed during project implementation. In addition, technology transfer pertaining to design, management, and non-revenue water measures will be conducted for BWSSB employees as a consulting service pertaining to organizational capacity building. Also, based on the aforementioned lessons learned from Phase 1 and Phase 2, the project period for the sewerage portion will be set with additional time.

7. Evaluation Results

In order to increase the water supply volume to the BBMP and strengthen the water supply capacity for the 110 villages region, a new water treatment plant (using the Cauvery River as its water source) and conveyance/distribution pipes will be constructed to provide safe and stable water service. Additionally, major sewer lines, intermediate sewerage pump stations, and sewage treatment facilities will be constructed for sound urban development in the same region. The Project is in line with India's development issues and development policy, as well as the assistance policies of JICA and the Government of Japan. Additionally, the development of water supply and sewerage with the Project will lead to the stimulation of industry through investment promotion and the expansion of foreign companies (including Japanese companies) into the area. Furthermore, since the Project is thought to contribute to Sustainable Development Goal 6, which is to "ensure availability and sustainable management of water and sanitation for all," the necessity for implementation support for the Project is high.

8. Plan for Future Evaluation

(1) Indicators to be Used

Items (1) – (3) described under Target Outcomes

(2) Timing of the Next Evaluation

Ex-post Evaluation: Two years after project completion