

India

FY2020 Ex-Post Evaluation Report of Japanese ODA Loan Project

"Amritsar Sewerage Project"

External Evaluator: Keisuke Nishikawa, Octavia Japan, Co., Ltd.

0. Summary

The objective of this project was to provide stable sewerage services by constructing sewerage facilities in Amritsar (MCA), thereby contribute to the improvement of sanitation and living conditions of the residents including the poor in the city. This project has a high level of relevance as it is consistent with development policies and needs of India at the time of appraisal and ex-post evaluation, and with Japan's ODA policy at the time of appraisal. In terms of project implementation, although there was a difficulty in calculating the exact actual amount against the planned cost based on the planned components, the efficiency of the project is low because the actual project cost exceeded the plan by more than 5% by taking into account of the project scope practically reduced against the plan, and the project period exceeded the plan. Regarding the project effects, it was confirmed that the quantitative indicators achieved the target values and the qualitative effects were also achieved. In terms of impact, the project has contributed to the improvement of the living environment in the target areas and the sanitation of the local population. Therefore, the effectiveness and impact of the project are high. As for the sustainability of the project, there are some problems in the institutional, technical and financial aspects of the operation and maintenance of sewerage treatment facilities, so the sustainability of the project effects is fair.

In light of the above, this project is evaluated to be partially satisfactory.

1. Project Description



Project location



Sewerage treatment plant (Settling basin)

1.1 Background

In India, population growth had led to serious imbalance between water supply and wastewater treatment, with sewerage failing to keep pace with rising water consumption and over-dependence on groundwater causing the groundwater level to fall. In addition, the health condition of local population had been threatened with diarrhoea and hepatitis caused by contaminated water by the deterioration of living environment due to the rapid influx of people into urban areas, the discharge of sewage beyond the treatment capacity due to industrialisation, and the discharge of sewage into rivers which was far in excess of their natural purification capacity. In response to this situation, the Government of India advocated in "*The 10th Five Year Plan (2002-2007)*" the provision of adequate and safe drinking water to all citizens, clean-up of major polluted rivers and improvement of the basin environment.

Amritsar, a core city in the north-western Indian state of Punjab, bordering Pakistan, had a sewerage coverage rate of only 62% for a rapidly population growth (from 590,000 in 1981 to 980,000 in 2001) and was suffering from poor sanitation due to the discharge of sewage around its houses. Since there wasn't any sewerage treatment plant, all of wastewater was discharged into surrounding rivers directly, which caused the pollution of international rivers flowing into neighbouring Pakistani territory¹. This project was to support the expansion of the sewerage treatment capacity to meet the growing need for improved sanitation in Amritsar.

1.2 Project Outline

The objective of this project is to provide stable sewerage services by constructing sewerage facilities in Amritsar, thereby contributing to the improvement of sanitation and living conditions of the poor and other residents in the area.

<ODA Loan Project>

Loan Approved Amount / Disbursed Amount	6,961million yen / 6,154 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 2007 / March 2007
Terms and Conditions	Interest Rate 0.75%
	Repayment Period 40 years (Grace Period) (10 years)
	Conditions for Procurement General Untied
Borrower / Executing Agency	The President of India

¹ The water quality immediately prior to the inflow into Pakistan was as serious as 80mg/l BOD (based on data provided by JICA).

	Punjab Water Supply and Sewerage Board: PWSSB
Project Completion	March 2019
Target Area	Amritsar, Punjab State
Main Contractor(s)	Oriental Ceramics & Refractories Pvt. Ltd (India) Jyoti Build Tech Pvt. Ltd. (India) / Abhyudaya Housing & Constructions Pvt. Ltd. (India), Passavant Rodeiger Gmbh (Germany) / Shapporji Pallonji (India), M/S Nagarjuna Construction Company Ltd (India)
Main Consultants	Poyry Environment Gmbh (Germany) Tokyo Engineering Consultants Co. Ltd. Tetra Tech Inc (USA)
Related Studies (Feasibility Studies, etc.)	<ul style="list-style-type: none"> • Feasibility Study by Punjab Water Supply and Sewerage Board (2005) • Special Assistance for Project Formation (SAPROF) for Amritsar Water Supply and Sewerage Project in India (2006)
Related Projects	[Technical Assistance] The Formulation and Revision of Manuals on Sewerage and Sewage Treatment in the Republic of India (2009-2013)

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa (Octavia Japan, Co., Ltd.)²

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule;

Duration of the Study: February, 2021 - February, 2022

Duration of the Field Study: July, 2021 - November, 2021 (Remote implementation)

2.3 Constraints during the Evaluation Study

Due to the COVID-19 outbreak, the evaluator could not conduct a field study, and collection of information for ex-post evaluation was conducted by the local consultant and through online interviews based on the questionnaire. Therefore, some information and data were not sufficiently

² From QUNIE Corporation, assisting Octavia Japan, Co., Ltd. with this ex-post evaluation.

provided by the executing agency and implementing consultants, which limited the analysis of some of the project contents and outcomes.

3. Results of the Evaluation (Overall Rating: C³)

3.1 Relevance (Rating: ③⁴)

3.1.1 Consistency with the Development Plan of India

At the time of appraisal, the national development plan in India, "*The 10th Five Year Plan (2002-2007)*" put forward the provision of adequate and safe drinking water to all citizens, the clean-up of major polluted rivers and the improvement of their basin environments. Also, in "*Common Platform (May 2004)*", which was developed by the administration at the time of appraisal, and "*National Urban Renewal Mission*", which started from 2005, stated that public investment in urban infrastructure, including water supply, sewerage and sanitation, should be increased. The latter also included plans for administrative reforms, such as strengthening the financial foundations of each state and local government, and for large-scale support from the central government for development of infrastructure, with consideration to the poor.

"*Atal Mission for Rejuvenation and Urban Transformation (2015)*", a national policy at the time of ex-post evaluation, plans to improve urban infrastructure facilities, particularly water supply and sewerage facilities, in 500 cities across the country. "*Swachh Bharat Mission (Urban) 2.0*" launched in 2021 aims to ensure access to sanitation facilities in urban areas over a period of five years up to 2026 and promotes the development of sewerage facilities, waste management and hygiene awareness. "*Jal Jeevan Mission (Urban)*", also launched in 2021, aims to improve sanitation by providing wastewater treatment facilities for each household in the 500 cities covered by "*National Urban Renewal Mission*". In order to implement the aforementioned "*Atal Mission for Rejuvenation and Urban Transformation (2015)*" at the state level, the Government of Punjab has also developed "*State Annual Action Plan (3rd) after the year 2017*". In this action plan, sewerage system has been identified as the second priority after water supply and sewage pipes will be connected to households and commercial buildings in a phased manner. It also sets out indicators and targets for sewerage development and sewerage treatment facilities.

As mentioned above, the development of sewerage systems was a prioritized issue in the national development policy at the time of appraisal. Also, at the time of ex-post evaluation, the importance of sewerage systems has been more strongly recognized and various policies have been implemented to improve the sanitation environment, especially in urban areas. In Punjab, where Amritsar is located, an action plan has been formulated to implement these

³ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁴ ③: High, ②: Fair, ①: Low

national policies, and sewerage development has been set as one of the priorities. Therefore, this project, which includes the construction of sewerage treatment plants, sewage pipes and other civil works in Amritsar, has been in line with the development policy of India at the time of appraisal and ex-post evaluation.

3.1.2 Consistency with the Development Needs of India

At the time of appraisal, Amritsar had no sewerage treatment plant and the sewerage network had not kept pace to respond to the population growth. As a result, untreated sewage was discharged directly into the rivers, causing water pollution in the international rivers flowing into Pakistan. Specifically, the sewerage coverage was only 62%⁵ and the sewerage network, especially in the periphery of the city, was unmaintained. Due to the sewage being discharged, the hygiene and living conditions of the local population deteriorated in these areas. At that time, the amount of sewage in the city was about 61 million litres per day (61 MLD⁶) and with population growth, the daily sewage generation was expected to reach 201 MLD by 2025.

At the time of the ex-post evaluation, the indicators for the sewerage system were checked: the utilisation rate of sewerage treatment plants was 91% (2020) and the amount of sewerage treatment was 164 MLD (2020)⁷. Therefore, it is estimated that the amount of sewage generated has increased from 61 MLD at the time of the appraisal to around 180 MLD. In addition, the population in 2001 was 980,000 and in 2011 was 1.13 million (*Census of India, 2011*) in Amritsar. Therefore, the population in 2020 is estimated to be just under 1.3 million. This suggests that Amritsar is experiencing a trend of population growth and an increase in the amount of sewage generated and treated, which will further increase the need for sewerage treatment.

Therefore, this project, which supported the construction of the first sewerage treatment plant in Amritsar, has met the needs of sewerage treatment in the city.

3.1.3 Consistency with Japan's ODA Policy

At the time of appraisal, JICA's "*Overseas Economic Cooperation Operation Implementation Policy (1 April, 2005 - 30 September, 2008)*" (2005) set four prioritised areas, one of which was "infrastructure development for sustainable growth," which mentioned the importance of economic and social infrastructure development. The other prioritised area was "support for global issues and peacebuilding," which mentioned the degradation of the urban

⁵ Data from the ex-ante evaluation report of JICA.

⁶ 1MLD=1,000m³

⁷ Data provided by the executing agency.

environment caused by water pollution from industrial activities and urban life, and the growth of urban population. In the same policy, it was advocated that assistance to India should focus on three prioritised areas; "development of economic infrastructure", "rural development benefiting the poor", and "addressing environmental problems", with the aim of reducing poverty through sustainable growth. In providing this support, it was also stated that efforts would be made to strengthen the capacity of organisations and human resources, and to provide intellectual and technical support for the improvement of policies and institutions.

Since the development of sewerage systems is intended to support the development of economic and social infrastructure, as well as to address the environmental degradation caused by population growth and industrialisation, the social infrastructure development and social development implemented under this project are consistent with these policies. In addition, since all of components of this project are in line with the three prioritised areas of assistance to India, the project has been highly consistent with Japan's ODA policy at the time of appraisal.

This project has been highly relevant to India's development plan and development needs, as well as Japan's ODA policy. Therefore, the relevance is high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

In this project, implemented components were construction of sewerage facilities (construction of sewerage treatment plants, sewage pipes, sewerage house connections and pumping stations), social development on hygiene, consulting services to Municipal Corporation Amritsar (MCA) (project supervision and institutional improvement). Planned and actual outputs of the project are shown in Table 1 .

Table 1 Planned and Actual Outputs of the Project

Components	Plan	Actual
(1) Civil works, procurement of equipment, etc.		
1) Sewerage facilities		
Construction of sewerage treatment plants	3 sites (201 MLD)	2 sites (95 MLD each in South zone and North zone, 190 MLD in total)
Construction of sewage pipes	271 km in total	464 km in total
Construction of sewerage house connections	54,300 connections	29,669 connections
Construction of pumping stations	Relay pumping stations: 2 Final pumping stations: 2	Relay pumping stations: 2 Final pumping stations: 2
Rehabilitation of pumping stations	Existing final pumping station: 1	None

Components	Plan	Actual
2) Social development	Water supply connection support for the poor (promotion of transition from communal taps to individual and shared water supply)	Implemented as part of the project of the Government of India ⁸
	Construction of toilets (public toilets at bus stops, communal toilets in slums)	Implemented as part of the project of the Government of India
	Support for the establishment of community self-management of waste and sanitation facilities	Implemented as part of the project of the Government of India
	Public awareness campaign on environment and sanitation	Implemented as part of the project of the Government of India
	Baseline survey	Implemented as part of the project of the Government of India
(2) Consulting services		
1) Project Supervision	Detailed design, tender assistance, construction management, asset condition survey, basic survey and planning for alternative water source development, etc.	Implemented as planned
2) Institutional Improvement	Asset management	The asset register ⁹ was developed, but leakage management or development of plan of water distribution network improvement was not conducted.
	Promotion of individual connections and tariff payment	Implemented as planned
	Utilization of private sector	Implemented as planned
	Improvement of customer relations	Partially implemented in other projects
	Improvement of management capacity	Partially implemented in other projects ¹⁰

Source: Prepared from materials provided by JICA and interviews with the executing agency.

It was planned to construct one sewerage treatment plant in each of three zones which were the north, south and south-east in the city at the time of planning, however, the plan was changed in February 2010 to construct two sewerage plants in the north and south zones. The south-eastern zone of Amritsar was excluded from targeted areas because of following three reasons; (1) the population had not grown much at the time of the change of the plan, (2) it accounted for only 7% of the project area at the time of the planning, and the need for sewerage

⁸ As described below, it was the own campaign of the Government of India called "Swachh Bharat Mission (Urban)" launched in 2014, which targeted eradicating open defecation and improving waste management.

⁹ As described below, mapping of assets using Geographic Information Systems (GIS) and electronic asset registration based on Unique IDs were also carried out.

¹⁰ Introduction of double-entry bookkeeping system was implemented in this project.

treatment was not as high as in the north and south, and (3) although it was envisaged that the population would increase in the future, it was considered too early to formulate an urban development plan. Therefore, the sewerage system in the south-eastern region would be developed as a separate sewerage network from sewerage treatment plant to be constructed in this project under *Jawaharlal Nehru National Urban Renewal Mission (JNNURM)*, an initiative of the Ministry of Housing and Urban Affairs. As a result of this change, the total quantity of treated sewage at sewerage treatment plants was reduced from 210 MLD as planned to 190 MLD, but the required quantity of treated sewage in the north and south zones was covered.

The number of construction of sewerage house connections was reduced from the planned number of 54,300 to 29,669 due to the exclusion of the south-eastern zone, the fact that no houses were built on the plots that were to be connected at the time of planning, and delays in the construction work. Although the exact number of connections was not known at the time of ex-post evaluation, MCA is continuing to connect individual houses to sewerage network after the completion of the project.

In addition, the total length of sewage pipes was changed from 271km to 464km in this project. It was decided that a longer sewer was needed because a more detailed survey was carried out at the start of the project, and the population increased more than the estimation after the start of the project.

As for the pumping stations, the construction of the relay and final pumping stations was carried out as planned, but the rehabilitation of one existing final pumping station was not carried out due to changes in the overall plan.



Grit Chamber



Pumping Station

In terms of the component of social development, no activities which were planned were implemented in this project but they were implemented under other projects. Water supply connection support for the poor (promotion of transition from communal taps to individual and shared water supply) has been implemented free of charge as per the policy of the Government of Punjab to promote door to door connection in slums and poor areas. Also, the construction of public toilets and communal toilets in slums was carried out by MCA. Support for the establishment of community self-management of waste and sanitation facilities, public awareness campaign on environment and sanitation and baseline survey were conducted under "Swachh Bharat Mission (URBAN) 2.0". As the results of these activities, Amritsar was awarded the certificate of "Open Defecation Free" by the Government of India.

In consulting services, some activities were partially implemented in this project and others were carried out by other projects. The consultancy of asset management was planned to be carried out through a consultant who was employed in this project, but in fact it was carried out not by the consultant but by PWSSB. However, according to MCA, PWSSB could not provide enough guidance of capacity building and did not reach a certain level at which MCA could subsequently implement asset management on its own. Improvement of customer relations was also not carried out under this project, but was carried out by other projects of the Government of India, which introduced development of a customer database, online payment of water tariffs and other measures to promote digitalisation. Improvement of management capacity was also implemented by other projects. As some of the components were implemented by other projects, the following three new components were implemented as part of the institutional improvement of MCA since 2017.

1. Mapping of assets with Geographic Information System (GIS)
This includes the establishment of a property tax portal, online applications for water and sewerage use, online applications for trade permits, maintenance of GIS data, and operation of a payroll management system.
2. Asset registration and computerisation based on Unique ID
Each household and sewerage asset are registered on a GIS map by means of a unique ID, which is then monitored and managed by digital tools.
3. Introduction of double-entry bookkeeping system

It was confirmed that all these components were implemented under this project and that the implementation was completed during the project period.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The cost of the project was planned to be 9,073 million yen, including 6,961 million yen as ODA loan. A comparison of planned and actual project costs is shown in Table 2.

Table 2 Comparison of Planned and Actual Project Costs

Unit: Million Yen

Plan		Actual	
Total	Of which, ODA Loan	Total	Of which, ODA Loan
9,073	6,961	9,575	6,154

Source: Materials provided by JICA, Materials provided by the executing agency

Although the disbursed amount was within the plan, the total project cost was 9,575 million yen, which was 5.5% higher than the planned cost. While the length of sewage pipes increased, the scope of the project has been reduced compared to the original plan as a whole according to following reasons: (1) the number of areas covered by the sewerage network was reduced from three to two, (2) some activities, such as the rehabilitation of pumping stations, were not implemented, (3) the number of construction of sewerage house connections was reduced, (4) the social development component was not implemented, (5) some activities of consulting services were implemented in other projects (not implemented in this project). Therefore, the actual cost of the project, taking into account the reduction of the scope, has exceeded the planned total project cost by more than 5.5%.

3.2.2.2 Project Period

The project was planned to be carried out over a total of 62 months, from February 2007 to March 2012. The planned and actual project periods are shown in Table 3 .

Table 3 Comparison of Planned and Actual Project Periods

	Plan	Actual
Project Period	February 2007 - March 2012 (62 months in total)	March 2007 (L/A signed)- March 2019 (145 months in total) 234% of the planned period
Consulting Services (including selection period)	February 2007 - March 2012	March 2007 - June 2018
Tendering and Contracting	December 2007 - August 2009	May 2014 - May 2017
Construction works	September 2009 - March 2012	June 2008 - March 2019
Social Development	October 2007 - March 2012	Implemented as part of the project of the Government of India

Source: Prepared from materials provided by JICA and materials provided by the executing agency.

Tenders, contracts and construction works were significantly delayed from the original plan. The main reasons for this were as follows:

- The pre-appraisal and preparation of the tender documents for the sewage pipes and sewerage treatment plants, the change of the target area (see 3.2.1), and review of the project took 18 months.
- It took about a year to finalise the sewerage treatment technology¹¹.
- A further one year delay was caused by the re-tendering of sewerage treatment plants (including the preparation of tender documents and the re-implementation of the evaluation process) due to bids exceeding the estimated cost.
- There have been delays in obtaining approvals for the laying of the sewage pipes from various relevant departments, including Indian Railways, National Highways Authority of India and Punjab State Power Corporation Ltd.

As mentioned above, various factors have delayed the commencement of tenders and contracts for the construction of sewerage treatment plants and sewage pipes, and as a result, the completion of the subsequent construction works has also been significantly delayed. Though the planned project period was from February 2007 to March 2012 (62 months), the actual period from the signing of the Loan Agreement to the completion of the construction work was from March 2007 to March 2019 (145 months), which is 234% of the planned period, much longer than the plan.

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

At the time of appraisal, the Economic Internal Rate of Return (EIRR) was assumed to be 11.2%. This figure was calculated on the basis of expenditure (construction, operation and maintenance) and revenue (people's willingness to pay for the improvement of sewerage services and health benefits) over the 40-year life of the project. At the time of ex-post evaluation, the expenditure on construction was clear, but the cost of operation and maintenance and the revenue for each financial year of the project life were not available from the executing agency or MCA who has been responsible for operation and maintenance. Therefore, it was not possible to calculate the EIRR at the time of ex-post evaluation.

¹¹ Stricter effluent standards by the Punjab State Government necessitated a review of the sewerage treatment method. At the time of the appraisal, it was decided that the Upflow Anaerobic Sludge Blanket (UASB) system would be adopted, but it was compared and reviewed with the Sequencing Batch Reactors (SBR) system and the Activated Sludge Process (standard system). Finally, the JICA technical appraisal mission visited the site, and based on the results of the technical appraisal, the Activated Sludge Process (standard method) was adopted.

Based on the above, the project cost exceeded the plan and the project period significantly exceeded the plan. Therefore, the efficiency is low.

3.3 Effectiveness and Impacts¹² (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Five operation and effect indicators were set to measure the quantitative effects of the project, with a target value set for 2015 (two years after completion of the project) based on the value in 2005. A comparison of the planned and actual performance of operation and effect indicators is shown in Table 4 .

Table 4 Comparison of Operation and Effect Indicators

Indicators	Baseline	Target	Actual		
	2005	2015	2018	2019	2020
Population served (1,000 persons)	647	1,048	865 *	1,125 *	1,176 *
Amount of wastewater treated (m ³ /day)	-	148	126	146	164
Rate of facility utilisation (Sewerage treatment plants) (%)	-	74	68	88	91
BOD concentration for each treatment plant (effluent mg/litre)	129-205	Less than 30	13 - 17	15	16-18
Sewerage penetration rate (%)	62	83	70	90	93

* As the executing agency did not have actual data available, the figures calculated by the external evaluator with multiplying the estimated population by the sewerage penetration rate are given as estimates.

Source: Prepared from materials provided by JICA and the executing agency

As the construction work was completed in March 2019, the actual figures for two years after the completion of the project (2021), which were assumed to be the original target figures, are not available at the time of the ex-post evaluation. Therefore, achievement of the operation and effect indicators of the project was evaluated by confirming the data for the period 2018-2020 and changes over time.

It is considered that generation of effects has been delayed due to the significant extension of the period of construction works, however, the expected quantitative effects have been achieved as all the indicators had exceeded the targets which were set at the time of planning by 2020 and the project has outperformed the previous year's results every year since 2018. Initially, the project was planned to be completed in 2012, and the target values were calculated

¹² Sub-rating for Effectiveness is to be put with consideration of Impacts.

based on the estimated population in 2015 which was over two years after the completion of the project. However, at the time of the actual completion of the project, the population had increased more than assumed for 2015, and the amount of sewage discharged from households and other sources increased accordingly. Therefore, the rate of facility utilisation (sewerage treatment plants) was assumed to be 74% in 2015. But the actual figures for 2020, based on the actual population and the amount of sewage discharged, show that both of the amount of wastewater treated and the rate of facility utilisation (sewerage treatment plants) are higher than the target values.

As described above, the targets set at the time of appraisal have been achieved in all indicators, and the quantitative effects of the project are sufficiently generated.

3.3.1.2 Qualitative Effects (Other Effects)

At the time of the appraisal, it was expected that the implementation of the project would have the qualitative effect of "raising awareness of local residents to improve their sanitation environment".

The component of social development that was envisaged to be implemented at the time of planning, in particular the "public awareness campaign on environment and sanitation", was supposed to raise awareness of sanitation among the local population, but since this activity was not implemented in the project, it was not possible to confirm the direct qualitative effects of this activity. As an alternative way of evaluation, the beneficiary survey was conducted with the local residents of the areas where the sewerage network was newly constructed in this project. Through the results of these interviews, it was checked whether there was any change in hygiene awareness among them. According to a brief interview in this beneficiary survey¹³ which was conducted in the process of ex-post evaluation, 95% of respondents answered that their hygiene awareness had been raised through the project period compared to before the construction of the sewerage network. In particular, many respondents said that they came to clean up their bathrooms and the surrounding areas around their houses more often.

From the above, the awareness of local residents towards the improvement of sanitation environment has been raised, comparing the time of planning and the time of ex-post evaluation, and the expected qualitative effects have been generated.

3.3.2 Impacts

3.3.2.1 Intended Impacts

At the time of appraisal, the impacts of project implementation were envisaged as follows:

¹³ Twenty local residents (17 males and 3 females) were selected using a purposive sampling method and were interviewed individually based on a questionnaire.

- Improving the living conditions of local population, including the poor, in Amritsar
- Improving conditions of sanitation in Amritsar

As a result of the project, the executing agency confirmed that the connection of the sewage pipes to each house eliminated the need for sewage collection and reduced the odour in the surrounding area caused by the sewage flowing through the gutters.

At the time of ex-post evaluation, the beneficiary survey with local residents based on a questionnaire collected their voice about the improvement of the local sewerage treatment environment, and its main feedbacks were as follows:

- The sewerage treatment environment has been improved and the local population is generally satisfied with the situation.
- Sanitation of nearby ditches and rivers were improved.
- Odours in the vicinity have disappeared or been reduced.
- Mosquitoes and flies are no longer present or have been reduced.
- There were some people who experienced being infected with waterborne diseases before the project, but no longer suffer from them after the completion of the project
- Awareness of hygiene among local residents was raised, and many residents started to clean up their houses and dispose rubbish properly.

As a result of these interviews, it was confirmed that the sewerage treatment environment in the area has been improved, and the development of sewerage treatment facilities under this project has contributed to improve the sanitation environment in the area to a certain extent. Although the component of social development was not implemented as planned, the improvement of the sewerage treatment facilities in this project and the awareness raising activities by the Government of India and NGOs have resulted in a certain level of improvement in the awareness of sanitation among the local people.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

At the time of appraisal, the project was considered not to have a significant undesirable impact on the environment (Category: B) as per the "*Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations*" (developed in April 2002). In addition, an Environmental Impact Assessment (EIA) for the project was not required under Indian domestic law. The treated water from sewerage treatment plants constructed under this project is discharged into surrounding rivers in compliance with national standards of India. No specific effects of treated water discharge were foreseen and the project area was not located in or around a sensitive area such as a

national park, so the undesirable impact on the natural environment was assumed to be minimal.

At the time of ex-post evaluation, as a result of the assessment by PWSSB, the executing agency, no adverse effects on the natural environment and the rivers due to the discharge water were observed during and after the project period. BOD for each treatment plant (effluent mg/lit), which is one of the operation and effect indicators, has also fully achieved the target value, and it is considered that the discharge of treated sewage has not caused any pollution of the rivers.

Overall, the project has not had any negative impacts on the natural environment.

(2) Resettlement and Land Acquisition

At the time of appraisal, it was envisaged that 78 hectares of land would be acquired for the construction of sewerage treatment plants and pumping stations, and that the acquisition process would be carried out in accordance with Indian regulations, with no resettlement associated with land acquisition.

At the time of ex-post evaluation, it was confirmed that 78 acres (about 32 hectares) of land had been acquired and that a total of 74 landowners had been affected by land acquisition, with a total compensation of 412 million rupees. The land acquisition and its compensation were carried out in accordance with the institution of India and "*JBIC Guidelines for Confirmation of Environmental and Social Considerations*" agreed at the time of appraisal, and no resettlement occurred as a result of this land acquisition. In the above-mentioned beneficiary survey with the local residents, it was confirmed that there was no resettlement due to the land acquisition and complaint from the affected residents regarding the land acquisition procedure.

Based on the above, no particular problems related to the land acquisition, including resettlement, have arisen.

This project has mostly achieved its objectives. Therefore, the effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspects of Operation and Maintenance

PWSSB, the executing agency of the project, which is under the jurisdiction of the Department of Local Government of Punjab, is responsible for planning and implementing the development of water supply and sewerage facilities in Punjab State. PWSSB has set up a project implementation unit within the organisation to construct sewerage treatment plants, sewerage pipes and pumping stations. MCA, which is also under the jurisdiction of the

Department of Local Government of Punjab, is responsible for the operation and maintenance of the water supply and sewerage works in Amritsar. After the completion of construction by PWSSB, it was planned that MCA would take responsibility of the operation and maintenance, and actual tasks of the operation and maintenance would be outsourced to a private company. In terms of the maintenance of the public latrines constructed under the component of social development, it was envisaged that community groups would be responsible for sanitation facilities such as communal latrines in slums, and NGOs would be responsible for maintenance of other public latrines.

At the time of ex-post evaluation, MCA is fully responsible for the operation and maintenance of facilities and equipment installed under this project, but PWSSB supervises the operation and maintenance of sewerage treatment plants on behalf of MCA. MCA has obligation to pay the cost of the operation and maintenance to PWSSB, and PWSSB contracts the private contractor who built facilities to carry out the operation and maintenance. PWSSB is responsible for the management and guidance to the private contractor, and there is no adequate institutional structure within MCA to ensure the operation and maintenance of facilities. PWSSB continues to supervise and guide the project after its completion, as MCA does not have enough knowledgeable and experienced engineers in the electrical and mechanical fields to operate and maintain the sewerage treatment facilities, which requires professional expertise. The contract with the private contractor for the operation and maintenance will expire five years after the completion of the project in 2024, however it is unclear whether MCA will assume the responsibility for supervision and guidance that PWSSB has been taking.

As mentioned above, there are some challenges in the system and structure of MCA for the operation and maintenance of sewerage treatment facilities.

3.4.2 Technical Aspects of Operation and Maintenance

At the time of appraisal, it was assumed that PWSSB would not have any technical problems in implementing this project, as it has been implementing water supply and sewerage projects supported by World Bank for the past 5 years and has experience in maintaining anaerobic pre-treatment sewerage treatment plants similar to this project. It was also planned that the consulting services for MCA would include support for capacity building in leakage management, planning of water network improvement, promotion of sewerage house connections and tariff payment, utilisation of private sector and improvement of customer relations and management capacity.

In this project, sewerage treatment facilities and pipes were constructed, with changes as mentioned above, and the manual of the operation and maintenance for sewerage treatment

plants was newly developed and used by PWSSB, in charge of operation and maintenance, but it was confirmed at the time of ex-post evaluation that there was no training on the operation and maintenance conducted for the technicians of MCA during and after the project period. In addition, although the consulting service of the project has improved the capacity of MCA in asset management and utilization of the private sector, it has not reached the level that MCA has had sufficient technical capacity, as being clear from the fact that PWSSB continues to supervise and guide the contractor in operation and maintenance.

Therefore, there are some challenges in technical aspects of the operation and maintenance of sewerage treatment facilities.

3.4.3 Financial Aspects of Operation and Maintenance

At the time of appraisal, it was assumed that MCA had no financial concerns, as the costs of water and sewerage maintenance were covered by tariff revenues of water and sewerage and the general funds from the Government of India. However, in terms of the sustainable provision of high-quality public water supply and sewerage services, it was necessary to strengthen the financial constitution of MCA. In order to achieve this, the consulting services of this project were expected to provide support for improvement of management capacity, and through the implementation of measures such as tariff revisions and non-revenue water measures, it is planned that water supply and sewerage tariff revenues would be sufficient to cover all the costs of the maintenance.

At the time of completion of the project, the cost of the operation and maintenance for the first five years of operation of facilities was estimated as shown in Table 5 .

Table 5 Estimated Cost of Operation and Maintenance for Sewerage Treatment Plants Developed in This Project

(Unit: Million rupee)

	1 st year	2 nd year	3 rd year	4 th year	5 th year
South	14.4	17.3	19.2	21.2	24.1
North	15.2	18.3	20.3	22.3	25.4
Total	29.7	35.6	39.6	43.5	49.5

Source: Project Completion Report

MCA's income and expenditure and their main components are shown in Table 6. As it was not possible to obtain income and expenditure specific to sewerage only, income and expenditure for water and sewerage in general are shown. It can be seen in Table 6 that the water and sewerage revenue does not cover the entire related expenditure, and that MCA has not moved into the black. Although MCA has been allocated subsidies from the Government of Punjab, the collection of water and sewerage charges has not always been sufficient, and in

fact the tariff income has not been as planned. As indicated in section 3.2.1 Project Outputs, consulting services were provided to enhance the management capacity of MCA (asset management, improvement of customer relations, etc.), but no significant improvement in tariff collection was observed at the time of ex-post evaluation.

As described above, the cost of the operation and maintenance of sewerage treatment plants constructed under this project is well covered by tariff income, and expenditure on water and sewerage services as a whole is supported by subsidies from the Government of Punjab. However, as the sewerage network develops, it will be important to ensure that charges are certainly collected.

Table 6 Summary of Revenue and Expenditure of MCA

	(Unit: Million Rupee)		
	2016/17	2017/18	2018/19
Revenue	3,571.8	3,540.0	4,000.0
Income from water and sewerage charges	240.0	260.0	350.0
State Grants	900.0	740.0	420.0
Other income	2,431.8	2,540.0	3,230.0
Expenditures	3,571.8	3,540.0	4,000.0
Current expenditure	2,157.4	2,175.0	2,488.7
<i>of which water and sewerage related</i>	240.0	447.2	467.2
Reserve funds	110.0	105.0	105.0
<i>of which water and sewerage related</i>	3.0	2.5	2.5
Development project costs	1,304.4	1,260.0	1,406.3
<i>of which water and sewerage related</i>	470.1	480.0	220.0

Source: Created based on MCA website (<https://www.amritsarcorp.com/income.html>)

3.4.4 Status of Operation and Maintenance

At the time of ex-post evaluation, it was confirmed that all the facilities were managed by the private contractor commissioned by PWSSB and were generally operating without problems. In addition, the operation and maintenance of the facilities is considered to be in good condition as the operation and effect indicators of the project have been fully achieved as mentioned above.

Therefore, there is not any problem with the status of the operation and maintenance of the facilities built under the project.

Based on the above, some minor problems have been observed in terms of the institutional/organizational, technical and financial aspects. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to provide stable sewerage services by constructing sewerage facilities in Amritsar (MCA), thereby contribute to the improvement of sanitation and living conditions of the residents including the poor in the city. This project has a high level of relevance as it is consistent with development policies and needs of India at the time of appraisal and ex-post evaluation, and with Japan's ODA policy at the time of appraisal. In terms of project implementation, although there was a difficulty in calculating the exact actual amount against the planned cost based on the planned components, the efficiency of the project is low because the actual project cost exceeded the plan by more than 5% by taking into account of the project scope practically reduced against the plan, and the project period exceeded the plan. Regarding the project effects, it was confirmed that the quantitative indicators achieved the target values and the qualitative effects were also achieved. In terms of impact, the project has contributed to the improvement of the living environment in the target areas and the sanitation of the local population. Therefore, the effectiveness and impact of the project are high. As for the sustainability of the project, there are some problems in the institutional, technical and financial aspects of the operation and maintenance of sewerage treatment facilities, so the sustainability of the project effects is fair.

In light of the above, this project is evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It was confirmed that the construction of sewerage treatment facilities has made it possible to provide stable sewerage services, but the establishment of the structure of the operation and maintenance is a challenge to keep it continuously. Currently, MCA, which is responsible for the operation and maintenance, is not involved in the supervision and guidance of the operation and maintenance of sewerage treatment facilities. MCA itself is unlikely to supervise the operation and maintenance after 2024, when the contract between PWSSB and the private contractor which has been in place since the completion of the project will expire. Therefore, it is important for MCA to strengthen its capacity for the operation and maintenance and to establish an appropriate implementation structure for the sustainable provision of stable

sewerage services achieved in this project before the end of the five-year contract with the private contractor.

4.2.2 Recommendations to JICA

In this project, it was confirmed that facilities such as sewerage treatment plants and sewerage pipe networks have been constructed and that the project effects have been fully realized, albeit with some delays. On the other hand, there were some concerns about the sustainability of the project effects as mentioned above.

At the time of ex-post evaluation, management of sewerage treatment facilities was being carried out by PWSSB through supervision of the private contractor responsible for the operation and maintenance of sewerage treatment facilities. However, as it will be difficult for the PWSSB, as a state agency, to continue the supervision in the long term, it is important to develop an adequate structure and secure human resources that can technically supervise the facilities in MCA. In this respect, it would be desirable that JICA, which supported the construction of the facilities, provide appropriate support such as advice and training, with regard to securing a sustainable implementation structure and improving the maintenance and management capacity of engineers, so that sewerage services can continue to be provided in a stable manner.

4.3 Lessons Learned

Flexibility to ensure that effectiveness of the project is properly generated

In this project, the operation and maintenance of the sewerage facilities after the completion of the project was outsourced to a private company, and MCA was supposed to manage the facilities. For this purpose, capacity building of MCA was planned through consulting services, but the structure and capacity building were not sufficiently developed, and PWSSB, which was responsible for the implementation of the project, continued to supervise and guide the private contractor in charge of maintenance even after the project was completed.

It is essential for the sustainability of the project to ensure the implementation of capacity building activities for the organization that lacks the capacity to properly carry out the operation and maintenance after the completion of the project. Therefore, in the similar JICA projects in the future, when there are any obstructive factors such as challenges in strengthening the capacity of the organisation in charge of operation and maintenance, it will be important to take flexible measures such as the provision of additional technical assistance to build up its capacity, through consultations among related stakeholders as necessary, in order to resolve obstructive factors and promote the appropriate generation of effectiveness of the project.

Comparison of the Original and Actual Scope of the Project

Items	Plan	Actual
<u>Outputs</u>		
(1) Civil engineering works, procurement of equipment, etc.		
1) Sewerage construction		
Construction of sewerage treatment plants	3 sites (201MLD)	2 sites (95 MLD each in South zone and North zone, 190 MLD in total)
Construction of sewerage pipes	271 km in total	464 km in total
Construction of sewerage house connections	54,300 connections	29,669 connections
Construction of pumping stations	Relay pumping stations: 2 Final pumping stations: 2	Relay pumping stations: 2 Final pumping stations: 2
Rehabilitation of pumping stations	Existing final pumping station: 1	None
2) Social development	Water supply connection support for the poor (promotion of transition from communal taps to individual and shared water supply) Construction of toilets (public toilets at bus stops, communal toilets in slums) Support for the establishment of community self-management of waste and sanitation facilities Public awareness campaign on environment and sanitation Baseline survey	Implemented as part of the project of the Government of India Implemented as part of the project of the Government of India Implemented as part of the project of the Government of India Implemented as part of the project of the Government of India Implemented as part of the project of the Government of India
(2) Consulting services		
Project Supervision	Detailed design, tender assistance, construction management, asset condition survey, basic survey and planning for alternative water source development, etc.	Implemented as planned
Institutional Improvement	Asset management Promotion of individual connections and tariff payment Utilisation of private sector Improvement of customer relations	The asset register was developed, but leakage management or development of plan of water distribution network improvement were not conducted. Implemented as planned Implemented as planned Partially implemented in other projects

	Improvement of management capacity	Partially implemented in other projects
<u>Project Period</u>	February 2007 - March 2012 (62 months in total)	March 2007 - March 2019 (145 months in total)
<u>Project Cost</u>		
Amount Paid in Foreign Currency	803 million yen	N/A
Amount Paid in Local Currency	8,270 million yen (3,281 million rupee)	N/A
Total	9,073 million yen	9,575 million yen
ODA Loan Portion	6,961 million yen	6,154 million yen
Exchange rate	1 rupee = 2.52 yen (As of September 2006)	1 rupee = 1.59 yen (Average between July 2008 and July 2018)
Final Disbursement	July 2018	

End