

India

FY2019 Ex-Post Evaluation of Japanese ODA Loan Project
“Kolkata Solid Waste Management Improvement Project”

External Evaluator: Yumiko Onishi, IC Net Limited

0. Summary

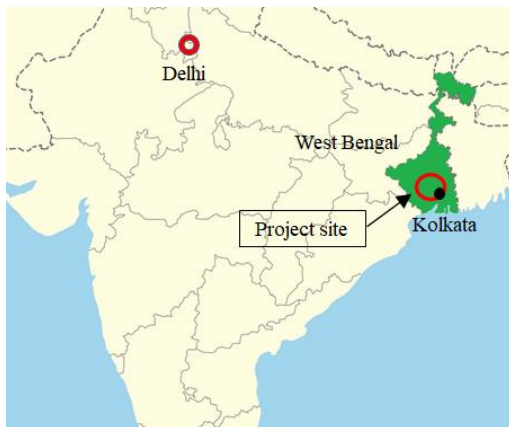
In the beginning of 2000, the living environment for people in the Kolkata Metropolitan Area (KMA) was threatened by odor and unhygienic conditions from a rapid increase in solid waste and a lack of proper waste management. Six municipalities, namely Champdani, Baidyabati, Serampur, Rishra, Konnagar, and Uttarpara-Kotrung located on the western bank of the Hooghly River, were no exception. Therefore, the project was implemented to promote proper management of solid waste generated in the region through establishing a sustainable regional waste management system, including the construction of a sanitary landfill, thereby contributing to improving the living and sanitary conditions of the people and conserving the environment.

Throughout the period between the project appraisal and the ex-post evaluation, the health and sanitation sector and the water supply and sewage sector including waste management have been given an important position in India’s development policy. The issues of odor and unhygienic conditions, which were caused by a lack of solid waste management system and recognized at the time of the appraisal, have been partially solved by the establishment of a regional waste management system by the project. However, the need for such system remains at the time of the ex-post evaluation, and consistency with the development needs is also recognized. Moreover, the project matches Japan’s ODA policy at the time of the appraisal. Thus, the relevance of the project is high. Most of the project scope has been implemented as planned. In addition, because of fluctuations in the exchange rate during the implementation period, the project cost was within the planned amount. On the other hand, the project was delayed significantly because it spent much time on consultant procurement and handing over the land for facility construction to the contractors, rendering its efficiency fair. In regard to operation and effect indicators, while waste disposal to the Regional Waste Management Center (RWMC) has achieved the target, compost plant input is significantly below the target, indicating that there is room for improvement in segregating waste at source. However, three out of the five indicators have achieved the target, a certain degree of improvement in the living and hygiene conditions of the people in the target area is observed, and no adverse impacts were reported during the project on the natural environment, land acquisition and resettlement. Therefore, the effectiveness and impacts of the project are high. Although there are no issues related to technical aspects of operation and maintenance (O&M), because of shortage of funds, manpower and equipment are running short, and sometimes door-to-door waste collection service is not provided and the waste segregated at households is mixed up after the collection. Moreover, although the system for collecting a user fee for solid waste management exists, it is

not implemented. Thus, the sustainability of the project faces a few issues; however, efforts are being made to resolve them. Therefore, the sustainability of the project is fair.

In light of the above, although the project has issues in sustainability, efforts are being made to resolved them at the earliest, and the project is evaluated to be satisfactory.

1. Project Description



Project location



Primary waste collection

1.1 Background

The KMA has Kolkata Port, one of the major Indian ports facing the Bay of Bengal, and has developed as the center of economy, industry and transportation for eastern India since the British colonial period. At the time of the appraisal, the KMA had a population of 15 million, consisting of 41 urban local bodies. The living environment of residents was at risk because of a lack of proper management for the rapidly increasing amount of solid waste. However, because solid waste management was not given high priority, regulations and budget allocation for the issue were insufficient. Thus, issues such as the fragile financial foundation of urban local bodies and the need for acquisition of land suitable for a final disposal site were pointed out. Although the *Municipal Solid Waste (Management and Handling) Rules* were issued in October 2000, no proper regional waste management system,¹ which includes a leachate collection facility and a landfill site using cover soil, has been developed in either the KMA or nationwide.

The six target municipalities of the project (Champdani, Baidyabati, Serampur, Rishra, Konnagar, and Uttarpara-Kotrung) are located on the western bank of the Hooghly River, which flows through the center of the KMA. The total population of the six municipalities was estimated to grow from 790,000 in 2004 to 1,120,000 by 2025. With the projected population growth, the amount of solid waste generated was expected to increase from 100,000 tons to

¹ For efficient management of solid waste, the waste from several local bodies is disposed together.

140,000 tons annually. The lack of a proper regional waste management system was causing the following problems: a) deteriorating living environmental conditions such as bad odor, flies, and rats due to waste that is left uncollected for a long time; b) pollution of soil and groundwater due to unsegregated dumping and illegal dumping in areas without a waste collection system; and c) overflowing of drains during the rainy season owing to dumping to open drains that reduces the drains' carrying capacity.

1.2 Project Outline

The objective of this project is to promote appropriate solid waste management by developing a sustainable regional solid waste management system including sanitary landfill site for the six municipalities in the KMA, thereby improving the living environment and hygienic conditions of the people in the region and safeguarding the natural environment. The project was expected to become a model case for solid waste management in India and to be replicated elsewhere.

Loan Approved Amount/ Disbursed Amount	3,584 million yen / 2,467 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2006 / March 2006
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 / Kolkata Metropolitan Development Authority
Project Completion	July 2017
Target Area	Six municipalities in the Kolkata Metropolitan area in the State of West Bengal
Main Contractor(s) (Over 1 billion yen)	SMS Infrastructure Ltd (India)
Main Consultant(s) (Over 100 million yen)	Senes Consultants India Private Limited (India) / Yachiyo Engineering Co., Ltd. (Japan)
Related Studies (Feasibility Studies, etc.)	Pilot Study for Urban Environment Development and Employment Development (2004) (JICA), SAPROF (2005)

Related Projects	<u>Technical Cooperation</u> Technical Assistance for Kolkata Solid Waste Management Improvement Project (2015–2017) Technical Assistance for Kolkata Solid Waste Management Improvement Project Phase 2 (2018–2020)
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2. Outline of the Evaluation Study

2.1 External Evaluator

Yumiko Onishi, IC Net Limited

2.2 Duration of Evaluation Study

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

Duration of the Study: July 2019–August 2020

Duration of the Field Study: November 4–16, 2019 and February 15–22, 2020

2.3 Constraints during the Evaluation Study

At the time of the ex-post evaluation, the Kolkata Metropolitan Development Authority (KMDA), which was the executing agency, was not directly involved in the operation and maintenance of the project, and the external evaluator was unable to obtain the KMDA's cooperation in collecting information on the project's implementation. Therefore, it was not possible to confirm part of the information required for the evaluation study such as project cost borne by the Indian side.

3. Results of the Evaluation (Overall Rating: B²)

3.1 Relevance (Rating: ③³)

3.1.1 Consistency with the Development Plan of India

The *Tenth Five-Year Plan* (April 2002–March 2007), the development plan of India that was in effect at the time of the project appraisal, mentioned a) providing sustainable access to potable water across the country in accordance with standards for minimum supply of drinking water; b) cleaning the major polluted rivers and improving their watershed environment; c) establishing sanitary landfill sites and water channels as soon as possible as part of urban sanitation policy; d) rendering institutions operating water supply and sewage facilities financially sound for sustainable operation; and e) strengthening the local governing bodies at the municipal and village levels to accelerate decentralization. Moreover, in the National Water Policy (2002), the

² A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

³ ③: High, ②: Fair, ①: Low

Ministry of Water Resources aimed at providing adequate and safe drinking water to all citizens by giving priorities in the order of water supply, irrigation, and hydropower for allocation of water resources. Furthermore, the Common Minimum Programme of the administration at that time pledged expansion of public investment to the water supply, sewage and sanitation sectors, and gave the highest priority to providing drinking water to all classes in urban and rural areas and expanding the sources of drinking water. Thus, health and sanitation as well as water supply and sewage sectors were given importance in the Indian government's development plan at the time of the appraisal.

Vision 2020, the development plan of the Indian government at the time of the ex-post evaluation, indicates the necessity for infrastructure development on water supply and sanitation in urban areas. To address such situation, the *Vision* points out that strengthening the capacity of local bodies and reform based on appropriate management are essential. Particularly, for the urban poor to escape poverty by 2020, the *Vision* states that more efficient initiatives are the key in sectors such as health, sanitation, water supply and education. The *Three-Year Action Agenda* (FY 2017–2019) of the Indian government promotes a nationwide cleanup mission by the “Swachh Bharat” campaign established by the Modi government in 2014. In addition to abolishing the manual cleaning of feces and open defecation by 2019, Swachh Bharat aims for scientifically sound waste management and improving people's awareness on public health.

The *Municipal Solid Waste (Management and Handling) Rules* issued by the Ministry of Environment and Forest in October 2000, based on the guiding principles on waste management, obliged the local bodies to establish appropriate waste management facilities providing leachate treatment and cover soil and to report the situation on waste management to the Central Pollution Control Board annually. The Rules were revised in 2016 by adding the following items.

- Waste segregation before collection
- Having the local bodies set a user fee for bulk waste generators
- Promoting the use of biodegradable waste (production of compost)
- Promoting the use of compost

Thus, it has been confirmed that, at the time of the ex-post evaluation, the health and sanitation sector and the water supply and sewage sector including waste management are given importance in the development plan of the Indian government.

3.1.2 Consistency with the Development Needs of India

As described in “1.1 Background,” because a proper regional waste management system did not exist at the time of the appraisal, the six target municipalities faced the following issues: a) deteriorating living environmental conditions such as bad odor, flies, and rats due to waste left uncollected for a long time; b) pollution of soil and groundwater due to unsegregated dumping

and illegal dumping in areas without a waste collection system; and c) overflowing of drains during the rainy season owing to dumping in open drains that reduces their carrying capacity.

At the time of the ex-post evaluation, it became evident from the interviews with residents, municipal chairpersons and site inspectors of the six municipalities that illegal dumping of waste and waste left uncollected for a long time decreased compared to the time prior to the project. In a few areas, open drains are cleaned regularly and the overflowing of drains during the rainy season appeared to have decreased.

According to the data provided by the Technical Assistance for Kolkata Solid Waste Management Improvement Project Phase 2, the rates of waste collection and segregation at source as of October 2019 are as follows.

Table 1: Rates of waste collection and segregation at source in six target municipalities
(as of October 2019)

Municipality	Collection	Segregation
Uttarpara-Kotrung	90%	85%
Konnagar	83%	70%
Rishra	85%	70%
Serampur	87%	20%
Baidyabati	97%	90%
Champdani	23%	20%

Source: Materials provided by the Technical Assistance for Kolkata Solid Waste Management Improvement Project Phase 2 Project team

The estimated waste collection rate before the project is 30-40%, and it seems to have improved by the implementation of the project. Waste segregation at source was not implemented before the project.

Considering the situation in the six municipalities at the time of the appraisal, the implementation of the project was consistent with the development needs of the target areas. The interviews with residents and other stakeholders confirmed that the issues recognized at the time of the appraisal saw improvement. As seen in the data on waste collection rates in Table 1, door-to-door collection is relatively high except Champdani. Although described in “3.4 Sustainability,” issues related to the operation of a regional waste management system exist, and it is still necessary to strive to operate the system smoothly.

3.1.3 Consistency with Japan’s ODA Policy

At the time of the appraisal, as focus areas, the Medium-Term Strategy for Overseas Economic Cooperation Operations referred to “economic and social infrastructure development for sustainable growth” and “assistance for global issues and peace building.” With regard to

assistance to India, the strategy mentioned “response to environmental problems” as a focus area. In addition, the project pertains to assistance on “the water issues, directly affecting the people’s health, which is becoming worse with industrialization and urbanization” as mentioned in the Country Assistance Strategy for India of 2005. Furthermore, by providing support centered around “improvement of water supply, sewage and sanitation in urban areas, as effective project scale and high economic return can be secured, and because it contributes to economic infrastructure development for industries which in turn would trigger foreign direct investment” and “improvement of overall living conditions by providing safe and stable drinking water and improving poor public health conditions against the backdrop of a rapid increase in the urban poor,” the efforts for “a) effective use of water resources (water leakage countermeasures and water conservation); b) pursuing the financial health of the project operating institution (increasing fees to the level that meets the maintenance cost, reviewing the fee structure, cost cutting, and reducing the rate of non-revenue water); c) building capacity of the project operating institution (training, review of standards and manuals, improving relationship with customers through activities such as public relations, strengthening the human development and public relations departments, and strengthening the information system); d) consideration for the poor (slum areas) and public awareness; and e) promoting private sector participation (outsourcing operation and maintenance) while keeping in mind cooperation with local bodies of Japan” were to be made. Thus, the project was consistent with Japan’s ODA policy at that time.

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

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The planned project scope was implemented almost as planned.

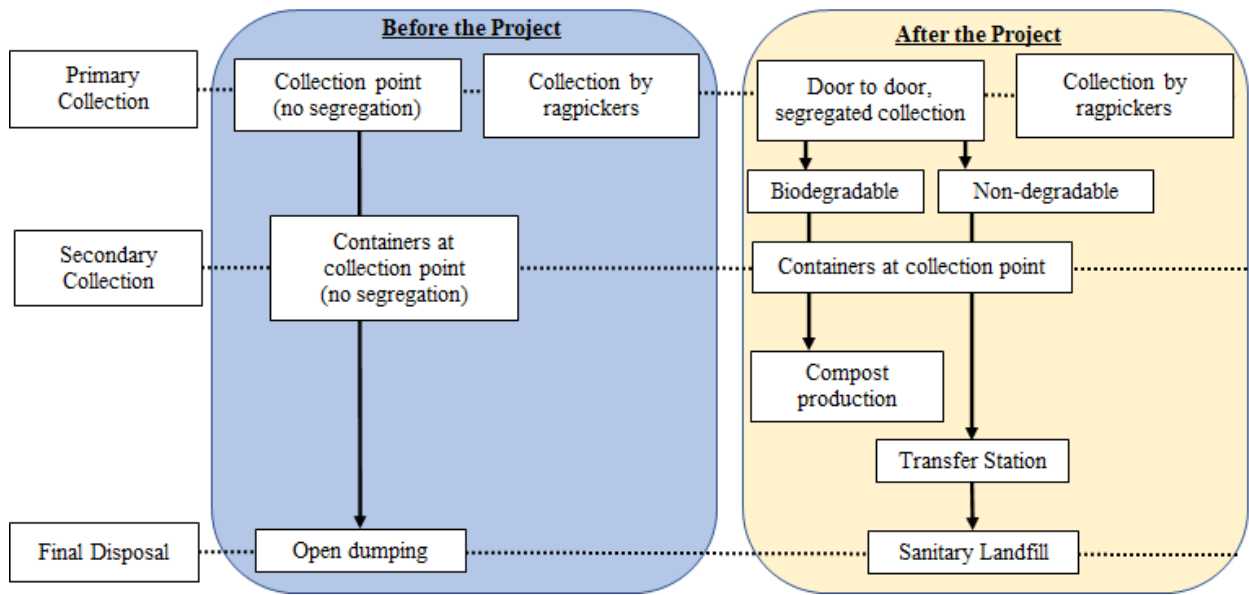


Figure 1: System for Solid Waste Management

Five Transfer Stations (TSs), six compost plants (CPs) and the final disposal site called the Regional Waste Management Center (RWMC) were constructed as per the plan, and the final quantity of equipment and vehicles for the collection system was decided based on the population of each municipality and convenience for transportation. The capacity of the RWMC decreased from the planned 1,537,000 m³ to 1,406,200 m³ because illegal timber factories on the RWMC land did not agree to vacate.

In consulting services, in addition to overall management of the project, detailed planning, assistance with procurement, and construction management were delivered. Awareness raising and education on the environment and sanitation, waste segregation and the door-to-door waste collection system (the latter two were introduced in the project) were implemented intensively by appointing in each municipality six extension workers known as social mobilizers. For supporting ragpickers (scavengers),⁴ a baseline survey was conducted for the ragpickers working in the target areas, but no specific support program was formed or implemented.

Technical training for the executing agency and officials of the target municipalities, as well as the formulation of a plan for introducing a waste collection fee system was implemented.

⁴ People at the bottom of the caste system who make a living by picking recyclable items from waste collection points and selling them to recycle operators.



Figure 2: RWMC



Figure 3: Posters for awareness

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned project cost was JPY 4,239 million (out of which JPY 593 million was the foreign currency and JPY 3,646 million was the local currency) and JPY 3,584 million was an ODA loan (out of which JPY 593 million was the foreign currency and JPY 2,991 million was the local currency). The total disbursed amount of the ODA loan was JPY 2,467 million, but it was not possible to confirm details of the cost borne by the Indian side. According to the ODA loan disbursed amount, the project cost was within the plan. The disbursed amount of the ODA loan was less than the Loan Agreement (L/A) amount because of fluctuations in the exchange rate during the project period.

3.2.2.2 Project Period

According to the plan at the time of the appraisal, the project duration was from March 2006 (date of the L/A) to November 2010 (4 years and 9 months, 57 months). Completion of facility construction and consulting services, and the maintenance period of one year after the completion of the regional waste management system were the project completion. In reality, the consulting service completed in March 2015 and construction completed in March 2016; however, the project duration including the maintenance period supported by the Japanese ODA loan was from March 2006 (date of L/A) to July 2017 (11 years and 5 months, 137 months), which is 240% against the plan, significantly longer than planned. The main reasons for the prolonged project duration are as follows:

- The project was the first Japanese ODA loan project for the executing agency, which was not familiar with procedures for international competitive bidding, and thus took more time than necessary to procure consultants.
- Lands for constructing TSs and CPs were originally used as dumping sites, and it took time to find alternative sites for waste collection and dumping. In addition, it took time

to vacate people who were illegally occupying the lands, and the beginning of construction was delayed.

- The progress of the contractor who was constructing TSs and CPs was not satisfactory, and the contract was divided into multiple parts. Thus, it took time to split the task into smaller procurement packages and to re-tender.

Because of delays listed above, the disbursement period was extended. Moreover, because financial sources for the maintenance cost were not secured, thus, the disbursement period was extended for the second time by applying the unused portion of the Japanese ODA loan for the maintenance cost.

Considering that the project was the first Japanese ODA loan project for the executing agency, the timeline for consultant procurement should have been set by giving some additional time instead of applying the standard schedule. In regard to the delay in starting the construction, it was not necessarily possible to foresee beforehand. On the other hand, regarding the second-time extension of the disbursement period, while the necessity to apply unused funds for O&M is understandable, the need to secure funds for O&M for the project was pointed out from the time of the planning.

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

In a solid waste management project, revenues from it usually do not reach the level to yield benefits in the Financial Internal Rate of Return (FIRR). Thus, only the Economic Internal Rate of Return (EIRR) was calculated for this project. Table 2 shows the EIRR at the time of the appraisal and the ex-post evaluation along with assumptions.

Table 2: EIRR and assumptions

Cost	Project cost, operation and maintenance cost
Benefit	User fee, economic impact of RWMC (cost borne by the six municipalities), revenue from compost and recyclables, cost saving on alternative facilities in the six municipalities by establishing RWMC, saving of drainage cleaning cost due to reduction in waste dumping into open drains, land cost saving of final disposal site for the six municipalities, effect from leachate treatment (preventing ground water pollution) and annual O&M cost for leachate treatment, reduction in CO ₂ from preventing emission of methane gas
Project life	16 years
EIRR	At the time of the appraisal: 8.77% At the time of the ex-post evaluation: -17.40%

The EIRR from the appraisal has been recalculated in accordance with the ex-post evaluation reference based on documents that provide details of the original calculation by taking the L/A

year as the first year of calculation. As a result, the EIRR at the time of the appraisal was 8.77%. In recalculating the EIRR at the time of the ex-post evaluation, cost saving from the cleaning of open drains was not considered as drainage cleaning is regularly carried out even now. The EIRR at the time of the ex-post evaluation became -17.40%. There is a significant gap between the EIRR at the time of the appraisal and the one at the time of the ex-post evaluation for the following reasons: the handover of facilities was delayed compared to the plan from the time of the appraisal; revenues from compost and recyclables were less than anticipated; there was no cost saving in drainage cleaning from reduced waste dumping into open drains; and the amount of the user fee collected is less than the assumption at the time of the appraisal.

Although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the project is fair.

3.3 Effectiveness and Impacts⁵ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The table below indicates the baseline and target values for the operation and effect indicators, and actual figures at the time of the ex-post evaluation.

Table 3: Operation and Effect Indicators

	Baseline	Target	Actual
	2004	2011	2019
		2 Years After Completion	2 Years After Completion
Compost plant input (t/year)	-	20,000	6,400
Waste disposal volume (t/year)	94,500	64,000	65,043
BOD concentration of effluent (Leachate treatment plant) (mg/l)	-	<100	95* (as of July 2019)
BOD concentration of effluent (Septic tank sludge treatment system) (mg/l)	-	<30	N/A
Waste capture (% of households collected)	-	75	23 - 97 (average 78%)

Source: Materials provided by JICA, Technical Assistance for Kolkata Solid Waste Management Improvement Project, and RWMC

*Wastewater from the leachate treatment plant is treated at aerobic lagoons and sedimentation ponds. The results of monitoring are obtained from the samples from the sedimentation ponds.

The actual figure of the compost plant input is much lower than the target one. Although the waste disposal volume did not decrease sufficiently to meet the target, it was confirmed that the

⁵ Sub-rating for Effectiveness is to be put with consideration of Impacts.

disposal volume decreased to a certain extent. Against the planned capacity of the RWMC, which is 200 tons/day, over 300 tons of waste is being transported currently. At the same time, the probable reason the compost plant input is less than the expected is that waste is not segregated properly at source or during collection and transportation.

Regarding the BOD concentration of effluent, the wastewater discharged from the septic tank sludge treatment system, which is in the premises of the RWMC, meets the wastewater from leachate treatment plant in the aerobic lagoon. The wastewater treated in the two lagoons and the sedimentation pond is reused in the septic tank sludge treatment system, instead of being discharged outside the RWMC.⁶ According to the most recent water quality testing from the sedimentation pond, the BOD concentration is approximately 100 mg/l. The wastewater produced in the septic tank sludge treatment system flows into the lagoon and then merges with the wastewater from the leachate treatment plant. Thus, the BOD concentration of the wastewater from the septic tank sludge treatment system is not separately monitored.

As of October 2019, the average rate of waste capture from the households across the six municipalities is 78%, which has exceeded the target. At the time of the field work in February 2020, it was reported from the municipalities that the rate was on an improving trend.

Out of the five indicators, it is fair to say that three have achieved the target. Therefore, the project has been able to bring about a certain degree of effectiveness.

3.3.1.2 Qualitative Effects (Other Effects)

Described in the “Impacts” section.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impacts of the project are defined as “improving the living environment and hygienic conditions of the people” and “safeguarding the natural environment.” Because it is difficult to prove the causal effects between these impacts and the project, in the ex-post evaluation, “improving the quality of life in the target area” and “improving environmental awareness of people in the target area,” which are the qualitative effects that can be confirmed as impacts of the project, were taken up.

Through interviews with the project consultants and officials of the six municipalities and group discussions with social mobilizers and local residents,⁷ the following points were confirmed.

⁶ As the wastewater discharged from the leachate treatment plant is reused within the RWMC, the BOD concentration of effluent must meet the standard of less than 100 mg/l. If the wastewater is discharged from the leachate treatment plant to the canal outside, the BOD concentration must be less than 30 mg/l in accordance with the standard set by the Pollution Control Board.

⁷ Group discussions with the local residents were conducted with several to about 30 people depending on the location mainly with women in the age groups between 20s and 50s whom the social mobilizers summoned.

- Waste collection (segregation and door-to-door collection): A waste collection system existed before the project. However, the service was not well-established and door-to-door collection was irregular, causing people to dump their waste illegally. Currently, door-to-door collection is practiced regularly in many areas. Because illegal dumping has become less rampant, incidents of water overflowing from the drains during the rainy season have decreased. On the other hand, because of the shortage of waste collectors and equipment, there are cases where waste cannot be collected from the same area daily and the segregated waste from households gets mixed up during collection.
- Each municipality has a noticeable tendency of unsegregated waste from households and inappropriate ways of taking out the waste, particularly among residents of apartment complexes.
- Social mobilizers have called on the people to improve awareness on health and sanitation and the environment in addition to methods of waste segregation and collection. The people feel that vector-borne diseases have decreased in recent years.

The project conducted its awareness activities by engaging six social mobilizers. Women were appointed for all the social mobilizer's posts considering that they will be reaching out to women, who mainly take out the waste from home, and that the activities targeting self-help groups (SHGs), where most members were women, were planned. Through existing groups such as SHGs, they encouraged people to participate in meetings and various awareness activities. Moreover, by working with healthcare workers in the area and going around daily with waste collectors, they provided on-the-job training to the waste collectors and monitored the situation of waste segregation.

In 2016, the project received a C40 Cities Award.⁸ In 2017, a Deputy Collector of Hooghly District, where the six municipalities are located, visited the project and started preparing for establishment of a regional waste management system including five surrounding villages. In the five villages, as was done in the project, waste was to be segregated into biodegradable and other types, and then collected and transported to the TSs and CPs of the project.⁹ According to the interviews with project stakeholders at the time of the ex-post evaluation, there was a plan to replicate a regional waste management system based on the model from the project in seven locations in the State of West Bengal. Furthermore, out of the six municipalities, three of them (Uttapara-Kotrung, Rishra and Baidyabati) have been awarded the status of model city for solid

⁸ C40 is a network of global cities working against climate change. It assists cities to undertake sustainable actions by working together and by sharing knowledge on climate change. C40 Cities Awards select best initiatives from cities around world that other cities can emulate, and honor outstanding activities that have shown a high level of performance that contributes to the environment even under difficult circumstances.

⁹ Final Report of the Technical Assistance for Kolkata Solid Waste Management Improvement Project

waste management from the West Bengal state government.

With regard to improving the quality of life in the target area and improving environmental awareness of people in the area, the living conditions appear to have improved because of regular waste collection by the project. Residents of the target area feel that the incidence of diseases such as malaria has decreased compared to earlier times because of improved sanitation. As the establishment of a regional waste management system based on the project as a model is being considered, it is fair to say that the project brought a certain impact.



Figure 4: Waste segregated at households



Figure 5: Transfer station (Konnagar)

3.3.2.2 Other Positive and Negative Impacts

Impacts on the Natural Environment

The project target area does not fall into the category of sensitive areas or their surroundings that may be easily affected by the project such as nature reserve. Thus, an undesirable impact on the natural environment was assumed to be minimal and the project was classified as Category B according to the JBIC Guidelines for Confirmation of Environmental and Social Consideration. As an anti-pollution measure in the project, soil cover was to be applied at a sanitary landfill and leachate was to be properly collected and treated; thus, no particular adverse impact was anticipated. Moreover, as an anti-scattering measure during transportation, waste was to be transported in a container with lids. In addition, the KMDA, the executing agency, was expected to monitor the quality of ground water, etc., around the RWMC.

In January 2010, the project obtained environmental clearance from the State Environmental Impact Assessment Agency. The clearance included compliance conditions stating that the design, construction and operation of various facilities should be carried out as per the plan. The conditions set in the clearance required the project to design, construct and operate facilities according to the project plan, and most of them seem to be complied with.

At the time of the ex-post evaluation, although not on a regular basis, cover soil was being

used to prevent odor at the RWMC. Leachate is treated in the aerobic lagoons and sedimentation pond, and reused within the RWMC thereafter, and it is not discharged outside the premises. No specific adverse impacts and complaints are reported from around the TS and CP.

Resettlement and Land Acquisition

Lands for TSs, CPs and the RWMC were all owned by either municipalities or the KMDA except in Konnagar. For construction of the TS and CP in Konnagar, 2.5 acres of vacant private land was acquired according to the domestic law. No resettlement took place in the project.

Unintended Positive/Negative Impacts

As part of the consulting service in the project, by understanding the details of ragpickers' age, gender and domicile, a plan for improving their income and health was to be formulated. In addition, it was expected that ragpickers would be employed in the regional waste management system established by the project. However, the support to ragpickers in the project was limited to the baseline survey. Nevertheless, the project has provided place for the ragpickers in TSs and the RWMC to segregate recyclable waste and made an effort to work with them. Waste collectors who collect waste from households are employed by the municipalities. Although several waste collectors were interviewed during the field survey, they did not necessarily have a ragpicker background. Thus, no particular contribution was found in increasing employment opportunities or improving the livelihood of ragpickers.

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

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

In West Bengal State, the Department of Urban Development and the Department of Municipal Affairs were consolidated in 2016 and became the Department of Urban Development and Municipal Affairs. As a result, the KMDA, which implemented the project, and the State Urban Development Agency (SUDA), which supervises the municipal administration including the six target municipalities of the project, came under the Department's umbrella.

According to the plan at the time of the appraisal, regarding the maintenance of the project, the six municipalities were to look after the primary and secondary collection systems while the KMDA was to take care of TSs, CPs, and the RWMC. However, based on discussions among the stakeholders during the project, it was decided that the primary and secondary collection systems and, TS, and CP would be operated by each of the six municipalities. The O&M of the

RWMC is taken care by Baidyabati municipality, where the RWMC is located. Although an option was considered to have the management committee, formed by the target six municipalities, take charge of the O&M of the RWMC, the RWMC was transferred to Baidyabati municipality in April 2017 and a contractor is operating the facilities. According to interviews with project stakeholders, although several municipalities are using the facilities, the other municipalities are not at all involved in the O&M, and coordination between Baidyabati municipality and other municipalities seems difficult when problems such as hauling of unsegregated waste occur.

Each municipality is headed by chairperson and the Conservancy Department is in charge of the O&M from the stages of primary collection to transporting the waste to the RWMC. Each municipality faces a shortage of manpower required for waste collection and operating vehicles due to a lack of funds. According to an interview with a project stakeholder, while the national average ratio between the number of households and primary waste collection is 180 households per waste collector, it is 220 households per waste collector in the project area.

After the project, six mobilizers deployed in each municipality have been absorbed by the Technical Assistance for Kolkata Solid Waste Management Improvement Project Phase 2. As the technical cooperation project will terminate in March 2020, each municipality is considering continuing the engagement of social mobilizers with its own budget. Serampur is already using the social mobilizers to collect user fees for waste management from commercial establishments.

Solid waste management is enacted as the responsibility of municipalities under the *West Bengal Municipal Act* of 1993. Under the Act, the municipalities are allowed to collect user fees related to solid waste management; however, as described in detail in “3.4.3 Financial Aspect of Operation and Maintenance,” hardly any fee collection has been implemented so far. Because of the shortage of manpower and equipment due to a financial crunch, there are situations where door-to-door collection service has not been able to cover everywhere and the segregated waste from the households is mixed up after collection, and institutional arrangements on waste management service delivery face issues. The O&M and institutional arrangements of the regional waste management system, including fund sources, were discussed repeatedly among the stakeholders in the past several years. As of February 2020, the Department of Urban Development and the Department of Municipal Affairs decided to assist in meeting the gaps of manpower and equipment for primary and secondary collection in the six municipalities, and to outsource the operation of TSs, CPs, the RWMC and transport to the RWMC¹⁰, based on a micro-plan described in a later section, and was preparing for the tendering procedure.

¹⁰ At the same time, two neighboring municipalities will be included in the regional waste management system established by the project. Construction of new facilities in these two municipalities, solid waste management services beyond secondary collection and augmenting existing facilities of the six municipalities are to be included in the agreement with the contractor.

3.4.2 Technical Aspect of Operation and Maintenance

Technical training for municipal personnel who are responsible for the O&M of TSs and other facilities was conducted during the project. Various facilities were initially operated and maintained by contractors, and technical guidance to the workers was provided during that time, but it was not sufficient. Maintenance manuals for the facilities were developed by Technical Assistance for Kolkata Solid Waste Management Improvement Project; however, the O&M of these facilities does not require advanced technical skills, and the municipal staffs do not seem to be using the manual continuously.

Books for recording waste transported into TSs and CPs were developed in the Technical Assistance for Kolkata Solid Waste Management Improvement Project. Waste brought into TSs and the RWMC is recorded by measuring at a weighing bridge. In most facilities, records are entered every day. However, at such facilities as one in Champdani, records were not being made because the weighing bridge was not working. Manuals for collection, transportation, and O&M are prepared, and training sessions to conservancy personnel and workers were conducted. Small booklet manual developed for the waste collectors is used by the waste collectors and social mobilizers even now.

Primary and secondary collection of waste and the O&M of facilities constructed by the project do not require advanced techniques, and municipal personnel, workers, and waste collectors have appropriate skills.

3.4.3 Financial Aspect of Operation and Maintenance

As in the case of a sewage project, it was recognized from the beginning that securing the funds for maintenance after the project completion was important for a solid waste management project. To address this issue, the project was aiming to improve the financial situation of each municipality by increasing the collection rate of property tax through managing property registries in addition to grants from the State government, tax revenues of the six target municipalities, revenue from compost sales, introduction of and gradually increasing the user fee as a source of the maintenance budget. By taking the steps above, the project aimed to operate without grants from the State government in the future.

User fee collection for the solid waste management service was introduced temporary around 2009 based on the user fee collection plan formulated in the project; however, when the current government won the State election in 2011, fee collection was stopped citing that waste management is a basic service. Therefore, no user fee is currently collected from the general households. However, from around September 2019, some of the municipalities started collecting a user fee from commercial establishments such as restaurants. In addition, the municipalities started collecting the fee targeting bulk waste disposed from companies and the waste from households that hold celebrations such as wedding whenever possible.

Each municipality is required to devise the budget covering the steps from primary collection to operation of TS and CP. However, in addition to each municipality's weak financial foundation, grants have not been allocated regularly despite continued discussions with the State government for several years. On the other hand, as described earlier, the state government is getting ready to outsource the O&M of TS and CP of each municipality and the RWMC to private contractors in February 2020. Thus, if a private contractor is selected and begins operating the facilities, the financial problems that the municipalities and the RWMC have faced are likely to improve. The table below presents the estimated O&M cost of facilities in each municipality in 2017.

Table 4: O&M cost of facilities in each municipality

Unit: INR thousand

Municipality	Annual O&M cost
Uttarpara-Kotrung	3,788
Baidyabati	3,855
Champdani	3,068
Konnagar	3,995
Serampur	3,870
Rishra	4,863

Source: Technical Assistance for Kolkata Solid Waste Management Improvement Project final report

The annual O&M cost for the RWMC is estimated to be INR 17.9 million. In August 2016, it was decided that the Department of Urban Development and Municipal Affairs would bear the operational cost of the RWMC. The cost was estimated as INR 1,530,000 per month, but the subsequent budget was to be recalculated based on the actual waste disposal amount and expenditure. According to interviews with project stakeholders at the time of the ex-post evaluation, the payment from the Department to the contractor operating the RWMC is not made on a regular basis.

The amount of compost manufactured in the CPs of the project as of October 2019 was 9.7 tons per day. Five municipalities other than Champdani began selling the compost, and the amount of compost sold has been shifting around 36 to 77 tons per month¹¹ since July 2019. Compost is packaged for household and industrial uses. Some of the municipalities have worked with distributors, and steady sales in the future are expected. Targeting local residents, expansion of sales channels is being worked on through awareness-raising activities and advertising while door-to-door waste collection is done.

¹¹ The amount of compost sold is the total of four municipalities excluding Baidyabati. The CP of Baidyabati is operated by a private contractor and does not disclose the amount of compost sold.



Figure 6: Compost plant



Figure 7: Compost

The tax revenue of each municipality accounts for 30-40% of the total revenue of the municipality; however, the property tax is only about 7% of the total revenue.

Considering that a shortage of funds in municipalities is affecting the availability of manpower and equipment as well as the quality of solid waste management service, micro-plans, which spell out the required manpower and equipment and their shortage for solid waste management services, were formulated based on the population in each ward and the amount of waste generated in each municipality. Based on the micro-plans, the Department of Urban Development and Municipal Affairs is preparing to assist in providing manpower and equipment shortage for primary and secondary collections in the six municipalities and to delegate to a private contractor the operation of the TSs, the CPs and the RWMC as well as transport to the RWMC. It is essential to resolve the financial issues as soon as possible in order to operate and maintain the solid waste management services properly. As of February 2020, the State government is proceeding with procurement of a private contractor and the contract should be signed in the next one to two months. If the contract is signed with the private operator and the State government assures regular payment, the issues will be resolved. The municipalities are to pay a service charge to the State government in the near future. Considering such situation, by resuming the user fee collection from the households and strengthening the financial foundation of the municipalities, a certain amount of the O&M cost to be borne by the municipalities can be secured from municipal tax revenues, compost sales, and fee collection.

3.4.4 Status of Operation and Maintenance

The field work in the ex-post evaluation revealed that solid waste management services as a whole were properly operated, but breakdown of and damage to the weighing bridges, equipment, and vehicles are seen in some of the facilities. Waste taken from each household is thrown into green and blue bins placed on the rickshaw cart pulled by the primary collector;

however, some residents and waste collectors were placing the waste in the wrong bins. Bins for waste segregation at the household level were initially distributed by the project; however, many years have passed and these bins were broken. Thus, in some households, one bin was not sufficient for waste segregation.

The TS and CP in each municipality receive biodegradable and other types of waste collected within the municipality, and their premises are cleaned thoroughly. At the same time, there are CPs whose compost production started only recently, and the amount of degradable waste brought into the CPs is limited and the production unit of compost is not fully established. As described earlier, most of the TSs and CPs weigh the waste brought into the facilities. However, in Champdani, the weighing bridge is not working, and records are not made daily. Equipment for waste collection and vehicles such as tipper trucks were mostly procured around 2011, and some were either broken or not being used. Those equipment and vehicles that passed their durable life either need to be repaired or replaced. As of February 2020, the State government has provided vehicles and equipment to some of the municipalities according to the micro-plan.

The RWMC receives the waste from each municipality and keeps records of weighing. No particular damage was seen on the impermeable lining at the landfill site; however, according to the personnel there, sometimes the sheet gets torn because of waste with sharp edges or a vehicle going directly into the landfill site. The leachate treatment plant is working, but the sludge treatment system has had a problem on digester from the beginning and not in proper use. Although there is no definite plan on repairing the sludge treatment system, the system is expected to be repaired once the RWMC is contracted out to a private party.

Some minor problems have been observed with regard to the institutional, organizational, and financial aspects; however, considering that outsourcing to a private contractor is being processed under the leadership of the State government and solving these issues in the future is anticipated, the sustainability of the project effects is determined to be fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In the beginning of 2000, the living environment for people in the KMA was threatened by odor and unhygienic conditions from a rapid increase in solid waste and a lack of proper waste management. Six municipalities, namely Champdani, Baidyabati, Serampur, Rishra, Konnagar, and Uttarpara-Kotrung located on the western bank of the Hooghly River, were no exception. Therefore, the project was implemented to promote proper management of solid waste generated in the region through establishing a sustainable regional waste management system, including the construction of a sanitary landfill, thereby contributing to improving the living and sanitary conditions of the people and conserving the environment.

Throughout the period between the project appraisal and the ex-post evaluation, the health and sanitation sector and the water supply and sewage sector including waste management have been given an important position in India's development policy. The issues of odor and unhygienic conditions, which were caused by a lack of solid waste management system and recognized at the time of the appraisal, have been partially solved by the establishment of a regional waste management system by the project. However, the need for such system remains at the time of the ex-post evaluation, and consistency with the development needs is also recognized. Moreover, the project matches Japan's ODA policy at the time of the appraisal. Thus, the relevance of the project is high. Most of the project scope has been implemented as planned. In addition, because of fluctuations in the exchange rate during the implementation period, the project cost was within the planned amount. On the other hand, the project was delayed significantly because it spent much time on consultant procurement and handing over the land for facility construction to the contractors, rendering its efficiency fair. In regard to operation and effect indicators, while waste disposal to the RWMC has achieved the target, compost plant input is significantly below the target, indicating that there is room for improvement in segregating waste at source. However, three out of the five indicators have achieved the target, a certain degree of improvement in the living and hygiene conditions of the people in the target area is observed, and no adverse impacts were reported during the project on the natural environment, land acquisition and resettlement. Therefore, the effectiveness and impacts of the project are high. Although there are no issues related to technical aspects of O&M, because of shortage of funds, manpower and equipment are running short, and sometimes door-to-door waste collection service is not provided and the waste segregated at households is mixed up after the collection. Moreover, although the system for collecting a user fee for solid waste management exists, it is not implemented. Thus, the sustainability of the project faces a few issues; however, efforts are being made to resolve them. Therefore, the sustainability of the project is fair.

In light of the above, although the project has issues in sustainability, efforts are being made to resolve them at the earliest, and the project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

This recommendation is for the West Bengal Department of Urban Development and Municipal Affairs as the executing agency was not directly involved in O&M. With regard to the O&M funds for the facilities constructed in the project, discussions took place repeatedly among the stakeholders from the project implementation stage. A shortage of funds is affecting the manpower and equipment required for solid waste management services, and deterioration

in the service quality may reduce the motivation of the local residents who have been practicing waste segregation at source. At the time of the ex-post evaluation, based on the micro-plan, providing necessary equipment and appointing private contractor for the O&M of facilities are in progress. This task must be done steadily and completed as soon as possible. Furthermore, to strengthen the financial base of the municipalities, it is necessary to collect a user fee from general households. However, in case the user fee collection is impossible for political reasons, the stakeholders need to coordinate so the state government can allocate necessary budget.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Raising people's awareness and establishing a solid waste management system by deploying social mobilizers

In the project, together with awareness raising to the local residents on waste segregation and door-to-door collection, social mobilizers were assigned in each municipality as bearers for environmental education and sanitation. The social mobilizer team comprising six women visited house to house in each neighborhood and promoted people's understanding on the solid waste management system by explaining waste segregation at home and how the waste is collected under the system. The social mobilizers were present on the spot of waste collection with primary waste collectors; by doing so, they provided training to the waste collectors and monitored the quality of services. Moreover, they contributed to raising people's awareness on health and sanitation, and even environmental conservation by working with health workers, SHGs, and schools in the area. To establish a solid waste management system, understanding and cooperation from the local people is indispensable along with the construction of facilities. The outreach to the people using the social mobilizers was an essential part of achieving the project's outcome.

Political lobbying for securing O&M funds

At the time of the project appraisal, one of the lessons learned from similar projects in the past was that it is important to confirm how to secure O&M funds from the financial aspect. Based on the lesson, the project was collecting a user fee at one point. Although many residents approve of user fee collection, it was discontinued for a political reason. Although O&M institutional arrangements and sources of funds have been discussed among the State government, municipalities, and JICA since the implementation stage, the project came to an end without a specific way out including the implementation of fee collection as mentioned above. This has resulted in municipalities struggling with a shortage of funds. In the future, it is

crucial to consider possible solutions and confirm the possibility of implementing them such as financial support from the Department of Urban Development and Municipal Affairs and lobbying politicians to request their understanding on the importance of fee collection, among the stakeholders before the project completion.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	a) Procurement of equipment for improving collection system b) Introduction of collection system to the slum areas c) Construction of TS: 5 locations (excluding Baidyabati) d) Construction of CP: 6 locations, 120 tons/day capacity e) Construction of landfill site: 1 location, 1,537,000 m ³ capacity f) Access road improvement: 16.9 km g) Consulting services <ul style="list-style-type: none"> • Detail design, procurement, construction management, overall project management, etc. • Education on the environment and sanitation, public awareness on new solid waste management system to be introduced by the project such as waste segregation and door-to-door collection, assistance to ragpickers, capacity building of project personnel, formulating plan on introducing user fee 	As planned As planned As planned As planned 1 location, 1,406,200 m ³ capacity 10.8 km Almost as planned
2. Project Period	March 2006 – November 2010 (57 months)	March 2006 – July 2017 (137 months)
3. Project Cost		
Amount Paid in Foreign Currency	593 million yen	Unknown
Amount Paid in Local Currency	3,646 million yen (1,464 million Indian rupees)	Unknown
Total	4,239 million yen	Unknown
ODA Loan Portion	3,584 million yen	2,467 million yen
Exchange Rate	1 Indian rupee = 2.49 yen (As of July 2005)	- -
4. Final Disbursement	July 2017	