Ex-Post Project Evaluation 2022:

Package I-1 (India)

Evaluation Reports

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JAPAN INTERNATIONAL COOPERATION AGENCY

OPMAC CORPORATION

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Republic of India

FY2022 Ex-Post Evaluation Report of
Japanese ODA Loan "Program for Japan-India Cooperative Actions towards Sustainable Development Goals in India"

External Evaluator: Kazuhiro Nakagawa, OPMAC Corporation

0. Summary

The objective of the Program for Japan-India Cooperative Actions towards Sustainable Development Goals (SDGs) in India (the Program) is to promote efforts towards SDGs in India's social development by strengthening and assisting the framework of various policies and implementation platforms for the SDGs, thereby contributing to the achievement of SDGs in 2030. The implementation of the Program was consistent with the development policy and development needs of India. The Program was also consistent with Japan's ODA policy, internally consistent with JICA's other projects, and externally consistent with the activities of other donors. Therefore, its relevance and coherence are high.

As for the operation and effect indicators, 9 indicators were set at the time of appraisal for 5 sectors: health and nutrition, education, agriculture and water resources, financial inclusion and skill development, and basic infrastructure. Of these, two indicators (Percentage of learning outcomes in mathematics for grade 3 of elementary school and Employment percentage of youths who took skills training courses) achieved more than the planned targets at the Program completion. Four indicators (Percentage of pregnant women receiving ante natal check-ups 4 times or more, Percentage of secondary schools with electricity connection, Percentage of the population with bank accounts, and Percentage of villages with internet connectivity) were mostly achieved. Three indicators (Percentage of children of 9 to 11 months fully immunized, Percentage of high value crops, and Percentage of population in rural areas with access to adequate quantity of potable water) had been partially achieved. As for qualitative effects, all three effects envisaged at the time of appraisal (the enhancement of a system to monitor the achievement of SDGs by the central government of India, the promotion of Japan-India cooperation such as SDGs-related technical input by Japan, and the enhancement of the skills of government agency staff in the SDGs) were achieved. Regarding impact, 11 goals were expected to have been improved by the implementation of the Program at the time of appraisal. Of these, seven goals (Goal 2: Zero Hunger, Goal 3: Good Health and Well-being, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 6: Clean Water and Sanitation, Goal 9: Industry, Innovation and Infrastructure, and Goal 13: Climate Action) were improved. In addition, technical and intellectual inputs for the achievement of SDGs in India, based on experience in Japan and JICA-supported projects and programs in India, were provided, a ranking mechanism was introduced in the Aspirational Districts Programme (ADP) supported by the Program, and a database was established and operated to confirm and monitor progress. In general, the expected impact has been observed. The Program

also had a certain positive impact on gender, marginalized people, social systems and norms, human well-being and human rights, due to the nature of the Program, which supported activities to achieve the SDG. Therefore, the effectiveness and impacts of the project are considered to be high.

Sustainability is ensured since there are no problems with the operation and maintenance of the Program in terms of the policy and system aspects and the institutional/organizational aspects. Preventive measures have been taken against risks.

1. Project Description

Project location (Source: Evaluator)[1]

Solar panels installed at a primary health center (Source: NITI Aayog)

1.1. Background

The Millennium Development Goals (MDGs), which were set to be achieved by 2015, highlighted the fact that, while India had made improvements in many of the goals, it continued to face challenges in areas of social development, such as sanitation, education, and health, that were common to many developing countries.

The Government of India continued to work on the SDGs, which were adopted by all member states of the United Nations in 2016 as a successor to the MDGs, and also began work on a total of 17 goals. The National Institution for Transforming India (NITI Aayog), established in 2015, served as the coordinating body for SDGs in the Government of India, and designated a lead ministry for each of the 17 SDG targets, listing related government of India initiatives and schemes. In addition, in July 2017, at the High-Level Political Forum on Sustainable Development, held annually at the United Nations, the Government of India became a Voluntary National Review state, announcing plans to achieve the goals that were set as the themes of that year's forum. The Government of India has since been actively working toward achieving the

[1] Disclaimer: This map is only for illustrative purposes and does not imply any opinion of JICA on the legal status of any country or territory, the border line of any country or territory or its demarcation, or the geographic names.

SDGs. In addition, in January 2018, NITI Aayog designated 112 districts that were lagging behind in progress toward achieving the SDGs as Aspirational Districts (ADs) and launched the ADP, a program that aims to achieve SDGs across a country and raise the bottom level by ranking, based on each indicator, achievement in five sectors (health and nutrition, education, agriculture and water resources, financial inclusion and skill development, and basic infrastructure) in which deviation from the targets was particularly large in the ADs, and by promoting competition, as well as by monitoring progress monthly.

1.2. Project Outline

The objective of the Program is to promote efforts towards SDGs in India's social development by strengthening and assisting the framework of various policies and implementation platforms for the SDGs, thereby contributing to their achievement in 2030.

For efficient evaluation, the ADP, which has been implemented by the Government of India since January 2018, was considered to be a project supported by the Program. The policy actions to be achieved in the ADP for each fiscal year were organized as a policy matrix in the Program, and the achievement status was monitored by both the Government of India and JICA to promote the achievement of the policy actions.

Loan Approved Amount / Disbursed Amount	15,000 million yen / 14,985 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	December 2018 / January 2019	
Terms and Conditions	Interest Rate	1.45%
	Repayment Period (Grace Period	30 years 10 years)
	Conditions for Procurement	General Untied
Borrower / Executing Agency(ies)	The President of India / The National Institution for Transforming India (NITI Aayog)	
Project Completion	March 2020	
Target Area	All of India	
Main Contractor(s) (Over 1 billion yen)	N.A.	

Main Consultant(s) (Over 100 million yen)	N.A.[2]
Related Studies (Feasibility Studies, etc.)	N.A.
Related Projects	Technical cooperation project for promotion of the program for Japan - India cooperative actions towards sustainable development goals (SDGs) in India

2. Outline of the Evaluation Study

2.1. External Evaluator

Kazuhiro Nakagawa, OPMAC Corporation

2.2. Duration of Evaluation Study

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

Duration of the Study: September 2022 - November 2023

Duration of the Field Study: December 4 - December 23, 2022

2.3. Constraints During the Evaluation Study

The Program is a program loan project (Development Policy Lending), which encourages the implementation of reforms by the government of developing country through policy dialogue, providing funds once the reforms are accomplished. The funds provided are not earmarked for specific purposes and go into the general account budget. As a result, it is difficult to quantitatively compare inputs (expenses) and outputs (achievements), which is why efficiency is excluded from the analysis and evaluation. Sustainability is included in the analysis, but it is not subject to evaluation scope, and no sub-rating is conferred. Since no sub-rating is conferred on efficiency and sustainability, no overall rating has been conferred either.

[2] To support implementation, a team of experts in the "technical cooperation project for promotion of the program for Japan - India cooperative actions towards sustainable development goals (SDGs) in India" was dispatched by JICA.

3. Results of the Evaluation (Overall Rating: N/A[3])

3.1. Relevance/Coherence (Rating: ③[4])

3.1.1. Relevance (Rating: ③)

3.1.1.1. Consistency with the Development Plan of India

As described in 1.1. Background, at the time of appraisal, the Government of India had positioned the SDGs as goals to be addressed and was actively working towards achieving them. Furthermore, in January 2018, NITI Aayog had launched the ADP, a program aimed at achieving the SDGs across the country.

At the time of the ex-post evaluation, the SDGs has been positioned as goals that the Government of India should continue to address. A total of 17 goals for the SGDs were being addressed, and the ADP was being implemented with the coordination of NITI Aayog. NITI Aayog established a database called the Champions of Change Dashboard, which provides online information on the progress of each AD in five sectors (health and nutrition, education, agriculture and water resources, financial inclusion and skill development, and basic infrastructure) together with the ranking of each AD.[5]

It is recognized that the Program was consistent with the development plan at the time of appraisal and at the time of the ex-post evaluation. Policies and projects that were related to, and consistent with, the development plan at the time of appraisal also existed at the time of the ex-post evaluation. The Program has been implemented based on these policies and projects, and is consistent with the development plan.

3.1.1.2. Consistency with the Development Needs of India

At the time of appraisal, the SDG Index and Dashboards Report, published in July 2018 by Sustainable Development Solutions Network[6] and the Bertelsmann Stiftung in Germany, found that India's achievement rate for the Goal 2. Zero hunger, 5. Gender equality, 9. Industry, innovation and infrastructure, 10. Reduced inequality, and 15. Life on land, was below 50%, ranking 112th out of 156 countries in terms of achievement. In addition, a survey conducted by NITI Aayog revealed that 112 districts in the country were particularly slow in achieving the SDGs, making it a challenge to promote achievement of the SDGs in these districts.

At the time of the ex-post evaluation, India's achievement rate against the targets for Goals 5.

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[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory, N/A: Not Applicable

[4] ④: Very High, ③: High, ②: Moderately Low, ①: Low

[5] Champions of Change Dashboard: http://championsofchange.gov.in/site/coc-home/

[6] A global network established by the United Nations in August 2012. The objective of the Network is to bring together research institutions, universities, businesses, and civil society organizations to identify and share best practices for solving the world's environmental, social, and economic problems and achieving a sustainable society. By collaborating with businesses and civil society organizations in various countries, as well as with officials from UN agencies and other international organizations, the Network aims to utilize private sector knowledge and practical problem-solving ideas.

Gender equality, 9. Industry, innovation and infrastructure, and 10. Reduced inequality, was below 50% according to the 2022 version of the above SDG report, and the country had dropped to 121st out of 163 countries in terms of achievement. The ranking is relative to other countries, and the fact that the country's activities to achieve the SDGs were heavily restricted due to the impact of COVID-19 may have contributed to this decline in ranking.

The SDGs are targets to be achieved by 2030, and at the time of the ex-post evaluation, no targets had been achieved. Therefore there is still a need for activities to achieve the SDGs.

3.1.1.3. Appropriateness of the Project Plan and Approach

At the time of appraisal, the appropriateness of implementing the Program as a Japanese ODA loan project was discussed on the Japanese side. If the Project had been implemented as a technical cooperation project, the interaction would have been solely between the consultant having the know-how and the counterpart organization on the Indian side. Thus, it was decided that the Program would be implemented as a Japanese ODA loan project because this would allow involvement in the policy planning of the Indian central government as a policy-support-type of Japanese ODA loan project while also providing an opportunity to approach a wide range of areas in India as a whole. It was significant that the relationship between JICA and NITI Aayog was strengthened by the selection of NITI Aayog as the implementing agency for the Program, since NITI Aayog is the planning agency for the Indian government's development policy and plays an important role in the process of forming Japanese ODA projects.

The ADs targeted by the ADP were areas in India where progress toward achieving the SDGs were slow from the time of appraisal to the time of the implementation of the project. The Program supporting the ADP was designed to benefit people who were prevented from participating fairly in society, and, therefore, equality was taken into consideration in the Program.

Furthermore, lessons learned from similar past projects, which were mentioned at the time of appraisal, were utilized in the Program. Specifically, a lesson learned from the "Indonesia Climate Change Program Loan (I-III)" was that "operation and effect indicators should be such that they can be regularly monitored by the competent ministries." A lesson learned from the Japanese ODA loan project "Tamil Nadu Investment Promotion Program" for India, was that "the Program Monitoring Committee (PMC) and a Japan-India Opinion Exchange Forum should be held to discuss the implementation of policy inputs related to the target areas related to previous JICA projects." The Program's operation and effect indicators were managed through a database constructed and operated by NITI Aayog, and the indicators were updated monthly. The Japan-India SDGs Forum was held under the Program, and Japanese technology and the efforts of JICA projects were also introduced. In particular, in the agricultural sector, the Indian side requested the introduction of the Smallholder Horticulture Empowerment & Promotion (SHEP) approach, which was introduced at the Forum, and it was suggested that the SHEP approach be introduced

in ADs in the future.

Based on the above, it is evaluated that the project plan and approach were appropriate.

3.1.2. Coherence (Rating: ③)

3.1.2.1. Consistency with Japan's ODA Policy

Japan's Country Assistance Policy for India (March 2016) at the time of appraisal stipulated that Japan would provide assistance contributing to poverty reduction and development of the social sector in order for the country's high economic growth to be sustainable. The Program was related to cooperation programs in the priority area "Support for Sustainable and Inclusive Growth," such as the "Agriculture and Rural Development Program," the "Basic Social Services Improvement Program," and the "Water, Sewage, Sanitation, and Pollution Control Program." In addition, the policy mentioned support based on a program approach, in which the policy matrix was mutually agreed upon through close and continuous policy dialogue, where monitoring and reviews were conducted, and where support was provided on the basis of the progress of policy actions, contributing to the improvement of ownership in recipient countries. The gradual promotion of this policy was noted.

Through analysis in *the JICA Country Analysis Paper for India* (March 2018), it was found that while comprehensively supporting India's efforts toward the achievement of the SDGs, it was also important to focus cooperation on solving key development issues where funding needs are large and where Japan and JICA can demonstrate their strengths. In addition, it was concluded that one of the approaches to cooperation in the development issues that JICA should address was "contribution to the Government of India's National Development Program," and that JICA should consider contributing to higher-level policies by providing feedback to relevant government agencies through program loans and other means, based on its on-the-ground experience with Japanese ODA loan projects to date. Furthermore, "inclusive growth in rural areas" was raised as one of the major development issues, which said that support should be conducted for the realization of sustainable and inclusive growth in rural areas where many low-income people live. Therefore, the Program is consistent with these policies and analyses.

3.1.2.2. Internal Coherence

Although no specific synergies or interlinkages with other JICA projects were expected at the time of appraisal, during the implementation of the Program, JICA India Office published a brochure explaining JICA's contribution to the efforts to achieve the SDGs in India.[7] In this brochure, JICA's contribution for each goal was described, and a summary is shown in Appendix

[7] JICA India Office SDGs Brochure: https://www.jica.go.jp/Resource/india/english/office/others/c8h0vm00004cesxi-att/brochure_19.pdf

1. As shown in Appendix 1, JICA was implementing Japanese ODA loans and technical cooperation projects in India in various areas related to the SDGs during the Program period. As an example, “Jharkhand Horticulture Intensification by Drip Irrigation” was expected to improve the livelihood of small and micro farmers and contributed to the improvement of “Goal 1: No poverty.” In addition, the implementation of the “Tamil Nadu Urban Health Care Project” has improved the urban health care system, contributing to the improvement of “Goal 3: Good health and well-being.”

3.1.2.3. External Coherence

At the time of appraisal, the World Bank identified “promoting resource efficient growth, enhancing competitiveness, and investing in human capital” as key priorities/areas in the *India - Country Partnership Framework for the Period FY18-FY22* (July 2018), and was providing support for health and education where it lagged behind in the SDGs in India as well as for economic growth. In addition, the Asian Development Bank (ADB), in *the Country Partnership Strategy 2018-2022* (September 2017), stated that it would support India’s efforts to achieve the SDGs, raising three pillars for this support: “boosting economic competitiveness,” “providing inclusive access to infrastructure networks and services,” and “addressing climate change.” Moreover, the ADB had provided a total of 20 program loans to the Government of India, totaling US$4.7 billion (as of December 2017, in terms of agreed amount). These frameworks and strategies were up-to-date and valid at the time of the ex-post evaluation.

During the implementation of the Program, ADB and the United Nations Development Programme (UNDP) also supported the abovementioned ADP. Neither organization provided financial assistance as JICA did to NITI Aayog, but only technical cooperation. Specifically, in the five sectors covered by the ADP, they assisted ADs in the preparation of proposals to apply to the Challenge Fund[8]. The team of experts for the “technical cooperation project for promotion of the program for Japan - India cooperative actions towards sustainable development goals (SDGs) in India” provided the same support for proposal preparation, but since the ADs targeted were different, there was no overlap in the support among the three parties.

As for the consistency with development plan, since the policies at the time of appraisal are still in effect at the time of the post-evaluation, it is recognized that the Program is consistent. The SDGs are targets to be achieved by 2030, and at the time of the ex-post evaluation, there were no targets that had already been achieved. The need for the development of activities to achieve the SDGs was still recognized. The ADs targeted in the ADP were an area in India where progress

[8] Funds for each AD to implement a subproject in the ADP. Each state submitted a project proposal for implementation of the ADP, which was reviewed and approved by the Empowered Committee of the NITI Aayog and then funded from the Challenge Fund.

toward achieving the SDGs was slow, and the Program was designed to support ADPs working in the ADs so that those who were excluded from equitable participation in society could benefit from the Program. Therefore, the Program was designed with equality as a consideration. The lessons learned from similar projects mentioned in appraisal documents were utilized in the Program, and no problems were observed regarding the appropriateness of the project plan, its approach, and so on.

The Program was consistent with Japan's aid policy at the time of appraisal, because it was also consistent with the priority areas of *Japan's Country Assistance Policy for India* (March 2016) and *the JICA Country Analysis Paper for India* (March 2018). As for internal coherence, although there were no specific synergies or interconnections with other JICA projects in appraisal documents at the time of appraisal, JICA, through the implementing agency of the Program, supported India's achievement of each of the SDGs by providing Japanese ODA loans, technical cooperation, and grant aid in areas related to each goal of the SDGs. Thus, internal coherence was observed. As for external coherence, World Bank and ADB's policy of support for India continued from the time of appraisal to the time of the ex-post evaluation, and program loans were provided to each of the sectors. Furthermore, in the ADP supported by the Program, ADB and UNDP also supported the preparation of proposals for each AD to apply for the Challenge Fund, which means there has been a synergistic effect with JICA and other donors in terms of promoting the progress of the ADP, and thus external consistency has also been observed.

Therefore, relevance and coherence are high.

3.2. Effectiveness and Impacts[9] (Rating: ③)

3.2.1. Effectiveness

3.2.1.1. Quantitative Effects (Operation and Effect Indicators)

Under the Program, the policy actions for each policy item (five sectors: health and nutrition, education, agriculture and water resources, financial inclusion and skills development, basic infrastructure, and, in addition, overall / global partnerships) were set for each fiscal year, and loans were to be disbursed based on achievement at the end of the fiscal year. A joint evaluation conducted by JICA and NITI Aayog in FY 2019 (April 2019 - March 2020), the final year of the Program's policy action implementation, confirmed the achievement of all policy actions. Disbursements were also carried out as scheduled, although it was some time before joint evaluations were held to confirm the achievement of the policy actions for each fiscal year, which was a condition for disbursement. The achievement status of the operation and effect indicators for each field is shown in Table 1. Note that, although at the time of planning Program completion was defined as loan completion (i.e., February 2021), the target year for the operation and effect

[9] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

indicators was defined as the year of policy action completion (i.e. March 2020). Therefore, Program completion was redefined as the year of policy action completion. Achievement status was judged according to the degree of achievement of the actual value against the target value (100% or more: achieved more than planned; 70-100%: mostly achieved; 50-70%: partially achieved; 50% or less: not achieved). However, the indicators for which the actual value was below the baseline value were downgraded one level. The FY 2016 values set as the baseline value were the values for India as a whole, while for the actual value, the overall average values for all ADs were used for convenience.

Table 1: Operation and Effect Indicators

Indicator	Baseline value	Target value	Actual value		
	FY2016	FY2019	FY2018	FY2019	November 2022
		Completion Year		Completion Year	Ex-post Evaluation
<Health and Nutrition>					
Percentage of pregnant women receiving ante natal check-ups 4 times or more	64%	75%	63%	70% (93%)	80%
Percentage of children of 9 to 11 months fully immunized	89%	95%	85%	88% (93%)	95%
<Education>					
Percentage of learning outcomes for mathematics in grade 3 of elementary school	62%	75%	55%	76% (101%)	76%
Percentage of secondary schools with electricity connection	84%	95%	85%	90% (95%)	85%
<Agriculture and Water Resources>					
Percentage of high value crops	15%	20%	16%	15% (75%)	19%
<Financial Inclusion and Skill Development>					
Percentage of the population with bank accounts	32%	40%	35%	37% (93%)	45%
Employment percentage of youths who took skills training courses	18%	25%	25%	30% (120%)	40%
<Basic Infrastructure>					
Percentage of villages with internet connectivity	38%	55%	40%	45% (82%)	60%
Percentage of population in rural areas with access to an adequate quantity of potable water	82%	90%	75%	80% (89%)	85%

Source: Documents provided by JICA and NITI Aayog

The percentage of pregnant women receiving ante natal check-ups 4 times or more was mostly achieved (target ratio: 93%). Although the target was not fully achieved at the time of Program completion, partly due to lockdowns caused by COVID-19 in many ADs, the target had been achieved at the time of the post-evaluation.

The percentage of children of 9 to 11 months fully immunized was partially achieved (target ratio: 93%, below baseline). Although the target of was not fully achieved at the time of Program completion, partly due to lockdowns in many ADs caused by COVID-19, the target had been

achieved at the time of the ex-post evaluation.

The percentage of learning outcomes for mathematics in grade 3 of elementary school was achieved more than planned (target ratio: 101%). Although there were periods when students were unable to attend school due to COVID-19, the project had achieved more than planned at the time of Program completion through the introduction of e-learning and learning recovery programs. This was continuing at the time of the ex-post evaluation.

The percentage of secondary schools with electricity connection was mostly achieved (target ratio: 95%). The target was not fully achieved at the time of Program completion, partly because electrification was suspended due to the COVID-19 pandemic. At the time of the ex-post evaluation, the percentage had decreased, the reason for which could not be identified.

The percentage of high value crops was partially achieved (target ratio: 75%, below baseline); however, at the time of the ex-post evaluation, it had been mostly achieved. Although the reason of this limited achievement could not be identified, it is assumed to be partly due to the difference in reference data between the baseline value and the actual value.

The percentage of the population with bank accounts was mostly achieved (target ratio: 93%). Although the target was not fully achieved at the time of Program completion, it had been achieved at the time of the ex-post evaluation, partly due to the establishment of Customer Service Points (CSPs) providers with banking functions such as cash withdrawal within a 5 km radius of each village across India.

The employment percentage of youths who took skills training courses was achieved more than planned (target ratio: 120%). Although it was difficult to conduct on-the-job training during the lockdown caused by COVID-19, India's economy continued to grow and the demand for young people's labor was strong. Therefore, the Program achieved more than planned at the time of Program completion and this was continuing at the time of the ex-post evaluation.

The percentage of villages with internet connectivity was mostly achieved (target ratio: 82%). The target of was not fully achieved at the time of Program completion, partly due to the suspension of radio tower construction during the lockdown caused by COVID-19. The target had been achieved at the time of the ex-post evaluation.

The percentage of the population in rural areas with access to an adequate quantity of potable water was partially achieved (target ratio: 89%, below baseline). Although there were suspensions in construction due to COVID-19, the development of a dashboard (database) enabled the timely monitoring and follow-up of progress in each AD, and although the target had not been achieved even at the time of the post-evaluation, it has been improving on a daily basis.

Solar panels installed at a primary health center

Drinking water facility installed in a school

Bike ambulance

Source: NITI Aayog

3.2.1.2. Qualitative Effects (Other Effects)

(1) The Enhancement of a System to Monitor the Achievement of SDGs by the Central Government of India

During the implementation of the Program, NITI Aayog established a database called the Champions of Change Dashboard and the data is available online. The database provides information on the progress of each AD in five sectors (health and nutrition, education, agriculture and water resources, financial inclusion and skill development, and basic infrastructure), as well as the ranking of each AD. The data in the database is updated periodically, and was at the time of the ex-post evaluation, and monthly rankings of ADs are published. In addition, in 2018, NITI Aayog published the SGD India Index, a report on SDG achievement by state, and the third edition of this (FY2021-2022) was available at the time of the ex-post evaluation. As mentioned above, the monitoring system (including the dashboard) for achievement of the SDGs has been established, and the data is updated and disclosed to the public in a timely manner. Thus, the system to monitor the achievement of SDGs by the central Government of India has been enhanced through the Program, and no major issues have been found.

Furthermore, the consultants hired by JICA (the team of experts for the technical cooperation project for promotion of the Program) provided assistance to some ADs in preparing Plans of Action (POA) for the Challenge Fund, which supported and enhanced NITI Aayog's activities.

(2) The Promotion of Japan-India Cooperation such as SDGs-Related Technical Input by Japan

In the first PMC (held in February 2019) JICA and NITI Aayog agreed to hold the Japan-India SDGs Forum and provide JICA technical cooperation as Japan-India cooperative actions. However, due to COVID-19 (including lockdown) from March 2020, some of the contents of these agreements were changed, such as the holding of the online instead of face-to-face forums. In addition, although the Japan-India SDG Forum was to be held in each of the five sectors

(health and nutrition, education, agriculture and water resources, financial inclusion and skill development, and basic infrastructure), due to COVID-19, it was held in only three sectors (health and nutrition, education, and agriculture and water resources). At the Forum, some Japanese systems were introduced as a reference for ADs in preparing POA for the Challenge Fund applied for under the ADP. As specific examples, school lunches in the health and nutrition sector, the improvement of school toilets in the education sector, and the SHEP approach and the One Village One Product movement in the agriculture sector were introduced.

In terms of technical cooperation, the team of experts conducted research and analysis in AD to identify issues and problems, and also provided support for the preparation of POA for the Challenge Fund based on requests from NITI Aayog.

As of the time of the ex-post evaluation, the "Data Collection Study for SHEP in India" was being conducted for the SHEP approach in the agricultural sector, introduced at the Japan-India SDG Forum held under the Program. In addition, the SHEP approach has been incorporated into some of the outcomes of the ongoing Japanese ODA loan project "Himachal Pradesh Crop Diversification Promotion Project (Phase 2)" (signed in February 2011). The new Japanese ODA loan project "Uttarakhand Integrated Horticulture Development Project" (signing in March 2022) is also considering the introduction of the SHEP approach.

From the above, it can be said that the Program has promoted Japan-India cooperation such as SDGs-related technical input by Japan.

(3) The Enhancement of Government Agency Staff Skills in the SDGs

During the implementation of the Program, the personnel in charge of the 112 districts covered by the ADP were identified, and although details could not be confirmed, regular training was provided to these personnel, including to the field workers, and was still being provided at the time of the ex-post evaluation.

The ranking system based on data measured in real time, which provided incentives for each AD to achieve SDG targets, as envisioned at the time of appraisal, was introduced by NITI Aayog during the Program period and was being continued at the time of the ex-post evaluation.

From the above, it can be said that the Program has enhanced the skills of government agency staff in the SDGs.

3.2.2. Impacts

3.2.2.1. Intended Impacts

(1) Quantitative Impacts

As the quantitative impact, achievement of the SDGs was analyzed. At the time of appraisal, it was assumed that the Program would contribute to 11 goals out of the 17 SDGs (Goal: 1-10 and 13) through support to five sectors (health and nutrition, education, agriculture and water

resources, financial inclusion and skill development, and basic infrastructure). The level of achievement of these 11 goals at the time of the ex-post evaluation was confirmed and analyzed as shown in Table 2.

Table 2: Status of Achievement of SDGs

Goal	Indicator	Actual value (2018)	Actual value (2019) Completion Year	Actual value (2020)	Target value (2030)	Analysis
1. No Poverty	1-1. % of the population living below National Poverty line	21.92	21.92	21.92	10.95	Comparing Program completion with 2020, no significant improvements were found.
	1-2. % of households with any usual member covered by any health scheme or health insurance	28.70	28.70	28.70	100	
	1-3. Persons provided with employment as a % of persons who demanded employment under MGNREGA[10]	84.74	85.26	84.44	100	
	1-5. No. of homeless households per 10,000 households	10.39	4.20	4.20	0	
2. Zero Hunger	2-2. % of children under aged 5 years who are stunted in growth	38.40	34.70	34.70	21.03	Comparing Program completion with 2020, rice, wheat and coarse cereals produced annually per unit area has increased.
	2-3. % of pregnant women aged 15-49 years who are anemic (11.0 g/dl)	50.3	50.3	50.4	23.57	
	2-4. Rice, wheat and coarse cereals produced annually per unit area (kg/ha)	2,509.22	2,516.67	2,995.21	5,018.44	
3. Good Health and Well-being	3-1. Maternal mortality ratio per 100.000 population	130	122	113	70	Comparing Program completion with 2020, while the under-five mortality rate per 1,000 live births has improved, the annual notification of tuberculosis cases per 100,000 population has increased. As for the decreasing under-five mortality rate per 1,000 live births, the National Health Mission implemented by Ministry of Health and Family Welfare (MoHFW) has contributed to some extent.
	3-2. Under-five mortality rate per 1,000 live births	50	50	36	11	
	3-4. Annual notification of tuberculosis cases per 100,000 population	138.33	160	177	242	
4. Quality Education	4-5. Average annual drop-out rate at secondary level (%)	17.06	19.89	17.87	10	Comparing Program completion with 2020, the average annual drop-out rate at secondary level and % of school teachers professionally qualified have improved. Samagra Siksha
	4-6. % of school teachers professionally	81.15	78.84	82.62	100	

[10] Mahatma Gandhi National Rural Employment Guarantee Act

Goal	Indicator	Actual value (2018)	Actual value (2019) Completion Year	Actual value (2020)	Target value (2030)	Analysis
	qualified					Abhiyan, implemented by Ministry of Human Resource Development (MoHRD) has contributed to some extent to the improvement.
5. Gender Equality	5-1. Sex ratio at birth (female per 1,000 male)	898	896	899	954	Comparing Program completion with 2020, the sex ratio at birth (female per 1,000 male), % of seats won by women in the general elections to state legislative assembly, and % of female labor force participation rate to male labor force participation rate have improved. In particular for the % of female labor force participation rate to male labor force participation rate, policies and projects implemented by the Ministry of Skill Development and Entrepreneurship (MoSDE) have promoted women's participation in society, and these policies and projects have contributed to some extent.
	5-4. % of seats won by women in the general elections to state legislative assembly	8.7	8.32	8.46	50	
	5-5. % of female labor force participation rate to male labor force participation rate	32	17.5	33	100	
6. Clean Water and Sanitation	6-3. % of districts verified to be open defecation free	31.95	88.41	100	100	Comparing Program completion with 2020, % of districts verified to be open defecation free has improved and the target for 2030 was also achieved.
7. Affordable and Clean Energy	7-1. % of households electrified	94.57	99.99	99.99	100	Comparing Program completion with 2020, % of households electrified has not improved but had reached almost 100% at the time of Program completion.
8. Decent Work and Economic Growth	N/A	N/A	N/A	N/A	N/A	Since there was no data for three consecutive years, comparisons could not be verified.
9. Industry, Innovation and Infrastructure	9-1. % of targeted habitations connected by all-weather roads under Pradhan Mantri Gram Sadak Yojana	47.38	69.89	97.65	100	Comparing Program completion with 2020, % of targeted habitations connected by all-weather roads and no. of internet subscribers per 100 population has improved drastically. As for no. of internet subscribers, Bharat Net implemented by Bharat Broadband Network Ltd. has contributed to some extent.
	9-2. No. of mobile connections per 100 persons in rural and urban area	82.97	88.41	84.38	100	
	9-3. No. of internet subscribers per 100 population	33.47	48.48	55.41	100	
10. Reduced Inequalities	10-3. Ratio of transgender labor force participation rate to male labor force participation rate	0.64	0.64	0.64	1	Comparing Program completion with 2020, nothing has changed.
13. Climate Action	13-3. % of renewable energy out of total installed generating capacity (including allocated shares)	17.51	35.22	36.37	40	Comparing Program completion with 2020, % of renewable energy out of total installed generating capacity has increased/improved slightly.

Source: SDG INDIA Index & Dashboard, NITI Aayog, external evaluator
Note 1. NITI Aayog has compiled a database of the progress of India and its states (including Union Territories (UTs)) toward each of the SDG targets in the SDG INDIA Index & Dashboard, which is available online. The database provides multiple indicators for each goal, and the indicator values are converted to index scores and averaged out to be used as actual values for the goal, which are used to check the progress toward the 2030 target as 100.
Note 2. At the time of the ex-post evaluation, there were only three years of data available for each goal, from 2018, when the database was first constructed, to 2020, so the impact was verified by comparing the values in 2019, when the Program was completed, with those in 2020, one year later. However, because the indicators used to calculate the score for each goal change from year to year, the indices for each goal cannot be simply compared, and only those indicators for which three years of data are available are shown in the table above. In addition, for some data, actual values cannot be collected every year for some indicators.

With regard to the 11 goals for which the situation was expected to improve as a result of the implementation of the Program at the time of appraisal, comparing the values in 2019, at Project completion, with the ones in 2020, one year later, the indicators for the following 7 goals had improved: 2. Zero hunger, 3. Good Health and Well-being, 4. Quality Education, 5. Gender Equality, 6. Clean Water and Sanitation, 9. Industry, Innovation and Infrastructure, and 13. Climate Action. The various projects and policies implemented by the ministries made a certain contribution to the improvement of those indicators.

(2) Qualitative Impacts

Qualitative impacts were assumed at the time of appraisal to contribute to Goal 17: Partnerships for the Goals through the improvement of implementation measures and systems. The progress of each achievement target under Goal 17 was verified and analyzed as follows. However, some indicators overlapped with the qualitative effects in effectiveness, and therefore these overlapping indicators were verified in the effectiveness.

1) To assist with and contribute to the on-going efforts of the Government of India to achieve all the goals and targets of SDGs by 2030

As confirmed by the quantitative impacts, although there were improvements in 7 out of the 11 goals, the achievement of the SDGs was still recognized as an issue that the Government of India should address at the time of the ex-post evaluation.

2) To make available technical and intellectual inputs for achieving SDGs in India, based on experience in Japan, and JICA supported projects and programs in India.

This indicator overlaps with the qualitative effects in effectiveness and was verified in the effectiveness.

3) To ensure a sense of competition among the government entities delivering public services having a bearing on SDGs

The level of achievement of SDGs of each State/UT and of AD as a government agency providing public services, is published in a ranking style on the database established during the Program period. This was continuously being updated at the time of the ex-post evaluation. In addition, the ADP provides funding for the implementation of subprojects for ADs with high rankings. As described above, a sense of competition

among government entities has been fostered.

4) To build the capacities of 36 States/UTs to achieve the SDG targets as part of SDGs-17.9, and to establish a robust system of performance monitoring and evaluation of this

This indicator overlaps with the qualitative effects in effectiveness and was verified in the effectiveness.

3.2.2.2. Other Positive and Negative Impacts

(1) Impacts on the Environment

The Program is a policy lending loan, and no large-scale construction works were implemented in the basic infrastructure sector, such as telecommunication network development and water supply works, and therefore no impact on the natural environment was observed.

(2) Resettlement and Land Acquisition

The Program is a policy lending loan, and no large-scale construction works were implemented in the basic infrastructure sector, therefore no impact on resettlement or land acquisition was identified.

(3) Gender Equality

The Program supported the achievement of the SDGs in India, with gender equality being set as one of the SDG targets. As confirmed by the quantitative impact, gender indicators have improved since Program completion.

ADP subprojects supported by the Program also included activities targeting women, such as activities to provide pre-recorded knowledge and precautions during pregnancy and after giving birth to expectant and nursing mothers via cell phone. There were also activities to organize school gatherings in which only women (mothers) could participate in order to raise awareness of the importance of education for girls. At the time of the ex-post evaluation, these activities were still ongoing, and the impact on gender, such as promoting women's participation in society, which was assumed at the time of appraisal, has been generally achieved as planned.

(4) Marginalized People

The Program supported the achievement of the SDGs in India, and reduced inequalities was set as one of the SDG targets. As confirmed by the quantitative impact, the indicator for reduced inequalities has improved since the Program completion.

In addition, the ADP supported by the Program targeted areas in India where the achievement of the SDGs was delayed, thus targeting people who were inhibited from equitable

participation in society.

In addition, the implementation of the ADP subprojects supported by the Program has resulted in positive impacts on those who were inhibited from equitable participation in society, resulting in increased child enrollment in schools and decreased dropout rates, which were not envisioned at the time of appraisal.

(5) Social Systems and Norms, Human Well-being and Human Rights

Some of the ADP subprojects supported by the Program targeted financial inclusiveness, which had the impact of contributing to the creation of a social system that provides financial services to people living in remote areas. This was not envisioned at the time of appraisal.

(6) Unintended Positive / Negative Impacts

Climate change and reduced poverty, which were assumed as impacts at the time of appraisal, were not verified as other impacts, but were confirmed in the quantitative impacts, since they are already included in the SDG targets.

In summary, as for the operation and effect indicators, although there was some impact due to COVID-19, among the nine indicators set at the time of appraisal, two indicators (Percentage of learning outcomes for mathematics in grade 3 of elementary school and Employment percentage of youths who took skills training courses) achieved the targets more than planned at the time of Program completion. Four indicators (Percentage of pregnant women receiving ante natal check-ups 4 times or more, Percentage of secondary schools with electricity connection, Percentage of the population with bank accounts, and Percentage of villages with internet connectivity) were mostly achieved, and three indicators (Percentage of children of 9 to 11 months fully immunized, Percentage of high value crops, and Percentage of population in rural areas with access to an adequate quantity of potable water) were partially achieved. As for qualitative effects, all three effects envisaged at the time of appraisal (the enhancement of a system to monitor the achievement of SDGs by the central government of India, the promotion of Japan-India cooperation such as SDGs-related technical input by Japan, and the enhancement of government agency staff skills for the SDGs) were achieved.

Regarding impact, out of the 11 goals that were expected to be improved by the implementation of the Program at the time of appraisal, 7 goals (Goal 2: Zero Hunger, Goal 3: Good Health and Well-being, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 6: Clean Water and Sanitation, Goal 9: Industry, Innovation and Infrastructure, and Goal 13: Climate Action) were improved. In addition, technical and intellectual inputs for achieving SDGs in India, based on experience in Japan and JICA supported projects and programs in India, have been provided. A ranking mechanism has been introduced in the ADP supported by the Program, and a database

has been established and is operated to confirm and monitor progress. Therefore, in general, the expected impact has been observed.

The Program has had no particular negative impact on the environment, and there has been a certain positive impact on gender equality, marginalized people, social systems and norms, human well-being and human rights, since the Program naturally supports activities to achieve the SDGs in which these aspects are included as the targets.

The Program has mostly achieved its objectives. Therefore, effectiveness and impacts of the Program are high.

3.3. Sustainability (Rating: N/A)

3.3.1. Policy and System

The continuation situations of policies and projects in the five sectors (health and nutrition, education, agriculture and water resources, financial inclusion and skills development, and basic infrastructure) that were targeted for support under the Program are as follows.

(1) Health and Nutrition

In the health and nutrition sector, the National Health Mission and the Ayushman Bharat (National Health Protection Mission) were being implemented as policies and projects related to the Program at the time of appraisal. The National Health Mission is a policy that addresses strengthening of the health system, maternal and infant care, and national disease control in rural areas, together with improvement in access to health care for the urban poor. The Ayushman Bharat is a policy which has a two-pillar program: one to provide national health care coverage and the other one to provide free health care services at community health centers, including maternity care and immunization services. These policies were either planned to continue or ongoing at the time of the ex-post evaluation. In addition, the Ministry of Health and Family Welfare has established the SDG Health Dashboard, which summarizes efforts and progress related to SDG Goal 3: Good Health and Well-being, and which has identified the achievement of the SGDs as an important issue for the Ministry.

(2) Education

In the education sector, the Samagra Siksha Abhiyan (Overarching Program for the School Education Sector) was being implemented as a policy and project related to the Program at the time of appraisal. This policy comprehensively supports school education from pre-school to the end of secondary education. At the time of the ex-post evaluation, it had been decided that this would continue to be implemented until the end of March 2026. The policy is positioned by the Ministry of Education in line with Goal 4: Quality Education of the SDG.

(3) Agriculture and Water Resources

In the agriculture and water resources sector, the Pradhan Mantri Fasal Bima Yojana (Crop Insurance Scheme) was being implemented as a policy and project related to the Program at the time of appraisal. This policy is to provide government subsidies to commercial and horticultural grain farmers who use comprehensive natural disaster insurance to promote diversification of production varieties and increase farmers' income. At the time of the ex-post evaluation, the scheme was still ongoing. Farmers who wish to obtain insurance coverage under this scheme can apply for it through the scheme's website.

(4) Financial Inclusion and Skill Development

In the area of financial inclusion and skills development, Pradhan Mantri Jan Dhan Yojana (National Mission on Financial Inclusion), Deen Dayal Upadhyaya Grameen Kaushalya Yojana (Youth Employment Scheme), Pradhan Mantri Kaushal Vikas Yojana (Skill Certification Scheme), and the Programme to Mainstream Aspirational Districts through Skill Development were being implemented as policies and projects related to the Program at the time of appraisal. All of these policies were ongoing or expected to continue at the time of the ex-post evaluation, as summarized in Table 3.

Table 3: Summary of Related Policies and Projects under the Financial Inclusion and Skill Development Sector

Policy/Project	Description	Status at the Time of Ex-post Evaluation
Pradhan Mantri Jan Dhan Yojana (National Mission on Financial Inclusion)	Comprehensive government support policies to promote bank account opening and improve access to financial services such as remittances, loans, insurance, and pensions for citizens aged 18 to 65.	Ongoing. In addition to this policy, other policies such as Pradhan Mantri Jeevan Jyoti Bima (PMJJB) and Pradhan Mantri Suraksha Bima (PMSB) that provide insurance, Atal Pension Yojna (ATY) that provides pensions, Pradhan Mantri Mudra Yojna (PMMY) that provides microfinance, and other policies are also implemented by the Ministry of Finance.
Deen Dayal Upadhyaya Grameen Kaushalya Yojana (Youth Employment Scheme)	A project aimed at training to diversify sources of income for rural poor families and create jobs for young people in rural areas as part of a poverty relief plan.	Ongoing. Although the project period expired at the end of March 2023, the second phase resumed in April of the same year with improved content based on the results and lessons learned from the past implementation of the policy.
Pradhan Mantri Kaushal Vikas Yojana (Skill Certification Scheme)	A project that provides training and skills certification, mainly in soft skills, for young people engaged in the manufacturing and service industries at training centers around the country, mainly operated by the Ministry of Skills Development and Entrepreneurship.	Although the project expired at the end of March 2021, it is a program to be implemented continuously and is expected to be resumed in 2023 with improved content based on the results and lessons learned from this project.
Programme to Mainstream Aspirational Districts through Skill Development	A project that aims to strengthen the governance and organizational structure of administrative agencies by having the Ministry of Skills Development and Entrepreneurship promote the identification of issues, the formulation of improvement plans, and implementation in the field of skills development conducted by ADs.	Ongoing.

Source: Documents provided by Ministry of Finance and Ministry of Skill Development and Entrepreneurship in India

(5) Basic Infrastructure

In the basic infrastructure sector, Bharat Net (National Optical Fibre Network) and Swajal Yojana (Community-owned Drinking Water Projects) were being implemented as policies and projects related to the Program at the time of appraisal. Bharat Net is a project that aims to provide internet access to all villages in India. Swajal Yojana is a project in which the Government of India and community groups in each village jointly fund the installation of small-scale water supply facilities in rural villages in ADs, to be maintained and managed by the community groups. At the time of the ex-post evaluation, Bharat Net was still ongoing, and only 40,000 of the approximately 640,000 villages in the ADP were without internet access. Although Swajal Yojana had been completed at the time of the ex-post evaluation, Jal Jeeven Mission has been implemented from 2019 as succeeding project, not only in ADs but also in all rural areas of India.

Based on the above, at the time of the ex-post evaluation, the Government of India as a whole has continued to implement policies and projects to achieve the SDGs, and there has been no change in the priorities and positioning of these policies and projects.

3.3.2. Institutional/Organizational Aspect

The following related organizations are responsible for activities to achieve the SDGs after Program completion.

(1) NITI Aayog

NITI Aayog played the role of coordinator for SDGs in the Government of India from the time of appraisal to the time of ex-post evaluation, and has monitored the progress of achievement. A database has been established and there is the staff to maintain and update the database.

As of the time of the ex-post evaluation, the ADP was still being implemented and the team for implementing the ADP was maintained within NITI Aayog. Although personnel in charge of the ADP is changed by personnel transfers within NITI Aayog, the necessary personnel to implement the ADP have been maintained.

(2) Ministry of Health and Family Welfare

At the time of the ex-post evaluation, the Ministry of Health and Family Welfare, which is in charge of the health sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects such as the National Health Mission and Ayushman Bharat. A mechanism to hire fixed-term consultants has been established for when additional staffing is needed.

In addition, the SDG Health Dashboard, which summarizes efforts and progress related to SDG

Goal 3: Good Health and Well-being, has been established, and the Ministry of Health and Family Welfare publishes indicators (such as the neonatal mortality rate) related to SDG Goal 3 in its annual report. Therefore, it is clear that the Ministry has established a system to confirm and monitor progress in achieving the SDG targets.

(3) Ministry of Education

At the time of the ex-post evaluation, the Ministry of Education, which is in charge of the education sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects, such as Samagra Siksha Abhiyan, as well as to conduct field surveys for the monitoring of the ADP. The Ministry of Human Resource Development, which was in charge of the education sector at the time of appraisal, was reorganized into the Ministry of Education in 2020.

(4) Ministry of Agriculture and Farmers' Welfare

At the time of the ex-post evaluation, the Ministry of Agriculture and Farmers' Welfare, which is in charge of the agricultural sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects such as Pradhan Mantri Fasal Bima Yojana.

(5) Ministry of Finance

At the time of the ex-post evaluation, the Ministry of Finance, which is in charge of the financial inclusiveness sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects such as Pradhan Mantri Jan Dhan Yojana, PMJJB, PMSB, ATY, and PMMY, although the structure and personnel were not sufficient.

(6) Ministry of Rural Development

At the time of the ex-post evaluation, the Ministry of Rural Development, which is in charge of the skills training sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects, such as Deen Dayal Upadhyaya Grameen Kaushalya Yojana. In addition, the Ministry of Rural Development has a department that checks and monitors the progress of the above policies and projects, and this system is maintained.

(7) Ministry of Skills Development and Entrepreneurship

At the time of the ex-post evaluation, the Ministry of Skill Development and Entrepreneurship, which is in charge of the skill training sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects such as Pradhan Mantri Kaushal Vikas Yojana and the Programme to Mainstream Aspirational Districts through Skill Development.

(8) Telecommunications Bureau, Ministry of Communications

At the time of the ex-post evaluation, the Telecommunications Bureau in the Ministry of Communications, which is in charge of the basic infrastructure sector of the ADP, maintained the structure and personnel to implement the ADP and the related policies and projects such as Bharat Net. Bharat Broadband Network Ltd., which was in charge at the time of appraisal, is a state-owned company under the Ministry, and the Telecommunications Bureau of the Ministry is in charge from the perspective of monitoring the ADP.

(9) Ministry of Jal Shakti

At the time of the ex-post evaluation, the Ministry of Jal Shakti, which is responsible for the basic infrastructure sector of the ADP, maintained the structure and personnel to implement the ADP and related policies and projects such as the Jal Jeevan Mission. The Ministry of Drinking Water and Sanitation, which was listed as the responsible agency at the time of appraisal, was merged with the Ministry of Water Resources, River Development & Ganga Rejuvenation in May 2019 and became the Ministry of Jal Shakti.

The Ministry of Jal Shakti has established a database for checking and monitoring the progress of the Jal Jeevan Mission, and from this database, the progress of water supply dissemination (i.e., drinking water) in each region, including ADs, can be checked.

As of the time of the ex-post evaluation, the ADP was still being implemented, and the organization and structure of NITI Aayog, as the coordinating body, and the relevant ministries in charge of each sector were maintained.

3.3.3. Preventative Measures to Risks

(1) COVID-19

The lockdown caused by COVID-19 meant delays in the progress of policies and projects in various sectors. Some SDG indicators also worsened. In the basic infrastructure sector in particular, construction work was required and it was difficult to secure workers.

In order to proceed with the Program even in this situation, activities which could be carried out under the restrictions were carried out, some online. In many sectors, during the lockdown and other similar periods of restricted activity, some activities were conducted online. The Japan-India SDG Forum was also held online.

The Ministry of Education took action by establishing a consultation service for matters other than study, because as a result of the online school education system, the amount of time children spent with their parents at home increased, and in some cases domestic violence occurred.

The Ministry of Rural Development arranged for migrant workers to work within a region because they could not go outside the region due to the lockdown, and the ministry supported a part of their wages.

4. Conclusion, Lessons Learned and Recommendations

4.1. Conclusion

The objective of the Program is to promote efforts towards SDGs in India's social development by strengthening and assisting the framework of various policies and implementation platforms for the SDGs, thereby contributing to the achievement of SDGs in 2030. The implementation of the Program was consistent with the development policy and development needs of India. The Program was also consistent with Japan's ODA policy, internally consistent with JICA's other projects, and externally consistent with the activities of other donors. Therefore, its relevance and coherence are high.

As for the operation and effect indicators, 9 indicators were set at the time of appraisal for 5 sectors: health and nutrition, education, agriculture and water resources, financial inclusion and skill development, and basic infrastructure. Of these, two indicators (Percentage of learning outcomes in mathematics for grade 3 of elementary school and Employment percentage of youths who took skills training courses) achieved more than the planned targets at Program completion. Four indicators (Percentage of pregnant women receiving ante natal check-ups 4 times or more, Percentage of secondary schools with electricity connection, Percentage of the population with bank accounts, and Percentage of villages with internet connectivity) were mostly achieved. Three indicators (Percentage of children of 9 to 11 months fully immunized, Percentage of high value crops, and Percentage of population in rural areas with access to adequate quantity of potable water) had been partially achieved. As for qualitative effects, all three effects envisaged at the time of appraisal (the enhancement of a system to monitor the achievement of SDGs by the central government of India, the promotion of Japan-India cooperation such as SDGs-related technical input by Japan, and the enhancement of the skills of government agency staff in the SDGs) were achieved. Regarding impact, 11 goals were expected to have been improved by the implementation of the Program at the time of appraisal. Of these, seven goals (Goal 2: Zero Hunger, Goal 3: Good Health and Well-being, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 6: Clean Water and Sanitation, Goal 9: Industry, Innovation and Infrastructure, and Goal 13: Climate Action) were improved. In addition, technical and intellectual inputs for the achievement of SDGs in India, based on experience in Japan and JICA-supported projects and programs in India, were provided, a ranking mechanism was introduced in the ADP supported by the Program, and a database was established and operated to confirm and monitor progress. In general, the expected impact has been observed. The Program also had a certain positive impact on gender, marginalized people, social systems and norms, human well-being and human rights, due to the nature of the Program, which supported activities to achieve the SDG. Therefore, the effectiveness and impacts of the project are considered to be high.

Sustainability is ensured since there are no problems with the operation and maintenance of the Program in terms of the policy and system aspects and the institutional/organizational aspects.

Preventive measures have been taken against risks.

4.2. Recommendations

4.2.1. Recommendations to the Executing Agency

(1) Establishment of an AD Replacement Mechanism

The ADP supported by the Program started in January 2018, with 112 districts that were lagging behind in their progress toward achieving the SDGs designated as ADs. At the time of the ex-post evaluation, although approximately five years had passed, the ADs eligible for support under the ADP had been fixed since the beginning, resulting in a widening gap between ADs that had developed and those that remained underdeveloped. As a result, some developed ADs have already improved their SDG-related indicators to a greater extent than those outside the ADs as they received more funding and could implement more subprojects. Therefore, NITI Aayog is recommended to establish a mechanism in which AD progress is evaluated every five years; ADs that meet certain criteria graduate from support, while new districts where progress is lagging behind are incorporated into the ADP as new ADs; and the overall level of ADs are raised from the bottom up.

(2) Support for Underdeveloped ADs

Although the ADP system ranks ADs according to the data in the level of development from the previous month, which makes it easier for underdeveloped ADs to obtain higher rankings because they have more room to grow, the gap between developed ADs and underdeveloped ADs was widening at the time of the ex-post evaluation, as described in (1) above. In reality, some ADs remain underdeveloped because they cannot receive financial support and cannot implement subprojects. Motivating these underdeveloped ADs to take action once again to achieve the SDGs would be effective in improving the SDG indicators for India as a whole. Among ADs, there are differences in ability to prepare proposals for applications to the Challenge Fund and to implement subprojects, so the recommendation to NITI Aayog is that more focused support be provided to underdeveloped ADs, including the dispatch of personnel (e.g., experts and consultants in various fields) to help them strengthen the capacities needed to move up the ranks.

4.2.2. Recommendations to JICA

None

4.3. Lessons Learned

(1) Database Development

In the ADP supported by the Program, a system was adopted to promote competition among ADs by ranking their achievements in each sector based on each indicator. In order for this

competition and ranking mechanism to work effectively, NITI Aayog developed a database into which each AD's indicators were entered. The database was updated and published monthly, making the ranking system transparent not only to ADs but also to third parties. With this database, not only can rankings be created and published objectively, but also the progress of SDG-related indicators by AD and by sector can be easily checked. This is also pointed out in the ADP project report which UNDP issued in December 2020.[11] Furthermore, the database was continuously updated and managed through the incorporation of competition and ranking mechanisms. In addition, several related organizations that implemented policies and projects in each sector also established and operated their own databases to check the progress of their policies and projects, and developed mechanisms to immediately check the progress of the policies and projects using this data. The data is very useful for checking the progress and achievement of projects such as the Program, which requires the collection and analysis of information and data from a variety of sectors, and it is recommended that a similar database be established and operated when similar Japanese ODA loan projects are implemented in the future.

(2) Collecting and Sharing Good Practices

NITI Aayog has compiled good practices of ADP activities supported by the Project and published them as Stories of Change on the NITI Aayog website. The UNDP ADP project report also provides a good example of an ADP. The JICA India Office compiles information on JICA projects that contribute to India's achievement of the SDGs and publishes this as brochures on its website. These efforts focus on those who are engaged in such work in the field, and they may encourage them to further their activities as well as serving as a reference for other organizations and groups considering similar work. In general, policy lending loans do not include large-scale construction nor the construction of visible structures, making it difficult for the recipient to understand how the loan has contributed to the development of the target country. Therefore it is important to publicize and advertise achievements through brochures and other means.

(3) Setting Policy Actions and Their Indicators

Although the policy actions on the policy matrix of the Program were implemented, there were some operation and effect indicators that were not affected by the actions. For example, for the indicator "Percentage of children of 9 to 11 months fully immunized," although a special team was formed to achieve 100% immunization and maternal care registration rates as a policy action to achieve the indicator, the baseline value and the actual value at the Program completion were almost the same. Although the impact of COVID-19 was an external factor, it is assumed that one

11 UNDP (2020). Aspirational Districts Programme: An Appraisal.
https://www.undp.org/india/publications/aspirational-districts-programme-appraisal

of the reasons for this was the difference in the sources of reference used for the baseline and actual values. When setting policy actions and indicators, it is essential that the logic for emerging effects is properly organized and that they are set appropriately. The ex-post evaluation report of the Japanese ODA loan "Tamil Nadu Investment Promotion Program (Phase 2)" (2017-2020) describes as the lessons learned that JICA interviewed organizations including the Japan External Trade Organization (JETRO) and private companies during the appraisal; and that, based on the development needs, JICA had discussions with the implementing agencies, which resulted in a well-designed policy matrix that works in a complementary manner. Considering this lesson, at the time of appraisal, JICA should consult not only with the implementing agencies but also with other relevant parties (such as the Ministry of Health and Family Welfare and ADs in the Program) in order to set appropriate policy actions and indicators.

5. Non-Score Criteria

5.1. Performance

5.1.1. Objective Perspective

The unique feature of the Program, which differed from other Japanese ODA loan projects and support from other development partners, was that it was "a policy lending Japanese ODA loan project" with "NITI Aayog as the implementing agency" to promote the SDGs in India. Other loan-type projects, including Japanese ODA loans, are generally provided to specific sectors, and in such cases, the implementing agency is the ministry or agency with jurisdiction over the sector (Ministry of Construction or Ministry of Electricity) or a state-own enterprise. In this case, the Program did not focus on a specific SDG target, but rather targeted the promotion of the SDGs in general, and therefore, NITI Aayog, which served as the coordinating body for the SDGs, was the implementing agency. Also, an ADP supported by the Program was implemented as a policy lending Japanese ODA loan project to promote the implementation of policy actions to solve issues, with NITI Aayog as the implementing agency. Meanwhile, ADB and UNDP provided technical cooperation type support such as support for proposal preparation. Frequent policy dialogue, operational coordination, and monitoring between JICA and NITI Aayog through the Program have further deepened the relationship between the two parties and enhanced the consistency and coherence between JICA's assistance and India's development policies, thereby strengthening relationship with NITI Aayog, which plays an important role in the process of the Government of India's requesting ODA projects from Japan, and providing great advantage for JICA to formulae and implement Japanese ODA loan projects continuously in the future. In conclusion, the Program has made a certain contribution to demonstrating the uniqueness of JICA's assistance in India and to strengthening the relationship between JICA and NITI Aayog.

(End)

Appendix 1: Internal consistency

List of Cooperation with Other JICA projects

Goal	Related JICA Projects	Scheme	Project Period	Project Summary
1. No Poverty	Jharkhand Horticulture Intensification by Micro Drip Irrigation (MDI) Project	Japanese ODA Loan	2016-2023	The project improved irrigation efficiency, increased agricultural productivity, and diversified crops by installing drip irrigation systems in target farm households and providing technical assistance on horticultural crop cultivation and marketing, thereby contributing to improving the livelihoods of small and micro farmers.
	Odisha Forestry Sector Development Project	Japanese ODA Loan	Phase 1: 2006-2013 Phase 2: 2017-2027	The project enhanced the forest ecosystem along with the livelihoods of local people by improving sustainable forest management, sustainable biodiversity conservation and community development, thereby contributing to harmonization between environmental conservation and socio-economic development in Odisha.
2. Zero Hunger	Himachal Pradesh Crop Diversification Promotion Project	Japanese ODA Loan	2011-2020	The project promoted sustainable crop diversification in all districts of Himachal Pradesh by the development and rehabilitation of minor irrigation facilities and access farm roads, as well as by marketing promotion and the improvement of extension services, thereby contributing to improvement of livelihood of farmers in Himachal Pradesh.
	Andhra Pradesh Irrigation and Livelihood Improvement Project	Japanese ODA Loan	Phase 1: 2007-2013 Phase 2: 2017-2024	The project raised agricultural productivity and water management capacities through the construction of minor irrigation facilities, the rehabilitation of medium irrigation facilities, capacity building of operation and maintenance setups, and the spread of farming technologies, in the state of Andhra Pradesh in southern India, thereby contributing to an increase in farm income and the alleviation of poverty
3. Good Health and Well-being	The Project for the Improvement of the Institute of Child Health and Hospital for Children, Chennai	Grant Aid	2014-2016	By supporting the construction of a comprehensive pediatric outpatient ward and the provision of medical equipment necessary for neonatal care and pediatric care (ultrasound machines, incubators, neonatal and pediatric ventilators, pediatric surgical equipment, etc.), the project improved the quality of local health and medical services, educational functions, and the health of children.
	Tamil Nadu Urban Health Care Project	Japanese ODA Loan	2016-2021	The project developed health care facilities and equipment and built up the capacity of medical personnel for NCD interventions to improve urban health care systems in Tamil Nadu, thereby contributing to the health promotion of residents in the state.
4. Quality Education	Campus Development Project of IIT Hyderabad	Japanese ODA Loan	2014-2021	By supporting the construction of the International House and the Student House at the Indian Institute of Technology Hyderabad and

Goal	Related JICA Projects	Scheme	Project Period	Project Summary
				the procurement of related materials and equipment, the project promoted technological innovation in India and fostered the development of human resources capable of leading the industrial world.
	Japan Overseas Cooperation Volunteers	Other		The program promoted the contribution of culture to cultural diversity and sustainable development by sending volunteer Japanese language teachers to teach and promote Japanese language education.
5. Gender Equality	Rajasthan Water Sector Livelihood Improvement Project	Japanese ODA Loan	2017-2025	In Rajasthan, the project improved irrigation efficiency and agricultural productivity by rehabilitating aging irrigation facilities and providing agricultural support based on market demand, taking into consideration the participation of women farmers, thereby contributing to improving farmers' livelihoods and promoting women's participation in socio-economic activities.
	Delhi Mass Rapid Transport System Project Phase I–III	Japanese ODA Loan	1997-2021	The project encouraged women to work in urban areas and contributed to economic activity by providing safe public transportation for women.
6. Clean Water and Sanitation	Hogenakkal Water Supply and Fluorosis Mitigation Project	Japanese ODA Loan	2008-2013	The project aimed to provide safe and stable water supply services to meet the rapidly increasing water demand in the Krishnagiri and Dharmaburi districts of Tamil Nadu by constructing new water supply facilities using the Cauvery River as a water source, and by conducting anti-fluorosis activities.
	Delhi Water Supply Improvement Project	Japanese ODA Loan	2012-2022	The project supported the reconstruction and renewal of existing water supply facilities in the Chandrawal Water Treatment Plant System District, the oldest in the Delhi metropolitan area in India, to drastically improve the leakage rate and contribute to the provision of a continuous and stable water supply service 24 hours a day.
7. Affordable and Clean Energy	New and Renewable Energy Development Project	Japanese ODA Loan	Phase 1: 2011-2016 Phase 2: 2014-2020	The project aimed to secure a stable power supply to meet increasing power demand and diversify power supply sources by providing medium to long-term funds necessary for new and renewable energy development projects as loan funds for power generation companies through the Renewable Energy Development Corporation of India.
	Project for Construction of Turga Pumped Storage	Japanese ODA Loan	2018-2028	By constructing a pumped storage power plant that could easily regulate electricity, the project strengthened the power supply and grid stabilization during peak periods, contributing to the economic development and improvement of the standard of living in the state.
8. Decent Work and Economic Growth	Dedicated Freight Corridor (DFC) Project	Japanese ODA Loan	2009-2025	By constructing a new line connecting major cities and supporting the introduction of a fully automatic signaling and communication system together with high-powered, high-speed locomotives, the project contributed to the country's broad-based economic

Goal	Related JICA Projects	Scheme	Project Period	Project Summary
				development by meeting the expected high growth rate of the demand for freight transportation and by improving the efficiency of the logistics network.
	Tamil Nadu Investment Promotion Program (TNIPP) Phase I&II Gujratat Investment Promotion Program (GIPP)	Japanese ODA Loan	TNIPP (Phase 1): 2012-2015 TNIPP (Phase 2): 2016-2020 GIPP: 2016-2020	The projects aimed to improve the investment climate in Tamil Nadu and Gujarat through policy support loans.
9. Industry, Innovation and Infrastructure	The Project on Improvement of Chennai Port Operation in India	Technical Cooperation	Phase 1: 2014-2016 Phase 2: 2017-2018	The project made the Chennai Port more accessible by reducing transport time for containerized cargo.
	Mumbai Trans-harbor Link (MTHL) Project	Japanese ODA Loan	2016-2023	By constructing a marine road connecting central Mumbai to Navi Mumbai on the other side of the Mumbai Bay, the project improved access to Mumbai and Navi Mumbai, where large-scale urban development is underway, and contributed to economic development in the Mumbai metropolitan area.
10. Reduced Inequality	Bihar National Highway Improvement Project (Phase 1 and 2)	Japanese ODA Loan	Phase 1: 2013-2020 Phase 2: 2014-2022	The project was expected to contribute to the improvement of passenger and cargo transportation efficiency and the development of the tourism industry in Bihar, which has been experiencing remarkable economic growth in recent years, by supporting the construction of four-lane major arterial roads and the development of main roads, bridges, service roads, and intersections in the province.
	North East Road Network Connectivity Improvement Project (Phase 1-3)	Japanese ODA Loan	2017-2030	The project improved connectivity within the northeastern region of India and with other regions within and outside of the country by improving existing roads (including the construction of a new bypass), thereby contributing to the promotion of economic development in the region.
11. Sustainable Cities and Community	Delhi Mass Rapid Transport System Project, Chennai Metro Rail Project Bangalore Metro Rail Project Kolkata East-West Metro Project Mumbai Metro Line 3 Project Ahmedabad Metro Project	Japanese ODA Loan	-Delhi Mass Rapid Transport System Project: 1997-2021 -Chennai Metro Rail Project: 2008-2027 -Bangalore Metro Rail Project: 2007-2017 -Kolkata East-West Metro Project: 2008-2021 -Mumbai Metro Line 3 Project: 2013-2022 -Ahmedabad Metro Business: 2015-2022	The project supported the construction of rapid transit systems (metros) in the cities of Delhi, Chennai, Bengaluru, Kolkata, Mumbai, and Ahmedabad, which helped reduce traffic congestion, facilitate mobility, and disperse population.
	The Project for Implementation of Advanced Traffic Information and Management System in Core Bengaluru	Grant Aid, Japanese ODA Loan	-The Project for Implementation of Advanced Traffic Information and Management System in Core Bengaluru: 2018-2021	The project supported the development of an intelligent road transportation system in the cities of Bengaluru, Delhi, Chennai, and Hyderabad, thereby contributing to the alleviation of traffic congestion in the metropolitan area and to regional economic

Goal	Related JICA Projects	Scheme	Project Period	Project Summary
	Delhi Eastern Peripheral Expressway ITS Installation Project Project for Installation of Chennai Metropolitan Area Intelligent Transport Systems Project for the Construction of Chennai Peripheral Ring Road The Assistance for the Introduction Of ITS Related to Hyderabad Outer Ring Road Construction Project		-Delhi Eastern Peripheral Expressway ITS Installation Project: 2017-2022 -Project for Installation of Chennai Metropolitan Area Intelligent Transport Systems: 2018-2027 -Project for the Construction of Chennai Peripheral Ring Road: 2019-2026 -The Assistance for the Introduction of ITS Related to Hyderabad Outer Ring Road Construction Project: 2008-2020	development.
12. Responsible Consumption and Production	Kolkata Solid Waste Management Improvement Project	Japanese ODA Loan	2006-2016	The introduction of a wide-area waste treatment system, including the construction of a final disposal facility, covering multiple municipalities promoted the appropriate treatment of waste generated in the region, thereby contributing to an improvement in the living and sanitation environment and environmental preservation for the residents of the region.
13. Climate Action	29 projects supporting Forestry sector in India (27 Japanese ODA Loans and 2 Technical Cooperations)	Japanese ODA Loan, Technical Cooperation		Under the framework of Joint Forest Management (JFM), in which village communities surrounding forests cooperated with the State Forestry Department to conserve, plant, and manage forests, the projects supported the restoration of ecosystems through afforestation, reforestation, and conservation activities with the active participation of communities.
	Micro, Small and Medium Enterprises Energy Saving Project (Phase 3)	Japanese ODA Loan	Phase 1: 2008-2011 Phase 2: 2011-2014 Phase 3: 2014-2020	By providing medium- to long-term funds to small and micro-enterprises for energy conservation efforts, the program promoted more efficient energy use and contributed to environmental improvement, sustainable economic development, and climate change mitigation.
14. Life below Water	Ganges River Basin Urban Sanitation Improvement Project (Varanasi) Yamuna River Basin Urban Sewerage Improvement Project	Japanese ODA Loan	-Ganges River Basin Urban Sanitation Improvement Project (Varanasi): 2005-2020 -Yamuna River Basin Urban Sewerage Improvement Project: 1992-2022	In addition to the reconstruction and renewal of sewage facilities and the construction of facilities to reuse sewage after treatment, the projects contributed to the improvement of the sanitary environment and the health of residents in the cities in the basin by conducting educational and public relations activities for residents.
	Project for Upgradation of Environmental Management for Ship Recycling in Alang and Sosiya in Gujarat	Japanese ODA Loan	2017-2024	The project improved environmental and occupational health management in the Arran and Sosiya districts of Gujarat by upgrading related facilities and introducing work methods that conform to international conventions, thereby contributing to environmental conservation and sustainable industrial development in the state.
15. Life on	Sikkim Biodiversity Conservation	Japanese	2010-2020	The project contributed to environmental conservation and balanced

Goal	Related JICA Projects	Scheme	Project Period	Project Summary
Land	and Forest Management	ODA Loan		socio-economic development in the State of Sikkim in northeastern India by strengthening biodiversity conservation and forest management capacity and increasing the income of local people through biodiversity conservation activities, forest management, the promotion of eco-tourism, livelihood improvement activities, etc.
	West Bengal Forest and Biodiversity Conservation Project	Japanese ODA Loan	2012-2020	The project contributed to the conservation of biodiversity in the state while reducing greenhouse gas emissions by supporting afforestation activities with the participation of local residents, strengthening forest management, enhancing protected area management systems, and improving wildlife habitats.
16. Peace, Justice and Strong Institutions	Women Safety Net	Other		The project worked with NGOs to establish prevention programs against gender-based violence (GBV) and helped women achieve legal, social, and economic self-sufficiency by building safety nets in poverty-stricken rural areas.
	Japan Overseas Cooperation Volunteers	Other		The program dispatched JICA Overseas Cooperation Volunteers to national institutions and NGOs that support people with disabilities and contributed to creating efficient ways to improve the lives of patients through mutual cooperation with their counterparts in India.
	JICA's Anti-Corruption Policy Guide	Other		In order to put into practice a policy of adherence to anti-corruption and compliance requirements by Japanese ODA stakeholders, JICA prepared a series of policy statements and made them available on its website. In addition, to raise awareness of the anti-corruption policy, the Ministry of Foreign Affairs and JICA distribute the Anti-Corruption Policy Guide, which outlines the key concepts and required actions of the policy, to all parties involved in ODA activities.
17. Partnerships for the Goals	Japan Overseas Cooperation Volunteers	Other		JICA Overseas Cooperation Volunteers contributed to the capacity-building goals of SDG-17 by using their technical skills and practical experience to work with local communities at the grassroots level to improve holistic development.
	Private-Sector Participation	Other		In order to strengthen partnerships with Japanese companies, the project provides proposal-based funding programs to conduct market research, feasibility studies, and pilot projects in collaboration with counterpart organizations in India (state governments, local governments, research institutions, etc.) to promote investment through the application of Japanese products and technologies and innovative technologies.

Source: JICA India Office SDGs Brochure

Republic of India

FY2022 Ex-Post Evaluation Report of
Japanese ODA Loan
Ganga Action Plan Project (Varanasi)

External Evaluator: Maki Nakamura, Metrics Work Consultants Inc.
Hiroshi Nishino, Metrics Work Consultants Inc.

0. Summary

The objective of the Ganga Action Plan Project (Varanasi) (hereinafter referred to as "the Project") was to improve wastewater treatment capacity and sanitation conditions in Varanasi, Uttar Pradesh, by constructing and rehabilitating sewage treatment facilities, constructing sanitation facilities such as community toilets, and implementing sanitation improvement activities such as public awareness programs, thereby contributing to the improvement of water quality in the Ganges River and sanitation conditions for citizens, pilgrims, and tourists.

The implementation of this Project, from the time of appraisal to the time of ex-post evaluation, was fully consistent with India's development plan and development needs, and the planning and approach of the Project were appropriate. In addition, the Project was found to be consistent with Japan's development assistance policy and other projects within and outside of JICA, hence the relevance and coherence of the Project are high.

Regarding the outputs, although changes from the plan occurred in each component, the increase or decrease from the plan was not such as to affect the achievement of the Project's outcomes. Although the project cost was within the plan, the project period was much longer than planned, rendering the efficiency of the Project moderately low.

As for project effectiveness, the Project largely achieved its goals in terms of operation and effectiveness indicators related to the improvement of sewerage infrastructure, with the exception of indicators related to water quality in the downstream area of the Ganges River. The qualitative effects and impacts related to the improvement of the sanitation environment were confirmed, and no negative impact of the Project on the natural environment was reported. Therefore, the effectiveness and impact of the Project are high.

Regarding the sustainability, considering the operation and maintenance of the Project, no problems were found in the related policies and systems, institutional/organizational aspect, technical aspect, environmental and social aspect, and risk prevention measures, but the financial situation was partially worrisome because of a delay in the payment of operation and maintenance expenses at the time of the ex-post evaluation, and the prospects for improvement and resolution were uncertain. Therefore, the sustainability of the Project is moderately low.

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

1. Project Description

Project location
(Source: evaluator)

Sewage treatment plant constructed by the Project (Source: evaluator)

1.1 Background

The Ganges River is the largest river in India, with a basin area of 861,404 km2, or one-fourth of the country's total land area. About 43% of India's total population lives in the Ganges River basin. The Ganges River is not only a source of drinking water and irrigation but is also a sacred river where many Hindus bathe daily in devotion to their faith. However, due to rapid population growth and industrialization in the basin since the early 1980s, sewage far in excess of the natural purification capacity has been discharged into the river, resulting in rapid deterioration of water quality, which has had a significant negative impact on the living environment. In order to improve this situation, the Government of India launched the Ganga Action Plan (GAP) in 1985, and has been promoting the construction of sewage treatment facilities in major cities in the river basin to implement countermeasures against water pollution in the Ganges River.[1]

Varanasi City in Uttar Pradesh is an ancient city located on the banks of the Ganges River, and as the sacred city of Hinduism, it is visited by many people from home and abroad for pilgrimage and tourism purposes. In Varanasi City, although sewage treatment facilities and a network of sewage pipes were constructed under the Ganga Action Plan (GAP) mentioned above, at the time of the appraisal of this Project, only about 35% of the sewage was treated at sewage treatment plants (hereinafter referred to as "STP"), and the rest flowed into the Ganges River through rainwater drainage channels and the Varuna River. As a result, the water quality of the Ganges River had deteriorated significantly to a maximum of 15 mg//L BOD[2], compared to the bathing-qualified water quality standard of less than 3 mg/L BOD, and there were concerns about the sanitary impact not only on the city's residents but also on pilgrims.

[1] The Ganga Action Plan (GAP) was divided into two phases: Phase I, launched in 1985, covered the three states of Uttar Pradesh, Bihar, and West Bengal; Phase II, launched in 1993, covered seven states: Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Delhi, and Haryana.

[2] Abbreviation for Biochemical Oxygen Demand, one of the most common water quality indicators. High BOD means that dissolved oxygen is easily depleted and that there is a high level of organic matter.

1.2 Project Outline

The objective of this Project is to improve wastewater treatment capacity and sanitation conditions in Varanasi, Uttar Pradesh, by constructing and rehabilitating sewage treatment facilities, constructing sanitation facilities such as community toilets, and implementing sanitation improvement activities such as public awareness programs, thereby contributing to the improvement of water quality in the Ganges River and sanitation conditions for citizens, pilgrims, and tourists.

Loan Approved Amount / Disbursed Amount	11,184 million yen / 6,200 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	March 2005 / March 2005	
Terms and Conditions	Interest Rate	0.75%
	Repayment Period (Grace Period	40 years 10 years)
	Conditions for Procurement	General Untied
Borrower / Executing Agency(ies)	The President of India / National Mission for Clean Ganga (NMCG)[3]	
Project Completion	June 2022	
Target Area	Varanasi, Uttar Pradesh	
Main Contractor(s) (Over 1 billion yen)	Satish Kumar (India) / Toshiba Water Solutions Pvt. Ltd. (India), VA Tech Wabag Ltd. (India) / Bahadur & Company (India), Shriram EPC Ltd. (India)	
Main Consultant(s) (Over 100 million yen)	Aecom Asia Company Ltd. (Hong Kong) / TTI Consulting Engineers India Pvt. Ltd. (India) /NJS Consultants Co., Ltd. (Japan) / NJS Engineers India Pvt. Ltd. (India), TEC International Co, Ltd. (India)	
Related Studies (Feasibility Studies, etc.)	The Study on Water Quality Management Plan for the Ganga River in the Republic of India (2005)	

[3] The executing agency of the Project was the National River Conservation Directorate (NRCD) of the Ministry of Environment and Forests prior to October 2014, which was changed to the NMCG established in the Ministry of Water Resources, River Development and Ganga Rejuvenation in 2014. The Ministry of Water Resources, River Development and Ganga Rejuvenation was merged into the Ministry of Jal Shakti, which specializes in water-related affairs, in 2019, and at the time of the ex-post evaluation, the NMCG is under the jurisdiction of the Department of Water Resources, River Development and Ganga Rejuvenation in the Ministry of Jal Shakti.

Related Projects	Project for the Comprehensive Improvement of Environmental Sanitation in Varanasi (Technical Cooperation Project, 2020-2023)

2. Outline of the Evaluation Study

2.1 External Evaluator

Maki Nakamura, Metrics Work Consultants

Hiroshi Nishino, Metrics Work Consultants

2.2 Duration of Evaluation Study

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

Duration of the Study: September 2022 – November 2023

Duration of the Field Study: December 10-27, 2022, May 21-27, 2023

3. Results of the Evaluation (Overall Rating: B[4])

3.1 Relevance/Coherence (Rating: ③[5])

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of India

At the time of appraisal, the Government of India's Tenth Five Year Plan (2002-2007) included a commitment to improve sanitation sector indicators with a focus on poverty reduction, as well as to ensure sustainable access to drinking water in all villages by 2007, and to clean up major polluted rivers and improve their basin environments. In addition, the Common Minimum Programme under the Singh administration, inaugurated in May 2004, included a commitment to increase public investment in water supply, sewage treatment infrastructure, and sanitation facilities. The Ministry of Environment and Forests[6] was implementing nationwide river water quality protection projects through sewage treatment improvement under the National River Conservation Plan, a national policy covering 157 cities in 31 river basins. The Ganga Action Plan (GAP), which is the core of the Plan, has been implemented since 1985, and this Project was positioned as a Phase II project of the GAP.

At the time of the ex-post evaluation, the national policy and initiative for conservation of river water quality of the Ganges River basin is the Namami Gange Programme[7], which was launched in 2015. The Namami Gange Programme was launched by Prime Minister Modi,

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ④: Very High, ③: High, ②: Moderately Low, ①: Low

[6] At the time of appraisal, the National River Conservation Directorate (NRCD) under the Ministry was the executing agency for the Project.

[7] *Namami Ganga* is a Sanskrit term meaning “to pray to the Ganges River”.

appointed in May 2014, and is being promoted by NMCG, the executing agency of the Project[8]. Namami Ganga focuses on sewage treatment infrastructure, river-front development, afforestation, biodiversity, public awareness, and so on. Some 315 projects (including 151 sewerage infrastructure projects) were implemented by 2020, with a budget of 288.5 billion rupees[9]. In December 2022, four states, including Uttar Pradesh, approved sewerage infrastructure projects worth 27 billion rupees, making Namami Ganga an important flagship program for the country.

In terms of policies to improve sanitation, the Swachh Bharat Mission[10], a key policy launched in 2014, is being promoted on a national scale. One of the most important policies of the mission is the promotion of toilet facilities, with the goal of becoming open defecation-free (ODF).

Given the above, this Project is consistent with India's development plan, as pollution of rivers, especially the Ganges River, has continuously been an important agenda in India, both at the time of the appraisal and at the time of the ex-post evaluation. As for sanitation improvement, the objectives and contents of the sanitation improvement component of the Project are consistent with the policies of India, as the country has been promoting sanitation improvement measures, including the promotion of toilet facilities, under the Swachh Bharat Mission, an important initiative launched in 2014, at the time of the ex-post evaluation.

Therefore, the Project has been in line with the development plan of India both at the time of appraisal and at the time of ex-post evaluation.

3.1.1.2 Consistency with the Development Needs of India

At the time of appraisal, the sewage treatment capacity of Varanasi City was only about 102 MLD[11] for a sewage discharge of about 290 MLD, which meant that only about 35% was treated. The water quality of the Ganges River in Varanasi was significantly degraded from the Ministry of Environment and Forests' standard of less than 3 mg/L BOD to a maximum of 15 mg/L, and there were concerns about the sanitary effects not only on the city residents but also on pilgrims.

The actual/predicted data of population, sewage generation, sewage treatment capacity, and sewage inflow in Varanasi at the time of the ex-post evaluation are shown in Table 1 below. As the sewage treatment capacity of Varanasi City was enhanced to 361.8 MLD by the Project, followed by the construction of a new 50 MLD STP with self-financing by the Indian side, the sewage treatment capacity of Varanasi City reached 411.8 MLD as of 2022. Although the

[8] Prime Minister Modi had made a commitment to purify the Ganges River before taking the post, establishing the NMCG in October 2014 in the Ministry of Water Resources, River Development and River Ganges Restoration and launching the Namami Ganga Programme in 2015.
[9] Source: Namami Gange Programme At a Glance (September 2020)
[10] *Swachh Bharat* means “Clean India”.
[11] MLD: Million Liters per Day. 1 MLD=1,000 m3/day

increased sewage treatment capacity ensures that the city has enough capacity to handle the volume of incoming sewage, there are still areas of the city where the sewer network has not yet been developed, and sewage and wastewater treatment during the rainy season continues to be a challenge. In addition, the population of Varanasi is increasing, and the amount of sewage is expected to increase in the future, so it is recognized that further expansion of sewage treatment capacity is necessary to cope with this demand. There is also a strong need to continue to encourage behavior change of the residents and improve the sanitation environment in the city. The water quality (BOD) in the Ganges River basin in Varanasi City is up to 2.5 mg/L near Assi Ghat, upstream, and 3.8 mg/L at Malviya Bridge, downstream, as of 2022, which is a significant improvement from the time of the appraisal, although the levels downstream may exceed the standard level.

Table 1 Changes in population and volume of sewage generated and treated in Varanasi

Item	Unit	2020 (actual)	2022 (actual)	2035 (estimate)	2050 (estimate)
Population*	1,000	1,832	2,488	3,218	4,331
Sewage production	MLD	302	299	386	519
Sewage treatment capacity		361.8	411.8	466.8	521.8
Inflow to STP		270.5	375	-	-

Source: Data provided by UPJN and NMCG
*All population figures are projections (as no census has been conducted since 2011)

Therefore, although sewage treatment capacity has been increased, the sewer network needs to be improved, and sewage treatment capacity needs to be further increased to meet the needs of a growing population, and also the environmental sanitation in the city needs to be improved. Given the above, the need for improvement of sewerage infrastructure and environmental sanitation in Varanasi City continues to be recognized.

3.1.1.3 Appropriateness of the Project Plan and Approach

Based on the lessons learned from the previous projects[12], this Project included procurement assistance and implementation supervision under the consulting service component, as well as an Institutional Development Program (IDP) to strengthen the organizational capacity of the implementing agencies, which included studies and recommendations for setting appropriate fees.

[12] At the time of the ex-ante evaluation, it was noted that "delays in the construction schedule and securing sewerage fee revenues for operation and maintenance have been identified as problems" as lessons learned from the past. As measures for the construction period, it was assumed that the TOR of consultants for detailed design and procurement would be clarified, the organization of the implementing agency for operation and maintenance of sewerage facilities would be strengthened, and appropriate technology would be transferred to the implementing agency, etc. It was assumed that measures for revenue sources would include interim supervision to ensure appropriate fee setting and collection.

Although there were differences between the planned and actual outputs (see 3.2.1 Project Outputs), all changes were due to rational reasons, and it can be considered that the changes in the plan were appropriate.

One distinctive feature of the Project approach is that, in addition to the construction of sewerage infrastructure, the non-sewerage component included the construction of community toilets and laundry facilities (Dhobi Ghats) for local residents, as well as awareness-raising activities related to public health. The non-sewerage component was positioned as the social development component, and activities focused on the poor and vulnerable, especially in slum areas, in cooperation with local NGOs. The context for this was that 30% of the population of Varanasi City lived in slums, many of whom poor, with poor sanitation conditions. In the construction of community toilets, which was carried out in collaboration with Sulabh International, a local NGO that has been working on sanitation projects in India for more than 50 years, a pro-equity approach was adopted, with priority given to slum communities, which have low rates of toilet ownership. In addition, the toilets were designed to be accessible to people with disabilities, toilet management staff were hired from the local community, and the toilets in slum communities were set at a low cost of 50 rupees per household per month for unlimited use (urban toilets charge 5 rupees per use) to ensure that underserved populations could benefit from the facilities. In selecting the location of the community toilets, based on the opinions and suggestions of the representatives of each district and Sulabh International, Varanasi Municipal Corporation (Varanasi Nagar Nigam; hereinafter referred to as "VNN"), the implementing agency of the component of the Project, decided on the location of the community toilets after consulting with the parties concerned. Based on the idea that active participation of beneficiaries and other stakeholders is essential for social development, awareness-raising activities related to public health were effectively implemented by four local NGOs using participatory methods in the form of Public Awareness and Public Participation (PAPP)[13]. The approach was appropriate in that it involved partners who knew the local area well, used participatory methods, and focused on the poor and vulnerable so that no one would be left behind.

As discussed below in "3.3.1.2 Qualitative Effects (Other Effects)," the synergistic effects of combining the infrastructure development and sanitation improvement components were remarkable, and the project design was appropriate for enhancing the manifestation of the project effects.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

[13] Regarding public awareness activities related to public health, collaboration with NGOs was not planned at the time of appraisal but was organized and implemented during the implementation of the Project.

At the time of the appraisal, the Country Assistance Policy for India (2005) included the following priority objectives: (1) promotion of economic growth, (2) improvement of poverty and environmental problems, and (3) assistance for human resource development and expansion of human resource exchange. In the area of (2) improvement of poverty and environmental problems, support for water supply and wastewater management to prevent and improve water pollution was included in the "Addressing environmental problems" section. In addition, in the former JBIC's Overseas Economic Cooperation Implementation Plan (2005-2008), the country-specific policy for India identified the improvement of economic infrastructure, rural development benefiting the poor, and addressing environmental issues as priority areas.

3.1.2.2 Internal Coherence

This Project was planned based on the master plan of the JICA Development Study "The Study on Water Quality Management Plan for Ganga River in the Republic of India" in FY2002. At the time of appraisal, no specific linkage with other JICA projects was planned, but at the time of ex-post evaluation, the technical cooperation "Project for the Comprehensive Improvement of Environmental Sanitation in Varanasi (2020-2023)" (hereinafter referred to as the "Technical Cooperation Project") and the "Verification Survey with the Private Sector for Disseminating Japanese Technologies for Tafgard Technology for Environmentally-Friendly Toilets in India" (hereinafter referred to as the "Verification Survey") were identified.

There was mutual coordination between the Technical Cooperation Project and the Project. Specifically, the IDP component of the Project included capacity-building for maintenance and management of sewer pipes in areas where sewer networks had been developed, and the Technical Cooperation Project focused on treatment of septage sludge in areas where sewer networks had not been developed, and efforts to improve the hygiene awareness of local residents were implemented under both projects. Adjustments were made to segregate the sewerage network areas and underserved areas, thus avoiding duplication.

In the Verification Survey, a demonstration test was conducted to introduce environmentally friendly toilets using the community toilets developed in this Project. Some of the community toilets constructed in this Project were not connected to the sewer system and used septic tanks, but the leakage of untreated wastewater was a problem. Environmentally friendly treatment systems that utilize technology from a private Japanese company were installed in these areas, and demonstration tests were conducted with the aim of promoting the use of these systems as an environmentally friendly public toilet model.

3.1.2.3 External Coherence

At the time of appraisal, plans were made to collaborate with a local NGO for the construction and maintenance of public toilets in the slum area. As mentioned above in "3.1.1.3 Appropriateness of the Project Plan and Approach," this Project has constructed and is maintaining community-based public toilets in collaboration with Sulabh International. Sulabh International had been operating public toilets in Varanasi before this Project, and had abundant knowledge and experience in the locations where public toilets were needed, the details of toilet facilities, and the setting of fees.[14] In particular, Sulabh International's experience in operating public toilets enabled it to select locations for public toilets, giving priority to slum communities with low rates of toilet ownership. This collaboration and division of roles with Sulabh International's own existing projects led to the effective implementation of this Project.

In light of the above, the implementation of this Project is fully consistent with India's development plan and development needs, and the project plan and approach are considered appropriate. The Project is also coherent with Japan's development assistance policy, JICA's other projects, and other organizations' projects. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The Project consists of three major components: a sewerage component, a non-sewerage component (sanitation improvement component), and consulting services. Under the supervision of the executing agency (NMCG), the sewerage component was to be carried out by the Uttar Pradesh State Water Supply and Sewerage Corporation (U.P. Jal Nigam, hereinafter referred to as "UPJN") and the non-sewerage component was to be implemented by VNN.

The contents of each component are shown in Table 2, and the proposed and actual outputs of each component, as well as the reasons for changes from the plan, are described below.

[14] Sulabh International, founded in 1970, has been working on toilet issues in India for 50 years since its establishment, installing household toilets, public toilets in urban areas, community toilets in slums, and school toilets, as well as overseeing awareness-raising, education, and human rights issues for the toilet-cleaning segment of the population. Prior to the construction of community toilets under this Project, the company had constructed and operated multiple public and community toilets in Varanasi, and had a track record of proper operation and much better sanitary conditions compared to other toilet facilities.

Table 2 Components of the Project

Sewerage component	Non-sewerage component (sanitation improvement)	Consulting services
(1) Construction/rehabilitation of STPs (2) Construction/rehabilitation of pumping stations (3) Construction/renovation /rehabilitation of sewers (4) Renovation/rehabilitation of existing irrigation canal	(1) Construction of community toilet complexes (2) Construction/renovation of Dhobi Ghats (3) Public Awareness and Public Participation (PAPP)	(1) Assistance of procurement process, management and supervision of project implementation (2) Comprehensive assistance for public health conditions (3) Institutional Development Programme (IDP)

Sewerage Component

The plans, modified plans, and actual details of the outputs were as follows.

Note that the numbers in parentheses after the name of the STP or pumping station (MLD) indicate the sewage treatment capacity of each facility.

Table 3 Planned and Actual Outputs of the Sewerage Component

Components	Plan (2005)	Modified Plan (2010)	Actual
(1) Construction /rehabilitation of STPs	[Construction] ・Location: Sathwa (200 MLD) [Rehabilitation] ・Location: Old Dinapur, Bhagwanpur	[Construction] ・Location: Sathwa (140 MLD) [Rehabilitation] ・Location: Old Dinapur, Bhagwanpur	[Construction] ・Location: Dinapur (140 MLD) [Rehabilitation] ・Location: Old Dinapur, Bhagwanpur
(2) Construction /rehabilitation of pumping stations	[Construction: 5 locations] -Chaukaghat R/B (140 MLD) -Chaukaghat L/B (19 MLD) -Phulwaria (8 MLD) -Narokhar Nalla (18 MLD) -Saraiya (4 MLD)	[Construction: 3 locations] -Chaukaghat R/B (140 MLD) -Phulwaria (8 MLD) -Saraiya (4 MLD)	[Construction: 3 locations] -Chaukaghat R/B (140 MLD) -Phulwaria (7.6 MLD) -Saraiya (3.7 MLD)
	[Rehabilitation] ・Konia (replacement of pumps and diesel generation sets) ・5 Ghat pumping stations (Trilochan Ghat, Jalesean Ghat, Dr. Rajendra Prasad Ghat, Mansarovar Ghat, Harishchandra Ghat)	[Rehabilitation] ・Konia (replacement of pumps and diesel generation sets) ・5 Ghat pumping stations (Trilochan Ghat, Jalesean Ghat, Dr. Rajendra Prasad Ghat, Mansarovar Ghat, Harishchandra Ghat)	[Rehabilitation] ・Konia (replacement of pumps and diesel generation sets) ・5 Ghat pumping stations (Trilochan Ghat, Jalesean Ghat, Dr. Rajendra Prasad Ghat, Mansarovar Ghat、Harishchandra Ghat)[15]
(3) Construction /renovation /rehabilitation of sewers	[Construction] Total length: 35.8 km ・Interceptor sewers (14.7 km) -Assi primary interceptor sewers 5,170 m -Assi secondary interceptor sewers 3,575 m - Varuna Right Bank (Upstream and Downstream) and Left Bank (Upstream) Interceptor Sewers 6,000 m ・Sewers/Rising Mains (21.1 km) -Varuna Left Bank (Downstream) 17,275 m -Extension of Relieving Trunk Sewer 3,810 m	[Construction] Total length: 33.2 km ・Interceptor sewers (14.5 km) -Assi primary interceptor sewers 5,821 m -Assi secondary interceptor sewers 3,575 m -Varuna Right Bank (Upstream and Downstream) Interceptor Sewers 5.135 m ・Sewers /Rising Mains (18.7 km) -Extension of Relieving Trunk Sewer 4,310m -Rising Mains for Chaukaghat R/B pumping station 7,419m	[Construction] Total length: 28.8 km ・Interceptor sewers (13.3 km) -Assi primary interceptor sewers 6,185 m -Assi secondary interceptor sewers 2,262 m -Varuna Right Bank (Upstream and Downstream) Interceptor Sewers 4,808 m ・Sewers/Rising Mains(15.5 km) -Extension of Relieving Trunk Sewer 3,904 m

[15] Among the five Ghat pumping stations, Jalesean Ghat was closed in 2021 due to the government's large-scale development project around the Shri Kashi Vishwanath Temple, but no sewage spillage or other problems have occurred because a new pump was constructed underground. The pumps replaced by this Project were moved to another pumping station.

Components	Plan (2005)	Modified Plan (2010)	Actual
	-Sathwa Rising Mains 40 m -Rising Mains for Phulwaria, Narokhar, Saraiya, Chaukaghat Left and Right Bank pumping stations	-Rising Mains for Phulwaria pumping station 1,650 m -Rising Mains for Saraiya pumping station 1,100m	-Rising Mains for Chaukaghat R/B pumping station 7,072 m -Rising Mains for Phulwaria pumping station 2,137 m -Rising Mains for Saraiya pumping station 1,207 m
	[Rehabilitation] ・Detailed Investigation & Rehabilitation of old trunk sewer 7,172 m	[Rehabilitation] ・Detailed Investigation & Rehabilitation of old trunk sewer 7,172 m	[Rehabilitation] ・Detailed Investigation & Rehabilitation of old trunk sewer 6,905 m
(4) Renovation /rehabilitation of existing irrigation canal	・Total length 18 km	・Total length 18 km	・Due to the change in location of the STP, the discharge channel did not need to be rehabilitated, and a 1.7 km drainage channel was constructed instead.

Since the contents of the Modified Plan (2010) in the table above were formally agreed upon in a written document between the Government of India and JICA, and the details of the modification are reasonable considering the circumstances at that time, it is appropriate to use the Modified Plan (2010) as the planned value and compare it with the actual results.

The main reason for the change in scope in 2010 was the delay in government approval of the Project, during which time another project (JNNURM: Jawaharl Lal Nehru National Urban Renewal Mission) decided to construct a 120 MLD STP in Goithaha (northern part of the Varuna River, the same area where the Sathwa STP is to be located). As a result, the capacity of the STP to be constructed under this Project was revised from 200 MLD to 140 MLD, and the construction of pumping stations (Chaukaghat Left Bank Pumping Station and Narokar Pumping Station) and associated sewer construction components planned for the northern part (left bank) of the Varuna River were reorganized as the scope of the JNNURM project and excluded from this Project. The change was reasonable to avoid duplication with other projects, and the change process was also appropriate, as it was formalized through a decision within JICA based on the change request letter from the executing agency.

The differences between the Modified Plan (2010) and the actual details and the reasons for the changes are as follows.

(1) Construction/rehabilitation of STPs

The difference between the Modified Plan and the actual details is the location of the STP.

In 2012, the location of the STP was changed from Sathwa to Dinapur due to a land acquisition issue in Sathwa. The land to be expropriated was agricultural land, but the farmers did not agree to the acquisition of the land, which resulted in the change of location. There was an STP in Dinajpur, which started operation in 1994, and the new sewage treatment plant was constructed as the New Dinajpur STP on an adjacent site.

(2) Construction/rehabilitation of pumping stations

The difference between the Modified Plan and the actual details is a minor change in the treatment capacity of the Phulwaria and Saraiya pumping stations. The change in the treatment capacity of the pump stations was due to the re-calculation of the actual treatment capacity at the time of detailed design.

(3) Construction/renovation/rehabilitation of sewers

The difference between the Modified Plan and the actual details is the change in the total length of sewer pipe installation/rehabilitation (from 33.2 km to 28.8 km). The sewer pipe installation plan was affected by the change in location of the STP (from Sathwa to Dinapur). The changes in the plan were caused by the results of the implementation design according to the actual conditions at the site and the surrounding road and railroad facilities, and the change did not affect the increase or decrease of the sewage treatment capacity. In the renovation of sewers, it was necessary to dig up sewers that were laid more than 100 years ago, and sometimes the exact location and conditions could not be determined until after excavation. It was therefore necessary to make adjustments based on the actual site conditions when renovating sewers.

(4) Renovation/rehabilitation of existing irrigation canal

Due to the change in location of the STP, it was no longer necessary to renovate the irrigation canal, and instead a 1.7 km drainage channel was constructed at the New Dinajpur STP. There was no need to construct an irrigation canal at the STP.

None of the above changes affected the achievement of the Project's outcome, "Improvement of sewage treatment capacity and sanitation," and the changes were reasonable and in line with local conditions.

Non-Sewerage Component

The planned and actual outputs were as follows.

Table 4 Planned and Actual Outputs of the Non-Sewerage Component

Component	Plan	Actual
(1) Construction of Community Toilet Complexes	・Construction of Community Toilet Complexes (205 in slum areas, 26 in bathing Ghats)	・Construction of Community Toilet Complexes (154 in slum communities and urban areas, 952 seats in total, 26 in bathing Ghats) ・Renovation of 26 bathing Ghats (construction of changing rooms, repair and painting of dilapidated Ghats, etc.)[16]

[16] Bathing Ghats are stair-like water facilities along the Ganges River where people can bathe, pray, and hold funerals.

Component	Plan	Actual
(2) Construction/Renovation of Dhobi Ghats	・Construction: 7 locations Renovation 3 locations	・Construction: 4 locations Renovation 3 locations
(3) Public Awareness and Public Participation (PAPP)	・Raising awareness of public health among residents and government officials through the use of local newspapers, workshops at schools, billboards, street skits, etc.	・Public Awareness and Public Participation (PAPP) activities were carried out by several local NGOs. (See BOX-1 below.)

The differences between the Modified Plan (2010) and the actual details and the reasons for the changes are as follows.

(1) Construction of Community Toilet Complexes

At the time of planning, 205 public toilets were planned to be constructed in slum areas, but only 154 were built, both in slum communities and in the city center (along roads with heavy human and vehicular traffic). The reason for constructing toilets in the city center was that Varanasi has a large floating population of tourists, pilgrims, and migrant workers, and there was a significant need for facilities that could be used by these groups (in selecting locations for public toilets, as described in "3.1.1.3 Appropriateness of the Project Plan and Approach," VNN, the implementing agency, made the decision in consultation with the representatives of each district and Sulabh International based on their opinions and suggestions). The number of public toilets constructed was lower than planned due to factors such as increased costs and difficulties in acquiring land, as well as the government's promotion of the Swachh Bharat Mission to install individual toilets for household use. As a result of this mission, a total of 10,448 individual toilets were constructed in Varanasi, resulting in a decrease in the number of public toilets needed. On the other hand, the 154 public toilets with a total of 952 seats constructed by the Project have provided daily access to public toilets to 25,000 to 30,000 people, including the poor who cannot afford to build toilets at home and floating populations such as pilgrims and tourists, contributing to improved sanitation, which was the outcome of this Project.

In the bathing Ghats, at the 26 locations that were improved, not only were toilets installed, but also changing rooms were installed and the Ghats were restored and renovated according to the request of VNN, the implementing agency.

(2) Construction/Renovation of Dhobi Ghats

At the time of planning, the idea was to have 7 new Dhobi Ghats and 3 renovated, but the number of new Dhobi Ghats was changed from 7 to 4. The reason for the change in the number of new Dhobi Ghats was not only the budget and land availability problems, but also the unavoidable factor of not being able to reach a consensus with the local Dhobi community.

(3) Public Awareness and Public Participation (PAPP)

At the time of planning, the Project was supposed to use local newspapers to raise awareness, hold workshops at schools, install billboards, and perform street skits. The actual results of the Project were that in cooperation with four local NGOs (Amar Shahid Chetana Sansthan, Janvikas Avam Kalyan Samiti, Shanti Niketan Jan Seva Samiti, and the Centre for Environmental Education (CEE)), the activities were carried out in six areas (Bhelupur, Dashsurame, Varunapar, Adampur, Kotwali, and Ghat zones). Based on the concept that the participation of local residents is important in changing their awareness and behaviour, the activities were efficiently implemented by assigning an NGO in charge of each area. The specific activities are shown in BOX-1 below.

The outputs of the non-sewerage component include changes (decreases) from the plan in the construction of community toilet complexes and laundry facilities (Dhobi Ghats). On the other hand, as outputs not expected at the time of the plan, the maintenance of bathing Ghats (installation of changing rooms, restoration/renovation of Ghats, etc.) was implemented, and more diverse activities than planned were also implemented in the public awareness and public participation activities in collaboration with local NGOs.

BOX-1 Details of Public Awareness and Public Participation (PAPP) activities

Activities such as participatory workshops and study sessions were held at various locations in Varanasi to promote understanding of environmental issues, reduce open defecation, reduce household and commercial waste, and improve knowledge of hygiene and health, etc. In addition, educational activities were conducted in 100 schools with the participation of 15,000 children, and the "Clean Ganga Club" was established to promote environmental education in schools (including training for teachers). In Ghat areas, activities were conducted to prevent pollution of the Ganges River, such as reducing the amount of refuse in the river, promoting the use of toilets, reducing the use of soap for bathing, and cleaning the Ghats, as well as educational activities using an exhibition booth.

Awareness workshops in schools

Exhibition booth in Ghat zone

School awareness rally

Exhibition at Assi Ghat

Workshop on water conservation at a college

Teachers review workshop in the Clean Ganga Club (CGC) training program

Source: Project Completion Report

Consulting Services

The planned and actual outputs were as follows.

Table 5 Planned and Actual Outputs of the Consulting Services

Plan	Actual
(1) Assistance of procurement process, Management and supervision of project implementation (2) Comprehensive assistance for public health conditions (3) Establishment of action plans to strengthen the organizational capacity of implementing agencies (IDP component)	(1) As planned (2) As planned (3) Organizational enhancement and capacity-building training, development of a GIS-based asset management system, introduction of ICT for better administration and service delivery, financial management and measures to increase tax revenue, restructuring of the water/sewerage fee structure (including user surveys, etc.), and improvement of operation and maintenance of WATSAN (Water & Sanitation) assets

The outputs of the IDP component covered a broader scope than just establishment of action plans for organizational capacity strengthening, which was the plan at the time of appraisal. Specifically, with the aim of strengthening the organizational capacity of the Varanasi municipal water works department (Jal Kal Vibhag under VNN, hereinafter referred to as "Jal Kal Varanasi") and ensuring efficient and effective service delivery related to water and wastewater, the IDP component considered the development of an asset management system, implementation of ICT systems, and restructuring of water/sewerage tariffs (tax system), in addition to training.

3.2.2 Project Inputs

3.2.2.1 Project Cost

At the time of appraisal, the planned project cost was 13,248 million yen, of which 2,277 million yen was in foreign currency and 10,971 million yen was in domestic currency, and 11,184 million yen of the project cost was subject to ODA loans. The actual project cost was 6,194 million yen in total for the ODA loan and 3,637 million yen from India's self-financing, for a total project cost of 9,831 million yen.

The actual total project cost was 74% of the planned cost and was therefore within the plan. The reason why the total amount of the ODA loan was below the planned amount was that the Project was not completed within the loan period due to project delays, and the Indian side made expenditures for necessary outputs even after the yen loan period. In addition, a change in the location of the STP eliminated the need for land acquisition, which also affected the reduction in total project cost.

Table 6 Comparison of Planned and Actual Project Costs

Item	Plan (million yen)				Actual (million yen)*		
	Foreign currency	Domestic currency	Total	Of which, ODA loan	ODA loan	Indian side	Total
Sewerage component	1,099	6,417	7,516	7,516	5,604	2,730	8,334
Improvement of public health (non-sewerage component)	0	413	413	413	58	430	488
Price escalation	51	659	710	710	0	0	0
Physical contingency	149	713	862	862	0	0	0
Consulting service	679	705	1,384	1,384	414	477	891
Land acquisition	0	476	476	0	0	0	0
Taxes and duties	0	427	427	0	0	0	0
Administration	0	1,161	1,161	0	0	0	0
Interest during construction	299	0	299	299	118	0	118
Total project cost	2,277	10,971	**13,248**	11,184	6,194	3,637	**9,831**

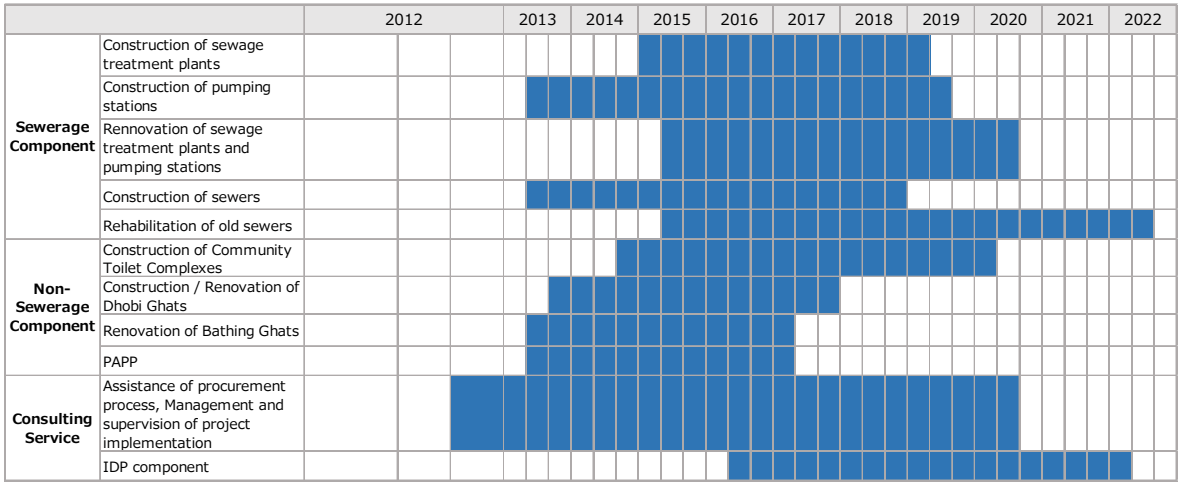
Source: Documents provided by JICA, data provided by NMCG
*The actual cost on the Indian side is converted into yen using the average exchange rate obtained from IMF statistics (1 INR = 1.644 JPY) for the period from 2010, when the Project was approved by the government, to 2022, when the Project was completed.

3.2.2.2 Project Period

The actual project period was 208 months (March 2005 to June 2022; 15 years and 5 months) compared to the planned project period of 85 months (March 2005 to March 2012; 7 years and 1 month), which was 245% of the plan and significantly exceeded the plan.

The implementation period for each component is shown in Table 7 below.

Table 7 Actual Project Period by Components



Source: Created by evaluator based on the Project Completion Report and materials provided by implementing agencies

The following points have been identified as factors that contributed to the delay, and the combination of multiple factors led to the significant delay.

Delay in the commencement of the Project

- Due to delays in project approval by the Indian government, which was granted in 2010 (a delay of more than 60 months), the start date of the consultancy contract was pushed back from the original target of 2005 to 2012.

Delay factors during implementation

- The delay was caused by the inability to secure a site in Sathwa, which was originally planned, meaning that the location had to be changed from Sathwa to Dinajpur. A change in the treatment method due to the change in location of the STP also contributed to the delay.
- The change of executing agency (see footnote 3) and the timing of the consultancy contract coincided, resulting in a total delay of 20 months due to delays in the procurement process and other factors.
- There were compensation demands from farmers near the Dinapur STP, and protests led to the suspension of work at the site for 6 months in 2015 and 1 month in 2017. In addition, compensation procedures and re-mobilization of workers took time.
- It took time to determine the location of the Phulwaria pumping station due to problems in securing a site and identifying an alternative site.
- Due to the delay in obtaining permission from the local administration to occupy the road, the construction of the sewers was delayed for more than 30 months. The rehabilitation of the old trunk sewer, the old STPs and the five Ghat pumping stations was temporarily suspended due to the need for a technical committee review of the proposal submitted by a local NGO (Sankat Mochan Foundation).
- The sanitation improvement component was also delayed due to land availability issues.
- Project implementation required a high degree of coordination among the various agencies involved, including the administration, the railways, the state public works department, and the city of Varanasi, and obtaining approvals and permits took time.
- Varanasi is a year-round festival city, and the construction of the sewage pipes was particularly affected. Flooding and bad weather also contributed to construction delays.
- Repeated lockdowns during the COVID-19 pandemic also affected project delays.

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

In this Project, the Economic Internal Rate of Return (EIRR) was calculated at the time of appraisal as shown in the table below. The internal rate of return at the time of ex-post evaluation was recalculated using the L/A signing year as the starting point, in accordance with the ex-post evaluation reference, as shown in the table below. As for the benefits, since similar data were not available at the time of the ex-post evaluation, the value calculated at the time of appraisal

was multiplied by the rate of increase of the consumer price index. Although the Project cost was lower than planned, the EIRR at the time of the ex-post evaluation was slightly lower than that at the time of the appraisal because the commencement of operation of the facility was delayed due to the delay in project implementation, and the period during which benefits were generated was shorter than that at the time of the appraisal.

Table 8 Calculation of Internal Rates of Return

	Economic Internal Rate of Return (EIRR)
IRR	Appraisal: 13.1% Ex-post evaluation: 12.7%
Cost	Actual project costs, estimated operation and maintenance costs
Benefit	Willingness to pay (WTP) for improvement of the water quality of the Ganges River, WTP for sewage treatment services, additional river visitors
Project life	30 years

Given the above, to summarize the efficiency, the outputs, sewerage component, non-sewerage component (sanitation improvement component), and consulting services, all underwent changes from the plan, but the changes from the plan were not such as to affect the achievement of the Project's outcomes. Although the project costs were within the plan (74% of plan), the project period significantly exceeded the plan (245% of plan). Therefore, the efficiency of the project is moderately low.

3.3 Effectiveness and Impacts[17] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

All quantitative indicators set at the time of appraisal were related to the sewerage component, mainly operation and effect indicators related to sewage treatment and the quality of the water in the Ganges River. Since the new Dinapur sewage treatment plant constructed under the Project was completed in 2019 and the Project Completion Report was submitted in 2020, a comparison of target and actual values was made, using 2020 as the Project completion year (see Table 9). A comparative analysis of the target and actual performance for each indicator is described below.

[17] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 9 Operation and Effect Indicators of the Project

	Baseline value	Target value	Actual value	
	2003	2015	2020	2022
		4 Years After Completion	Completion Year	2 Years After Completion
1) Total population served (*1)	435,525	1,437,762	570,000	1,343,000
2) Amount of wastewater treated (m3/d)	101,800(*2)	318,000	361,800 *Below is the breakdown* New Dinapur140,000 Old Dinapur 80,000 Bhagwanpur 9,800 DLW Campus 12,000 Goithaha[18] 120,000	411,800 *Below is the breakdown* New Dinapur 140,000 Old Dinapur 80,000 Bhagwanpur 9,800 DLW Campus 12,000 Goithaha 120,000 Ramana[19] 50,000
3) Rate of facility utilization (%)	-	100	100	100
4) BOD concentration of Each STP (Effluent) (mg/L)	-	<30	<20	<20
5) Fecal Coliform of each STP (Effluent) (MPN/100ml)	-	<10,000	<1000	<1000
6) Percentage of population served (%)	30	45	45 (*3)	54 (*4)
7) Improve of water quality (BOD mg/L)	3 - 15	<3	2.1 - 3.7	3.8
8) Improve of water quality (Fecal Coliform, MPN/100 ml)	2,500-50,000	<2,500	1,100-14,000	-

Source: documents provided by JICA, materials provided by UPJN and NMCG, project completion report

*1: The baseline value in the ex-ante evaluation was 575,000, but according to "The Study on Water Quality Management Plan for Ganga River in the Republic of India" (2005), the population connected to the sewage network in 2003 was 435,525. Also, according to the Project Completion Report, the connected population in 2010 was 485,000, so it can be inferred that the baseline value of 435,525 is appropriate. With regard to the target, although no information was available on the basis of which the target (1,437,762 persons) was calculated, the implementing agency was of the opinion that the target was an estimate of the population of the entire city of Varanasi. The actual figure for the year of completion (2020) is the figure stated in the Project Completion Report, but information on the basis of the calculation was not available. The actual population in 2022 is the estimated population of the target area covered by the sewage treatment facilities developed (constructed/rehabilitated) by the Project.

*2: The total of the old Dinajpur (80,000 m3/day), Bhagwanpur (9,800 m3/day), and DLW campus (12,000 m3/day). The baseline value (88,000 m3/day) in the ex-ante evaluation did not include the DLW campus sewage treatment plant, and the treatment capacity of the Bhagwanpur sewage treatment plant was modified from 8,000 m3/day to 9,800 m3/day, as the figure in the ex-ante evaluation was incorrect.

*3: According to UPJN, this figure is considered to be the percentage of sewage generated in Varanasi that will be treated at the new Dinapur STP only. Therefore, the actual figure could be even higher.

*4: Calculated by the evaluator based on population estimates for the city of Varanasi and the areas covered by the Project for sewage treatment.

Regarding Indicator 1, Total population served, as described in Note 1 of Table 9, information on the basis of calculation was not available for the target value (1,437,762 persons) set at the time of appraisal for the sewage treatment population, but according to NMCG and UPJN, the target value was considered to refer to the population of the entire city of Varanasi. Likewise, information on the basis of the calculation of the actual value for the

[18] Goithaha STP started operation in 2019 (construction funded by JNNURM)

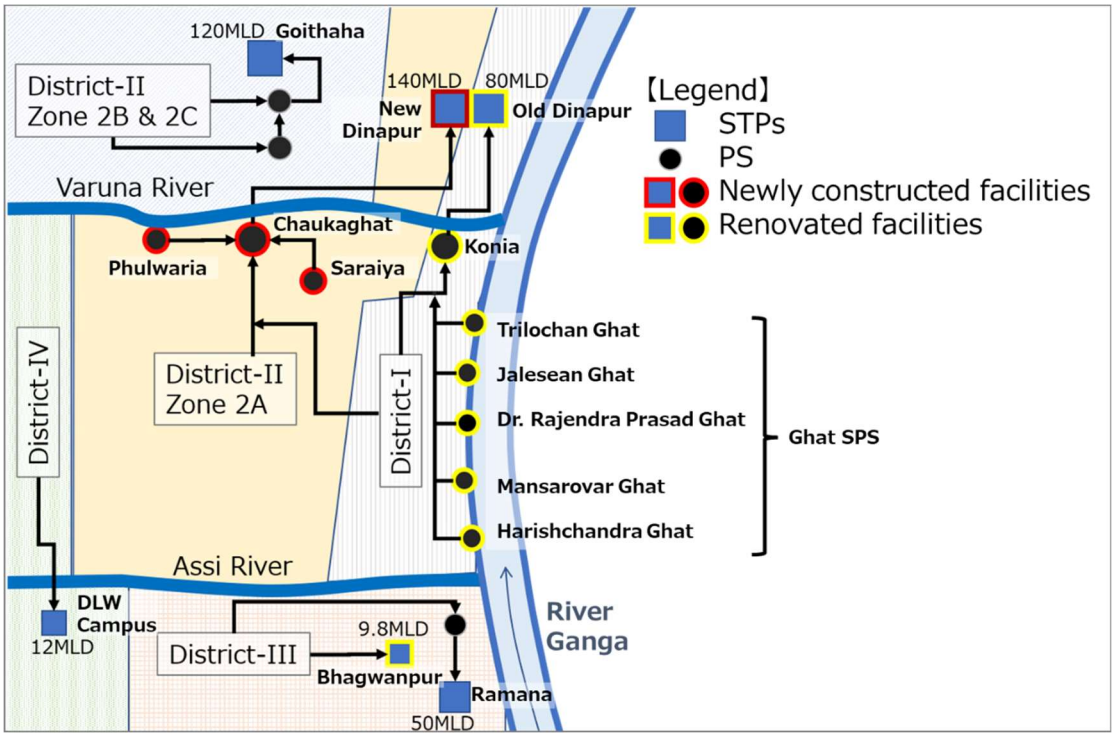
[19] Ramana STP started operation in 2021 (construction funded by Namami Ganga Programme)

year of project completion (2020) for the sewage treatment population was not available. According to NMCG and UPJN, the actual value for the year of project completion (2020), 570,000 persons, is considered to be the population estimate for the area to be treated by the new Dinapur STP, which corresponds to Zone 2A of District-II in Figure 1.

The actual figures for 2022 represent the estimated population in the area to be treated by the Project's sewage treatment facilities (including not only the new Dinapur STP but also renovated STPs, pumping stations, and areas where sewers are laid) and correspond to District-I and District-II Zone 2A, but since no census has been conducted in India since 2011 and the city of Varanasi expanded in 2020, the accurate figures for 2022 were not available. Therefore, although a comparison of the planned and actual figures is not simple to make, it can be concluded that the target has been achieved because new sewage treatment plants have been constructed through this Project and the Indian-budgeted project, and the areas to be treated are covered[20], which was assumed at the time of appraisal.

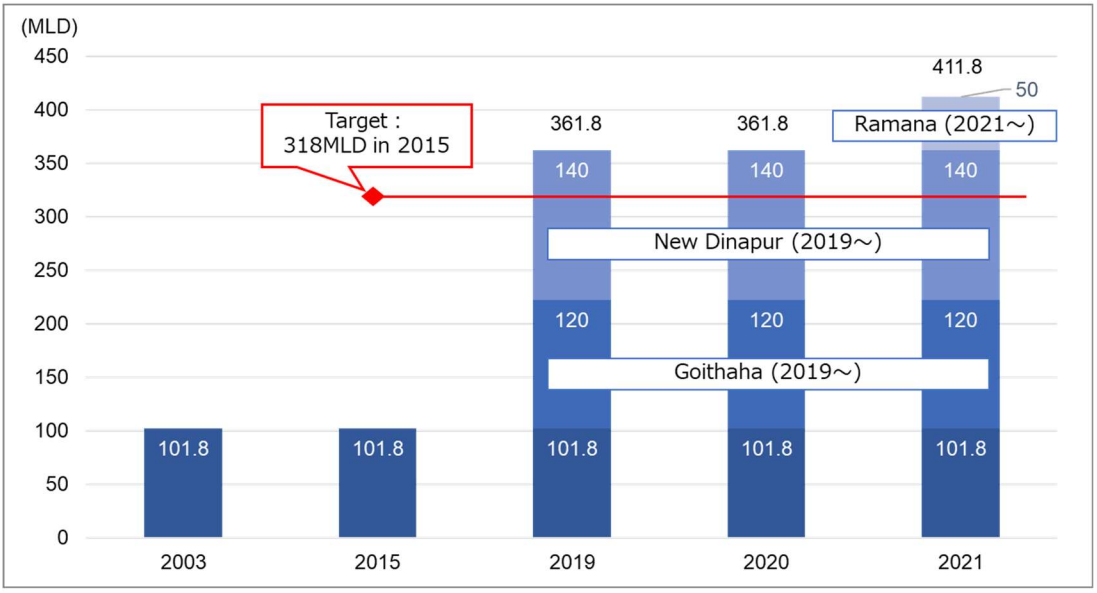
Indicator 2, Amount of wastewater treated (m3/d), is an indicator of the overall sewage treatment capacity of Varanasi City. The progress of sewage treatment capacity of Varanasi City is shown in Figure 2, and although the emergence of the effect was later than the target year, the target was achieved in 2019 when the New Dinapur STP (140 MLD) constructed by the Project and the Goithaha STP (120 MLD) constructed with the Indian budget started operation. By the time of the ex-post evaluation (2022), the sewage treatment capacity of Varanasi City had reached 411.8 MLD (129% of the target). The New Dinapur STP has the highest treatment capacity among the six sewage treatment plants in Varanasi, treating sewage from the heavily populated District I and District II Zone A areas and stopping the discharge of untreated sewage into the Ganges River.

[20] At the time of appraisal, a 200 MLD Sathwa STP was to be constructed in the northern area of the Varuna River (now District-II Zone 2B&2C), but the Goithaha STP was decided to be constructed, so the treatment capacity of the STP for this project was changed to 140 MLD and the location was changed as well. See Outputs for details on the change.



Source: Created by evaluator based on documents provided by UPJN

Figure 1　Location Map of Sewage Treatment Facilities in Varanasi City (2022)



Source: Created by evaluator based on documents provided by UPJN

Figure 2　Sewage Treatment Capacity in Varanasi City

Indicator 3, Rate of facility utilization (%), Indicator 4, BOD concentration of each STP (Effluent) (mg/L), and Indicator 5, Fecal coliform of each STP (Effluent) (MPN/100 ml), are all operational indicators for the new Dinapur STP, and all have met their targets. The quality of treated water discharged from the STP is tested in the laboratory.

Wastewater before and after treatment
Source: Evaluator

Aeration tank of the STP
Source: Evaluator

Indicator 6, Percentage of population served (%), is the percentage of the total population served by the sewage system in Varanasi City. However, as mentioned in Indicator 1, only estimated data on the population is available, making it difficult to calculate an accurate figure. On the other hand, the ratio of the population served in 2022 (estimated served population in the area covered by the sewerage facilities developed by the Project as mentioned in Indicator 1) out of the total estimated 2022 population of Varanasi City (2,488,000) is 54%. The percentage is even higher when areas not covered by the Project (District-II 2B&2C, District-III, and District-IV) are included, thus achieving the target value. At the same time, however, since there are still areas where sewer networks have not been developed in each region and the STP in District-IV covers only a part of the area, according to NMCG, the total percentage of sewage generated that is treated in the STPs is about 85%.

Indicator 7, Improvement of water quality (BOD mg/L), and 8, Improvement of water quality (Fecal Coliform, MPN/100 ml), are both indicators related to water quality in the downstream of the Ganges River, and are greatly affected by external factors. Although the actual values are significantly improved compared to the baseline values, they are lower than the target values depending on the season. It is difficult to calculate the degree of achievement against the target due to the fluctuation of actual values, but in 2020, the BOD mg/L (Indicator 7) was 2.1 mg/L, 30% lower than the target, at the best time, and 3.7 mg/L, 23% higher than the target, at the worst time. The actual values of Indicator 8, Improvement of water quality (Fecal Coliform, MPN/100 ml), were 1,100 MPN/100 ml, 56% lower than the target (2,500 MPN/100 ml) at the best time, but 14,000 MPN/100 ml, 460% higher than the target, at the worst time. The water quality of the Ganges River is maintained in good condition outside of the rainy

season, but when floods occur upstream during the rainy season, it is inevitable that sewage flows into the river together with rainwater.

Given the above, the construction of the new STP, pumping stations, and the installation of sewers by the Project has dramatically increased the sewage treatment capacity of Varanasi City, and the indicators related to the improvement of sewage treatment capacity and operational indicators have met their targets, but the indicators related to the improvement of water quality in the downstream area of the Ganges River, although there are seasonal fluctuations, have not always met their targets.

3.3.1.2 Qualitative Effects (Other Effects)

The Project not only improved the sewage treatment capacity, but also implemented a non-sewerage component, or sanitation improvement component, such as the construction of community toilets and laundry facilities (Dhobi Ghats), and educational activities on public sanitation, aiming to improve the sanitation environment and raise the awareness of local residents and government officials on public sanitation. In order to understand the effects of these components, interviews were conducted with VNN, the implementing agency of the sanitation improvement component, as well as with local NGOs and beneficiaries to investigate the outcomes of the Project.

Improvement of Sanitation in Varanasi City

According to VNN, the construction of 154 public toilets has enabled approximately 25,000 to 30,000 people, including the floating population, to use toilets every day, contributing to the reduction of open defecation (ODF). Access to toilets has dramatically improved as a result of the synergy between the construction of public toilets under the Project and the promotion of the installation of toilets in households under the Swachh Bharat Mission, a government campaign to improve sanitation. In addition, the awareness-raising activities conducted by both parties encouraged behavioral change. In the ODF assessment[21], Varanasi City achieved ODF+ in 2020 and ODF++ in 2021.

With the construction of 4 new Dhobi Ghats and the renovation of 3 existing Dhobi Ghats, approximately 1,200 to 1,500 Dhobies (laundry workers) work daily in the newly constructed washing stations connected to the water supply and sewage system, and the harmful washing sewage containing large amounts of chemicals is no longer discharged directly into the river. According to interviews with Dhobies, the improved facilities have improved the work environment. In addition, the restoration and renovation of the bathing Ghats and the campaign

[21] The ODF level certification system for each city/region is implemented as part of the Swachh Bharat Mission, with ODF+ requiring that public toilets are constructed and maintained in addition to zero open defecation, and ODF++ requiring that all sludge, waste, and sewage are safely managed and disposed of. Although it is not truly zero, as evaluators sometimes witnessed open defecation during the field survey, it has been significantly reduced as awareness of the need to stop open defecation has spread.

to improve sanitation around the Ghats have improved the landscape and sanitation along the Ganges River, benefiting not only the citizens but also tourists and pilgrims.

Community toilet constructed by the Project

Dhobi Ghat constructed by the Project

Bathing Ghats along the Ganges River, renovated by the Project

Awareness-raising paintings of "Namami Ganga" found all along the Ganges River

(Source: Evaluator)

Improvement of local residents' awareness for better living environment

Based on interviews with 45 households in three slum communities where community toilets were constructed under the Project, it was found that participation in the participatory workshops led to increased awareness, with comments such as "People started using community toilets instead of defecating outdoors," "Public spaces became cleaner and there were more places to sit and talk with each other," and "Children's hygiene awareness improved, and children became aware of the need to stop littering."

According to the same interview survey, 34 (75.6%) of the respondents indicated that they use the community's public restrooms, and the following comments were made: "Women and children can now use the restrooms safely," "I no longer see outdoor defecation," "Guests can now use the restrooms, and I feel proud of that," "In the past, I used to be scared to defecate outdoors on rainy days or at night," "The mindset of my children has changed," and "I am now able to lead a healthier life." Respondents who did not use community toilets indicated that they primarily used their own home toilets.

In the same interview survey, 33 respondents (73.3%) answered that they had participated in the participatory workshops of this Project, commenting that "the idea that cleanliness is godliness" had become widespread and that their perception of open defecation and refuse disposal had changed.

Thus, the Project not only improved the sewage treatment capacity but also constructed community toilets and laundry facilities as a sanitation improvement component, while also conducting public awareness activities on sanitation. This has helped residents understand that the living environment can be improved by proper treatment of wastewater generated through daily activities such as toilets and laundry, with a sense of realization, and has led to a change in behavior. If the sanitation improvement component had not been implemented, outdoor defecation and laundry wastewater would have continued to flow out, and the goal of improving water quality might not have been achieved to this extent. The combination of the two components has created a significant synergistic effect in improving the city's environment and the living conditions of local residents.

3.3.2 Impacts

3.3.2.1 Intended Impacts

To verify the impact of the Project in terms of "improvement of the water quality of the Ganges River and the sanitary environment for citizens, pilgrims, and tourists," interviews were conducted with hospitals in the city to examine the impact of the improved sanitary environment on the health situation, and with travel agencies in the city to examine the impact on the pilgrimage and tourism industry.

Impact on improvement of health condition of local residents and pilgrims/tourists

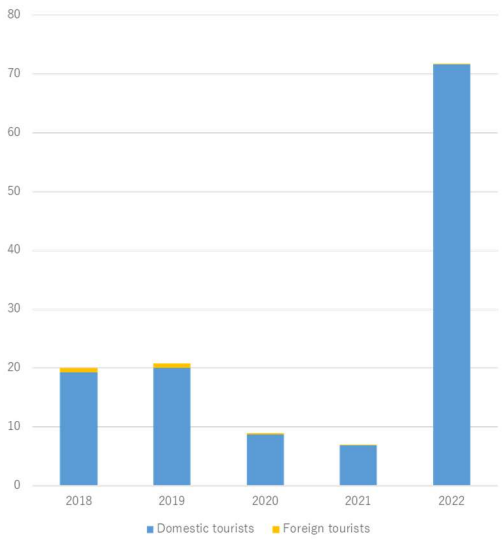
Interviews with doctors and health care workers at two community hospitals in the city revealed a significant decrease in the number of patients suffering from waterborne diseases with diarrhea symptoms such as cholera, typhoid fever, and dysentery, as well as skin diseases in particular. In the past, due to the deterioration of the water quality of the Ganges River, many patients suffered from skin problems after bathing, but the improvement of the water quality of the river has contributed to the decrease in the number of patients.

Impact on pilgrimage and tourism industry

In interviews at two travel agencies involved in pilgrimage and tourism, both stated that the water pollution situation in the Ganges River has improved dramatically over the past five years. They also said that although the number of tourists and pilgrims declined for a time due to the COVID-19 pandemic, domestic tourism demand has already recovered and Varanasi has become the most popular pilgrimage destination in the country. The government's large-scale

development of the corridor of the Shri Kashi Vishwanath Temple (Varanasi's largest Hindu temple and a center of pilgrimage) is the biggest factor, but the improved water quality of the Ganges River and the cleanliness of the Ghats have also contributed to its popularity, and according to the interviewees, the number of pilgrims and tourists has increased 1.6 to 2 times compared to 7 to 8 years ago. Statistical data also show that at the time of the ex-post evaluation (2022), more than 70 million people a year visited Varanasi, and considering that the number of pilgrims and tourists visiting Varanasi was slightly more than 1 million a year at the time of the ex-ante evaluation, the number of pilgrims and tourists visiting Varanasi has increased remarkably.

Figure 3 Number of visitors to Varanasi (million people)



Source: Created by evaluator based on tourist statistics in U.P.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment

At the time of appraisal, the Project was classified as Category B, because the Project aimed to improve the environment and was considered to have no significant undesirable effects on the environment in light of the sector, project, and regional characteristics listed in the Japan Bank for International Cooperation's "Guidelines for Confirmation of Environmental and Social Considerations" (April 2002). In addition, the Project area and its surrounding area were not classified as a nature conservation area, etc., and no negative impact on the natural environment was foreseen.

According to the confirmation with UPJN at the time of the ex-post evaluation, appropriate environmental mitigation measures were taken in accordance with the Environment and Social Management Report (ESMP), and no negative impacts on the natural environment have occurred. Since the completion of the Project, the water quality of the discharged water at the new STP has been tested daily to monitor the environmental impacts, and no negative impacts on the natural environment have occurred.

2) Resettlement and Land Acquisition

At the time of appraisal, no resettlement was expected for the construction of the new sewage treatment plant, the required land acquisition area was approximately 44 ha, and the land acquisition was to be conducted in accordance with Indian domestic law.

The land that was to be acquired, Sathwa, was agricultural land at the time of appraisal, but farmers' opposition made it difficult to expropriate the land, and consequently, the site for the construction of the new STP plant was changed.

At the time of the ex-post evaluation, it was confirmed by UPJN that no new land was acquired in Dinajpur, where the new site was to be located, but there was opposition by farmers on the grounds that they were not adequately compensated when the existing Dinapur sewage treatment plant (in operation since 1994; land acquisition was conducted from 1985 to 1989) was constructed. In response to this issue, the farmers were paid compensation calculated in accordance with national law, based on the instructions of the Hon'ble Court. No relocation of residents, including informal residents, occurred. At the time of the ex-post evaluation, there were no problems observed related to land acquisition.

3) Gender Equality

At the time of appraisal, there were plans to introduce a scheme for the construction and maintenance of community toilets that would involve participation by residents' organizations with the support of local NGOs, and which would include women as members of residents' organizations.

At the time of the ex-post evaluation, it was confirmed that the construction and maintenance of the community toilets are being carried out by Sulabh International, and that the toilet caretakers (who collect fees and perform cleaning) are social workers hired from the local community (not limited to women, but female caretakers were also observed during the field survey). All community toilet facilities have separate entrances for men and women, and women-only spaces are reserved[22]. In addition, the renovation of the bathing Ghats was designed with women in mind, including the installation of women-only changing rooms.

4) Marginalized People

At the time of appraisal, more than 30% of the population of Varanasi City lived in slums, and the construction of community toilets in slum areas was planned in view of the low rate of ownership and use of toilets and the poor sanitation environment.

It was confirmed at the time of the ex-post evaluation that the installation of community toilets in the slum areas has contributed significantly to improving the sanitation of people living in the slum areas (see 3.3.1.2 Qualitative Effects (Other Effects)).

[22] For facilities with a capacity of 5 people, there are 2 stalls for men, 2 for women, and 1 for the disabled; for facilities with a capacity of 10 people, there are 5 stalls for men, 4 for women, and 1 for the disabled; and for facilities with a capacity of 15 people, there are 8 stalls for men, 6 for women, and 1 for the disabled. All facilities also have showers.

Each community toilet complex also has a private room designed for people with disabilities. In addition, a fee structure was introduced in consideration of low-income groups, such as an affordable fee of 50 rupees per household per month for unlimited use of the toilets in slum areas.

5) Social Systems and Norms, Human Well-being and Human Rights

At the time of the ex-post evaluation, no particular impact on existing policies and social systems or cultural/social impacts were identified.

In order to obtain a deeper understanding of the Project outcomes, including impacts that were not anticipated in the Project, a detailed analysis was conducted with a particular focus on the impact on people's well-being. As a result, while various aspects of life such as income and assets, housing, education, environment, social connections, governance, and employment affect the subjective well-being and life satisfaction of the beneficiaries, the improvement of sanitation brought about not only the improvement of the living environment and health, but other positive changes too.

Unexpected impacts that emerged from interviews with beneficiaries included, for example, an increased sense of community belonging, ease of commuting to work and school, increased tranquility and relaxation (resulting from the improved riverfront environment), and increased religious devotion. The improvement of the sanitation environment, which was the focus of this Project, was found to have brought about these changes and consequently affected people's well-being. (See BOX-2 for details.)

Given the above, to summarize the effectiveness and impacts of the Project, the quantitative operational and effectiveness indicators that measure the effectiveness of the sewerage facility improvement component have mostly met their targets, except for the indicators related to water quality in the downstream area of the Ganges River, and the qualitative effects of the sanitation improvement, which are the outcomes of the sanitation improvement component, were confirmed.

No negative impacts on the natural environment have been observed, and the farmers' protests that occurred during the construction of the facility have been appropriately dealt with.

Therefore, the effectiveness and impacts of the Project are high.

BOX-2 Detailed Analysis of People's Well-being

A detailed analysis focusing on people's well-being was conducted with the aim of gaining a deeper understanding of the Project's outcomes, including unanticipated impacts.

Summary of the Survey

Target	Out of the slum communities where community toilets were constructed under the Project, 3 sites were selected, with 15 households in each community, for a total of 45 households.
Method	In-person semi-structured interviews were conducted by the evaluation team consisting of evaluator, and a local assistant. The evaluation team asked respondents about changes in subjective happiness or life satisfaction before and after the Project, and explored the factors that brought about such changes in each domain that is thought to define people's happiness (see below). Specifically, for those respondents who indicated that there was a change in subjective happiness or life satisfaction, we asked regarding each domain whether there was a relationship to the change in satisfaction[23], and if so, we identified the factors (changes in specific domains) that were relevant to the change in overall satisfaction. Based on the information obtained, we analyzed the relationship between the Project and changes in well-being and examined whether there was any unanticipated impact from the Project.

Interview scene
(Source: Local assistant)

Based on a pilot survey conducted by the evaluator, the domains that are thought to define people's well-being in this context were narrowed down to seven domains, for a total of 22 items.

Domains	Items
Income, assets	1 Income
	2 Income inequality
Housing	3 Availability of housing
	4 Quality of housing
Education	5 Reading and writing skills
	6 Basic arithmetic ability
	7 Years of school
Environment	8 Availability of fresh water
	9 Cleanliness of the local community
	10 Sewerage system and water logging
	11 Riverside environment
	12 Access to the natural environment
Social capital	13 Connection with the community
	14 Connection with family
	15 Free will
	16 Respect for cultural norms of behavior including rituals and beliefs
	17 Ganges River and faith
Governance	18 Level of trust in the local government
	19 Participation in political decision-making
	20 Discrimination and exclusion, such as gender discrimination and racism
Employment	21 Availability of employment
	22 Job satisfaction

Results of the Survey

1) Change in subjective happiness/satisfaction

When asked about subjective satisfaction, 73% (33 persons) answered "Much more satisfied" or "More satisfied," while 16% (7 persons) answered "Less satisfied" and 13% (6 persons) answered "No change."

[23] For each domain, we asked "Is XXX (income, for example) related to the changes in your life satisfaction?" and obtained a yes/no response. If yes, we further asked "How is it related to the changes in your life satisfaction?

2) Factors that affected the change in subjective happiness/satisfaction

- Those 39 respondents who indicated that their level of satisfaction had changed were asked whether each of the seven domains (22 items in total) had affected their level of subjective happiness and satisfaction. Most of the respondents answered that all of the following aspects had an impact on their satisfaction: income, assets, housing, education, environment, social connections, governance, and employment.
- Given the above, it can be said that all factors affect changes in subjective happiness, but it is also clear that the improvement of the sanitation environment, which was addressed in this Project, is one of the factors affecting happiness and life satisfaction.
- All respondents answered that environmental factors such as "Cleanliness of the local community" and " Sewerage system and water logging," which were expected as objectives of the Project, had an impact on their level of satisfaction, while other factors such as "Riverside environment " and "Ganges River and faith" were also considered as spillover impacts of the Project. For example, the impact of the Project was seen in terms of improved health (fewer illnesses), improved sanitation during the rainy season thanks to the improved sewerage system, spiritual enrichment resulting from the improved environment along the river, and increased religious devotion due to the purification of the Ganges River.

The following are some of the responses from the interviees.

How did the cleanliness of the local community affect your level of happiness and satisfaction?

Communities are cleaner and less vulnerable to seasonal diseases; fewer endemic diseases; fewer mosquito bites

Increased access for outsiders; better community environment makes people feel more comfortable in their homes; positive impact on mental health and well-being; community areas are cleaner and better maintained, leading to a sense of pride and belonging

How did the improvement of the sewerage system affect your level of happiness/satisfaction?

Improved sewerage system has reduced flooding, especially during the rainy season; sewage problems used to cause unpleasant smells and health hazards: in the past, the area used to be knee-deep in water containing sewage during the rainy season, but this is no longer the case; this is a big change from when the area was flooded and almost no one could enter the area; there is no wastewater logging now; it is now convenient to commute to work and school because roads are usable even during the rainy season; and the area has become more accessible during the rainy season.

How did the riverside environment affect your level of happiness/satisfaction?

The changed riverside environment has made it a place where the community frequents and spends quality time; families now prefer to visit; people regularly come for morning walks and spend quality time riverside with their families; trash cans have been installed and the area is greener and cleaner, so more people are visiting; the area provides tranquility and relaxation; release from the noise and pollution of the city.

How did the river pollution and beliefs of the Ganges affect changes in well-being/satisfaction?

Satisfied with the changes that have occurred as a result of the Ganges pollution control and government action, the level of religious belief has greatly increased; the Ganges is worshipped as a sacred river, and frequent family visits and spending time together have strengthened faith; pollution of the Ganges had led to a decrease in faith-related practices such as bathing and religious ceremonies; addressing the pollution of the Ganges has increased faith-related practices and improved the overall well-being of the individuals and the community.

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

The purification of the Ganges River, which is the goal of the Project, has been a priority policy focus from the time of appraisal to the time of ex-post evaluation, and has always remained as high priority even through the change of administrations. At the time of the ex-post evaluation, the Namami Ganga Programme driven by NMCG, the executing agency of the Project, has been positioned as an important national flagship program with respect to the conservation of river water quality in the Ganges River basin. Namami Ganga was selected as one of the top ten ecosystem restoration initiatives in the world in the United Nations Decade on Ecosystem Restoration, an initiative of the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization of the United Nations (FAO), announced in December 2022. This achievement comes from the Indian government's emphasis on the restoration of the Ganges River as a top priority issue and its strong promotion of this program.

As for policies to improve environmental sanitation, the Swachh Bharat Mission, an important initiative that has been promoted on a national scale since 2014, has been expanded to Phase 2 since 2020, focusing on maintaining open defecation-free conditions and improving waste management to further improve the sanitation environment.

From the above, it can be concluded that the sustainability of the policy and institutional aspects of the Project are ensured in terms of securing the sustainability of the project effects.

3.4.2 Institutional/Organizational Aspect

Sewerage Component

At the time of appraisal, UPJN was supposed to maintain and manage STPs and pumping stations after completion of the Project, while the maintenance and management of the sewers were to be carried out by Jal Kal Varanasi, and it was planned that the maintenance and management of all sewerage facilities would be transferred to Jal Kal Varanasi in the future.

Based on the verification at the time of the ex-post evaluation, the existing STPs and pumping stations rehabilitated under the Project are maintained and managed by UPJN as in the past. The newly constructed Dinajpur STP has been maintained and managed by VA Tech Wabag Ltd., which executed the construction, for 10 years after completion, after which the responsibility for maintenance will be decided by the U.P. state government.

The newly constructed pumping stations (Chaukaghat, Phulwaria, and Saraiya) have been maintained for 10 years since completion by UEM India Pvt. (now Toshiba Water Solution Co., Ltd.), which implemented the construction, after which the U.P. state government will determine the maintenance operator, as is the case with the STP. The maintenance of sewer pipes (new and rehabilitated) will be transferred from UPJN to Varanasi City (VNN) in phases, with gravity sewer pipes and old trunk sewers to be transferred to VNN first, which is being

coordinated as of the ex-post evaluation. According to UPJN, the maintenance and management of rising mains will be carried out by UPJN for the time being.

UPJN was separated into UPJN Urban and UPJN Rural in 2021, and the sewage treatment plants and pumping stations constructed under the Project are under the jurisdiction of UPJN Urban. The separation has had no particular impact on the maintenance and management structure, and the organizations responsible for the operation and maintenance of the various facilities established under the Project have clear and functioning inter-organizational responsibilities, decision-making processes, reporting systems, and so on.

Non-sewerage Component

At the time of appraisal, the maintenance of the community toilets was to be carried out by local residents with the support of an NGO, and the Dhobi Ghats were to be maintained and managed by VNN.

At the time of the ex-post evaluation, it was confirmed that, with regard to the community toilets, the contractors who built them (Sulabh International, an NGO, and M/S Prem Biogas) are contracted to operate and maintain the toilets for a period of 30 years. Each community toilet complex is staffed by a social worker employed by the local community. The Dhobi Ghats are operated and maintained by the Dhobi Association of Varanasi and the city of Varanasi under an MoU, with the association bearing the costs and VNN providing monitoring and supervision. In addition, operation and maintenance of the renovated bathing Ghats are being carried out by VNN with the cooperation of NGOs.

In each organization responsible for the operation and maintenance of the various facilities established under this Project, the responsibilities among the organizations, decision-making processes, and reporting systems are clear and functional, and no particular problems have been observed. The operation and maintenance of the newly constructed Dinapur STP, three pumping stations, and community toilet facilities have been outsourced to private organizations, but the division of roles and responsibilities is clear. The operation, maintenance, and management system after the outsourcing period has ended has not yet been determined at the time of the ex-post evaluation, but the appropriate system should be discussed at the UPJN and VNN.

3.4.3 Technical Aspect

At the time of appraisal, the executing agency had experience in implementing the Yamuna Action Plan Project under ODA loans, and although this was the first time for VNN to implement an ODA loan project, the sanitation improvement measures that they were in charge of had been implemented in the past under the Ganga Action Plan, so it was considered that

there were no problems with technical capacity and implementation capability. In addition, the consulting services for this Project were scheduled to include technical training, financial improvement, and organizational reform to improve the organizational capacity of Jal Kal Varanasi.

At the time of the ex-post evaluation, site visits and interviews with on-site staff indicated that the new STP in Dinapur has been properly operated and maintained by Wabag, with daily operational data and laboratory inspection data recorded and managed in accordance with the operation and maintenance manuals. At the new pumping stations, it was confirmed during the site visit that Toshiba Water Solutions was properly operating and maintaining the pumping stations, that regular training was provided for staff, and that daily operational data recording were being conducted in accordance with the operation and maintenance manuals. It was also confirmed during the site visit that UPJN's staff members are operating and maintaining the pumping stations that were renovated under the Project, and that daily operational data recording is being conducted in accordance with the operation and maintenance manuals.

The IDP component, implemented as part of the consulting services, included capacity building programs for VNN and Jal Kal Varanasi, such as training and skills development to strengthen organizational capacity, financial management including tax system review, and development of an asset management system[24].

In terms of operation and maintenance, no particular problems have been observed in terms of technical aspects, as sufficient experienced and competent engineers are in charge of operating each facility.

3.4.4 Financial Aspect

At the time of appraisal, the budget allocation from the state government for the Ganga Action Plan (GAP) in Varanasi, which has been implemented since 2003, had been made without delay, and there were no particular concerns about the financial aspects of the Project. While the sewerage rates at that time were not high enough to cover maintenance and management costs, based on the recommendations of JICA's feasibility study, including (1) establishment of a revenue department, (2) review of the taxation system, and (3) tax payment awareness activities through publicity, it was decided to formulate measures for financial improvement for UPJN and VNN in the consulting services for this Project.

At the time of the ex-post evaluation, information on revenues and expenditures of UPJN, VNN, and Jal Kal Varanasi was obtained: from UPJN, the operation and maintenance budget

[24] As for the asset management system, at the time of the ex-post evaluation, it was not available at the Jal Kal Varanasi and was not being utilized. This system is a database designed to manage the assets of citizens (location and size of houses, water and sewage facilities, etc.) using GIS, but it does not correspond to the technology required for the operation and maintenance of the project, and is therefore excluded from the perspective of the technical aspects of the evaluation.

related to the sewerage facility; from VNN, the budget for the entire sanitation sector; and from Jal Kal Varanasi, the revenue and expenditure information.

Table 10 Budget and Revenue/Expenditure Information of UPJN, VNN, Jal Kal Varanasi

(Million Rupees)

Organisation	Item	2020	2021	2022
UPJN	Budget for operation and maintenance of sewerage infrastructure	35.1	37.4	39.7
VNN	Budget for sanitation sector	158.8	162.4	155.2
		2021-22	2022-23	2023-24
Jal Kal Varanasi	Income	337.3	837.0	841.0
	Non-operating income	685.7	877.5	927.5
	Total Income	1123.0	1714.5	1768.5
	O&M cost	707.3	1145.4	1143.3
	Other cost	274.3	552.1	557.0
	Total Cost	978.7	1697.5	1700.3
	Income/Expenses	**44.3**	**17.0**	**68.2**

Source: Data provided by UPJN, VNN, and Jal Kal Varanasi

As confirmed at the time of the ex-post evaluation, no payments have been made since April 2022 to the private contractors that operate and maintain the sewerage facilities (Wabag, which maintains the STP, and Toshiba Water Solutions, which maintains the pumping stations). According to UPJN, the delay is due to a delay in the distribution of the operation and maintenance budget from the government. As of May 2023, the budget distribution process is ongoing and is expected to take place within a few months, but the exact timing of the payment is unknown. According to interviews with contractors, at the time of the post-evaluation, the delay in budget distribution had not had any particular impact on operations and maintenance yet, as they are required to treat incoming sewage on an ongoing basis.

According to VNN, the annual budget for the operation and maintenance of community toilets has not been distributed to Sulabh International, and since it is difficult to cover the operation and maintenance costs from toilet charges alone, they are also using revenue sourced from advertising in the public toilets.

According to an interview with Jal Kal Varanasi, the fee structure for the sewerage system is 4% of the annual rental value (ARV) of the property, which generates 130 million rupees per year. Jal Kal's main source of income is from water and wastewater use tax as well as government subsidies, and it has a surplus in revenues and expenditures.

Looking at the sustainability of operation and maintenance from a financial perspective, UPJN, VNN, and Jal Kal Varanasi have been able to secure the necessary financial resources, but a concern is that payments from UPJN to private contractors have been delayed for over a year.

3.4.5 Environmental and Social Aspect

At the time of the ex-post evaluation, no sustainability impacts were identified with respect to environmental and social considerations.

3.4.6 Preventative Measures to Risks

At the time of appraisal, the risks identified were economic stagnation/worsening in India and the surrounding areas, natural disasters, and an increase in the volume of untreated sewage discharged from the upstream cities of the Ganges River.

At the time of the ex-post evaluation, although there was an impact from the COVID-19 pandemic, there was no economic stagnation/worsening or major natural disasters, and there was no significant change in the volume of untreated sewage from the upstream area of the Ganges River.

It was confirmed to NMCG at the time of the ex-post evaluation that 25-30 MLD of sewage was discharged near Raj Ghat (a bathing Ghat located in the downstream area of the Ganges River) after the new Dinapur STP was commissioned. Then, a proposal was made by the state government to link the sewerage system laid under the JICA project with the sewerage system rehabilitated under the JICA project. As a result of this response, the sewage that was being discharged is now being treated at the new Dinapur STP through the Chaukaghat pumping station. The measure has already been completed, and no untreated sewage is currently discharging into the Ganges River. Thus, even after the completion of the Project, appropriate measures are being taken to address the risks.

3.4.7 Status of Operation and Maintenance

At the time of the post-evaluation, the following sites were inspected on-site to visually confirm the operational status of the facilities and the operation and maintenance of the facilities.

<u>Sewerage Component</u>

- New Dinapur STP (newly constructed)
- Chaukaghat R/B main pumping station (newly constructed)
- Phulwaria pumping station (newly constructed)
- Saraiya pumping station (newly constructed)
- Old Dinapur STP (rehabilitated/renovated)
- Bhagwanpur STP (rehabilitated/renovated)
- Konia main pumping station (rehabilitated/renovated)
- 4 Ghat pumping stations (rehabilitated/renovated): Trilochan Ghat, Dr. RP Ghat, Mansarovar Ghat, Harishchandra Ghat

Non-sewerage Component:

- 5 out of 154 newly constructed community toilet complexes
- 2 out of 4 newly constructed Dhobi Ghats (Pandeypur, Machodary)
- 2 out of 3 Dhobi Ghats renovated (Konia, Nadesar)
- At least 5 bathing Ghats along the Ganges River that have been renovated

From the confirmation of equipment and daily records during site visits and interviews with facility staff, it was observed that regular inspections and maintenance are conducted at each facility, no major problems have occurred to date, and the facilities are operated and maintained in good condition and properly managed.

From the above, to summarize the sustainability of the Project, no problems were found in the operation and maintenance of the Project in terms of related policy/system, institutional/ organizational aspect, technical aspect, environmental and social aspect including the current status of operation and maintenance, and preventative measures to risks. However, the financial aspects are partially problematic due to the delay in payments to private contractors at the time of the ex-post evaluation, and the uncertainty regarding the prospects for improvement and resolution of the situation. Although the delay in budget distribution did not have any impact on operation and maintenance at the time of the ex-post evaluation, it could be a cause for concern for the continuation of appropriate operation and maintenance in the future. Therefore, the sustainability of the project effects is moderately low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the Ganga Action Plan Project (Varanasi) (hereinafter referred to as “the Project”) was to improve wastewater treatment capacity and sanitation conditions in Varanasi, Uttar Pradesh, by constructing and rehabilitating sewage treatment facilities, constructing sanitation facilities such as community toilets, and implementing sanitation improvement activities such as public awareness program, thereby contributing to the improvement of water quality in the Ganges River and sanitation conditions for citizens, pilgrims, and tourists.

The implementation of this Project, from the time of appraisal to the time of ex-post evaluation, was fully consistent with India's development plan and development needs, and the planning and approach of the Project were appropriate. In addition, the Project was found to be consistent with Japan's development assistance policy and other projects within and outside of JICA, hence the relevance and coherence of the Project are high.

Regarding the outputs, although changes from the plan occurred in each component, the increase or decrease from the plan was not such as to affect the achievement of the Project's outcomes. Although the project cost was within the plan, the project period was much longer than planned, rendering the efficiency of the Project moderately low.

As for project effectiveness, the Project largely achieved its goals in terms of operation and effectiveness indicators related to the improvement of sewerage infrastructure, with the exception of indicators related to water quality in the downstream area of the Ganges River. The qualitative effects and impacts related to the improvement of the sanitation environment were confirmed, and no negative impact of the Project on the natural environment was reported. Therefore, the effectiveness and impact of the Project are high.

Regarding the sustainability, considering the operation and maintenance of the Project, no problems were found in the related policies and systems, institutional/organizational aspect, technical aspect, environmental and social aspect, and risk prevention measures, but the financial situation was partially worrisome because of a delay in the payment of operation and maintenance expenses at the time of the ex-post evaluation, and the prospects for improvement and resolution were uncertain. Therefore, the sustainability of the Project is moderately low.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

With regard to the operation and maintenance of sewerage facilities, it is proposed that NMCG and UPJN review the appropriateness of the operation and maintenance budget allocation process and consider measures to prevent recurrence, as there have been delays of more than one year in the payment of operation and maintenance fees to private contractors. Regarding the future operation and maintenance system, it is also suggested that if the operation and maintenance is outsourced to the private sector, an appropriate structure be established prior to the end of the outsourcing period so that proper operation and management can continue seamlessly after the end of the outsourcing period.

Regarding the maintenance and management of public toilets, some of the community toilets constructed under this Project are not connected to the sewer pipes and using septic tanks. Since untreated sewage spillage and maintenance of septic tanks have become issues, it is proposed that VNN check the current status and examine the measures to be taken.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Multi-component sanitation improvement approach (combining sewerage, non-sewerage, and other components)

The Project was designed and implemented under the master plan of the development study "The Study on Water Quality Management Plan for Ganga River in the Republic of India" with multiple components: a sewerage component, a non-sewerage component (sanitation improvement component), and consulting services (including organizational development). To reduce river pollution and improve environmental sanitation in the city as a whole, it is necessary not only to build infrastructure such as STP, sewers, and pumping stations, but also to stop runoff from other sources of wastewater (open defecation, washing water, etc.), to encourage people to change their attitudes and behaviors, and to improve the capacity of implementing agencies. A multi-pronged approach is effective, and this Project is a good example of such an approach.

Many residents of the local community, as well as hospitals and travel agencies, have realized an improvement in sanitation in the city of Varanasi. The factors contributing to this realization include not only the improvement in the water quality of the Ganges River, but also the change in people's awareness and behavior, such as the reduction of open defecation and littering in the river. These are the results of a multi-component approach that includes awareness-raising activities and the construction of facilities to improve the living environment (construction of toilets and washing facilities, improvement of bathing Ghats, etc.). Under the supervision of VNN, the implementing agency, the sanitation improvement component of the Project was also effective, in that the construction and maintenance of community toilets and awareness-raising activities were outsourced to local NGOs. The construction and maintenance of community toilets was achieved by outsourcing to a local NGO with extensive experience in operating public toilets, and by working with the NGO from the stage of considering the location and specifications of the toilets. Awareness-raising activities were also effectively implemented by partnering with local NGOs with experience in sanitation education and community activities. This suggests that when implementing a multi-component project, it is effective to work with NGOs that have a wealth of experience in working with local communities, especially when implementing the sanitation component of a project.

On the other hand, multi-component projects involve a wide range of implementing agencies/other agencies, and there is a risk of increased complexity in project management, and in fact, this Project experienced significant delays (due to a variety of factors). However, by incorporating different components into one project, it was possible to respond flexibly to construction delays and site changes. When planning similar projects in the future, it will be necessary to establish a smooth project management mechanism while considering a multi-component approach aiming for significant results and impacts.

A brief analysis of other sewerage sector ODA loan projects shows that of the sewerage sector projects planned during the same period as this Project (2005-2010), 77% included organizational development and capacity building as a non-sewerage component (excluding assistance of procurement process and construction supervision), 38% included awareness-raising activities and environmental education, and only 23% worked to improve local sanitation. Looking at projects initiated in recent years (2019-2022), all projects include organizational development and capacity-building, and 75% of the projects include awareness-raising activities and environmental education. On the other hand, few projects included a local sanitation improvement component.

Table 11　Components of ODA loan sewerage infrastructure projects

	Sewerage Sector ODA Loan Projects initiated in 2005-2010	Sewerage Sector ODA Loan Projects initiated in 2019-2022
Number of projects	13	8
a) Incorporates organizational development and capacity-building components	10 (77%)	8 (100%)
b) In addition to a), awareness-raising and environmental education component is incorporated	5 (38%)	6 (75%)
c) In addition to b), local sanitation improvement component is incorporated	3 (23%)	1 (13%)

Source: Created by evaluator based on ex-ante evaluation reports of each project

The projects that incorporate local sanitation improvement component both from the same period as this Project (2005-2010) and from more recent years are projects in India, and they include slum development (transition to metered individual and shared water supply, construction and renovation of toilets, waste management) and construction of sanitation facilities such as electric crematoriums and cattle washing stations, etc.

The Project has contributed to improving people's wellbeing through the synergistic effects of the sewerage component and the sanitation improvement component (see BOX-2), suggesting that it is effective to implement a project directly related to improving local sanitation at the same time as the sewerage facility improvement. The multi-component approach is an approach that has been widely adopted in projects in India based on the policies of the Indian government, but it may also be a useful reference for similar projects in other countries.

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5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

Although the Project experienced significant delays and changes in the executing agency, and did not progress as planned, there was continuous communication between JICA and the executing agency, and an appropriate supervision system was put in place to respond to the changes in the project environment.

5.2 Additionality

None.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs a. Sewerage component	<u>Construction/rehabilitation of STPs</u> ・Construction of Sathwa STP (140MLD) ・Rehabilitation of 2 STPs <u>Construction/rehabilitation of pumping stations</u> ・Construction of 3 pumping stations ・Rehabilitation of 1 main pumping station and 5 Ghats pumping stations <u>Construction/renovation /rehabilitation of sewers</u> ・Construction: 33.2km ・Renovation 7,172m <u>Renovation/rehabilitation of existing irrigation canal</u> ・Total length 18km	・Location of STP was changed (140MLD) ・As planned ・Almost as planned ・As planned ・Construction: 28.8km ・Renovation; 6,905m ・Due to the change in location of the STP, it was no longer necessary to renovate the irrigation canal, and instead a 1.7 km drainage channel was constructed
b. Non-sewerage component	<u>Construction of community toilet complexes</u> ・205 in slum areas, 26 in bathing Ghats <u>Construction/renovation of Dhobi Ghats</u> ・Construction: 7 locations, Renovation 3 locations <u>Public Awareness and Public Participation (PAPP)</u>	・154 in slum communities and urban areas, 26 in bathing Ghats ・Renovation of 26 bathing Ghats ・Construction: 4 locations, Renovation 3 locations ・Almost as planned
c. Consulting services	・Assistance of procurement process, management and supervision of project implementation ・Comprehensive assistance for public health conditions ・Institutional Development Programme (IDP)	・As planned ・As planned ・More comprehensive content was implemented than planned
2. Project Period	March 2005- March 2012 (85 months)	March 2005- June 2022 (208 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency	2,277 million yen 10,971 million yen （4,571 million INR）	No data No data

Total ODA Loan Portion Exchange Rate	13,248 million yen 11,184 million yen 1INR ＝2.4 JPY (As of August 2004)	9,831 million yen 6,194 million yen 1 INR=1.644 JPY (Average between January 2010 and December 2022)
4. Final Disbursement	July 2020	

Republic of India

FY2022 Ex-Post Evaluation Report of

Japanese ODA Loan "New and Renewable Energy Development Project (Phase 2)"

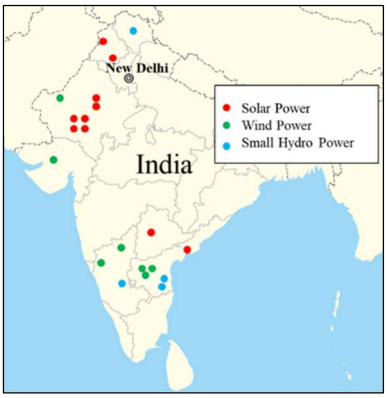
External Evaluator: Keishi Miyazaki, OPMAC Corporation

0. Summary

This project aimed to secure a stable electric supply and to diversify power supply sources to meet the increasing demand for electricity by providing two-step loans, through the Indian Renewable Energy Development Agency (IREDA), to new and renewable energy development projects in India, thereby contributing to improving the environment, achieving sustainable economic growth and mitigating climate change. The project was consistent with the development plan and development needs of India at the time of the appraisal and at the time of the ex-post evaluation. The consistency with Japanese's assistance policy was also confirmed. Although support for the strengthening of IREDA's appraisal system for environmental and social consideration was expected at the time of the appraisal, no directly beneficial support was provided. Besides, assistance in the area of environmental and social consideration was provided by another donor and the overlap of the assistance was avoided, while there was no official coordination between JICA and the other donor. Therefore, the relevance and coherence of the project are high. Since both the project cost and the project period were within the plan, the efficiency of the project is very high. The "installed generation capacity," "capacity factor of generation plants," "energy substitution" and "reduction of CO_2," which were set as the operation and effect indicators of the target sub-projects, were generally achieved against their respective targets. In addition, the project is estimated to have made a certain contribution to securing a stable electricity supply and diversifying the sources of electricity supply in the target states. Furthermore, it is estimated that the project has made a certain contribution to climate change mitigation through the effect of energy substitution and reduction of CO_2 of the project. No negative impacts on the natural environment caused by the project were identified. Land acquisition was carried out in accordance with Indian domestic law, and no resettlement occurred. Therefore, the effectiveness and impact of the project is high. As to the operation and maintenance of this project, no issues were observed in the policy/system, institutional/organizational, technical, financial, or environmental and social aspects; in the response to weather risks affecting the operation of the renewable energy power generation or risks such as non-performing loans; or in the status of operation and maintenance. Therefore, the sustainability of the project effects is very high.

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

1. Project Description



Project Locations
(Source: Evaluator)

Solar power plant eligible for the project
(Source: Evaluator)

1.1 Background

With its recent rapid economic growth, India has seen a rapid increase in demand for electricity with peak-hour demand increasing from 109,000 MW in 2007 to 130,000 MW in 2011. However, efforts to develop electric power have not kept pace with the increase in demand; peak-hour supply in 2011 was only 116,000 MW. India suffered from chronic electricity shortages. With poor oil resources and insufficient natural gas utilization, the country depended on coal-fired power generation for 57% of its power-generating capacity in 2012. On the other hand, the proportion of new and renewable energy was 13% of the country's total power-generating capacity in 2012 and renewable energy was considered to have high development potential. In the *Twelfth Five-Year Plan* (2012-2017), the government of India set out to promote new and renewable energy sources, including the introduction of a feed-in tariff system, in order to simultaneously increase domestic power supply and reduce dependence on fossil fuels. During the period of this plan, the government aimed to develop new power sources to provide 118,536 MW of power, of which 30,000 MW was to be supplied by new and renewable energy.

1.2 Project Outline

The objective of this project is to help India secure a stable electric supply and diversify power supply sources to meet an increasing demand for electricity by providing two-step loans, through IREDA, to new and renewable energy development projects in the country, thereby contributing to improving the environment, achieving sustainable economic growth and mitigating climate change.

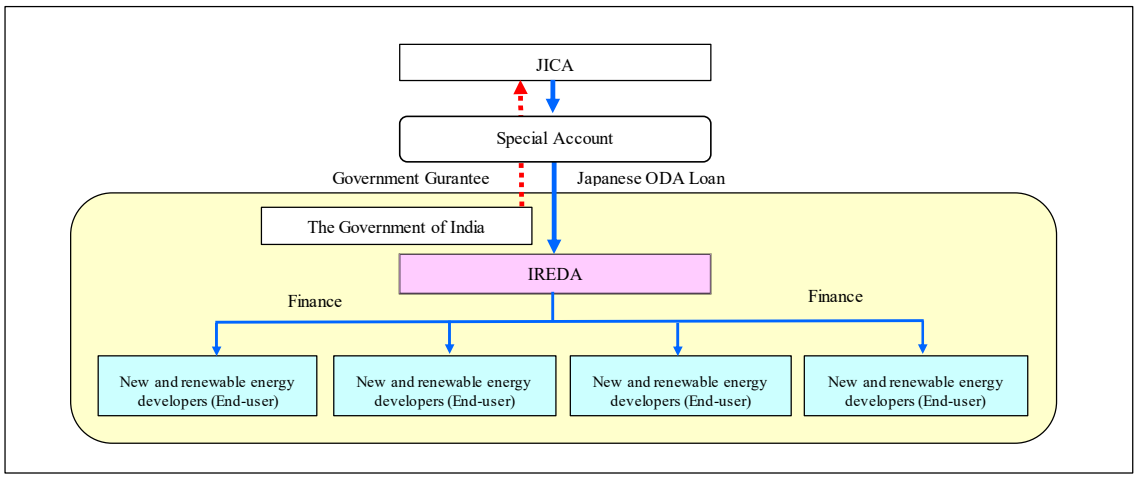
Loan Approved Amount / Disbursed Amount	30,000 million yen / 30,000 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	March 2014 / September 2014	
Terms and Conditions	Interest Rate	0.25%
	Repayment Period (Grace Period	30 years 10 years)
	Conditions for Procurement	General Untied
Borrower / Executing Agency	Indian Renewable Energy Development Agency Limited (IREDA) / IREDA (Guarantor: The President of India)	
Project Completion	March 2020	
Target Area	All India	
Main Contractor (Over 1 billion yen)	N.A.	
Main Consultant (Over 100 million yen)	N.A.	
Related Studies (Feasibility Studies, etc.)	"Special Assistance for Project Implementation: New and Renewable Energy Development Project (Phase 2)" (December 2014 - February 2018)	
Related Projects	"New and Renewable Energy Development Project" (2011-2014)	

[Structure of Financial Intermediary Loan (the Two-Step Loans)]

The Financial Intermediary Loan is a scheme to provide the necessary funds for the implementation of a policy including the promotion of certain sectors, such as small and medium-scale manufacturing and agriculture and the improvement of the livelihoods of the poor, through financial institutions such as development banks under the borrower's policy finance system. It is also called a two-step loan as the process involves two or more financial institutions before the funds are provided for the final beneficiary or end-user. The Financial Intermediary Loan scheme provides finance to a large number of beneficiaries or end-users in the private sector, and supports strengthening of financial institution's skills and development of the financial sector by involving the financial institutions.

This project was designed to provide the necessary funds for new and renewable energy

developers (end-users) in the private sector through IREDA, a government-affiliated financial institution, in order to promote new and renewable energy development in India. In this ex-post evaluation, the renewable energy development projects which were financed are referred to as sub-projects and their owners, borrowers, as end-users.



Source: drawn by the evaluator referring to sources provided by JICA

Figure 1 Funds Flow of a Two-Step Loan using a Special Account

2. Outline of the Evaluation Study

2.1 External Evaluator

Keishi Miyazaki, OPMAC Corporation

2.2 Duration of Evaluation Study

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

Duration of the Study: September 2022-November 2023

Duration of the Field Study: November 27-December 20, 2022, April 10-13, 2023

2.3 Constraints during the Evaluation Study

Of the 21 sub-projects eligible for financing through IREDA under the project, one sub-project was treated as a non-performing loan because the power plant was sold to another operator following the bankruptcy of the parent company of the end-user. IREDA has not received any monitoring information, including that on the status of plant operation, from the current owner of the plant. As 12 of the sub-projects were fully repaid before the loan repayment deadline for each sub-project and their loan agreements with IREDA were terminated, IREDA did not carry out any monitoring on these 12 sub-projects after the completion of repayment, including the collection of performance data on operational and effectiveness indicators. The remaining 8 sub-projects were continuing to make repayments to IREDA while operating their power plants at the time of

ex-post evaluation. In light of the above, this ex-post evaluation made an assessment of effectiveness based on the performance data of the operational and effectiveness indicators that IREDA obtained from the end-users.

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance/Coherence (Rating: ③[2])

3.1.1 Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of India

At the time of the appraisal, the *Twelfth Five-Year Plan* (2012 to 2017) aimed to develop new power sources to provide 118,536 MW of electricity, of which 30,000 MW (25%) was planned to be supplied by new and renewable energy, in order to simultaneously increase domestic electricity supply and reduce dependence on fossil fuels. The Ministry of New and Renewable Energy aimed to develop 21,700 MW of New and Renewable Energy through the *Strategic Plan for New and Renewable Energy Sector 2011-2017*.

At the time of the ex-post evaluation, although the government of India had not formulated a Five-Year Plan, at the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) in 2021, the government had announced a target to increase its non-fossil energy generation capacity to 500 GW by 2030 and to meet 50% of its energy needs from renewable sources. The Ministry of New and Renewable Energy launched the Green Energy Corridor in 2015 to establish a mechanism for the interchange over a wide are of electricity generated in states with potential for the development of renewable energies by strengthening intra-state and inter-state transmission systems and has decided to implement the second phase of the project covering 2022-2025 for the development of the transmission network.

As mentioned above, the project was consistent with the development policy of the government of India at the time of the appraisal and ex-post evaluation.

3.1.1.2 Consistency with the Development Needs of India

At the time of the appraisal, as stated in "1.1 Background," India was experiencing chronic power shortages because development of the power supply had not matched the rapid increase in demand for electricity as the country's economy rapidly grew. The proportion of new and renewable energy was only around 10% because India's power supply capacity depended heavily on coal-fired power generation. Meanwhile, the development potential of new and renewable energies was high and there was the necessity for the development of new and renewable energy sources in order to increase the capacity for electricity generation and

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory.
[2] ④: Very High, ③: High, ②: Moderately Low, ①: Low.

promote the diversification of energy sources.

At the time of the ex-post evaluation, according to the Ministry of Power, the gap between electricity supply and demand in the whole of India had gradually been reduced from 3.6% in FY 2014/2015 to 0.4% in FY 2021/2022. However, there was still a slightly negative gap between supply and demand. Compared to FY 2014/2015, the gap between supply and demand during peak periods has improved, although in FY 2020/2021 a certain gap between supply and demand was observed (Table 1 and Table 2). This caused power outages and restrictions on electricity use in some regions and industries and by time of day.

Table 1 Energy Requirement and Availability (Amount of Power)

Year	Energy Requirement ①	Energy Availability ②	Energy Shortage (②－①)	
	MU	MU	MU	%
2014/15	1,068,923	1,030,785	-38,138	3.6
2015/16	1,114,408	1,090,850	-23,558	2.1
2016/17	1,142,929	1,135,334	-7,595	0.7
2017/18	1,213,326	1,204,697	-8,629	0.7
2018/19	1,274,595	1,267,526	-7,070	0.6
2019/20	1,291,010	1,284,444	-6,566	0.5
2020/21	1,275,534	1,270,663	-4,871	0.4
2021/22	1,379,812	1,374,024	-5,787	0.4

Table 2 Peak Demand and Peak Met (Power Output at Peak)

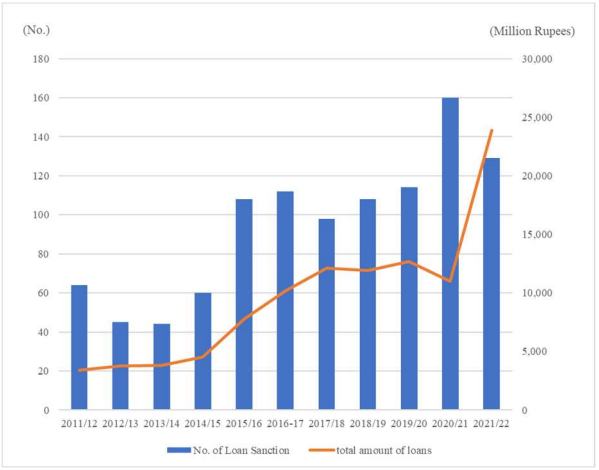
Year	Peak Demand ①	Peak Met ②	Peak Shortage (②－①)	
	MW	MW	MW	%
2014/15	148,166	141,160	-7,006	4.7
2015/16	153,366	148,463	-4,903	3.2
2016/17	159,542	156,934	-2,608	1.6
2017/18	164,066	160,752	-3,314	2.0
2018/19	177,022	175,528	-1,494	0.8
2019/20	183,804	182,533	-1,271	0.7
2020/21	190,198	189,395	-802	0.4
2021/22	203,014	200,539	-2,475	1.2

Source: made by the evaluator referring to annual reports issued by the Ministry of Power
Note 1: 1 MU (Mega Unit) = 1 GWh = 1,000 MWh

At the time of the ex-post evaluation, 57.5% of the total installed power generation capacity in India was by fossil-fuel power plants (51.3% of which were coal fired power plants) and of India's total generation capacity of 393.39 GW, 151.39 GW was from renewal power sources (Hydro 46.51 GW, Small Hydro 4.84 GW, Wind 40.08 GW, Bio-energy 10.17 GW, Waste Power 0.43 GW, Solar 49.37 GW) which was 38.5% of total installed power capacity (as of December 2021). Although the above-mentioned *Twelfth Five-Year Plan* set the target to increase the proportion of renewable energy sources in power generation capacity from 12% in 2012 to 33% in 2030, this target has been achieved earlier than planned, which indicates that the introduction of renewable energy had progressed faster than the plan. In addition, according to the Ministry of New and Renewable Energy, there is the potential to develop 750 GW of solar power, 695 GW of wind power (at 120m above ground), 42.3 GW of biomass power and 21.1 GW of small hydro power. There is still a need to strengthen efforts in renewable energy generation.

Compared to the time of appraisal, access to financial services for renewable energy projects has improved considerably. As the renewable energy market in India has matured, not only the support of the government of India, such as through loans and subsidy programs for renewable energy related projects, but also private financing services for the market have expanded. However, even under these circumstances, IREDA has continued to increase the number of

loan sanctions and the total amount of loans since 2014, set interest rates at the same level as private sector financial institutions and actively developed new financial products and services, such as financing rechargeable battery storage systems, green hydrogen and electric vehicle production (Figure 2). Therefore, it is confirmed that there was still the need for IREDA to support new and renewable energy development projects conducted by the Indian private sector at the time of ex-post evaluation.



Source: IREDA Annual Reports

Figure 2 IREDA's Number of Loan Sanctions and the Total Amount of Loans

From the above it can be seen that the development needs for renewable energy were consistently high at the time of the appraisal and at the ex-post evaluation and thus that there was consistency between the project and India's development needs.

3.1.1.3 Appropriateness of the Project Plan and Approach

At the time of the appraisal, as the renewable energy market in India was not bankable and was considered relatively risky, there was limited financing available for the market from private financial institutions. Under such circumstances, IREDA, a government-owned financial institution, was mandated to provide long-term and low interest loans to renewable energy developers with the aim of promoting new and renewable energy development projects in India. As this project aimed to provide funds necessary for renewable energy development projects to private-sector developers through IREDA, using the scheme of the two-step loan, thereby promoting the power supply development using renewable energies and securing a stable electric supply in India, the project approach was appropriate.

In addition, the Special Assistance for Project Implementation (SAPI) was conducted from December 2014 to February 2018 in collaboration with the project in order to strengthen the capacity of IREDA to operate and manage the information database for sub-project monitoring and evaluation, Non-Performing Loan (NPL) management, marketing and public relations. The support provided by the SAPI contributed to facilitating the operation of not only the sub-projects covered by the project but also that of IREDA as a whole. Therefore, the project plan and approach in conjunction with the SAPI were appropriate.

During the project period, the loans of 12 out of 21 eligible sub-projects were fully paid

before the repayment due date. This could be attributed to cases where end-users refinanced their loans from IREDA to private financial institutions after the construction of the power generation facilities was completed and their operation started, fully repaying the loans from IREDA. According to IREDA, the reason for early repayment by end-users has been that they consider the period from project formulation to construction to be of high business risk. Therefore, end-users prefer loans from IREDA. However, once the construction of a facility is completed and stable operation has started, the business risk is lowered. Therefore, end-users refinance with private financial institutions that offer lower interest rates than IREDA, allowing early full repayment to IREDA. Considering the provision of the finance necessary for the early stage of the project and the risk sharing and mitigation with end-users, it is worthwhile for IREDA, as a government owned financial institution with a public duty to support the private sector, to provide the financial support for renewable energy development projects. According to the end-users interviewed in this ex-post evaluation, good communication has been maintained between IREDA and end-users through opportunities for project monitoring by IREDA, including visits to power generation facilities, and through regular end-user project progress reports to IREDA. Moreover, IREDA's technical advice to end-users is highly valued.

The ex-post evaluation of the "New and Renewable Energy Development Project (2011-2014)" which preceded this project, showed lessons learned on the need for the implementing agency to establish a system for directly monitoring sub-projects. Based on this, the SAPI was implemented in conjunction with the project to strengthen IREDA's monitoring capacity. It can be concluded that in this sense the project reflected and utilized the lessons learned from the preceding project, which contributed to the smooth implementation of the project and the achievement of the project objective.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

At the time of the appraisal, "Improvement of the Poverty and Environment issues" was a high-priority goal of the *Country Assistance Program for India* (2006) which stated that assistance for new and renewable energy would be provided. The *JICA Country Analysis Paper for India* (March 2012) assigned high importance to "support for measures related to the environment and climate change." This was very important for India, which is increasingly dependent on foreign energy resources, to promote the introduction of renewable energy as an energy policy and for Japanese companies to utilize their knowledge and technology. As illustrated, this project is consistent with these polices. In addition, in response to the growing global interest in environmental issues, the government of Japan has actively supported India's environmental and energy policies though the India-Japan Energy Forum, the Japan-India Energy Dialogue and the Joint Statement of Japan-India Summit

Meeting. Therefore, this project is consistent with Japan's ODA policy.

3.1.2.2 Internal Coherence

The implementation of assistance to strengthen IREDA's capacity to monitor environmental and social consideration was expected at the time of the appraisal. However, at the time of the ex-post evaluation, it was confirmed that this assistance had not been implemented. However, as assistance for the area of environmental and social consideration was provided by other doners, duplication of assistance was avoided. In addition, no synergies or interlinkages between this assistance and JICA's electricity transmission and distribution development project were verified in the project states.

3.1.2.3 External Coherence

Although collaboration between JICA and other donors was not expected at the time of the appraisal and it did not take place during the project implementation period, it was confirmed that each doner provided assistance based on its objective and priority areas taking into account the position of IREDA. As a result, there was no overlap between doners.

Consistency with the development plan and development needs was recognized at the time of the appraisal and at the time of the ex-post evaluation. The project was also consistent with Japan's development cooperation policy at the time of the appraisal. Meanwhile, the assistance to strengthen IREDA's capacity to monitor environmental and social consideration which was envisaged at the time of the appraisal was not conducted and although there was no overlap in cooperation or areas of assistance between doners, there was no formal form of collaboration between JICA and other doners; therefore, no internal or external coherence was recognized.

Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ④)

3.2.1 Project Outputs

The financial scheme of this project, as shown in Figure 1, is in the form of a two-step loan, comprised of a loan by JICA to IREDA and IREDA's lending for eligible sub-projects according to JICA requirements. The sectors eligible for financing set at the time of the appraisal were photovoltaic and solar thermal power generation projects, wind power projects, small-scale hydropower projects (less than 30 MW), cogeneration (using bagasse) projects (less than 30 MW) and biomass power projects (less than 30 MW).

Under the project, 21 sub-projects were eligible for IREDA's financing, as shown in Table 3. Of these, 10 projects were photovoltaic power generation projects, 7 projects were wind power projects and 4 projects were small-scale hydropower projects. As for the loan terms and

conditions for the sub-projects, throughout the project period, IREDA reduced interest rates and extended the repayment period in accordance with market trends. However, the basic loan terms and conditions have not changed since the time of appraisal. According to IREDA, the reduction in interest rates and extensions of repayment period were made through the managerial efforts of IREDA.

When a loan application is submitted to IREDA by an end-user, the group in charge of each sub-sector (solar, wind, small hydro, or the like) of the technical-service department starts appraisal based on the eligibility criteria for financing loans. In addition, the finance department confirms the credit risk rating of the end-user and other financial aspects. Finally, after the technical service department conducts a technical review, including market and business risk analysis, and checks the status of environmental clearance, IREDA decides whether or not to approve the loan.

At the time of the ex-post evaluation, it was confirmed that IREDA had properly implemented appraisals for each sub-project in accordance with the screening procedure, had confirmed the acquisition of various government permits and approvals, including environmental clearances, and had monitored the utilization status of facilities and financial status during the construction and project implementation period.

Table 3 Number of Eligible Sub-Projects and Loan Condition

Project Type	No.	Loan Condition					
		(Appraisal and Actual) June 2012		(Actual) December 2015		(Actual) May 2017	
		Interest Rate	Repayment Period	Interest Rate	Repayment Period	Interest Rate	Repayment Period
Solar Power	10	12.25% -13.00%	5-10 years	10.20% -11.40%	Maximum 10-15 years	9.80% -11.00%	Maximum 10-15 years (Hydro power 20 years)
Wind Power	7	11.90% -12.50%		10.20% -11.40%		9.80% -11.00%	
Small Hydro Power	4	11.90% -12.25%		10.20% -11.70%		10.35% -11.50%	

Source: IREDA

As the project is a sovereign loan[3], the guarantee fee is charged by the government of India in the process of funding IREDA. On the other hand, some other doners provided non-sovereign loans[4] directly to IREDA, which has reduced the financing cost for IREDA and end-users. IREDA therefore indicated that it expects JICA to consider providing non-sovereign loans if JICA loans are available in the future. In addition, under the yen loan project, the borrower pays 0.02% of the loan amount to JICA as a Front-End Fee[5] after signing of the Loan Agreement. However, IREDA requested that JICA consider allowing the Front-End Fee to be paid in

[3] Loan guaranteed by the government of the borrowing country; in principle Japanese ODA loans are sovereign loans.
[4] Loan not guaranteed by the government of the borrowing country.
[5] Font-End Fee is a fee to be paid by the Borrower to JICA, when the provision of Japanese ODA loans starts.

instalments during the disbursement period due to the temporary large burden on the borrower. Furthermore, currently yen loans are denominated in either JPY or USD, but as the borrowing countries bear a heavy burden of foreign exchange risk, IREDA has requested that JICA consider loan agreements in local currency.[6]

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned total project cost was 33,060 million yen (of which the yen loan was 30,000 million yen), and the actual total cost was 33,060 million yen (of which the yen loan was 30,000 million yen), which was within the plan (within 100% of the plan).

Table 4 Project Cost (Plan/Actual)

Unit: million yen

Item	Plan (2014)		Actual (2020)	
	Total	Of which ODA Loan	Total	Of which ODA Loan
Provision of Finance	30,000	30,000	30,000	30,000
Front-End Fee	60	0	60	0
Administration Cost	3,000	0	3,000	0
Total	33,060	30,000	33,060	30,000

Source : JICA and IREDA

Note: As for Administration cost, since it was difficult to obtain the exact amount from IREDA, approximately 10% (3,000 million yen) of the loan amount was deemed to have been financed from the IREDA budget.

3.2.2.2 Project Period

The timing of project completion was defined as the last disbursement by JICA to IREDA. At the time of the appraisal, the project was expected to last from April 2014 to March 2020 (72 months) but the actual period was from September 2014 to March 2020 (66 months), so the project was completed six months earlier than the plan (91% of the planned period). Although the effectuation of the Loan Agreement was delayed by eight months, from April 2014 to December 2012, due to the time needed for the approval process between the two governments, the project was still completed within the plan. The reason why the project period was shortened and the project was completed within the planned period was that the need for funds in the Indian renewable energy sector rapidly increased from FY 2014/2015 to FY 2017/2018 and IREDA's raising funds alone from private financial markets could not keep up with the financial needs. Appraisal and sanction of the sub-project loans that were eligible for ODA loans were conducted earlier than had been expected. As a result, the project had lent up to the maximum loan limitation of 30,000 million yen by March 2020.

In light of the above, it is clear that both the project cost and project period were within the plan. Therefore, efficiency of the project is very high.

[6] The provision of non-sovereign loan, the payment of Front-End Fee and loan agreement in currencies other than yen and US dollar are matters that require institutional changes to the Japanese ODA loans.

3.3 Effectiveness and Impacts[7] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of the appraisal, the operation and effect indicators were "maximum power output," "capacity factor of generation plants," "energy substitution," and "reduction of CO_2." Target values were set at the time of the sanctioning of each sub-project, because the sub-projects to be targeted had not been identified at the time of the appraisal. IREDA conducted monitoring on a quarterly basis by means of collecting and reviewing a monitoring report from end-users, which included the actual values of the four operation and effect indicators. However, as IREDA did not sufficiently instruct the end-users in the method of calculating "energy substitution" and "reduction of CO_2," it became clear that the actual values for these in the monitoring reports had not been calculated properly in terms of consistency and reliability. Therefore, in this ex-post evaluation, the actual values were estimated by the evaluator based on the formulas used in the SAPI, and the achievement of effectiveness was analysed.

(1) Maximum power output (MW)

At the time of the appraisal "maximum power output (MW)" was set as one of the operation and effect indicators; however "installed generation capacity" was stated in the financing appraisal document and in the monitoring reports of each sub-project, instead of "maximum power output;" moreover, in the ex-post evaluation of the preceding project (Phase 1) "maximum power output" was synonymous with "installed generation capacity." Therefore, also in the ex-post evaluation, "maximum power output" was regarded as synonymous with "installed generation capacity," based on confirmation with IREDA; and achievement was analysed by comparing the target value of installed generation capacity set at the time of the financing appraisal for each sub-project and the actual value at the time of the ex-post evaluation. For the 12 sub-projects, repayment was completed before the scheduled repayment date, and therefore, the actual values at the time of the completion of repayment were compared with the target values (Table 5).

As shown in Table 6, as for maximum power output (synonymous with installed generation capacity), 19 of 21 eligible sub-projects were mostly achieved as planned, while 2 remained unverified. The reasons for this were that one sub-project was under a Non-Performing Loan (NPL), and that the other one completed repayment by December 2014, prior to the repayment due date, which made it difficult for IREDA to obtain the actual value of "installed generation capacity."

[7] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 5 Installed Generation Capacity of Each Sub-Project

Name of State	Name of End-User	Project Type	Installed Generation Capacity (MW)	
			Target	Actual
			At the time of Appraisal of Each Sub-project	At the time of Ex-post evaluation or Repayment Completion
Punjab	Allianz Ecopower	Solar	2.0	2.0
	Abundant Energy	Solar	2.0	2.0
Himachal Pradesh	Cosmos Hydropower	Small Hydro	19.8	19.8
Rajasthan	Tanot Wind Power Venture	Wind	120.0	120.0
	Azur Green Tech	Solar	40.0	40.0
	Azur Sun Shine	Solar	20.0	20.0
	Heramba Renewable	Solar	20.0	20.0
	Aalok Solar Farms	Solar	10.0	10.0
	Abha Solar Farms	Solar	10.0	10.0
	Shreyas Solar Farms	Solar	20.0	20.0
Karnataka	Greenenergy Wind	Wind	16.0	16.0
	Renew Wind Energy	Wind	50.4	un-verified
	Sri Maruthi Powergen	Small Hydro	18.9	18.9
Gujarat and Karnataka	Mahidad Wind Energy	Wind	63.2	un-verified (Uncompleted)
Andhra Pradesh	Photon Solar Power	Solar	5.0	5.0
	Balaji Energy	Small Hydro	3.0	3.0
	Balaji Energy	Small Hydro	8.0	8.0
	Ostro Andra Wind	Wind	98.7	98.7
	Ostro Wind	Wind	98.7	98.7
	Vayu Urja Bharat	Wind	120.0	120.0
Telangana	Maheswari Mining and Energy	Solar	10.0	10.0

Source: IREDA
Note 1: the target values were set at the time of the appraisal of each sub-project. The actual values are the installed capacity at the time of the ex-post evaluation or repayment completion. Although the Loan Agreement was signed in September 2014, Renew Wind Energy Corporation completed repayment in December 2014, and therefore IREDA did not keep any monitoring record of actual values.
Note 2: Although Mahidad Wind Energy Corporation had installed a part of the wind power plant by December 2019, at the time of the ex-post evaluation all facilities were still incomplete, and the corporation was under NPL.

Table 6 Operation Indicator (Maximum Capacity (= Installed Generation Capacity) of Each Sub-Project)

Achievement Status of Installed Generation Capacity	No. of Sub-Projects
Target was achieved beyond plan (criteria: over 100%)	0
Target was achieved mostly as planned (criteria: between 70% and 100%)	19
Target was achieved to some extent (criteria: 50% or more and less than 70%)	0
Target was poorly achieved (criteria: below 50%)	0
Un-verified	2
(breakdown) It is difficult to obtain actual values because the end-user was under NPL.	1
It is difficult to obtain actual values because the end-user completed repayment in December 2014.	1

Source: IREDA

(2) Capacity factor of generation plants (%)

The achievement was analysed by comparing the target value of the capacity factor of generation plants set at the time of the appraisal for each sub-project and the actual values for the most recent

year that was available at the time of the ex-post evaluation (Table 7).

Table 7 Operation Indicator (Capacity Factor of Generation Plants)

Name of State	Name of End-User	Type of Project	Time of Commencement	Time of Repayment	Target	Actual					
					At the Time of the Appraisal of Each Sub-project	Period of Operation of Power Generation Plant					At the Time of the Ex-post Evaluation
						Dec. 2016	Dec. 2017	Dec. 2018	Dec. 2019	Mar. 2020	Dec. 2022
Punjab	Allianz Ecopower	Solar	2015.03	2021.04	18.21	16.44	16.98	16.23	13.03	15.57	Re-payment
	Abundant Energy	Solar	2015.03	2021.09	18.86	15.05	15.98	Not submitted	13.11	13.38	Re-payment
Himachal Pradesh	Cosmos Hydropower	Small Hydro	2022.09		56.67						46.00
Rajasthan	Tanot Wind Power Venture	Wind	2015.12	2016.09	23.60	Un-verified	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Azur Green Tech	Solar	2015.5	2017.08	19.50	18.82	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Azur Sun Shine	Solar	2015.5	2017.08	19.50	18.60	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Heramba Renewable	Solar	2017.10	2020.12	23.91		Un-verified	26.42	17.53	26.42	Re-payment
	Aalok Solar Farms	Solar	2017.11	2021.12	23.86		Un-verified	26.71	17.90	26.69	Re-payment
	Abha Solar Farms	Solar	2017.10	2022.12	23.86		Un-verified	26.68	17.85	26.69	Re-payment
	Shreyas Solar Farms	Solar	2017.11	2023.12	24.04		Un-verified	26.57	17.05	26.60	Re-payment
Karnataka	Greenenergy Wind Corporation	Wind	2014.12		23.44	Un-verified	Not submitted	21.84	26.75	10.80	19.89
	Renew Wind Energy	Wind	2013.05	2014.12	23.56	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment	Re-payment
	Sri Maruthi Powergen	Small Hydro	2019.05		36.70		Un-verified	Under construction	9.00	—	16.93
Gujarat and Karnataka	Mahidad Wind Energy	Wind	2017.03		26.13		Un-verified	Un-verified	19.02	Un-completed	NPL
Andhra Pradesh	Photon Solar Power	Solar	2015.11		20.78		20.60	Not submitted	18.50	18.72	15.06
	Balaji Energy	Small Hydro	2017.11	2018.8	31.13		Un-verified	Re-payment	Re-payment	37.00	Re-payment
	Balaji Energy	Small Hydro	2017.12		32.36		Un-verified	Not submitted	20.00	27.72	Re-payment
	Ostro Andra Wind	Wind	2017.03		29.70		Not submitted	15.80	19.60	9.00	26.13
	Ostro Wind	Wind	2017.03		32.20		Not submitted	16.00	21.69	10.00	27.37
	Vayu Urja Bharat	Wind	2017.12		34.00				25.17	10.90	25.90
Telangana	Maheswari Mining and Energy	Solar	2016.03		19.50		19.81	18.04	16.40	22.00	Not submitted

Source: IREDA

Note 1: Monitoring reports for the project were prepared by IREDA every six months. However, the actual values of the reports submitted in December are described in the table above. The actual values of the reports submitted in June were also taken into account for the evaluation of the effectiveness of the project.

Note 2: Target values of each sub-project were set at the time of the appraisal of each sub-project.

Note 3: Boxes marked with a "diagonal line" are those where there was no record prior to the installation of the power plant. "Not submitted" are those where no submission was made to IREDA by the end-user. "Un-verified" are those that were left blank in the monitoring report.

Note 4: The capacity factor of Mahidad Wind Energy Corporation as of December 2019 indicated the capacity factor generated from the partially completed power plant and not the capacity factor generated from maximum installed capacity as set at the time of the appraisal of the sub-project. At the time of the ex-post evaluation, the plant was under NPL management.

Regarding the capacity factor of generation plants, as shown in Table 8, 6 of 21 eligible sub-projects were achieved, 11 sub-projects were almost achieved as planned, 2 sub-projects were not achieved, and 2 sub-projects were not verified. The reasons for non-achievement were that the one sub-project did not generate power after completion of the construction of the facility and made repayment before the repayment date in September 2016; and that the other sub-project reduced the volume of power generation due to a fault in the transmission line between the power plant and the substation where the distribution company was responsible for maintenance and operation. The reasons for the un-verified sub-projects were that one sub-project was under a Non-Performing Loan (NPL) and the other one completed repayment by December 2014 prior to the repayment due date, which made it difficult for IREDA to obtain the actual value of the "installed generation capacity."

Table 8 Operation Indicator (Capacity Factor of Generation Plants)

Achievement Status of Capacity Factor of Generation Plants	No. of Sub-Projects
Target was achieved beyond plan (criteria: over 100%)	6
Target was achieved mostly as planned (criteria: between 70% and 100%)	11
Target was achieved to some extent (criteria: 50% or more and less than 70%)	0
Target was poorly achieved (criteria: below 50%)	2
(breakdown) No power was generated after the commissioning (made repayment in September 2016)	1
Fault in the transmission line between the power plant and substation	1
Un-verified	2
(breakdown) It was difficult to obtain actual values because the end-user was under NPL.	1
It was difficult to obtain actual values because the end-user completed repayment in December 2014.	1

Source: IREDA

Note: For sub-projects currently under repayment, the achievement status was checked based on actual values at the time of the ex-post evaluation, and for sub-projects that had been repaid before the scheduled repayment date, the achievement status was checked based on actual values for the most recent year available.

(3) Energy substitution (tons of oil equivalent/year) and reduction of CO_2 (t-CO_2 equivalent/year)

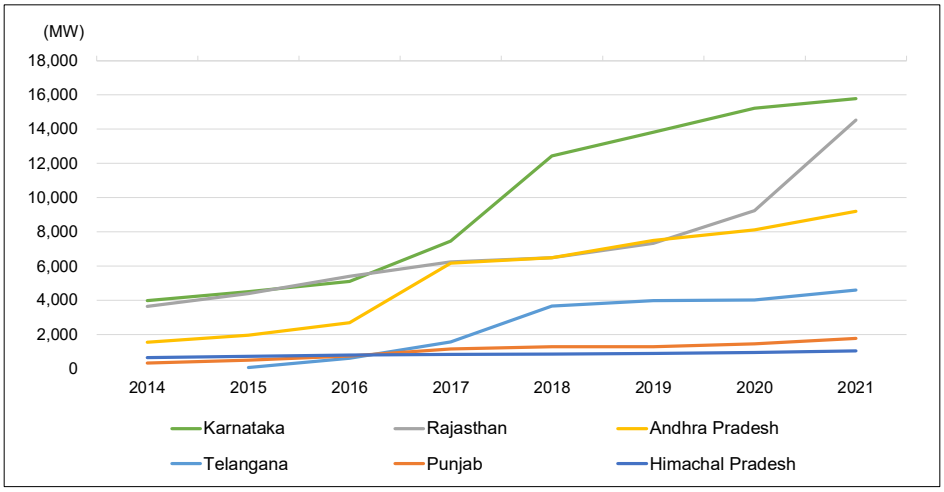
In this ex-post evaluation, the achievement was analysed by calculating and comparing the target and actual values for the "capacity factor of generation plant" set at the time of the appraisal of each sub-project, based on the formulae[8] used in the SAPI for "energy substitution" and "reduction of CO_2." Therefore, for "energy substitution" and "reduction of CO_2," as shown in Table 8, which indicates the achievement of the capacity factor of generation plants, 6 of 21 eligible sub-projects were achieved, 11 sub-projects were almost achieved as planned, 2 sub-projects were not achieved, and 2 sub-projects were not verified. The reasons for non-achievement are the same as those for the non-achievement of the "capacity factor of generation plants."

[8] Energy substitution = 85.98 (toe/year) × Installed Capacity × Capacity Factor × 24 (hrs) × 365 (days)/1000
Reduction of CO_2 = 2.26 ×85.98 (toe/year) × Installed Capacity × Capacity Factor × 24 (hrs) × 365 (days)/1000
In both formulae, 85.98 is the conversion factor for energy substitution and 2.26 is for the reduction of CO_2.

3.3.1.2 Qualitative Effects (Other Effects)

(1) Ensuring a stable electricity supply to meet increasing electricity demand

Reviewing the renewable energy power-generation capacity in the project states from the time of the appraisal to the time of the ex-post evaluation, it was found that it had increased in all states, as shown in Figure 3. In addition, the supply- demand gap for electricity narrowed significantly between FY 2016 and 2017 in all states except Himachal Pradesh, as shown in table 9. It is considered that the increase in the renewable energy generation capacity has contributed to narrowing the supply – demand gap in the project states. Around the same time, the sub-projects financed by the project started generation (Table 10). Therefore, it is assumed that the project had a certain effect on improving the supply – demand gap and ensuring a stable electricity supply in the project states.



Source: Ministry of Statistics and Programme Implementation (MOSPI) and Central Electricity Authority (CEA).

Figure 3 Renewable Energy Generation Capacity in the Project States (MW)

Table 9 Power Supply-Demand Gap in the Project States

Unit: Net Core Units = 10 MU

Name of State	2014	2015	2016	2017	2018	2019	2020	2021
Punjab	△155	△155	△342	0	3	△1	△7	△44
Himachal Pradesh	7	△9	△7	△5	△23	△7	△6	△3
Rajasthan	△768	△211	△63	△59	△20	△6	△10	△50
Karnataka	△459	△437	△593	△17	△6	0	△2	△2
Andhra Pradesh	2984	587	△393	△9	6	△4	0	△19
Telangana		△961	△308	△8	△27	△1	△1	△2

Source: Reserve Bank of India

Note 1: 1 MU= 1MW × 24(hrs) × 365(days) × Capacity factor/1,000.

Note 2: Data was not available for Telangana state in 2014, because Telangana state split from Andhra Pradesh state in June of that year.

Note 3: Numbers in the table show the power supply capacity against power demand and △ indicates an electricity shortage.

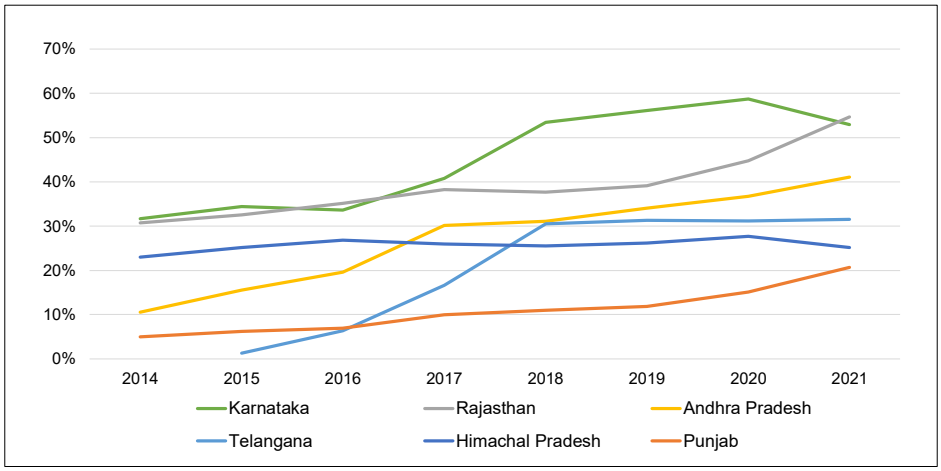
Table 10 Timing of Commencement of Sub-Projects in Target States

Year	No. of Commencements	Project States
FY 2013	1	Karnataka (1)
FY 2014	3	Karnataka (1), Punjab (2)
FY 2015	5	Rajasthan (3), Telangana (1), Andhra Pradesh (1)
FY 2016	4	Andhra Pradesh (2), Gujarat and Karnataka (2)
FY 2017	7	Rajasthan (4), Andhra Pradesh (3)
FY 2018	0	
FY 2019	1	Karnataka (1)
FY 2022	1	Himachal Pradesh (1)

Source: Evaluator

(2) Diversification of electricity supply sources

The proportion of renewal energy generation capacity to the total installed power generation capacity increased in all project states, as shown in Figure 4. It can be considered that there has been a shift from a power supply dominated by thermal power generation to a power supply incorporating renewable energy, which indicates that diversification of electricity supply sources has progressed. As shown in Table 11, in FY 2020, in Andhra Pradesh, the electricity capacity generated by sub-projects accounted for 7.76% and 6.76% of the total installed capacity of Wind and Small hydropower respectively. In Rajasthan, the sub-projects financed by the project also accounted for 2.34% and 2.79% of the total installed capacity of solar and wind, respectively. In light of the above, it can be assumed that sub-projects in project states financed by the project had a certain impact on the diversification of electricity supply sources.



Source: MOSPI and CEA

Figure 4 Percentage of Electricity Generation Capacity from Renewable Energy Sources out of Total Electricity Generation Capacity in the Target States

Table 11 Degree of Contribution to Power Source Diversification by the Project in the Target States (FY 2020)

State	Type of Power	Entire State (MW)	By Sub-Projects (MW)	Degree of Contribution
Punjab	Solar	947.1	4.0	0.42%
Himachal Pradesh	Small Hydro	911.5	19.8	2.17%
Rajasthan	Solar	5137.1	120.0	2.34%
	Wind	4299.7	120.0	2.79%
Karnataka	Wind	4790.6	16.0	0.33%
	Small Hydro	1280.7	18.9	1.48%
Andhra Pradesh	Solar	3610.0	5.0	0.14%
	Wind	4092.4	317.4	7.76%
	Small Hydro	162.1	11.0	6.79%
Telangana	Solar	3620.7	10.0	0.28%

Source: Calculated by the evaluator based on documents from MOSPI and the monitoring reports from IREDA
Note: Contribution degree = Installed generation capacity of sub-projects in each of the target states (by type of generation) / Installed generation capacity in each state (by type of generation)

3.3.2 Impacts

3.3.2.1 Intended Impacts

(1) Qualitative effect

At the time of the appraisal, environmental improvement, sustainable economic development and climate change mitigation were assumed as impacts. At the time of the ex-post evaluation, for the 19 sub-projects for which "capacity factor of generation plants" was verified, the cumulative total of energy substitution and the reduction of CO_2 were calculated from the month following the date of commissioning until FY 2022. For some sub-projects that had made prepayment prior to the repayment date, it was assumed that the capacity factor of the generation plants had remained unchanged between the final year for which actual value was obtained and the time of the ex-post evaluation. As a result, it is estimated that the sub-projects under the project have generated an energy substitution of about 410,000 oil equivalent tonnes and a reduction of CO_2 of about 119.6 million CO_2 equivalent tonnes. Therefore, the project has made a certain contribution to environmental improvement and climate change mitigation.

Table 12 Effect Indicator (Energy Substitution and Reduction of CO_2)

Indicator	Estimated Value
Energy substitution	410,000 oil equivalent tonnes
Reduction of CO_2	119.6 million CO_2 equivalent tonnes

Source: calculated by the evaluator based on actual values of capacity factor of each sub-project provided by IREDA

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Environment

The Project was classified as Category FI under the JICA Guidelines for Environmental and Social Considerations (April 2010), as sub-projects could not be identified before approval for JICA loans and such sub-projects are estimated to have an environmental impact.

According to IREDA, when a loan application is submitted by a renewable energy developer, IREDA officials visit the proposed project site to check the necessary permits and approvals, the environmental and social situation of the project site, and the status of end-user's actions for necessary consideration and environmental monitoring plans, based on the environmental screening check list. In addition, IREDA officials also visit project sites to check whether there has been any negative environmental and social impact during appraisal, construction, commissioning, and completion of the loan agreement. A total of 21 sub-projects under the project were not classified as Category A under the JICA Guidelines for Environmental and Social Considerations and were not expected to have negative environmental or social impacts. Moreover, the results of regular monitoring by IREDA were submitted properly to JICA and it was confirmed that no negative environmental or social impacts had occurred during the loan period of each sub-project.

(2) Resettlement and Land Acquisition

The results of the evaluation of the environmental screening checklist and interviews with IREDA officials during the ex-post evaluation showed that none of the 21 sub-projects under the project included resettlement. It was also confirmed that each end-user had properly acquired land for project sites in accordance with the relevant national laws of India, and that there were no particular problems regarding land acquisitions.

(3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights

As for Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights, it was confirmed that there was no negative impact from the project. The sub-projects visited by the evaluator during the ex-post evaluation actively employed local people as labourers during the construction of the power plant facilities, as well as facility maintenance staff, security guards and drivers. As part of their CSR activities[9] they provided support to the surrounding communities for medical, educational and water supply services.

In light of the above, it can be seen that the Operation and Effect Indicators of the 21 sub-projects under the project were mostly achieved. It was confirmed that there have been certain effects in securing a stable electricity supply and a diversification of electricity supply sources as well as impacts of a certain contribution to environmental improvement and climate change mitigation. No negative impacts on the environment or society were observed. Land acquisitions were carried out appropriately in accordance with the laws and regulations and no resettlement

[9] Social Contribution Activities that are carried out to fulfill the social responsibility of the company (CSR).

occurred under the project.

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

Column: Six Sub-Projects where a Site Visit was conducted in the Ex-Post Evaluation

	[End-user] Maheswari Mining & Energy Pvt. Ltd. [State] Telangana [Type of generation] Solar [Installed capacity] 10 MW [Commencement] 2016 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 3 of the end-user's technical staff and 5 technical staff dispatched from a foreign power generation company. In addition, local residents are employed as security guards and cleaning staff.
	[End-user] Photon Solar Power Pvt. Ltd. [State] Andhra Pradesh [Type of generation] Solar [Installed capacity] 5 MW [Commencement] 2015 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 11 of the end-user's technical staff. In addition, 6 local residents are employed as security guards and cleaning staff.
	[End-user] Greenenergy Wind Corporation Pvt. Ltd. [State] Karnataka [Type of generation] Wind [Installed capacity] 16 MW (800kW × 20 Turbines) [Commencement] 2014 [Operation and Maintenance System] The operation and maintenance of the facility is outsourced to a wind turbine manufacturer, with 20 technical staff stationed there and some local residents employed.
	[End-user] Vayu Urja Bharat Pvt. Ltd. [State] Andhra Pradesh [Type of generation] Wind [Installed capacity] 120 MW (2,000kW × 60 Turbines) [Commencement] 2017 [Operation and Maintenance System] The operation and maintenance of the facility is outsourced to a wind turbine manufacturer, with 45 technical staff stationed there. In addition, 40 local residents are employed as security guards and service staff.
	[End-user] Sri Maruthi Powergen Pvt. Ltd. [State] Karnataka [Type of generation] Hydro [Installed capacity] 24 MW [Commencement] 2019 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 25 end-user technical staff. In addition, 3 local residents are employed as security guards.
	[End-user] Cosmos Hydro Power Pvt. Ltd. [State] Himachal Pradesh [Type of generation] Hydro [Installed capacity] 19.8 MW [Commencement] 2021 [Operation and Maintenance System] The operation and maintenance of the facility is carried out by 40 end-user staff (20 technical and 20 non-technical staff).

(Source of photographs: Evaluator)

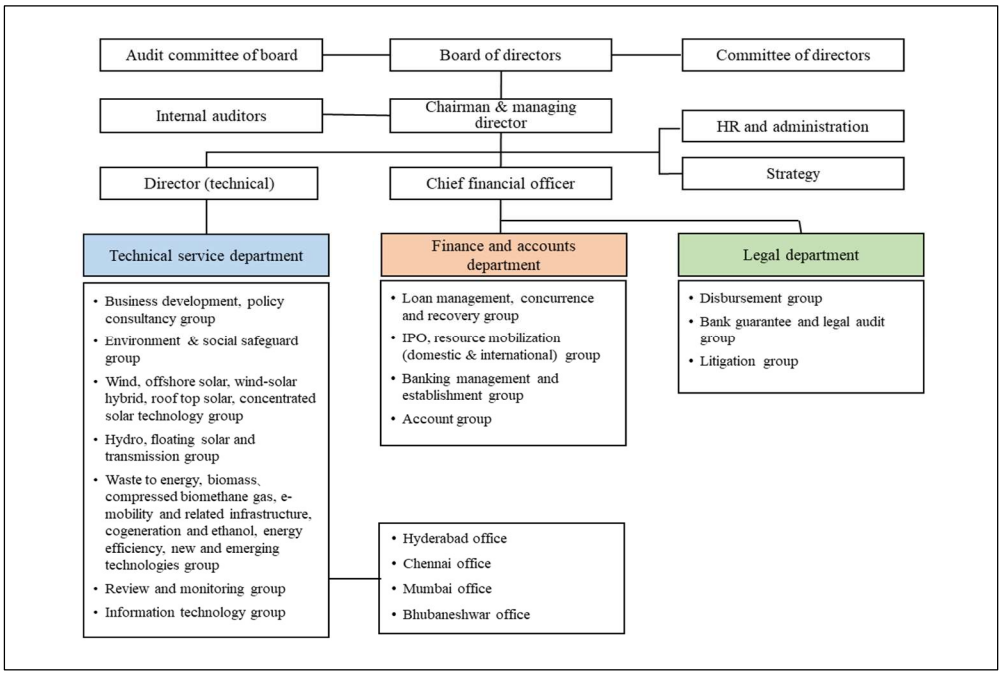
3.4 Sustainability (Rating: ④)

3.4.1 Policy and System

As stated in "3.1.1.1 Consistency with development plan of India," at COP 26 in 2021, the government of India announced the target to meet 50% of its energy needs from renewable energy sources by 2030 and to reduce carbon emissions by 1 billion tonnes. The introduction of renewable energy has also been identified as a priority in the development policies of the target states, and various policies to promote development in the renewable energy sector have been implemented at the national and state levels. Thus, the policies and systems necessary to sustain effectiveness have been ensured.

3.4.2 Institutional/Organizational Aspect

IREDA is a government-owned financial institution which was established in 1987 to promote new and renewable energy development projects in India through long-term and low-interest loans under the administrative control of Ministry of New and Renewable Energy. IREDA's organization chart is shown in Figure 5. Under the Board of Directors, the Chairman and Managing Director is placed as well as the technical service department, finance and accounts department, etc. In the technical service department, the groups responsible for solar, wind and hydro power, etc., are located as well as the review and monitoring, and information systems groups. The total number of staff is 159 (as of April 2023), including 70 staff in the technical service department and 25 staff in the finance and accounts department.



Source: Prepared by the evaluator quoting from the IREDA document (As of December 2022)

Figure 5 IREDA Organization Chart

IREDA's New Delhi head office is mainly responsible for loan appraisal, monitoring, fund raising, and loan disbursement and credit supervision. The branch offices in Hyderabad, Chennai, Mumbai and Bhubaneswar frequently visit project sites at the time of the appraisal, the first disbursement and the completion of the loan agreement, to confirm the project plans, check the status of construction and completion, and confirm the operational status of the facilities. At the same time, IREDA has hired external experts, called Lender's Independent Engineers (LIE),[10] for better monitoring. They conduct site inspections for each sub-project every quarter during the construction period of the power generation facilities and once in half a year or once a year after commissioning and provide end-users with technical and financial guidance and advice. According to IREDA, the number of staff is sufficient for IREDA's current operations, but IREDA plans to expand the number of loans and finance new areas such as green hydrogen and storage batteries. Therefore, IREDA is actively hiring new staff to strengthen its organizational structure.

As one initiative for further improvement, IREDA established Separate Monitoring Groups in its technical department consisting of technical service teams and monitoring teams for different sectors, such as solar, small hydro and wind power. Each group is responsible for the supervision of projects during the loan implementation process. Under this system, each group meets every Monday to review the quarterly monitoring reports submitted by end-users, check the operational status of sub-projects with problems and the financial status of end-users, and consider necessary measures. Since the establishment of this system, there has been an improvement in supervision, so that IREDA can now receive monitoring reports from 99% of end-users.

Therefore, no problems are found in the institutional/organizational aspect.

3.4.3 Technical Aspect

IREDA's technical department is made up of technical experts in various renewable energy sectors, who are comprehensively engaged on supervision of the sub-projects from loan appraisal, through monitoring, to the completion of repayment, and who have accumulated greater knowledge of financing in this sector than the staff of general financial institutions. The finance and accounts department sets the terms and conditions of IREDA's loans and offers appraisals for each sub-project provided by the technical service department. The two departments meet regularly for the purpose of credit protection. IREDA has established various training schemes to maintain knowledge of financing renewable energy power projects. IREDA staff attend an annual training course at the National Power Training Institute on renewable energy related technologies, finance, risk management, regulations, etc., and external experts are

[10] The Lender's Independent Engineer (LIE) is an external expert employed by a financial institution to monitor the operational, technical and financial aspects of a financed project and to advise the end-user.

invited as lecturers on new technologies to improve knowledge and service quality. At the time of the ex-post evaluation, IREDA was receiving technical transfer from two environmental and social experts hired with funds from the World Bank's Clean Technology Fund. It was confirmed that manuals for loan appraisal, loan disbursement and credit management were in place and updated on a regular basis.

IREDA is also working on further improvements and is developing a system that will allow end-users to input monitoring data (such as the operation status of a facility and financial information) directly through the IREDA portal website, instead of by email. IREDA plans to introduce the system from 2024.

Therefore, no technical problems have been identified.

3.4.4 Financial Aspect

There have been no major issues with IREDA's financial situation over the last five years. Table 13 shows IREDA's major financial data for the last five years. Regarding profit, although profit after tax decreased in FY 2018/19 and FY 2019/2020 compared to FY 2017/18, it improved to 3,464 million INR in FY 2020/21, which was similar to profit before FY 2017/18, going on to significantly increase to 6,335 million INR in FY 2021/22. The Capital Adequacy Ratio, an indicator of the company's capital strength and soundness in management, had been on a downward trend since 2012/13. However, it improved to 21.22% in FY 2020/21. The statutory minimum capital adequacy ratio for financial institutions set by the Reserve Bank of India, the country's central bank, is 12%, and IREDA has fully met this standard. The NPL ratio increased to 7.18% and 5.61% in FY 2019/20 and FY 2020/21 respectively, but it decreased to 3.12% in FY 2021/22, which was a significant improvement even during the COVID-19 pandemic and the subsequent economic downturn. This may be attributed to the fact that IREDA was able to increase the number and amount of loans, while at the same time reducing the conversion of sub-projects into non-performing loans by establishing a mechanism to identify and resolve various problems occurring in sub-projects at an early stage through a strengthening of the monitoring system.

Therefore, no financial problems have been observed.

Table 13 Major Financial Indicators of IREDA

Unit: million Rupees

	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22
Revenue	17,800	20,222	23,723	26,577	29,841
Interest Revenue	17,791	20,195	23,673	25,643	27,132
Profit before tax	5,607	3,109	2,411	5,695	8,338
Profit after tax	3,931	2,499	2,145	3,464	6,335
Dividend	1,355	1,281	exempted	exempted	exempted
Asset	202,772	245,179	276,519	302,929	367,084
Capital Adequacy Ratio	18.05%	16.32%	14.34%	17.12%	21.22%
Non-Performing Asset Ratio	3.84%	3.74%	7.18%	5.61%	3.12%

Source: IREDA documents
Note: The Department of Investment and Public Asset Management of the Ministry of Finance waived the payment of dividends for FY 2019/20, 2020/21 and 2021/22.

3.4.5 Environmental and Social Aspect

The project was required to consider environmental and social aspects, such as land acquisition and the damming of rivers for the construction of dams during the construction of the power generation facilities. Once the loan application has been submitted by the prospective borrower, IREDA conducts an environmental and social impact assessment (desk-based assessment) using an environmental screening checklist, visits a project site, checks the status of required environmental government permits and approvals, and conducts environmental monitoring during the construction and operation of the facilities until repayment. In addition, as mentioned above, the capacity of IREDA's Environmental and Social Safeguards and Safety Management Group, supported by the World Bank, has been strengthened, and a system to mitigate the risks of environmental and social considerations has been systematically put into place. These initiatives of IREDA surpass those of private sector financial institutions. Therefore, it is considered that there will be no problems in dealing with future environmental and social risks.

3.4.6 Preventative Measures to Risks

Although there is a risk that the operating conditions and power generation of renewable energy, such as solar, wind and small-hydro power, can be affected by changes in weather conditions, a certain degree of risk prediction is possible through proper analysis of the location of the project site and past weather conditions at the time of the appraisal of each sub-project. In addition, it is possible to reduce the risk of NPLs during the loan period with regular monitoring and financial analysis of the sub-project.

3.4.7 Status of Operation and Maintenance

At the time of the ex-post evaluation, one sub-project had become a non-performing loan and IREDA was not obliged to monitor 12 sub-projects that had been repaid before the repayment date. Therefore, it was not possible to directly verify the operation and maintenance of the 13 sub-projects. On the other hand, the 8 sub-projects that are still being financed have experienced no major problems in terms of the status of operation of the power generation facilities and the end-user's financial status. In the ex-post evaluation, the evaluator visited the sites of 6 sub-projects (two solar power plants, two wind power plants, and two small-hydro power plants) and confirmed that all the power generation facilities were properly maintained and managed by engineers stationed there and that there were no particular problems (See the Column).

No issues have been observed in the policy/system, institutional/organizational, technical,

financial, and environmental and social aspects, including the current status of the operation and maintenance. Future risks have been well mitigated. Therefore, sustainability of the project effects is very high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This Project aimed to secure a stable electric supply and to diversify power supply sources to meet the increasing demand for electricity by providing two-step loans, through the Indian Renewable Energy Development Agency (IREDA), to new and renewable energy development projects in India, thereby contributing to improving the environment, achieving sustainable economic growth and mitigating climate change. The project was consistent with the development plan and development needs of India at the time of the appraisal and at the time of the ex-post evaluation. The consistency with Japanese's assistance policy was also confirmed. Although support for the strengthening of IREDA's appraisal system for environmental and social consideration was expected at the time of the appraisal, no directly beneficial support was provided. Besides, assistance in the area of environmental and social consideration was provided by another donor and the overlap of the assistance was avoided, while there was no official coordination between JICA and the other donor. Therefore, the relevance and coherence of the project are high. Since both the project cost and the project period were within the plan, the efficiency of the project is very high. The "installed generation capacity," "capacity factor of generation plants," "energy substitution" and "reduction of CO_2," which were set as the operation and effect indicators of the target sub-projects, were generally achieved against their respective targets. In addition, the project is estimated to have made a certain contribution to securing a stable electricity supply and diversifying the sources of electricity supply in the target states. Furthermore, it is estimated that the project has made a certain contribution to climate change mitigation through the effect of energy substitution and reduction of CO_2 of the project. No negative impacts on the natural environment caused by the project were identified. Land acquisition was carried out in accordance with Indian domestic law, and no resettlement occurred. Therefore, the effectiveness and impact of the project is high. As to the operation and maintenance of this project, no issues were observed in the policy/system, institutional/organizational, technical, financial, or environmental and social aspects; in the response to weather risks affecting the operation of the renewable energy power generation or risks such as non-performing loans; or in the status of operation and maintenance. Therefore, the sustainability of the project effects is very high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Although the executing agency is obliged to collect monitoring data on the operation of power generation facilities and the effects of environmental improvement from end-users on a quarterly basis, there were some cases where information was missing from progress reports submitted to JICA due to failures of submission by end-users. It is important that the implementing agency continuously monitor the status of sub-projects' operation from the perspective not only of increasing the effectiveness of the project, but also of protecting the implementing agency's credit. Therefore, in addition to strengthening the supervision system of each sub-project by the sectoral monitoring groups, it is necessary to continuously work on the establishment of a more efficient monitoring system, such as the system of reporting monitoring data thorough the portal site, which is planned to be introduced from FY 2024.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

(1) Importance of project formulation based on lessons learned from similar and previous projects

Using lessons learned from similar and preceding projects, a Special Assistance for Project Implementation (SAPI) was conducted in parallel with the project to strengthen IREDA's capacity, including the maintenance of an information database for the monitoring and evaluation of the sub-projects. The ex-post evaluation confirmed that, as a result, IREDA's database had had some impact on the facilitation of project management. In addition, it is important for the implementing agency to conduct monitoring of the sub-projects in order to enhance the effectiveness of the project in two-step loans. For JICA, it is necessary to check the monitoring capacity of the implementing agency at the project formation stage and, if necessary, consider providing support for capacity building through the dispatch of experts or the carrying out of technical cooperation projects in combination with the project.

(2) The need to develop two-step loans attractive to borrowers

As financing services from financial institutions for private renewable energy projects in India were not as sufficient at the time of the planning of the project as they are today, the need for the finance of renewable energy development projects through IREDA was high. At that time, the loan terms of IREDA were competitive in the market. However, since then, with the maturing of the renewable energy market, financing options for renewable energy development projects have improved compared to the time of appraisal and IREDA has been placed in a more competitive market environment. This is due to the expansion of financial services to the sector by private financial institutions as well as loan and subsidy schemes by the government of India. The market

environment has also become more competitive. In this context, the Credit Institute for Reconstruction (KfW) which is the state-owned German development bank has started to offer non-sovereign loans to IREDA, and IREDA has also made use of non-sovereign loans and borrowing from private commercial banks to offer interest rates comparable to those of private financial institutions. In the case of yen loans, which are in principle sovereign loans, the funds are provided to the implementing agency with a certain interest rate added as a government guarantee, which increases the actual interest burden on the implementing agency and reduces the incentive of the implementing agency (borrower). In order for yen loans of the two-step loan scheme to become more attractive to borrowers, it is necessary to consider providing charge-free soft components such as the technical assistance and consulting services needed by borrowers, like the SAPI in this project, as a higher value-added service package with the loan.

5. Non-Score Criteria

5.1. Performance

5.1.1 Objective Perspective

Although IREDA did have a technical department for project appraisal, monitoring and evaluation, based on the preceding project, New and Renewable Energy Development Project (Phase 1), it was required to adapt to the significant technological innovation and diversification in the field of renewable energy and conduct smooth operation of the information system for monitoring existing projects. Therefore, JICA implemented the SAPI from December 2014 to February 2018 in parallel with the project. The aim of this was to strengthen the capacity of IREDA, in a flexible way taking into consideration IREDA's actual situation and challenges, such as strengthening the capacity for managing the information database for the monitoring and evaluation of sub-projects, and supporting the establishment of a management system for the purpose of credit protection. Meanwhile, IREDA has been able to significantly increase the number of loan approvals in response to the growing financing needs for renewable energy projects since 2014. Since the SAPI collaboration with the project also coincided with the period of expanding lending, the support to IREDA made through the SAPI made a certain contribution to IREDA's business expansion.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs (1) Number of Sub-Projects	Two-step loans from IREDA as borrower to end-users Number of sub-projects was not set	As Planned 21 sub-projects
(2) Terms and Conditions		
Eligible Sub-Projects	Power industry (Private and public companies registered in India that are investing in new and renewable energy development)	As Planned
Eligible End-Users	・Photovoltaic and Solar thermal power generation ・Wind power generation ・Small hydro power generation (less than 30 MW) ・Cogeneration power generation (using bagasse) (less than 30 MW) ・Biomass power generation (less than 30 MW)	・Solar photovoltaic power generation ・Wind power generation ・Small hydro power generation
Financing Norms and Schemes	・Set based on each end-user's credit risk. ・Interest rate: 11.90-13.25% ・Repayment period: 5-10 years (as of June 2012)	As planned or equivalent to the plan
2. Project Period	April 2014-March 2020 (72 months)	September 2014-March 2020 (66 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	 60 million yen 33,000 million yen (21,154 million Rupees) 33,060 million yen 30,000 million yen 1 Rupee = 1.56 yen (as of October 2013)	 60 million yen 33,000 million yen (20,000 million Rupees) 33,060 million yen 30,000 million yen 1 Rupee = 1.65 yen (average between 2014 and 2020)
4. Final Disbursement	March 2020	