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Republic of Costa Rica

FY2023 Ex-Post Evaluation Report of
Japanese ODA Loan “Guanacaste Geothermal Development Sector Loan (Las Pailas II)”

External Evaluator: Hiromi S. Suzuki, IC NET Limited

0. Summary

The “Guanacaste Geothermal Development Sector Loan” aims to increase the electricity supply through renewable energy and respond to climate change impacts by constructing multiple geothermal power plants in Guanacaste Province, thereby contributing to the sustainable economic development of the country.¹ The “Guanacaste Geothermal Development Sector Loan (Las Pailas II)” (hereinafter referred to as “the Project”), one of the subprojects under the above sector loan, contributes to the objectives of the sector loan by constructing a geothermal power plant in the Las Pailas area of Guanacaste Province. The implementation of the Project is fully consistent with Costa Rica’s development policies, development needs, and Japan’s development assistance policies. Although no results beyond expectations were achieved in terms of concrete collaboration with JICA and other international organizations, coordination was carried out as planned. Therefore, the relevance and coherence are high. Changes in the quantities of access road and steam-water transport pipeline construction occurred, but these were in line with the project objectives. While costs and period of the Project slightly exceeded the initial plan due to some changes in outputs and the progression of the yen depreciation, the efficiency remains high. The equipment introduced by the Project is being operated appropriately, and the degree of achievement of the project objectives is high. The contribution to Costa Rica’s electricity supply and decarbonization is recognized. From the project implementation period to the time of ex-post evaluation, the Project’s contributions to the natural environment, social environment, labor conditions, local economic revitalization, and improvements in the living standards of local residents are recognized. Based on the above, the Project has mostly achieved its objectives. Therefore, the effectiveness and impacts of the Project are high. There are no issues regarding the operation and maintenance in terms of related policies and systems, institutional/organizational, technical, financial, environmental and social aspects and risk management. Regarding the operation and maintenance status, the ferromagnetic elements contained in the steam supplied to the power plant are affecting the generation efficiency. However, this is a minor issue, and there is a high likelihood of improvement and

¹ The Project is the first case of a sector project loan, based on the results of the trial operation of a method where multiple geothermal projects are grouped together under a single Exchange of Notes (E/N) agreement as one way to utilize ODA loans. This method was introduced in Indonesia’s “Geothermal Development Acceleration Program” (E/N signed in August 2011, with an E/N amount of 55,299 million yen).

resolution. Therefore, sustainability of the project effects is high.

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

1. Project Description



Project Location

(Source: Created by the evaluator based on a map from the Japan Ministry of Foreign Affairs)



Las Pailas II Geothermal Power Plant

(Source: Photo taken by the evaluator)

1.1 Background

Driven by increased foreign direct investment and exports due to free trade agreements with the United States and others, Costa Rica achieved an average GDP growth rate of 3.9% from 2007 to 2013, reflecting steady economic growth. Along with this, the annual electricity demand showed an average growth rate of about 2.2%, with electricity demand in 2012 recording a 3.8% increase. With an installed capacity of 2,731 MW as of 2013, average annual electricity demand was expected to grow by approximately 5.3% from 2014 to 2020. To meet this demand, an increase in generation capacity through the development of new power sources was necessary.

As of 2013, the composition of Costa Rica's power generation capacity was as follows: hydropower (63%), thermal power (22%), geothermal power (8%), wind power (5%), and other sources (2%). Hydropower, a renewable energy source, was the largest power source. However, hydropower faced the issue of reduced generation due to a decrease in rainfall during the dry season. The shortfall was covered by thermal power generation using high cost imported fossil fuels, which not only increased greenhouse gas emissions but also contributed to rising electricity generation costs in the country.

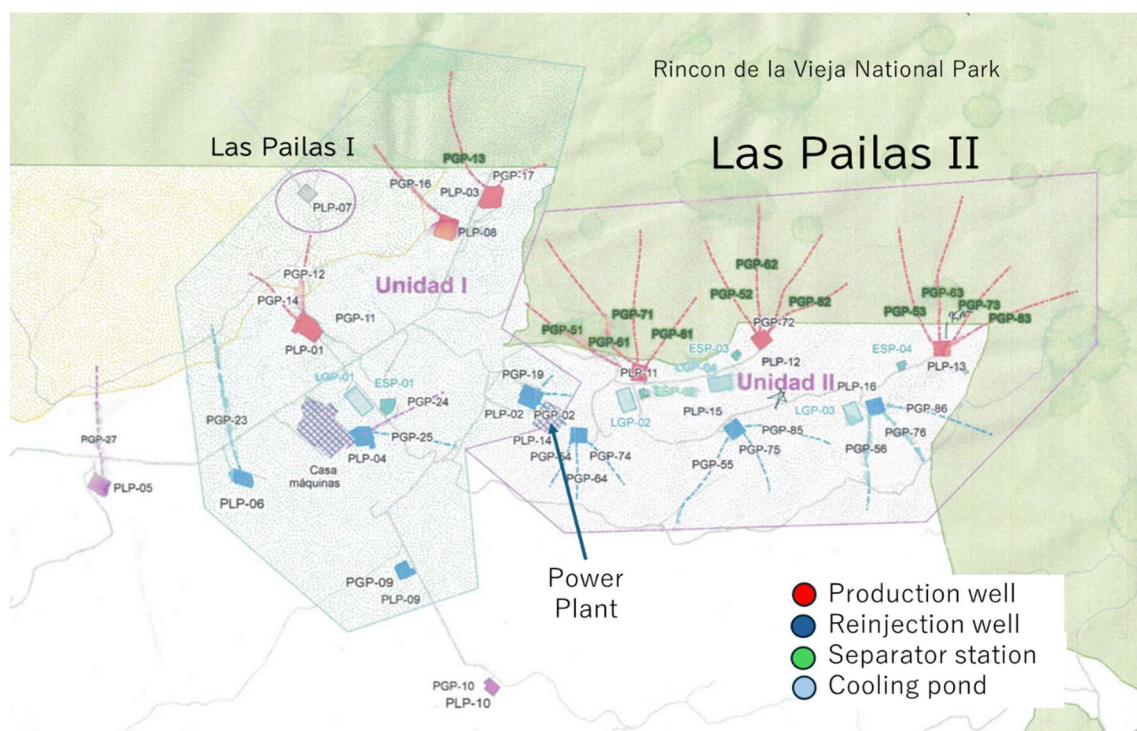
On the other hand, geothermal power, the second largest renewable energy source in the country after hydropower, provides stable electricity supply throughout the year. Given its potential contribution to reducing greenhouse gas emissions, its importance was increasing as a means to enhance electricity generation during the dry season in the country. While Costa Rica's geothermal power potential is estimated to be around 865 MW, the total

installed capacity from geothermal energy currently stands at 217 MW, indicating a high level of expectation for further geothermal development.

Against this background, the Project, along with the “Borinquen I Geothermal Development Project” and “Borinquen II Geothermal Development Project,” forms part of the “Guanacaste Geothermal Development Sector Loan” which applies the sector project loan approach. The loan agreement was signed in August 2014.²

1.2 Project Outline

The “Guanacaste Geothermal Development Sector Loan” aims to increase the electricity supply through renewable energy and respond to climate change impacts by constructing multiple geothermal power plants in Guanacaste Province, thereby contributing to the sustainable economic development of the country. The Project is one of the subprojects under this sector project loan and contributes to its objectives by constructing a geothermal power plant in the Las Pailas area of Guanacaste Province.



Source: Materials provided by Costa Rican Electricity Institute (ICE)

Figure 1: Layout of Las Pailas Geothermal Power Plants I and II

² The sector project loan approach is a method that streamlines the procedural steps on the Japanese side by signing the Exchange of Notes (E/N) for multiple projects at once, particularly for geothermal development where Japanese technology is utilized.

【ODA Loan】

Loan Approved Amount / Disbursed Amount	16,810 million yen / 13,093 million yen
Exchange of Notes Date / Loan Agreement Signing Date	November 2023 / August 2024
Terms and Conditions	Interest rate : 0.6% (Consulting services : 0.01%) Repayment period : 40 years (Grace period : 10 years) Conditions for Procurement : General Untied
Borrower / Executing Agency	Costa Rican Electricity Institute (Costa Rican Government Guarantee) / Costa Rican Electricity Institute
Project Completion	September 2019
Target Area	Guanacaste Province, Las Pailas Area
Main Contractor (Over 1 billion yen)	Initec Energía, S.A (Spain)
Main Consultant (Over 100 million yen)	West Japan Engineering Consultants, Inc. (Japan)
Related Studies (Feasibility Studies, etc.)	• Preparatory Survey for Guanacaste Geothermal Project, Costa Rica (July 2011 - February 2014) • Guanacaste Geothermal Development Sector Loan Implementation Promotion Study (Las Pailas II Geothermal Reservoir Evaluation Support (Conceptual Model Creation Support) / July 2014 – March 2015) • Special Assistance for Project Implementation (SAPI) on Guanacaste Geothermal Development Sector Loan (Environmental Monitoring Support Focused on Ecosystem Impacts) (December 2015 – May 2017)
Related Projects	【ODA Loan】 • Borinquen 1 Geothermal Project (Guanacaste Geothermal Development Sector Loan) (June 2017) 【Other international organizations, donors, etc.】 • Inter-American Development Bank (IDB) and JICA “Coordinated Financing Scheme for Renewable Energy and Energy Efficiency in the Central America and Caribbean Region (CORE Scheme)” (2011–Present) • Central American Bank for Economic Integration (CABEI): “Las Pailas Geothermal Development Project (I)” (2017–2019)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hiromi S. Suzuki, IC NET Limited

2.2 Duration of Evaluation Study

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

Duration of the Study: November, 2023 – February, 2025

Duration of the Field Study: June 6, 2024 – June 17, 2024

October 5, 2024 – October 10, 2024

3. Results of the Evaluation (Overall Rating: A³)

3.1 Relevance/Coherence (Rating: ③⁴)

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Costa Rica

At the time of planning the Project, Costa Rica was the first country outside of the developed countries to pledge carbon neutrality. In *the Peace with Nature Initiative (2007)*, the country set the goal of offsetting its carbon dioxide emissions and absorption by 2021. To achieve this, the *National Development Plan (2011–2014)* emphasized the importance of mitigation measures against climate change by promoting the use of renewable energy, particularly hydropower and geothermal power, in economic activities. *The VI National Energy Plan (2012–2030)*, formulated in 2011 based on the national development plan, aimed to maintain the use of clean energy as a substitute for imported liquid fossil fuels, improve energy efficiency, and promote the use of domestic energy, with the goal of improving the living conditions of all Costa Rican citizens. Furthermore, based on these policies, the Costa Rican Electricity Institute (Instituto Costarricense de Electricidad, hereinafter “ICE”) conducted scenario analyses in its revised *Electric Power Generation Expansion Plan (2014–2035)*, published in April 2014. In addition to updating existing power plants, the plan included the integration of renewable energy into the power grid. In all scenarios, the three geothermal power plants to be built under this sector project loan were deemed essential to achieving the objectives of the power expansion plan.

At the time of the ex-post evaluation, the achievement of carbon neutrality continues to be set as a national goal in the *National Decarbonization Plan 2018-2050*. Decarbonization is also included as a focus area in the *National Development and Public Investment Plan (2023-2026)*, with a goal to achieve a year-on-year reduction in CO₂ emissions from fossil fuel use, targeting a change rate from 5.9% in 2021 to -1.4% by 2026.

As outlined above, in Costa Rica, enhancement of electricity supply through renewable energy while mitigating the impacts of climate change was the goal at both the planning stage and the ex-post evaluation stage. Thus, the Project is consistent with the country’s development policies.

3.1.1.2 Consistency with the Development the Development Needs of Costa Rica

At both the planning stage and the ex-post evaluation stage, most of Costa Rica’s installed power capacity and annual total electricity generation came from renewable energy, including hydropower, which produced more than 98% of the country’s total energy. Specifically, hydropower accounted for 63% of installed capacity and 67% of annual total

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

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

electricity generation in 2013, and for 68% and 70%, respectively, in 2023 (Table 1). However, hydropower has extremely high uncertainty in electricity supply due to climate change. To offset this variability, stable power sources such as thermal power generation and geothermal power generation are necessary. Additionally, thermal power generation not only leads to an increase in electricity prices but also carries the risk of environmental issues due to the rise in greenhouse gas emissions in the medium to long term. This concern remains unchanged at both the planning stage and the ex-post evaluation stage.⁵ In the future, to mitigate the impact of the variability of renewable resources, ICE plans to develop infrastructure by 2040 with an installed capacity of 5,607 MW, comprising 43% hydropower, 16% wind power, 6% geothermal energy, 27% solar and other sources, and 8% thermal power, achieving a total generation capacity of 15,703 GWh.⁶ The infrastructure developed under the sector project loan to which the Project belongs has a total installed capacity of 165 MW, accounting for 50% of the total planned geothermal power capacity of 333 MW by 2040.

Table 1: Installed capacity and annual total electricity generation (actual) in 2013 and 2023

	2013				2023			
	Installed Capacity (MW)	%	Total Power Generation (Gwh)	%	Installed Capacity (MW)	%	Total Power Generation (Gwh)	%
Hydropower	1,725	63%	6,791	67%	2,372	68%	8,327	70%
Geothermal	217	8%	1,520	15%	263	8%	1,479	12%
Wind power	148	5%	507	5%	408	12%	1,461	12%
Thermal power	596	22%	1,216	12%	382	11%	608	5%
Other*	45	2%	102	1%	76	2%	64	1%
Total	2,731	100%	10,136	100%	3,501	100%	11,939	100%

*: Primarily solar power generation

Source: Prepared by the evaluator based on the material provided by JICA and ICE

Based on the above, strengthening power supply through renewable energy and mitigating the impact of climate change will continue to be important challenges to address. The Project is consistent with Costa Rica's development needs.

3.1.1.3 Appropriateness of the Project Plan and Approach

During the planning phase of the Project, one of the lessons learned from past similar projects was highlighted, emphasizing the importance of securing sufficient steam to meet the planned electricity generation capacity. This could be achieved through pre-analysis of the geothermal reservoir and effective management during the operation phase of the power

⁵ In Costa Rica, starting in mid-2023, the El Niño phenomenon led to a decrease in rainfall, reducing hydropower generation and increasing thermal power generation. As a result, renewable energy accounted for only 91.3% of the domestic energy demand in 2023, a lower figure than the previous eight years. With the increase in thermal power generation, electricity generation costs rose. To cover this, electricity prices were raised by 5% to 17% starting January 1, 2024.

⁶ ICE *Electric Power Generation Expansion Plan (2014–2035)*

plant. Additionally, as a risk related to securing steam, it was pointed out that the planned number of wells might not be sufficient to secure the required steam volume. This could lead to the need for an increase in the number of wells drilled during the construction phase, which could result in schedule delays. Therefore, it was emphasized that conducting thorough prior analysis would be crucial to mitigate this risk. Regarding steam supply, based on steam blowout tests from pilot wells drilled with ICE's own funds during the preparatory survey, a simulation of the geothermal reservoir was conducted. It was confirmed that with the planned number of production wells for the Project, it would be possible to operate at approximately 55 MW for the next 30 years. Additionally, through JICA's technical assistance under the ODA loan scheme Guanacaste Geothermal Development Sector Loan Implementation Promotion Study: Las Pailas II Geothermal Reservoir Evaluation Support (Conceptual model creation support) (July 2014 - March 2015), the simulation of the above reservoir was updated. Furthermore, through the consulting services of the Project, numerical models were created, and the calibration of the models was carried out using the data obtained from actual operations.

In this way, lessons learned from other projects were utilized during the project planning and implementation stages, leading to the expected outcomes. Based on this, it can be concluded 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 the Republic of Costa Rica (April 2014)* places support for sustainable development, with a focus on environmental issues, as its core principle. "Guanacaste Geothermal Development Sector Loan" including the Project is included as part of the climate change mitigation program in the "Environmental Issues" priority area of this assistance policy. This program includes "mitigation measures" through support for renewable energy and energy efficiency sectors, such as solar power and geothermal energy, explicitly aiming to address climate change issues. Therefore, it can be recognized that the Project aligns with Japan's development cooperation policy at the time of appraisal.

3.1.2.2 Internal Coherence

Internal coherence could not be confirmed for the project planning and implementation phases. On the other hand, the ex-post evaluation confirmed that from 2022 to 2024, JICA and ICE implemented a third-country training program, "Capacity Building for Geothermal Development," in Costa Rica with the goal of expanding knowledge of geothermal power generation and its potential utilization in the Latin American and Caribbean region. Many

countries in Latin America have not yet tapped into the potential for geothermal power generation, and the sharing of methodologies and technologies from successful geothermal countries like Costa Rica is highly significant. The training targeted technicians working at geothermal power-related facilities, with a total of 29 trainees from 8 countries, Bolivia, Colombia, Ecuador, El Salvador, Guatemala, Nicaragua, Honduras, and Peru, participating in the 4-week program. The training content included not only operational and maintenance methods for geothermal power plants through site visits as part of the project, but also a visit to the Miravalles Geothermal Power Plant, which was built with Japan's ODA loan in 1994. It has been decided that this third-country training will continue for another three years starting in 2025.

3.1.2.3 External Coherence

In the Central and Latin American region, including Costa Rica, international organizations such as the Inter-American Development Bank (IDB) and donors, including JICA, have been continuously providing support for renewable energy and decarbonization even before the planning phase of the Project. The Project was structured as a parallel co-financing arrangement with IDB from the planning stage, with 56% of the total project cost covered by the Japanese ODA loan and the remaining 44% financed by IDB, the European Investment Bank (EIB), and ICE's own funds. The support from each donor was provided as planned and without delays, contributing to the achievement of the Project's goal of enhancing power supply from renewable energy.

In summary, regarding the objective of the Project "to increase the electricity supply through renewable energy and respond to climate change impacts," the clarification of the scope of support from the three donors, including JICA, and the coordination and alignment of the timing of financing were carried out as planned, which contributed to the achievement of the project outcomes.

Based on the above, the implementation of the Project is fully aligned with Costa Rica's development policies and needs, and the approach and appropriateness of the project plan were reasonable. It is consistent with Japan's development assistance policies, and specific collaboration with other JICA projects can also be recognized. The Project was carried out as planned in terms of promoting the increase of power supply from renewable energy and mitigating the impacts of climate change in cooperation with JICA and other international organizations. However, no significant additional collaboration or outcomes beyond what was originally anticipated can be observed. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The Project is located in the Las Pailas geothermal area, which is situated within the Guanacaste Conservation Area, northeast of the Curubandé District in Liberia Canton, Guanacaste Province, Costa Rica, and adjacent to a nature reserve. The outputs (see the table below) mainly consist of the construction of a single-flash geothermal power plant and related facilities.⁷ The ODA loan was allocated to the necessary well drilling work, procurement of related equipment, power generation plant construction including the procurement of generators, and consulting services.

Table 2: Planned and actual outputs

	Plan	Actual
1. Civil works and procurement of equipment		
1) Preconstruction works	Access road 6000m, water line, site preparation, drilling mud pits, etc.	Almost as planned
2) Drilling of wells ⁸	Production wells: 11 sets Reinjection wells: 9 sets	As planned
3) Power generation equipment	Power generation equipment: 55MW x 1 set	As planned
4) Procurement of equipment and materials for the construction of the power plant	Surveillance cameras, access control systems, lightning monitoring systems, fire detection systems, etc.	As planned
5) Construction work for generation plant	Site preparation, installation of mechanical and electrical equipment, etc.	As planned
6) Construction of gathering system pipelines, procurement of related equipment and materials	Two-phase piping, steam piping, hot reinjection piping, cooling towers, etc.	Almost as planned
7) Procurement of transmission and substation equipment, construction of transmission lines, and substation construction work	Expansion of existing switchyard, transmission lines	As planned
2. Consulting services	Support for geothermal reservoir assessment, detailed design reviews, progress bidding assistance, monitoring, etc.	Almost as planned

Source: Materials provided by JICA and ICE

⁷ The single-flash method is a process in which geothermal fluid discharged from production wells, which contains hot water in addition to steam at high temperatures (around 250°C), is used after separating the steam from the liquid using a separator. The hot water is then directly returned to the injection well. This is the most proven method worldwide.

⁸ There are 12 production wells at Las Pailas II, but one of them was drilled during the feasibility study (F/S) phase and is not included in the outputs of the Project. Additionally, three wells were drilled by ICE using its own funds before the signing of the Loan Agreement (L/A), but since they were within the scope of the ODA loan, JICA agreed to retroactively recognize them.

There were two changes in the civil work: i) Based on the actual conditions after the start of construction, it was determined that the access road could be shortened, and the planned length of 6,000 meters was reduced to 4,225 meters; ii) for the construction of the gathering system and procurement of related equipment, the final locations of the production wells, reinjection wells, and separator base were determined based on actual conditions, and the length of each pipeline was subsequently decided. As a result, there were increases and decreases in the length of the pipelines. By placing the separator base near the production wells, the length of the steam and hot water pipelines increased, while the length of the two-phase flow pipelines was kept to a minimum. Regarding consulting services, they were almost in line with the plan, but drilling support was carried out by ICE before the L/A signing and was not included in the consulting services. Additionally, due to COVID-19 pandemic, face-to-face training was changed to an online format.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned total project cost was 24,267 million yen, of which the ODA loan portion was 16,810 million yen. The remaining 7,457 million yen was funded through other sources than ODA loans, including IDB loans, EIB loans, and ICE's own funds.

Table 3-1: Project Cost (Plan)

(Unit: million yen)

Item	Plan (at the time of appraisal)					
	Foreign currency		Local currency		Total	
	Total	ODA loan portion	Total	ODA loan portion	Total	ODA loan portion
Preparatory work	0	0	666	0	666	0
Steam development	5,203	2,994	4,163	2,077	9,366	5,071
Construction of power plant	6,024	6,024	2,754	2,754	8,777	8,777
Construction of transmission facility and substation	388	0	128	0	516	0
Price escalation	803	648	1,385	834	2,189	1,482
Contingency	621	483	455	283	1,076	767
Consulting services	132	132	0	0	132	132
Interest during construction	465	465	0	0	465	465
Commitment charge	117	117	0	0	117	117
Land acquisition	0	0	274	0	274	0
Administration	0	0	690	0	690	0
Total	13,753	10,862	10,514	5,948	24,267	16,810

Exchange rate: 1 USD = 87.01 JPY, 1 USD = 497.9 CRC, 1 CRC = 0.175 JPY

Price escalation rate: 2.1% for foreign currency, 5.4% for domestic currency

Contingency rate: 5%

Cost estimation reference period: January 2013

Note: Due to rounding, there may be discrepancies in the calculated values displayed.

Source: Materials provided by JICA

Table 3-2: Project Cost (Actual)

(Unit: million yen)

Item	Actual						
	Foreign currency		Local currency		Total		Change from plan (% of plan)
	Total	ODA loan portion	Total	ODA loan portion	Total	ODA loan portion	
Preparatory work	0	0	1,482	0	1,482	0	816 (223%)
Steam development	5,777	2,796	5,493	1,940	11,270	4,736	1,904 (120%)
Construction of power plant	5,992	5,992	1,644	1,644	7,636	7,636	-1,414 (87%)
Construction of transmission facility and substation	487	0	163	0	649	0	133 (126%)
Price escalation	750	605	1,294	779	2,043	1,384	-146 (93%)
Contingency	518	389	425	264	943	654	-133 (88%)
Consuling services	185	185	0	0	185	185	53 (140%)
Interest during construction	434	434	0	0	434	434	-31 (93%)
Comittment charge	109	109	0	0	109	109	-8 (93%)
Land aquisition	0	0	256	0	256	0	-18 (93%)
Administration	0	0	1,972	0	1,972	0	1,282 (286%)
Total	14,253	10,512	12,726	4,627	26,978	15,138	2,711 (111%)

Exchange rate: The weighted average of the annual exchange rates based on annual expenditure amounts from the IMF International Financial Statistics was applied (1 USD = 112.0 JPY, 1 USD = 558.6 CRC, 1 CRC = 0.201 JPY)

Source: ICE

The actual total project cost amounted to 26,978 million yen, of which 15,138 million yen was covered by ODA loans.⁹ The remaining 11,840 million yen was funded through other sources than ODA loans, including IDB loans, EIB loans, and ICE's own funds. This brought the total project cost to 111% of the planned amount (Table 3-2).

The main reasons for the deviation in project costs from the plan are as follows:

- Exchange rate: The planned exchange rate was 1 USD = 87.01 JPY, whereas the actual exchange rate was 1 USD = 112.0 JPY, reflecting a depreciation of the yen, which contributed to the increase in project costs.

⁹ One of the reasons the ODA loan amount fell short of the plan was the imposition of penalties on the contractor for delays in delivering certain electrical equipment for the targeted power plants.

- Preconstruction work: The Project is located in a forested area, and during the implementation phase, access proved to be more complex and difficult than anticipated. Additionally, to proceed with land reclamation according to the final design, the costs reached 223% of the planned budget.
- Steam development: Although the number of production and reinjection wells remained unchanged, as drilling and the construction of water and air transport pipelines progressed, adjustments were made to accommodate the current geological conditions, leading to an increase in the length of piping, as well as the addition of separators, cooling ponds, etc. While the amount of two-phase flow piping and cooling towers was reduced, the overall cost reached 120% of the planned budget.
- Power plant construction: Due to the final price of electrical and mechanical equipment being lower than the initial estimate, the costs were kept at 87% of the planned budget.
- Transmission and substation equipment: While costs were reduced by utilizing some existing structures, the increase in equipment import prices led to higher expenses, resulting in costs being 126% of the planned budget.
- Consulting services: An extension of the contract with the consultant was required (for details, refer to the project period), resulting in the contract amount being 140% of the planned budget. However, this was covered by reallocating funds from the contingency budget.
- Administration costs: In line with changes in the project scope, administration costs increased in the Project for items such as preparatory work, construction of water and air transport pipelines, procurement of related equipment and materials, and consulting services.

The construction costs of the power plant were below the plan, but due to the yen depreciation, the increase in steam development and management costs exceeded those savings, resulting in a total project cost that slightly exceeded the plan.

3.2.2.2 Project Period^{10, 11}

The planned project duration was 52 months, from the signing of the Loan Agreement (L/A) in August 2014 to the commencement of operation in November 2018. In contrast, the actual duration was 62 months, from August 2014 to September 2019, which is 119% of the planned duration.

	2014	2015	2016	2017	2018	2019	2020
Loan agreement	▲						
Steam development, preconstruction work	 						
Water and air transport pipelines		 					
Procurement of consulting service	 						
Consulting service		 					
Procurement of generation equipment		 					
Procurement and implementation of construction of power plant			 				
Construction of transmission lines and substation			 				
Completion of the Project (commencement of operation)					 		

Source: Prepared by the evaluator

Figure 2: Project Duration: Planned and Actual

In the Project, there was a delay of nearly one year in the commencement of operations. The main reasons are as follows.

- Steam development: Due to the early completion of the drawings, the work started ahead of schedule, but there were delays in the delivery of control valves. Additionally, during well drilling, work considering the characteristics of the reservoir was required, resulting in an extension of the timeline.
- Water and air transport pipelines: Since design and material procurement were feasible on-site, the Project could start early. However, due to the need to secure personnel and consider the progress of other tasks, the overall construction period took more than twice as long as initially planned.

¹⁰ For the three production wells, which are part of the outputs of the Project, drilling was carried out prior to the signing of the Loan Agreement (L/A). JICA agreed with ICE to retroactively recognize these wells. However, during this ex-post evaluation, a clear response regarding the exact start date could not be obtained from ICE. Since JICA's "2024 External Ex-Post Evaluation Reference" states that, unless otherwise specified in the project's ex-ante evaluation sheet, the project start date should be considered as the month of L/A signing, it was agreed with ICE to use August 2014, the month of the L/A signing, as the project start date.

¹¹ The risks that were raised during the appraisal, which could potentially lead to schedule delays (① the possibility of an increased number of wells being drilled due to insufficient steam and reinjection capacity from the drilled wells, and ② the potential delay in the IDB financing review schedule affecting ICE's funding), were mitigated through prior investigations and information sharing among the donors.

- Procurement of generating equipment: The preparation and revision of the tender announcement, verification of bidding documents, and obtaining JICA's approval took more than twice the originally planned duration.
- Construction of the power plant: In addition to delays in the bidding process due to the approval of the financing method, bidding documents, and extension of the bidding period, there were significant delays in the procurement of equipment and materials for the construction of the power plant (such as fire detection systems) and the delivery of flow meters.
- Consulting services: To ensure compliance with JICA's procurement guidelines, more time was required for internal verification within ICE. Additionally, due to the delayed start of operation of the power plant, the necessary data for updating the numerical model of the geothermal reservoir evaluation was not obtained, requiring an extension of the consulting services.
- Construction of transmission lines and substations: The start was delayed due to delays in the drawings.
- Start of operation: Due to delays in the delivery of drawings and electrical equipment, it took 6 months from the completion of the power plant to the commencement of operation.

As mentioned above, the project period was 119% of the plan, slightly exceeding the plan, but this was due to delays associated with changes in the outputs required to achieve the project effects.

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

At the planning stage, under the following assumptions, the financial internal rate of return (FIRR) for the Project was assumed to be 8.05%, and the economic internal rate of return (EIRR) was assumed to be 24.70%. In the ex-post evaluation, the same methods were attempted, but no comparable recalculation information was obtained from ICE regarding FIRR based on electricity sales revenue, or for EIRR based on the reduction in CO₂ emissions compared to the operation of thermal power plants.

Table 4: Assumptions for the Internal Rate of Return (IRR) of the Project

	FIRR	EIRR
At Planning	8.05%	24.70%
Cost	Project cost Operation and maintenance cost	Project cost (excluding tax) Operation and maintenance cost
Benefit	Electricity sales revenue	Reduction in fossil fuel purchases, reduction in CO ₂ emissions compared to the operation of thermal power plants
Project Life	30 years after startup	30 years after startup

Source: Materials provided by JICA

As noted above, in the Project, there were fluctuations in the construction of access roads and water and air transport pipelines. However, these outputs represented appropriate changes in line with the project scope. Due to the changes in outputs and the progression of the yen depreciation, both the project costs and duration slightly exceeded the original plan. Therefore, efficiency of the project is high.

3.3 Effectiveness and Impacts¹² (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

In the Project, as operational indicators for the objective of “increasing power supply through renewable energy,” indicators ① to ⑤ in Table 5 were set, while effectiveness indicators ⑥ and ⑦ were established. Additionally, for “responding to climate change impacts,” the reduction of greenhouse gas emissions was set, with indicator ⑦ being used.

¹² When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 5: Comparison of Planned vs Actual Operation and Effect Indicators

Name of Indicator	Target (2 years after completion)	Actual (achievement rate)		
		2021 (2 years after completion)	2022 (3 years after completion)	2023 (4 years after completion)
Operation Indicators				
① Maximum Output (MW)	52	50.31 (96.75%)	47.32 (91.00%)	51.30 (98.65%)
② Plant Load Factor (%)	80	82.26 (103.83%)	86.08 (107.60%)	79.80 (99.75%)
③ Availability Factor (%)	85	85.41 (100.48%)	94.60 (111.29%)	80.80 (95.06%)
④ Auxiliary Power Ratio (%)	8 or less	5.71 Achieved	6.14 Achieved	5.67 Achieved
⑤ Unplanned Outage Hours (hr/year)				
a) Human Error	0	0 (100%)	0 (100%)	0 (100%)
b) Mechanical Failures	0	70.27 (Not achieved)	0 (100%)	3.43 (Not achieved)
c) Others (natural disaster, etc.)	—	0 (100%)	0 (100%)	0 (100%)
Reference Indicators*				
Reference ① Planned Outage Hours (hr/year)	—	1,206.46	472	1,677.39
Reference ② Reliability (%)	100%	99.49%	100%	99.76
Effect Indicators				
⑥ Power Generation at the Transmission End (GWh/yr)	364	381.39 (104.78%)	391.35 (107.51%)	363.95 (99.99%)
⑦ Contribution to Greenhouse Gas (GHG) Emission Reduction (CO ₂ equivalent)				
a) Based on Costa Rica’s Power Generation Mix	14,308 ton/year	3,426 ton/year (23.94%)	8,431 ton/year (58.93%)	17,532 ton/year (122.53%)
b) Based on the power generation from diesel-fired power plants expected in Costa Rica if the Project had not been constructed	294,728 ton/year	272,616 ton/year (92.50%)	279,937 ton/year (94.98%)	260,151 ton/year (88.27%)

* The operational indicator used by the implementing agency.

Reliability Factor = $100 - [(\text{Unplanned Downtime} / (\text{Annual Operating Hours} + \text{Unplanned Downtime})) \times 100]$

Source: Materials provided by JICA and the implementing agency

1) Operation indicators

- ① Maximum output: From the second year after the Project's completion, the target achievement rate has been over 90%, although 100% has not been reached. The main

reason for this is that the characteristics of ferromagnetic elements, such as iron, nickel, and cobalt, had changed and the amount had increased compared to the specifications at the time of order. These elements accumulate as scale (deposits of impurities) in turbines and pipes, leading to reduced power generation efficiency. The reason for the high presence of ferromagnetic elements has not been fully clarified, and at the time of the ex-post evaluation, measures to minimize their impact, such as scale removal by sandblasting and the installation of sand traps and steam cleaning systems for impurity collection, were the only actions taken.¹³

- ② Plant load factor: The target was achieved in both 2021 and 2022. However, in 2023, to mitigate the effects of ferromagnetic elements in the steam, a turbine overhaul was conducted from November to December based on the manufacturer's advice. As a result, the target achievement rate was slightly below the goal at 99.75%.
- ③ Availability factor: The target was achieved in both 2021 and 2022, but in 2023, due to issues related to ferromagnetic elements in the steam, as mentioned in "Maximum output," a turbine overhaul was conducted. As a result, planned downtime increased, and annual operating hours decreased, causing the target achievement rate to slightly fall below the target at 95%.
- ④ Auxiliary power ratio: Since the start of operation, the auxiliary power ratio has consistently been below 8%, achieving the target.
- ⑤ Unplanned outage hours: There have been no stoppages due to human error or natural disasters. However, as previously mentioned, mechanical failures caused by ferromagnetic elements in the steam resulted in unplanned outage hours of 70.27 hours in 2021 and 3.43 hours in 2023.

Reference Indicator ① Planned outage hours: In 2021, the planned outage hour was scheduled for maintenance. In 2023, the planned outage hour was scheduled for an overhaul to address issues caused by ferromagnetic elements in the steam, which had been occurring since 2021.

Reference Indicator ② Reliability: Despite challenges caused by ferromagnetic elements in the steam, the achievement rate has been nearly 100% from 2021 to 2023. The electrical and mechanical equipment of the Project has experienced few breakdowns,

¹³ In order to identify the root cause, an investigation was conducted by the Geothermal Reservoir Management Geochemistry Unit under ICE's Power Generation Department. The study concluded in June 2023 that "ferromagnetic materials are generated when abrasive fluids from the geological strata are drawn into the production wells, causing erosion and corrosion" "the investigation was unable to pinpoint the specific location or area of the strata where this abnormal situation occurs, and the exact cause of the phenomenon in the geological layer remains unclear." ICE plans to continue the investigation moving forward.

with almost no unplanned outages, ensuring stable operations.

2) Effect indicators

- ⑥ Power generation at the transmission end: Since the second year after project completion, the achievement rate has exceeded 100%, and it was almost 100% in 2023 as well.
- ⑦ Contribution to greenhouse gas (GHG) emission reduction
 - a) Based on Costa Rica's power generation mix: In both 2021 and 2022, the achievement rate was low, with the target only being met in 2023. In 2023, due to a decrease in rainfall and a reduction in hydropower generation, the share of thermal power plants increased, leading to a higher contribution of geothermal power to greenhouse gas emission reductions.
 - b) When compared to power generation from diesel thermal power plants that would be expected if the project had not been constructed in Costa Rica, the achievement rate is almost met, ranging from 88% to 94%.

As mentioned above, due to the higher-than-expected ferromagnetic elements in the steam supplied to the power plant, unplanned maintenance has been required. However, two years after the completion of the Project, the goals have been achieved, except for unplanned outage due to mechanical failures and maximum output. Additionally, regarding the issue of ferromagnetic elements in the steam, the implementing agency has been addressing the problem, and by 2023, all operational indicators have shown improvement. Regarding the effect indicators, by 2023, contributions to greenhouse gas emissions reduction have been recognized, and the achievement of the objectives of the Project is considered to be high.

3.3.1.2 Qualitative Effects (Other Effects)

The expected qualitative effects of the project, namely “regional economic revitalization” and “improvement of the living standards of local residents,” are analyzed as impacts.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact of the Project is “contributing to sustainable economic development of Costa Rica.” In this ex-post evaluation, it was analyzed that this is achieved through the Project's contribution to the country's electricity supply and its role in decarbonization.

1) Contribution of the Project to Costa Rica's electricity supply

As mentioned earlier, hydroelectric power will remain the primary energy source in Costa Rica. However, due to the high uncertainty in electricity supply caused by climate change, plans are being developed to reduce the share of hydroelectric power and increase other renewable energy sources by 2040, when electricity demand is expected to reach 18,029 GWh. Specifically, by 2040, infrastructure will be developed to increase electricity supply to 15,703 GWh (47% from hydroelectric, 22% from wind, and 18% from geothermal) and capacity to 5,637 MW.

The Project accounts for 25% of Costa Rica's geothermal power generation capacity as of 2024, providing stable electricity supply. Furthermore, by 2040, the sector loan, including Borinquen I and II, is expected to account for half of the total geothermal generation capacity, and it is anticipated to continue playing a crucial role in the future.

Table 6: Existing and Planned Geothermal Power Plants in Costa Rica (As of 2024)

	Power Plant Name	Year of Operation Start	Maximum Output (MW)	Percentage of Geothermal Power Capacity in 2040 (%)
Existing (2024)	Boca de Pozo	1994	5	2%
	Miravalles 1	1994 (Scheduled to operate until 2030)	50	-
	Miravalles 2	1998 (Scheduled to operate until 2031)	50	-
	Miravalles 3	2000 (Scheduled to operate until 2031)	26	-
	La Pailas I	2011	37	11%
	La Pailas II (the Project)	2019	55	17%
Plan	Borinquen I	2032	55	17%
	Borinquen II	2029	55	17%
	Geothermal Project 4	2029	12	4%
	Geothermal Project 5	2031	12	4%
	Geothermal Project 6	2032	12	4%
	Miravalles 1 (new)	2032	35	11%
	Miravalles 2 (new)	2033	35	11%
	Miravalles 3 (new)	2033	20	6%
Total for 2040			333	100%

Source: ICE “*Electric Power Generation Expansion Plan 2022-2040*”, and Programa Estado Nación, El Observador, Public Utilities Regulatory Authority (Aresep)

Note: The shaded portion refers to the “Guanacaste Geothermal Development Sector Loan,” which includes this project.

2) Contribution of the Project to Decarbonization in Costa Rica

Costa Rica aims to achieve zero use of fossil fuels by 2050 at the national level, with

activities and targets for each sector outlined in the *National Decarbonization Plan 2018-2050*. According to the progress report of the plan, in the electricity sector, where renewable energy accounted for 99.9% of the power generation in 2022, 66% of the activities aimed at achieving carbon neutrality had been completed by February of the same year. Even in 2023, when the share of hydropower decreased due to water scarcity, renewable energy, including this project, accounted for 94.5% of the total electricity generation, resulting in a significant reduction in the use of fossil fuels.

The Project plays a role in stabilizing the national electricity system (SEN) by providing reliable power to the SEN, which includes renewable energy sources with significant variability, such as hydropower, solar, and wind. In 2023, the average GHG emissions of the SEN were 78.7 gCO₂e/kWh¹⁴, whereas Las Pailas II had a much lower GHG emission rate of 30 gCO₂e/kWh, contributing to maintaining the SEN's GHG emissions at a low level.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment^{15, 16}

The Project was classified under the Environmental and Social Considerations category, as it falls within the geothermal sector outlined in the *JICA Environmental and Social Consideration Guidelines* (April 2010).

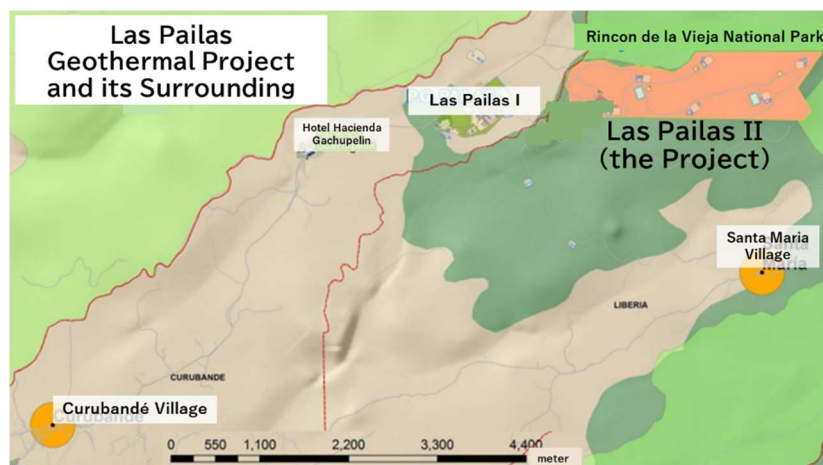
In this ex-post evaluation, it was confirmed that the Environmental Impact Assessment

¹⁴ CO₂e/kWh refers to the carbon dioxide equivalent emission factor, which is an indicator that shows how much CO₂ is emitted to supply 1 kWh of electricity.

¹⁵ In the Project, “Special Assistance for Project Implementation (SAPI) on Guanacaste Geothermal Development Sector Loan (Environmental Monitoring Support Focused on Ecosystem Impacts)” was conducted with the aim of improving the accuracy of ecosystem impact assessments through empirical investigation. The study examined the potential for improving investigation methods related to environmental impact assessments (EIA) for geothermal development. The study, conducted from December 2015 to May 2017, was led by the NGO Guanacaste Dry Forest Conservation Fund (GDFCF) with cooperation from the Rincón de la Vieja National Park, and it suggested that the impacts from the Las Pailas geothermal field may not have reached the Guanacaste Conservation Area (ACG). The SAPI was implemented for about a year and a half, but the investigation continued with the cooperation of GDFCF and ICE thereafter. By the time of the ex-post evaluation, data has been accumulated over a period of 10 years, and the analysis by GDFCF is ongoing. According to interviews with Dr. Daniel Hunt-Jansen and Dr. Winifred Hallwachs, leaders from the aforementioned NGO at the time of ex-post evaluation, and experts in ecosystem conservation, the likelihood remains high that the impacts from the Las Pailas geothermal field have not reached the Guanacaste Conservation Area. Additionally, the study highlighted that a strong partnership had been developed among ICE, the National Park Management Office, and the NGO. In large-scale infrastructure projects like this, there is often tension between the stakeholders involved in environmental protection, such as NGOs, and the project developers. However, the interviews revealed that while communication at the beginning of the Project was not smooth, over time, through continuous dialogue with ICE and the involvement of the national park, a cooperative relationship was built, leading to a successful partnership.

¹⁶ <https://www.grupoice.com/wps/wcm/connect/4a96db86-e963-4753-a0c6-2abe35fdaf21/II%20Informe%20Responsabilidad%20Ambiental%202020.pdf?MOD=AJPERES&CVID=nzHBMc>
(Please also refer to the ICE Environmental Report)

(EIA) report for the Project was approved by the Ministry of Environment and Energy, the National Environmental Technical Secretariat (SETENA), in September 2012. In addition to the EIA, the environmental checklist, environmental management plans during the implementation phase and after the start of operations, and the approved EIA progress reports were all completed. Furthermore, it was confirmed that measures to mitigate environmental impacts were implemented as planned during the Project's execution and continued through to the time of ex-post evaluation.



Source: ICE

Figure 3: The Project and its surroundings

Since the Project is adjacent to the Rincón de la Vieja National Park, ICE has implemented environmental management and monitoring under the supervision of the environmental officer¹⁷, who belongs to the environmental management department under the geothermal resource management team. The environmental officer is required to submit a biweekly environmental management plan implementation status report to SETENA and obtain approval. Additionally, SETENA conducts on-site inspections as necessary.

The contents of the environmental management plan and its monitoring are as follows:

- During the construction phase of the Project: speed limits for construction vehicles and diversification of traffic routes, accident prevention measures near access roads (e.g., installation of speed bumps), introduction of low-noise equipment, scheduling construction activities during the day, proper handling of excavation sludge, waste materials, and waste oil, as well as waste sorting and collection.

¹⁷ The environmental officer is required to be approved and registered by SETENA as an expert in the fields of natural and social environments.

- Environmental management monitoring conducted throughout the construction phase and after the Project becomes operational:
 - Minimizing environmental impacts: Air quality (hydrogen sulfide concentration), noise, river water quality (environmental and discharge standards), waste management, and soil contamination are regularly monitored. If any of the measured values exceed the established limits, necessary corrective measures are implemented. Additionally, regular meetings are held to explain the monitoring results and the measures taken to the local residents. Thanks to these measures, there were no complaints regarding environmental impacts from the residents of the Curubandé community, as confirmed through interviews.
 - Minimizing impacts on ecosystems: The Project aimed to minimize impacts on flora and fauna through activities such as ecosystem conservation in collaboration with experts and local residents. Measures included limiting land alteration and tree cutting, implementing reforestation, installing bird collision deterrent devices on transmission lines, and using insulated wire covers to prevent electrocution of wildlife such as monkeys. Environmental education was also provided for construction workers. Regarding the ecosystem, ICE's team of experts conducts regular monitoring surveys and, when necessary, carries out joint monitoring activities with the National System of Conservation Areas under the Ministry of Environment and Energy.¹⁸
 - Minimizing impact on the landscape: The power station and each geothermal field of the Project were landscaped to be lower than the natural ground level. The soil that was removed during this process was utilized to create natural barriers (strip greening) to conceal the power station and geothermal fields. During the site inspection, neither the power station nor the geothermal fields were visible from the road, demonstrating that the impact on the landscape has been minimized. Interviews with tourists visiting Rincón de la Vieja National Park, as well as with neighboring Hacienda Guachipelin Hotel, NGOs, and residents of the Curubandé community in Liberia, revealed that there have been no concerns raised regarding the impact on the landscape. On the contrary, there was an opinion that the implementation of the Project and the placement of the area under ICE's

¹⁸ Wildlife protection is mandated within ICE's facilities, and even if animals are encountered, it is prohibited to harm or capture them without permission. Ecosystem-related education is carried out thoroughly, both for ICE staff, local residents, and students in Liberia. ICE has ecosystem specialists, and these specialists ensure that education on wildlife protection is effectively delivered. Liberia has a rescue center for injured animals, and if an animal in need of protection is encountered, it is required to contact the center for assistance.

management led to the protection of the natural environment and improved it overall, including the landscape, due to reforestation efforts.

- Minimization of impact on cultural heritage¹⁹: In the area where Las Pailas II is located, three sites from the pre-Columbian period, likely garbage dumps or small burial sites, were found: Las Tepas, Las Serpientes, and El Encino. Although all of the sites suffered significant damage due to past looting, Las Tepas, which was presumed to be a relatively well-preserved cemetery, was protected by concrete pillars and barbed wire under the supervision of the National Archaeological Commission and the National Museum of Costa Rica. The remaining sites were accurately mapped using GPS and registered in the National Museum's database.
- Improvement of the working environment: During the project implementation period, the “Occupational Health and Safety Management Program” was carried out. This included orientations on labor standards, environmental regulations, and compliance with regulations at the worksite. Measures to minimize risks, such as prevention of dangerous situations (e.g., bruises, injuries from crushing or particles, and overwork), were implemented along with infrastructure improvements.
- Infrastructure development in the Curubandé community (refer to “Marginalized People”).



Wildlife-exclusive tunnel
(used by animals such as tapirs, jaguars,
and endangered peccaries)



Wildlife captured by 24-hour surveillance
cameras

¹⁹ Hernandez, Ana Cristina, “Diagnóstico-Reservas Arqueológicas Complejo Geotérmico Las Pailas I y II” (June 2015)



(Left, middle) Signboards indicating wildlife crossings and protective plates
(Right) Animal pathway

Source: (Top right) Provided by ICE, others taken by the evaluator.

Photo 1: Examples of facilities established for ecosystem protection under the Project

The implementation of the environmental management plan was confirmed through reports, interviews with environmental officers, residents of the Curubandé community, the adjacent Rincón de la Vieja National Park, and the neighboring NGO dedicated to conservation activities, the Guanacaste Dry Forest Conservation Fund (GDFCF). Additionally, management and monitoring based on the environmental management plan have continued till the time of ex-post evaluation. Therefore, it has been confirmed that efforts related to environmental and social considerations have been properly implemented as planned from the Project's execution to the present.

2) Resettlement and Land Acquisition

The land acquisition totaled 217 hectares (with 6 hectares acquired during the feasibility study phase) and was carried out as planned. The land in question was forest land not used for living or productive activities, and there was no need for resident relocation, nor were any significant economic impacts observed. The land acquisition was smoothly conducted in accordance with the methods established by Costa Rica's laws No. 6313 and No. 7945 of 2013 and their supplements as well as with the *JICA Environmental and Social Considerations Guidelines*. This involved land appraisal, where ICE paid the appraised value to the court for expropriation. Interviews with residents of the Curubandé community in Liberia (a population of approximately 1,000 people, with tourism as the main industry), which is directly impacted by the Project, as well as with the Rincón de la Vieja National Park management office adjacent to the Project, confirmed that there were no significant issues nor complaints with the land acquisition. According to the opinions of the residents of the Curubandé community, prior to the Project, there were issues with illegal hunting of wildlife and safety concerns. However, with the Project and the subsequent placement of these lands under ICE's management, these problems were significantly improved.

3) Gender Equality²⁰

During the peak year of employment in 2017, when the total number of employees was 686, there were 58 women and 628 men. Most of the women were under 40 years old and were employed in specialized roles (such as engineers), administrative positions, or as cooks. Interviews with ICE and former workers from the community of Curubandé indicate that gender-sensitive employment opportunities and work environments were established. Facilities such as restrooms, changing rooms, and harassment complaint hotlines were provided²¹, and there were no reported cases of gender-based violence or related issues.

4) Marginalized People

The Guanacaste Province, where the Project is located, is considered one of the regions in Costa Rica with a high poverty rate. Not limited to the Project, ICE's employment policy prioritizes the hiring of residents from areas directly affected by the project. If there is a shortage, the scope of the hiring area is expanded to secure the necessary workforce. The year with the highest number of employees for the Project was 2017, with a total of 686 workers, 84% of whom were residents of the neighboring Guanacaste province, including 37% from Liberia Canton. According to the residents of the Curubandé community, the peak period of the power plant construction saw a significant increase in the employment of local workers and engineers for civil engineering work. During the implementation of the Project, many employees ate meals in the community, which led to the thriving of small businesses such as cafeterias and mini supermarkets. However, as the Project neared completion, employment opportunities declined.²² As part of the environmental and social impact measures of the Project, in the Curubandé community, infrastructure improvements were carried out, including road development, along with the following basic infrastructure

²⁰ Since 2016, ICE has actively participated in the gender equality initiatives promoted by the World Economic Forum and the Inter-American Development Bank (IDB). Not limited to the Project, ICE has aimed to address gender disparities in labor participation, compensation, and leadership.

²¹ In Costa Rica, under Laws No. 7476 and 8805, the *Law for the Prevention of Sexual Harassment in the Workplace and Educational Institutions*, it is mandatory to have harassment complaint hotlines. During the project implementation period, the "Labor Relations Department" was established to address various labor conditions, including gender-based harassment issues. At the time of the ex-post evaluation, the "Corporate Gender and Human Rights Program Department," part of the ICE Executive Board, was specialized in handling all gender-related matters across ICE, including harassment issues.

²² Liberia City, in Guanacaste Province, has a tourism industry, and the local residents primarily work in the tourism sector of Liberia.

enhancements.²³



[Road and Water Supply Improvements]

The road improvements contributed to enhancing the living conditions and safety of the residents of the Curubandé community and led to an increase in the number of visitors to the Rincón de la Vieja National Park. The water supply improvements achieved a 100% coverage rate of the Curubandé community's potable water system and also improved water quality.



[Improvement of the Elementary School]

A classroom, a ramp, handrails, and a fence enclosing the entire school were developed at the elementary school in the Curubandé community, which has approximately 100 students.

Source: Photos taken by the evaluator

Photo 2: Infrastructure developed in the Curubandé community through the Project

The residents of the Curubandé community have highly praised ICE's environmental measures from the construction period of the Project to the present. ICE held meetings every three months to communicate with the residents before the start of the Project, and any issues were resolved as they arose. Additionally, a dedicated channel for residents to submit complaints was established from the beginning, and this transparent communication system has been maintained through the ex-post evaluation period. There was no significant evidence from hearings with the Curubandé community residents

²³ Beyond the Project, ICE has made efforts to cooperate with the local community as much as possible. For example, when the Curubandé community was developing a handicraft market, ICE provided contour maps of the community's terrain that were created as part of the Project (based on interviews with the residents of Curubandé).

indicating that the poor or marginalized groups faced disadvantages in their social or economic activities due to increased congestion or safety risks caused by construction vehicles.

In conclusion, it is believed that the job creation and infrastructure development brought about by the Project have contributed to the revitalization of the regional economy and the improvement of the living standards of the local residents.

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

From hearings with the residents of the Curubandé community, it became evident that ongoing environmental education, active and transparent information sharing, and collaboration with all stakeholders in the target area have deepened their understanding of the significance of working together for comprehensive regional improvement. This can be considered an important impact of the Project.

For example, whereas the previous mindset was that “illegal hunting is understandable if necessary for survival,” many residents now believe that wildlife should remain in their natural habitats for local ecotourism to grow and boost the regional economy. Additionally, a system has been established for continuously sharing information related to both natural disasters and community safety through social media and other channels, and partnerships with various local stakeholders, including ICE, have been successfully built.²⁴

In summary, regarding effectiveness and impact, the facilities and equipment introduced by the Project have been appropriately operated, and the degree of achievement of the project objectives is high. The contribution of the Project to Costa Rica's electricity supply and decarbonization is recognized. From the project implementation period to the ex-post evaluation, negative impacts on the natural and social environment have been minimized, and contributions to the working environment, regional economic revitalization, and the improvement of the living standards of local residents are recognized. Based on the above, the Project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating:③)

3.4.1 Policy and System

ICE was established in 1949 as a wholly government-owned corporation under the

²⁴ During the field survey, volcanic activity at Rincón de la Vieja Volcano was heightened, and ICE conducted meetings to explain the volcanic activity and emergency response procedures to stakeholders, including the adjacent national park, hotels, NGOs, and residents of the Curubandé community.

supervision of the Ministry of Environment and Energy, responsible for power generation, transmission, and distribution, as well as telecommunications. The power supply system in Costa Rica has remained unchanged since the planning stage, consisting of ICE and its subsidiary, the National Power Company (Compañía Nacional de Fuerza y Luz S.A., hereafter “CNFL”), municipal power authorities, and independent power producers. In some areas, power cooperatives operated by municipalities serve as power generators. However, at the time of the ex-post evaluation, ICE was supplying approximately 78% of the electricity generation in Costa Rica.

As mentioned earlier, ICE’s electric power generation expansion plan (2022–2040) is positioned as a policy for Costa Rica’s electricity sector. It continues to prioritize renewable energy sources, including geothermal power, aims to reduce reliance on fossil fuels, and seeks to ensure environmental sustainability. The authority for geothermal development is granted solely to ICE, and both at the time of project planning and ex-post evaluation, it is based on clear and stable policies and regulations. Therefore, there are no issues related to policies or regulations regarding the sustainability of the Project.

3.4.2 Institutional/Organizational Aspect

The President and members of the Board of Directors of ICE are appointed by the Costa Rican government, with the President serving as the Chairman of the Board. ICE has four departments: Power, Telecommunications, Finance, and Corporate Services. The Power Department’s Generation Division is responsible for the Project. This division includes “Geothermal Resources Unit,” which oversees the operation and maintenance of geothermal fields, including Las Pailas, and “Chorotega Regional Operations and Maintenance Unit,” which manages the operation and maintenance of the power plant.

“Geothermal Resources Unit” includes the “Geothermal Field Operations and Maintenance Team,” “Operations and Maintenance Support Team,” “Geothermal Reservoir Management Team,” and “Deep Drilling Team.” Under “Chorotega Regional Operations and Maintenance Unit,” there is Las Pailas Geothermal Power Center, which is responsible for the operations and maintenance of both Las Pailas Geothermal Power Plant I and II. The total number of employees in the power plant operations and maintenance team is 42, while the total number of employees in the geothermal field operations and maintenance team is 32. The ICE Group has undergone several organizational restructures; however, there have been no significant changes in the specialized geothermal power generation sector. The operations and maintenance organization and structure for the Project, as well as the chain of command, remain clear and well-defined. Based on the above, there are no issues related to the organizational and structural aspects concerning the sustainability of the Project.

3.4.3 Technical Aspect

At ICE, the hiring standards, including the necessary specialized knowledge, qualifications, and experience, are detailed and clearly defined for each job role and position. Additionally, due to the highly specialized nature of geothermal power generation, personnel transfers within the site are limited. As a result, the employees at Las Pailas Geothermal Power Center have long tenure. During the interviews conducted for the ex-post evaluation, it was noted that particularly the engineers and technical staff are highly experienced professionals who have worked in the operation and maintenance of other geothermal power plants and have gained extensive expertise in geothermal development, continuing to work as skilled personnel. Furthermore, knowledge and expertise are passed on through on-the-job training (OJT) at the site, ensuring a high level of technical proficiency.

Table 7: Operational and Maintenance Structure of the Las Pailas Geothermal Power Plant Center (Number of Employees, Background, etc.)

	Power Plant Operations and Maintenance Team			Geothermal Field Operations and Maintenance Team		
	No.	Education Qualification	Average years of service	No.	Education Qualification	Average years of service
Engineer	5	Bachelor Master	20	4	Bachelor Master	More than 10 years
Technical staff	19	Vocational school for electrical and mechanical engineering	20	26	Vocational school for electrical and mechanical engineering	More than 10 years
Administration	6	Middle and high schools	17	2	High school	More than 10 years
Skilled labor	12	Middle and high schools	15	-	-	-
Total	42			32		

Source: ICE

ICE focuses on human resource development, and as mentioned earlier, the necessary specialized knowledge and qualifications for each job type and position are clearly defined. Training programs are conducted to upgrade these skills and qualifications. All employees at Las Pailas, from skilled workers and clerical staff to technicians, had the opportunity to participate in training programs during the period from 2021 to 2023, as outlined below. The training plan for 2024 has also been confirmed. The training programs include general topics as well as specialized ones tailored to job roles, such as the power system restoration manual,

SAP plant maintenance²⁵, BIM (Building Information Modeling) I and II, an overview of operational parameters by technology, the SIGEST information system²⁶, and substation operations.

The operation and maintenance of the power plant are carried out in accordance with the specific manuals provided by the equipment manufacturers. The digital versions of the manuals are stored on ICE's servers, and the implementation and recording of operations and maintenance, as well as spare parts management, are conducted using an information management system. Each piece of equipment has a maintenance plan, and routine inspections and preventive maintenance (e.g., weekly, monthly, semi-annual, annual, and biennial) are carried out. Monitoring and management of the geothermal reservoir are conducted by the Reservoir Management Department in accordance with the geothermal reservoir development strategy created by ICE, based on international standards. This strategy is carried out through the creation and evaluation of the Cumulative Energy Production (CEP) curve. The trends of parameters for each production well are analyzed, and development policies for the reservoir are determined with the goal of sustainable resource management and ensuring the reservoir's lifespan. After the commencement of operations, Las Pailas II collected and analyzed data on the parameters of each production well every six months for the first two years. Since the parameters stabilized, production evaluations have been conducted annually starting from the third year. Additionally, since the Project has obtained and continues to maintain international standards such as ISO 45001, ISO 9001, and ISO 14001, the technical capacity for operation and maintenance meets the quality standards required by these certifications. Furthermore, in 2019, the Project was awarded the "Best Geothermal Project in the Latin America and Caribbean Region" at the Geothermal Conference for Latin America and the Caribbean held in Chile.

Based on the above, there are no technical issues regarding the sustainability of the Project.

3.4.4 Financial Aspect

The ICE Group is positioned as a strategic business group for Costa Rica, and in 2023 and 2024, it has been upgraded and assigned a "stable" outlook by major rating agencies.²⁷

²⁵ SAP Plant Maintenance is a system provided by SAP, a global enterprise application company, that enables the efficient management of factory-wide maintenance planning, preventive maintenance schedules, work order management, and equipment and spare parts management. (source: SAP)

²⁶ The SIGEST information system is an IT tool designed for the investigation, processing, and analysis of electrical energy data. It supports technical and economic decision-making related to electrical energy by using objective and structured data. (source: SICA)

²⁷ In March 2024, Fitch Ratings upgraded ICE's long-term international credit rating from BB- in 2023 to BB with a "Stable Outlook." (source: <https://www.fitchratings.com/research/corporate-finance/fitch-upgrades-instituto-costarricense-de-electricidad-to-bb-outlook-stable-04-03-2024>) Moody's also upgraded ICE's rating from "stable" to "positive" in 2023.(source: <https://www.moody.com/researchandratings/country/costa-rica/-/04206B>)

According to ICE's consolidated profit and loss statement, operating profit has consistently been positive over the past three years, with revenue from the two main businesses, electricity and telecommunications, sufficiently covering the operation and maintenance costs.

Table 8: ICE Group Profit and Loss Statement

(in million colons)

	2021	2022	2023
Revenue	1,293,641	1,388,910	1,420,532
Operating costs (operation and maintenance costs)	809,918	836,064	918,556
Gross profit	483,723	552,846	501,976
Other income	39,802	68,025	54,931
Total operating expenses	339,612	317,992	272,606
Operating profit	183,913	302,879	284,301
Finance income and costs	△277,360	△116,200	△8,033
Other gains and losses	47	△49	△70
Corporate income tax	367	4,389	2,227
Net profit for the period	△93,033	191,019	278,425

Source: ICE

ICE has a budget adjustment mechanism that allocates and balances the budget based on the progress of project activities and funding needs. For the Project, for example, if the budget is lower than the requested amount, the Power Management Division is asked to reallocate resources necessary for the operation and maintenance of the power plant. For the operation and maintenance of Las Pailas II, the required spare parts and equipment for the following year are identified each year, included in the procurement plan, and procurement is carried out accordingly.

Table 9: Operation and Maintenance Budget of Las Pailas II (in million colons)

	2022		2023		2024	
	Amount requested	Amount allocated	Amount requested	Amount allocated	Amount requested	Amount allocated
Operation	214.9	214.9	197.1	197.1	245.2	245.2
Maintenance	44.2	44.2	264.0	264.0	239.3	239.3
Total	259.1	259.1	461.1	461.1	484.5	484.5

Source: ICE

As mentioned above, the amount requested each year has been allocated, and the necessary maintenance budget is being distributed. There are no issues with operation and maintenance,

including problems such as shortages of spare parts. Overall, financial sustainability is high.

3.4.5 Environmental and Social Aspect

As mentioned earlier, for the Project, the environmental officer from the Environmental Management Department under the Geothermal Resource Environmental Management Team has been responsible for creating, implementing, and monitoring an environmental and social management plan that covers environmental pollution control, impacts on landscape, ecosystem and local communities, from the project implementation phase through to the ex-post evaluation stage. The environmental officer compiles the monitoring information into the environmental management plan implementation status report, which is submitted to and approved by the National Environmental Technical Secretariat every half month. Therefore, environmental and social considerations to ensure the sustainability of the Project are being appropriately carried out.

3.4.6 Preventative Measures to Risks

During the planning phase of the Project, there were concerns regarding the sustainability of the geothermal reservoir, which is crucial for the sustainable use of geothermal energy. These concerns included the risk of unforeseen circumstances exceeding the initial assumptions during the pre-analysis and the risk of inadequate management of the geothermal reservoir during the operational phase of the power plant. These risks were minimized through JICA's technical assistance under the ODA loan scheme and consulting services, which optimized scenarios for production and reinjection, as well as verification and adjustments in line with the geothermal reservoir development strategy created by ICE. This has ensured that appropriate management of the geothermal reservoir continues. (Refer to "Appropriateness of the Project Plan and Approach," etc.)

On the other hand, after the commencement of operations, the amount of ferromagnetic elements in the steam supplied to the power plant has exceeded expectations, impacting power generation efficiency. The root cause of this issue has not yet been determined; however, ICE has taken measures to minimize its impact. (Refer to "Effectiveness: Quantitative Effects: Operational Effect Indicators")

Based on the above, ICE is taking appropriate measures to address risks, and there are no particular issues.

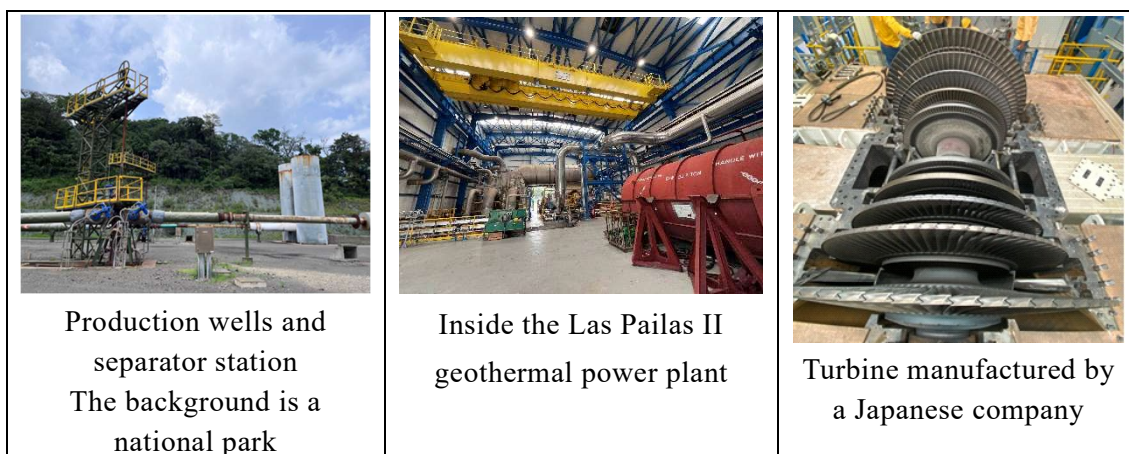
3.4.7 Status of Operation and Maintenance

The majority of the equipment established by the Project is operating smoothly, and the maintenance status is generally good. The main operational and maintenance conditions at the time of the ex-post evaluation are as follows.

Table 10: The Operation and Maintenance Status of the Las Pailas II Geothermal Power Plant

Equipment	Current status	Countermeasures
Wells	- All wells are operating at 100% capacity, and the quality of the steam supplied to the Las Pailas II power plant, including the non-condensable gas content, remains within the parameters necessary for continuous plant operation. - Between 2022 and 2023, lightning strikes caused the failure of 10 electric actuators, and during the on-site inspection, several electric actuators were found to be non-operational.	• During the on-site inspection, the electric actuators had been switched to manual valves, allowing operations to continue without difficulties. The repair of all failed electric actuators is planned for the 2025 budget.
Power plant	- At the time of the ex-post evaluation, operations were running normally. However, since 2021, the issue of turbine wear caused by higher-than-expected levels of ferromagnetic elements in the steam has emerged, necessitating continued monitoring in the future.	- Since 2021, unplanned sandblasting and turbine maintenance have been conducted. From November to December 2023, a turbine overhaul was carried out based on the manufacturer's advice. - At the time of the ex-post evaluation, sand traps and steam cleaning systems had been implemented, and the situation was under close observation.
Steam and water transportation pipe	- Operating normally. - Corrosion was noticeable on the pipelines. - To capture and eliminate the ferromagnetic elements present in the steam, collector legs were installed at the outlets of production wells, and valves were added to the steam and traps as part of measures separate from regular maintenance.	- Regarding corrosion, regular maintenance (painting) is planned to be carried out every 5 to 6 years, with the next scheduled maintenance set for the summer of 2025.
Transmission lines, power transmission and transformation equipment	- Operating normally.	- None
Substation	- Operating normally.	- None

Source: Prepared by the evaluator



Source: (left, center) Photo taken by the evaluator, (right) provided by ICE

Photo 3: Facilities established under the Project

Overall, the operation and maintenance of the equipment are generally in good condition. While the reduction in power generation efficiency due to ferromagnetic elements remains an issue to be addressed for the sustainability of the Project, ICE plans to continue investigating the cause and taking appropriate measures, making it highly likely that improvements will be achieved.

Based on the above, no issues have been observed in the policies/systems, institutional/organizational, technical, financial, environmental and social aspects. Risks have been well mitigated. Slight issues have been observed in the status of operation and maintenance, however, there are good prospects for improvement. Therefore, sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The “Guanacaste Geothermal Development Sector Loan” aims to increase the electricity supply through renewable energy and respond to climate change impacts by constructing multiple geothermal power plants in Guanacaste Province, thereby contributing to the sustainable economic development of the country. The Project, one of the subprojects under the above sector loan, contributes to the objectives of the sector loan by constructing a geothermal power plant in the Las Pailas area of Guanacaste Province. The implementation of the Project is fully consistent with Costa Rica’s development policies, development needs, and Japan’s development assistance policies. Although no results beyond expectations were achieved in terms of concrete collaboration with JICA and other international organizations, coordination was carried out as planned. Therefore, the relevance and coherence are high. Changes in the quantities of access road and steam-water transport pipeline construction

occurred, but these were in line with the project objectives. While costs and period of the Project slightly exceeded the initial plan due to some changes in outputs and the progression of the yen depreciation, the efficiency remains high. The equipment introduced by the Project is being operated appropriately, and the degree of achievement of the project objectives is high. The contribution to Costa Rica's electricity supply and decarbonization is recognized. From the project implementation period to the time of ex-post evaluation, the Project's contributions to the natural environment, social environment, labor conditions, local economic revitalization, and improvements in the living standards of local residents are recognized. Based on the above, the Project has mostly achieved its objectives. Therefore, the effectiveness and impact of the Project are high. There are no issues regarding the operation and maintenance in terms of related policies and systems, institutional/organizational, technical, financial, environmental and social aspects and risk management. Regarding the operation and maintenance status, the ferromagnetic elements contained in the steam supplied to the power plant are affecting the generation efficiency. However, this is a minor issue, and there is a high likelihood of improvement and resolution. Therefore, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Since 2021, the characteristics of ferromagnetic elements, such as iron, nickel, and cobalt, had changed and the amount had increased compared to the specifications at the time of order. This has led to the unplanned accumulation of scale (impurity deposits) inside turbines and piping, resulting in reduced power generation efficiency. To address this issue, ICE has already implemented measures to minimize its impact, including scale removal using sandblasting, installing sand traps and steam cleaning systems to capture impurities, and conducting overhauls. As a result, by 2023, they were able to achieve the target of operational indicators. However, the root cause of the issue has yet to be identified.

To achieve normal operations of the Project, it is essential for ICE to continue detailed monitoring of the issue. ICE should also consider additional investigations by Geothermal Resources, Geothermal Reservoir Geochemistry Unit under ICE's Power Generation Division, as well as the possibility of inviting external experts for further analysis. Identifying the root cause and promptly developing a solution is highly desirable.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Building a friendly partnership among the project stakeholders

Large-scale infrastructure projects, such as the Project, often encounter conflicts with various stakeholders, including nearby residents and environmental NGOs dedicated to preserving the natural environment. Although communication was initially challenging during the early stages of the Project, ICE gradually established a cooperative relationship with each stakeholder through careful dialogue. By the time of the ex-post evaluation, these relationships had matured to the point where stakeholders became reliable partners. Even before the start of the Project, ICE actively engaged in transparent information sharing with other stakeholders, including Rincón de la Vieja National Park, GDFCF, Hacienda Guachipelín Hotel, and the Curubandé community. This proactive approach gradually led to the establishment of win-win partnerships. By the time of the ex-post evaluation, a shared understanding had been established across the area: promoting the protection of the natural environment and ecosystems contributes to revitalizing the local economy through the expansion of ecotourism. This partnership also served as the foundation for a cooperative framework to support local disaster risk management, such as sharing information and responding during periods of activity at the Rincón de la Vieja Volcano, and to enhance local safety by reporting trespassers and illegal hunting. Moreover, it has evolved into a partnership addressing broader challenges.

From the above, it can be concluded that in large-scale infrastructure projects requiring environmental and social considerations, it is crucial to engage in transparent information sharing with a wide range of stakeholders including local residents and NGOs from the planning stage. Building mutually beneficial partnerships through ongoing dialogue is essential to the success of such projects.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

None

5.2 Additionality

None

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
① Project Outputs		
1. Civil works, procurement of equipment		
1) Preconstruction works	• Access road (width 5m): 6,000m • Water line: 1 set • Site preparation: 6 sets • Drilling mud pits: 6 sets • Concrete works: Production wells 11 units, reinjection wells 9 units • Fens: 6 units • Steel structure fabrication and installation: 12 units	• Access road (width 5m): 4,225m • As planned • As planned • As planned • As planned • As planned • As planned
2) Wells ²⁸	• Production wells: 11 sets • Reinjection wells: 9 sets • Drilling works and procurement of related materials and equipment	• As planned • As planned • As planned
3) Power generation equipment	• Mechanical equipment: 55MW×1set, • Procurement of related equipment • Electrical equipment, instrumentation and control equipment, spare parts and consumables	• As planned • As planned • As planned
4) Procurement of equipment and materials for the construction of the power plant	• CCTV, access control systems, lightning monitoring systems, fire detection systems, paging systems, and data networks	• As planned
5) Construction work for generation plant (including noise reduction works)	• Site preparation of power plant: 15,000m² • Mechanical/electrical/non-electrical equipment construction, building, construction work, and local transportation. • Noise reduction: 10m to 15m high steep slopes to the northeast and southeast of the terrace where the power plant is to be built, respectively; 90m soundproofing wall of metal structure and rock wool.	• As planned • As planned • As planned
6) Construction of gathering system pipelines, procurement of	• Two-phase piping: 4,390m • Steam piping: 2,295m • Hot reinjection piping: 1,770m • Cooling tower blowdown and silencer drain:	• 884m • 3,804m • 1,979m • 2,204m

²⁸ In Las Pailas II, there are 12 production wells, one of which was drilled during the feasibility study phase and is therefore not included in the outputs of the Project. Additionally, three wells were drilled by ICE using its own funds before the signing of the L/A; however, since these wells were eligible for financing under the ODA loan, JICA agreed to retroactively recognize them.

related equipment and materials	2,320m • Separator base: 2 units • Scrubber base: 1 unit • Cooling tank: 2 units	• 3 units • Canceled • 3 units
7) Procurement of transmission and substation equipment	• Expansion of Las Pilas I existing switchyard, switchgear, transmission line side (circuit breakers, disconnectors, transformers, overhead lines), structures (overhead structures, foundations) • Expansion of Las Pilas II switchyard, main transformer (68.75 MVA), switchgear (circuit breakers, disconnectors, transformers, overhead lines), structures (overhead structures, foundations)	• As planned • As planned
8) Transmission line construction and substation construction	• Transmission lines (Las Pilas II to I, 230 kV, 1 line, 2.55 km), towers, overhead wires, insulators • Construction and installation (including design and testing)	• As planned • As planned
2. Consulting services	• Support for reservoir evaluation • Detailed design review of power plant • Assistance in bidding for power plants • Monitoring the progress of power plants, etc. (including review of the implementation of safety and environmental management)	• Support for reservoir evaluation is as planned. Drilling assistance was performed by ICE prior to L/A signing and was not included in consulting services. In-person training changed to online. • As planned • As planned • As planned
② Period	August 2014 – November 2018 (52 months)	August 2014 – September 2019 (62 months)
③ Project Cost Foreign currency Local currency Total ODA Loan Portion Exchange Rates	13,753 million yen 10,514 million yen (60,080 million colon) 24,267 million yen 16,810 million yen 1 colon = 0.175 yen (as of January 2013)	14,253 million yen 12,726 million yen (63,313 million colon) 26,978 million yen 15,138 million yen 1 colon = 0.201 yen (Weighted average for January 2014 to December 2019)
④ Final Disbursement	October 2021	

(End)

FY2023 Simplified Ex-Post Evaluation Report of Japanese ODA Loan Project

External Evaluators: Yukimasa Fukuda, Akiko Kida, Global Group 21 Japan, Inc.

Duration of the Study: November 2023–February 2025

Duration of the Field Study: July 2–15, 2024

Country Name	Stand-by Loan for Natural Disaster Recovery
Republic of El Salvador	



Location of the Project site (country-wide)
(Source: Japan's Ministry of Foreign Affairs website)



Hospital El Salvador (Source: Photo by the evaluator)¹

I. Project Outline

Background	In El Salvador, natural disasters, such as the two large earthquakes of 1986 and 2001, as well as tropical depressions, have caused great human and economic losses and inhibited the development of the nation. In response to the high risk of natural disasters such as earthquakes, storm and flood damage, and landslides, the Government of El Salvador enacted the Law on Civil Protection, Disaster Prevention and Mitigation in 2005 as a basic law in the field of disaster prevention. Based on this law, Commissions for Civil Protection, Disaster Prevention and Mitigation (hereinafter referred to as “Civil Protection Commissions”) were established at the national, department, municipality, and community levels. Moreover, the Civil Protection, Disaster Prevention and Mitigation Fund (hereinafter referred to as “FOPROMID”) was created to secure financial resources for disaster recovery efforts. However, with only a small budget of four million USD per year—insufficient to ensure the restoration of basic services and recovery of social and economic infrastructure in the event of a disaster—the fund was unable to provide sufficient support. Thus, the problem remained how to secure financial resources for response to and recovery from disasters. Against this background, JICA had been implementing various assistance (see footnote No. 4) under its Program for Strengthening the Disaster Management System in El Salvador,² and as a part of the Program, a loan agreement for the “Stand-by Loan for Natural Disaster Recovery” (hereinafter referred to as “the Project”) was concluded in May 2016.			
Objectives of the Project	The Project aims to promote the policy actions required to improve the disaster risk management capacity of El Salvador, which is vulnerable to natural disasters, and support its swift recovery from natural disasters by providing financial resources for post-disaster reconstruction efforts, thereby contributing to sustainable economic and social development of the country.			
Contents of the Project	1. Project Site: El Salvador (country-wide) 2. Japanese side: JICA confirms the progress and agrees on next year's policy action matrix at annual monitoring meetings. JICA disburses funds for recovery from natural disasters based on the request made by the Government of El Salvador upon declaration of a state of emergency. 3. El Salvador side: Implement policy actions and review each policy action at annual monitoring meetings.			
Implementation Schedule	E/N Date	November 25, 2015	Disbursement Date	March 27, 2020
	L/A Date	May 28, 2016	Completion Date ³	March 27, 2020
Project Cost	Loan Limit: 5,000 million yen; Actual Loan Amount: 5, 000 million yen			
Executing Agency	Ministry of Finance (Ministerio de Hacienda)			
Conditions (Loan only)	Interest rate: 0.01%, repayment period: 20 years (including 6 years grace period), general untied			
Borrower (Loan only)	Republic of El Salvador			

¹ Half of the loan funds for the Project were used to build this hospital, which specialized in treating COVID-19 patients.

² The Program was positioned under one of the priority areas of Japan's Country Assistance Policy for El Salvador (April 2012): Disaster Prevention and Environmental Conservation for Sustainable Development.

³ The policy action support period for the Project was from January 2016 to December 2018, later being extended to September 2020. The Project is deemed complete upon the loan amount being fully disbursed or the disbursement period having expired.

Contracted Agencies	Main Contractor(s): None Main Consultant(s): None Agent: None
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II. Result of the Evaluation

Summary

The Project aimed to improve El Salvador's disaster risk management capacity by promoting the implementation of related JICA technical cooperation projects (two technical cooperation projects for improving disaster risk management capacity, and one dispatch of individual expert; hereinafter referred to as "JICA-related projects") through monitoring of the policy action matrix.⁴ In addition, in preparation for the financial needs required for recovery after a disaster, the Project was to disburse funds for natural disaster recovery efforts based on the request by the Government of El Salvador upon declaration of a state of emergency. Annual monitoring meetings were held four times from 2016 to 2019. Afterwards, in response to the global pandemic of the novel coronavirus disease (hereinafter referred to as "COVID-19") that emerged in early 2020, El Salvador declared a state of emergency in March 2020 and requested funds for disbursement under the Project. Based on the understanding between Japan and El Salvador that COVID-19 fell under the scope of those natural disasters covered by the Project, the loan amount of 5 billion yen was disbursed in March of the same year. The Project was consistent with the country's development policy at the time of ex-ante evaluation which aimed to transform the economy and society into one that was sustainable and resilient to the effects of climate change. The 5-billion-yen loan amount was also highly consistent with El Salvador's disaster recovery financing needs. Furthermore, the Project was consistent with Japan's development cooperation policy at the time of ex-ante evaluation. As the commitment of the executing agencies of JICA-related projects was strengthened through monitoring of the policy action matrix and this may have contributed to their steady implementation, it is considered that there was a certain synergy between the Project and JICA-related projects. JICA had been coordinating the direction of the Project with the World Bank during the planning phase, and the Project was consistent with the World Bank's assistance policy in the field of disaster management. Therefore, the relevance and coherence of the Project are high.

Strengthened commitment of each executing agency of the JICA-related projects through the monitoring of the Project may have contributed to the steady implementation of the JICA-related projects, but the results of each JICA-related project are largely attributed to the independent efforts of each executing agency. In addition, although initiatives started by the JICA-related projects continued to develop after conclusion of the Project, the impacts were derived from the JICA-related projects and cannot be considered as the impact of the Project. On the other hand, although the amount of funds provided by the Project as a COVID-19 countermeasure was not necessarily ample considering El Salvador's enormous financial needs in 2020, the rapid provision of funds made it an extremely timely line of support, and it was used for high-priority COVID-19 countermeasures, mainly the construction of a COVID-19 specialized hospital. Therefore, the effectiveness and impacts of the Project are high.

Overall Rating	-	Relevance & Coherence	③ ⁵	Effectiveness & Impact	③	Efficiency	-	Sustainability	-
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<Special Considerations & Constraints of the Ex-Post Evaluation>

Since the Project is a development policy loan, the evaluation criteria are "relevance/coherence" and "effectiveness/impact." "Sustainability" was analyzed with regard to the implementation and monitoring system of policy actions, and usage of the loan funds, and no sub-rating was given. Sub-ratings were given only for "relevance/coherence" and "effectiveness/impacts", with no overall rating given as sub-ratings were not given for all six criteria.

1 Relevance/Coherence

<Relevance>

- Consistency with the Development Policy of the Government of El Salvador at the Time of Ex-Ante Evaluation
- The Government of El Salvador has identified "transformation into a sustainable economy and society that is resilient to climate change impact" as one of the goals of its *National Development Plan 2014-2019*. In the draft *National Disaster Risk Management Plan* at the planning phase, "disaster preparedness and response," including disaster risk management, was prioritized, and "development of mechanisms to advance the process of sustainable recovery and reconstruction" was set as a theme to be addressed. Therefore, the Project, which aims to promote the implementation of policy actions necessary to

⁴ • Project on Capacity Development for Disaster Risk Management in Central America, Phase 2 (2015-2020) (known as BOSAI 2); Executing agency: General Directorate of Civil Protection (DGPC), Ministry of Interior (MIGOBTD)
• Project for Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure, Phase 2 (2016-2021) (known as GENSAI 2); Executing agency: Directorate for Adaptation to Climate Change and Strategic Risk Management (DACGER), Ministry of Public Works, Transportation, Housing and Urban Development (MOPTVDU; currently Ministry of Public Works and Transportation: MOPT)
• Project for Enhancement of Technology for the Observation of Earthquakes and Tsunamis (2015-2018); Executing agency: General Directorate of Environmental Observatory (DGOA), Ministry of Environment and Natural Resources (MARN)

Activities related to mainstreaming disaster prevention were extracted from the above three JICA-related projects and made into one target area of the policy action matrix.

⁵ ④: Very high, ③: High, ②: Moderately low, ①: Low

improve disaster risk management capacity, is highly consistent with El Salvador's development policy and disaster prevention policy at the time of ex-ante evaluation.

- Consistency with the Development Needs of El Salvador at the Time of Ex-Ante Evaluation

Though FOPROMID exists as a source of financial resources for post-disaster recovery in El Salvador, its annual budget is limited at four million USD. For this reason, in 2011, the Government of El Salvador signed a 50 million USD development policy loan agreement with the World Bank with a Catastrophe Deferred Drawdown Option (CAT-DDO) and drew down the full amount for the disaster inflicted by Tropical Depression 12-E in October of the same year. Since there was no additional World Bank loan to follow, the demand for funds for ongoing disaster recovery was high. In light of this, the Government of El Salvador requested a loan from Japan of the same size as the World Bank loan. In response, with consideration given to factors such as the scale of El Salvador's economy, the Japanese side decided on a loan amount of 5 billion yen. Therefore, the Project is highly consistent with El Salvador's development needs at the time of ex-ante evaluation.

<Coherence>

- Consistency with Japan's Development Cooperation Policy at the Time of Ex-Ante Evaluation

The Project corresponds to JICA's cooperation program "Strengthening the Disaster Management System," which is positioned under the priority area of "Disaster Prevention and Environmental Conservation for Sustainable Development" in Japan's Country Assistance Policy for the Republic of El Salvador (April 2012). In JICA's country analysis (March 2014), "disaster prevention" was positioned as the subsector with the highest priority in El Salvador. For the above reasons, the Project is consistent with the development cooperation policies of Japan and JICA at the time of ex-ante evaluation.

- Internal Coherence

The Project aimed to promote the implementation of JICA-related projects through monitoring the policy action matrix. The policy action matrix was created by extracting activities that can be implemented based on the activity plans of each JICA-related project. According to the JICA El Salvador office, the annual monitoring meeting was a forum to confirm the policy matrix, which was set by linking the progress of each JICA-related project, and did not serve to promote any proactive measures. On the other hand, according to the General Directorate of Environmental Observatory (hereinafter referred to as "DGOA") of the Ministry of Environment and Natural Resources (MARN), this monitoring process increased the commitment of each executing agency to the implementation of JICA-related projects. The Ministry of Finance said that it also increased its awareness of each JICA-related project. The Project may thereby have contributed to the steady implementation of JICA-related projects. As such, it is considered that there was a certain synergistic effect between the Project and JICA-related projects.

- External Coherence

When planning the Project, JICA held discussions with the World Bank's officer in charge of disaster risk reduction development policy loan for El Salvador at the World Bank headquarters so as to align the directions of both parties' assistance. Therefore, the Project's and the World Bank's assistance policies in the field of disaster prevention were consistent.

<Evaluation Result>

In light of the above, the relevance and coherence of the Project are high.⁶

2 Effectiveness/Impacts⁷

<Effectiveness>

- El Salvador's Disaster Response System

When a natural disaster occurs in El Salvador, a Civil Protection Commission is convened under Ministry of Interior and Territorial Development (hereinafter referred to as "Ministry of Interior (MIGOBDT)"), with the participation of relevant ministries such as the Ministry of Public Works and Transportation (MOPT), the Ministry of Environment and Natural Resources (MARN), the Ministry of Health (MINSAL), and the Ministry of Agriculture and Livestock (MAG). The Civil Protection Commission discusses and decides on necessary disaster countermeasures, establishes a crisis management center, and issues instructions for the implementation of those measures deemed necessary. The General Directorate of Civil Protection (hereinafter referred to as "DGPC") under the Ministry of Interior (MIGOBDT) serves as the secretariat of the Civil Protection Commission and is responsible for the practical aspects of disaster response. The relevant ministries and agencies coordinate and cooperate to respond to recovery. In addition to that at the national level, there are also Civil Protection Commissions at the department, municipal, and community levels, which work together with department administrations and municipal halls to respond to disasters in the event of a disaster.

The aforementioned FOPROMID has been the source of funding in times of disaster, with 4 million USD contributed from the national budget every year, and the Civil Protection Commission is the body that approves expenditures and manages these funds. Within this scheme, relevant organizations apply to the Civil Protection Commission for funding for necessary disaster response measures, and with its approval, funds are disbursed to the relevant organizations from FOPROMID.

⁶ Relevance: ③, Coherence ③

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

- Policy Action Matrix

Through monitoring the policy action matrix, promotion of the implementation of JICA-related projects was aimed for to thereby improve the country's disaster risk management capacity. For this purpose, clear, easy to grasp, and achievable policy actions were extracted from the activities of JICA-related projects in each field.

In the Project, a policy action matrix was formulated for the following four areas: 1) strengthening community-based disaster risk management capacities, 2) strengthening the capacity of the Department of Climate Change Adaptation and Strategic Risk Management to enhance public infrastructure, 3) strengthening capacity to analyze and address natural disasters (particularly earthquakes and tsunamis), and 4) mainstreaming of disaster risk management. This was formulated in association with JICA-related projects for each area and was reviewed and updated once a year at a monitoring meeting held by JICA, the Ministry of Finance, and the executing agencies of JICA-related projects.⁸ For the "mainstreaming of disaster risk management" field, efforts that lead to mainstreaming disaster risk management were extracted as policy actions from the activities of each JICA-related project corresponding to the other three fields ("strengthening community-based disaster risk management capacity," "strengthening the capacity of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure," and "strengthening capacity to analyze and address natural disasters").

JICA confirmed the achievement of certain policy action items as of August 2015 in the year prior to the signing of the loan agreement (L/A) for the Project (May 28, 2016), and the monitoring period for the policy actions necessary to be achieved for the Project was set as January 2016 to December 2018. JICA was to confirm that the policy actions were being implemented as well as confirm their progress during that period at annual monitoring meetings, and to disburse funds for recovery at the time of disasters based on the request by the Government of El Salvador upon it declaring a state of emergency. However, since no disasters had occurred by the end of 2018, and after confirming that the policy actions had been mostly achieved by that time, a new policy action period was agreed upon, being from 2019 to the same disbursement deadline, September 2020.

At the annual monitoring meetings, the progress of each JICA-related project was confirmed and policy actions reviewed, but nothing beyond what was planned for each JICA-related project was promoted. However, these meetings were considered useful to the executing agencies of the JICA-related projects and the Ministry of Finance as an opportunity to share information with each other by meeting together as project stakeholders and reviewing the progress of the JICA-related projects.

Some of the executing agencies pointed out that by reflecting the activities of JICA-related projects in the policy action matrix, the commitment of the executing agencies to each project was strengthened. In addition, some of the executing agencies hoped that the Ministry of Finance's awareness of disaster risk management would be raised. The Ministry of Finance also viewed the monitoring meetings positively as an opportunity to learn about the progress of each project related to disaster risk management.

On the other hand, according to interviews with each executing agency, the progress of JICA-related projects was attributed to each project's independent efforts, with no opinion or specific example given that the monitoring meetings had produced any additional results.

At the time of the ex-post evaluation (July 2024), the policy actions attached to the completion report of the Project (September 2020 target, final policy action matrix) had been largely achieved.⁹

As mentioned above, through linking the Project with each JICA-related project, its monitoring may have strengthened executing agencies' commitment to the implementation of these projects, potentially contributing to their steady implementation. Incidentally, each JICA-related project was generally implemented as planned. This was largely due to the independent efforts of each executing agency, but the Project may have also played a part.

- Effectiveness of Loan Funds

Project funds were disbursed upon the declaration of a state of emergency by the Government of El Salvador in response to COVID-19 (March 14, 2020), and most of the funds were used for COVID-19 countermeasures. A portion (approximately 0.4% of the total loan funds) was also used for disaster response to Hurricane Eta (of November 2020) which occurred during the COVID-19 pandemic.

[El Salvador's COVID-19 Countermeasures and Financial Needs]

According to its Ministry of Finance, in 2020, El Salvador was one of the countries in Latin America that took the quickest COVID-19 countermeasures, such as closing borders and imposing curfews. The Ministry of Health (MINSAL) played a leading role in El Salvador's COVID-19 countermeasures. According to the Ministry, El Salvador began collecting

⁸ The four areas of the policy action matrix and the corresponding technical cooperation are as follows:

- 1) Project on Capacity Development for Disaster Risk Management in Central America, Phase 2 (2015-2020) (known as BOSAI 2); Executing agency: General Directorate of Civil Protection (DGPC), Ministry of Interior (MIGOBDT)
- 2) Project for Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure, Phase 2 (2016-2021) (known as GENSAI 2); Executing agency: Directorate for Adaptation to Climate Change and Strategic Risk Management (DACGER), Ministry of Public Works, Transportation, Housing and Urban Development (currently Ministry of Public Works and Transportation: MOPT)
- 3) Project for Enhancement of Technology for the Observation of Earthquakes and Tsunamis (2015-2018); Executing Agency: General Directorate of Environmental Observatory (DGOA), Ministry of Environment and Natural Resources (MARIN)
- 4) Extraction of related initiatives from technical cooperation corresponding to 1) to 3) above.

⁹ The annex summarizes the degree of achievement of policy actions for 2016-2018, 2019-2020, and as of 2024.

information on the infection situation and countermeasures in China and other countries from around the beginning of 2020, and planned the medical supplies and consumables, medical equipment, emergency system development, hospital renovations to accept COVID-19 patients, and training for related staff that would be needed in the future. As part of this process, the construction of a specialized COVID-19 hospital was also planned. Since it became clear that COVID-19 countermeasures would require the cooperation and mobilization of related agencies beyond that required of normal natural disaster response, the President inaugurated an expanded health cabinet meeting upon the declaration of a state of emergency in March 2020. In addition to the members of the Civil Protection Commission, all agencies involved in COVID-19 countermeasures, such as the Ministry of Tourism (MITUR), Police, Ministry of Education, Aviation Agency, and Immigration Bureau, participated in this meeting, and major COVID-19 countermeasures were decided. The decision to build a specialized COVID-19 hospital was also made there.

A Civil Protection Commission was also convened as is usual in the case of natural disasters. A portion of the international aid funds for COVID-19 countermeasures was incorporated into FOPROMID, and a mechanism created for prompt disbursement of necessary funds from FOPROMID with the approval of the Civil Protection Commission, just as in the case of regular disasters.

According to the Ministry of Finance, FOPROMID's existing funds were insufficient to counter COVID-19, and rapid fund raising became necessary, so the government decided to seek assistance from the international community, including Japan. In addition to the request for disbursement of the Project, the congress of El Salvador approved new fund raising of up to 3 billion USD between March and May 2020. Of this, 2 billion USD was to be raised through foreign loans and foreign bond issuance, and 1 billion USD was to be raised through domestic bond issuance. Table 1 shows the main foreign loans in 2020. Note that these comprise new financing only, and do not include the already-approved loan for the Project (approximately 46 million USD, based on the exchange rate in March 2020 at the time of loan disbursement: 1 US dollar = 109 yen).

Table 1. External Borrowings Related to COVID-19 Response in 2020
(New financing)

Source	Amount (million USD)
International Monetary Fund (IMF)	389
World Bank	20
Inter-American Development Bank (IDB)	300
OPEC Fund for International Development (OFID)	15
Central American Bank for Economic Integration (CABEI)	650
Total	1,374

Source: Ministry of Finance response

As described above, in 2020, El Salvador had extremely high financial needs in order to counter COVID-19.

[Background to the Project Loan Request and Loan Disbursement]

Following the declaration of a state of emergency in March 2020 in response to COVID-19, the Government of El Salvador requested JICA to disburse the loan funds of the Project.

The Project supports recovery from natural disasters, and a condition of its disbursement of funds was the declaration of a state of emergency. However, since the signing of the L/A in May 2016, no state of emergency had been declared for natural disasters until March 2020. The Government of El Salvador declared a “state of national emergency, state of public calamity and natural disaster” throughout the country due to the COVID-19 outbreak, considering the infectious disease outbreak as a “natural disaster.” After considerations between the Japanese Ministry of Foreign Affairs and JICA on the request, the Japanese side also determined that categorization of the COVID-19 outbreak as a natural disaster was appropriate, and on that basis JICA disbursed funds of the Project.

The Stand-by Loan for Natural Disaster Recovery is a scheme that values promptness, and as the below chronology shows, disbursement was made only ten days after the request, constituting an extremely swift response.

March 14, 2020: State of emergency declared

March 16, 2020: Request for disbursement

March 27, 2020: Date of disbursement

In his speech at the 75th United Nations General Assembly on September 29, 2020, El Salvador President Bukele highly

praised Japan's swift support for COVID-19 countermeasures through the Project.¹⁰

The FOPROMID budget for the fiscal year 2020 was 675.8 million USD, and expenditures as of the end of December 2020 were 671.9 million USD, of which JICA funding constituted 46 million USD (Table 2).

The entire loan amount of the Project was incorporated into FOPROMID and allocated under the management of the Civil Protection Commission to the Ministry of Health (MINSAL), Ministry of Public Works and Transportation (MOPT), Ministry of Agriculture and Livestock (MAG), and Ministry of Tourism (MITUR) to be used for their respective COVID-19 countermeasures (Table 3).

Table 2. FOPROMID Budget for 2020

Source		Amount (million USD)
General account		570.5
External borrowing	JICA	46.0
	IMF	53.0
	Others	6.3
Total		675.8

Source: Ministry of Finance Report (December 2020)¹¹

Table 3. FOPROMID Expenditure in 2020 and Ratio of JICA Funding

Allocation recipients, etc.	Expenditure amount (million USD) (A)	Of which, JICA funding (million USD) (B)	Ratio (B)/(A)	Application
Ministry of Health (MINSAL)	65.6	14.8	22.6%	Medical equipment, medicines, consumables, hospital renovation costs, etc.
Ministry of Public Works and Transportation (MOPT)	63.7	26.4	41.4%	Hospital construction costs, hospital renovation costs, transportation vehicle costs, protective clothing, consumables, etc.
Ministry of Agriculture and Livestock (MAG)	176.7	0.8	1%	Food distribution and other support for impoverished persons
Ministry of Economy (MINEC)	350.0			Income support for impoverished persons
Ministry of Tourism (MITUR)	8.7	4.1	47.1%	Quarantine facility costs (hotel rental costs)
Ministry of the Interior and Territorial Development (MIGOBTD)	3.0			Food, hygiene products, consumables, and logistics support for quarantine facilities
Ministry of Justice and Public Security (MJSP)	0.5			Fuel costs for traffic control at borders, etc.
Ministry of National Defense (MDN)	0.8			Containment center operation, border/road controls, etc.
Ministry of Environment and Natural Resources (MARN)	0.1			Crisis management expenses
National Administration of Aqueducts and Sewers	2.8			Supplying water to citizens
Total	671.9	46.0	6.8%	

Source: Prepared by the evaluator based on the Ministry of Finance Report and the Project Completion Report

Note: Totals are subject to fraction error, with figures having been rounded to one decimal place.

¹⁰ In a video message, President Bukele said, "Without the cooperation of the Japanese government and people, we would not have been able to build the largest hospital in the region and the most modern hospital to combat the novel COVID-19 virus. We would like to express our sincere gratitude to the Japanese government and people of Japan." (Monthly Report of the Embassy of Japan in El Salvador, October 2020)

¹¹ Ministry of Finance, *INFORME DE MEDIDAS PRESUPUESTARIA Y FISCALES ADOPTADAS EN LA MARCO DE LA PANDEMIA COVID-19, Datos al 31 de diciembre de 2020*

An outline of how Project funds were used by each ministry is shown in Table 4.

Table 4. List of Uses of JICA Loan Funds (Unit: thousand USD)

Executing agency	Use of funds	JICA Funds
Ministry of Health (MINSAL)	Strengthening the functionality of medical facilities (optimization of medicines, consumables, various services, and infrastructure facilities)	12,050
	Purchase of medicines, consumables, video surveillance systems, burial services	2,000
	Medicines, video surveillance systems, distribution services, burial services, various consumables	795
	Subtotal	14,845
Ministry of Public Works and Transportation (MOPT)	Construction of a COVID-19 specialized hospital (Hospital El Salvador) and provision of equipment; improvements to public hospitals necessary to respond to COVID-19	23,000
	Transportation, haulage and logistics for COVID-19 response	3,350
	Subtotal	26,350
Ministry of Agriculture and Livestock (MAG)	Basic food distribution program for people affected by COVID-19	351
	Project for distributing food to victims of Hurricane Eta	200
	Project for distributing food to impoverished persons	244
	Subtotal	795
Ministry of Tourism (MITUR)	Provision of isolation facilities, food rations, drinking water, medicines, and consumables for infection prevention	1,984
	Provision of isolation facilities, food rations, medicines, and consumables for infection prevention	1,891
	Accommodation and food for medical personnel	180
	Subtotal	4,055
Total		46,045

Source: Project Completion Report

As described above, the Project was extremely timely support for El Salvador, which needed to quickly secure a large amount of funding for COVID-19 countermeasures.¹² This was made possible by the swift response of the Japanese government and JICA. Although its scale was not large compared to the enormous funding needs (approximately 7% of the 2020 FOPROMID budget, or approximately 2% of the total of the same budget combined with external borrowings related to COVID-19 countermeasures for 2020),¹³ the good timing allowed the funds to be used for high-priority COVID-19 countermeasures in each ministry, particularly for the construction of the specialized COVID-19 hospital which was urgently needed.

<Impacts>

• Qualitative Effects

Qualitative effects expected from the Project include strengthening disaster risk reduction and management capabilities at the national, municipal and community levels in El Salvador, accelerating disaster recovery projects based on the Build Back Better concept, and restoring and stabilizing the lives of affected residents.

¹² The country's Parliament approved the borrowing of 2 billion USD through Decree No. 608 of March 26, 2020, and of 1 billion USD through Decree No. 640 of May 5 of the same year.

¹³ FOPROMID budget 675.8 million USD ÷ ODA loan 46.0 million USD = 7%
(FOPROMID budget 675.8 million USD + external borrowings 1,374 million USD) ÷ ODA loan 46.0 million USD = 2%

[Reference information: Impacts of individual projects targeted by policy actions]

As illustrated below, each executing agency is continuing to develop its JICA-related projects, and the impact is being realized. Information sharing and cooperation systems for disaster risk response between related agencies that did not previously exist (e.g., the issuance of weather forecasts with disaster warnings by collaboration between DGOA and DGPC) are also functioning, and it is considered that El Salvador's disaster risk reduction and management capacity has been strengthened. However, this is the result of each project's independent implementation, with the Project's role limited to monitoring their progress during the implementation phase (until completion of the loan). No specific examples of the contribution of the Project to the impact of JICA-related projects could be confirmed. Therefore, impacts of those JICA-related projects included in the policy action matrix cannot be considered a direct impact of the Project.

➤ “Project on Capacity Development for Disaster Risk Management in Central America (Phase 2)”

According to DGPC, after experiencing various international cooperation projects,¹⁴ including the policy action matrix of the Project, the update of the National Civil Protection Plan (Plan Nacional de Protección Civil: August 2024-June 2030) in line with the Sendai Framework for Disaster Risk Reduction has been completed and is scheduled to be published in August 2024.¹⁵ This National Civil Protection Plan will form El Salvador's national strategy, and work is currently underway to position the 1) National Disaster Risk Reduction Plan (first edition), 2) Disaster Response Plan (updated from the 2018 edition), and 3) Recovery and Reconstruction Strategy (first edition) under it. As for other policy actions, information is being updated in the “Disaster Prevention and Mitigation Information and Disaster Response Capability Database System,” and disaster prevention training and drills are also being continued.

➤ “Project for Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure (Phase 2)”

According to the Directorate for Adaptation to Climate Change and Strategic Risk Management (hereinafter referred to as “DACGER”) of the Ministry of Public Works and Transportation (MOPT), following Phases 1 and 2, DACGER has become the organization with the capacity and responsibility to manage disaster risk for all public infrastructure projects implemented by the Ministry of Public Works and Transportation (MOPT). For example, when constructing a new road, DACGER reviews and recommends on its disaster risk management from the planning stage, and during the implementation stage, safety measures are taken which utilize the knowledge gained from the project. Even after the project, pilot projects (e.g. for installation of fences to prevent landslides and cliff collapses) continued until 2022, and monitoring has been carried out thereafter. The project manual has been revised, and DACGER is also playing an active role in dissemination activities to Central America. Based on this experience, the manual to be developed in the current JICA project is also scheduled to be disseminated to Central America.¹⁶ Road monitoring activities related to disaster risk are also continuing. With seismometers and rain gauges installed on multiple bypass roads, efforts are being made to grasp disaster risks such as landslides through monitoring. In addition, DACGER has collaborated with DGOA to create a new seismic motion map using measuring equipment purchased in the project, based upon which new seismic design standards for buildings have been developed. In disaster recovery, efforts are being made to incorporate the Build Back Better concept as much as budgets allow.

➤ “Dispatch of Experts under the Project for Enhancement of Technology for the Observation of Earthquakes and Tsunamis”

According to DGOA, they had been carrying out three types of observations: meteorological, hydrological, and geological, but they did not collaborate with other organizations. It was important to develop disaster prevention measures based on observation information, and so these activities were incorporated into the policy action matrix. Currently, they are collaborating with DGPC to contribute to disaster prevention measures based on observation data, just as they did in collaboration with DACGER to create new seismic design standards for buildings. Although previously they did not coordinate with DGPC, now daily discussions are scheduled to share information. As a result, weather forecasts are now issued along with disaster impact diagnoses (warnings), which had not been done previously.

• Impact of Loan Use

[Impact of loan use: Response to COVID-19]

The Ministry of Finance has evaluated the Project, which supported the construction of Hospital El Salvador, the distribution of food to impoverished citizens, and the costs of isolation facilities, as an extremely significant contribution.

¹⁴ For example: JICA's “Project for Capacity Development for the Evaluation and Seismic Reinforcement of Buildings in the Metropolitan Areas of San Salvador (commonly known as the HOKYO Project)” (November 2021 to November 2025) and JICA's “Project for Compound Disaster Risk Reduction Associated with Large Earthquakes and Tsunamis” [Republic of El Salvador/United Mexican States] (SATREPS)” (April 2024 to April 2029) (corresponding to (1) Understanding disaster risks in the Sendai Framework); and, the establishment of crisis management monitoring rooms in DGPC (San Salvador) and two other departments (San Miguel and La Unión) in cooperation with the United Nations Development Programme (UNDP) and the World Food Organization (FAO) (corresponding to (2) Strengthening disaster risk governance in the Sendai Framework).

¹⁵ The deadline is the same as the Sendai Framework for Disaster Risk Reduction.

¹⁶ Capacity Building Advisor for Bridge Reconstruction along the El Salvador Coastline (HASHIMORI) (2022-2025)

As shown below, the Ministry of Health (MINSAL), Ministry of Public Works and Transportation (MOPT), Ministry of Agriculture and Livestock (MAG) and Ministry of Tourism (MITUR), which utilized the Project, also praised the timeliness of JICA's support. It is considered that the Project boosted each ministry's countermeasures by being provided quickly in the early stages of the COVID-19 pandemic. Each ministry's use of the Project funds and their effects are described as follows:

➤ Ministry of Health (MINSAL): 14,845,000 USD

[Use of funds: hospital renovation costs, medical equipment, electronic devices, medicines, consumables, etc.]

Since the beginning of 2020, the Ministry of Health (MINSAL) had been collecting information on COVID-19 countermeasures and preparing to establish a medical system. At that time, the biggest concern was hospital capacity, and plans were underway to build a specialized hospital to accommodate an expected influx of COVID-19 cases. However, until such a hospital was completed, existing hospitals across the country needed to respond, and so funds from the Project were used to install intensive care units (ICUs) and various medical equipment in these hospitals, as well as to purchase a large amount of medical equipment, medicines, protective clothing, disinfectants, and so on. In the first half of 2020, international logistics were disrupted, and it was difficult to import necessary items. Because the Project provided prompt support, implementation of these COVID-19 countermeasures was made possible.

Based on the above, the Project is considered to have contributed to supporting the country's medical system until Hospital El Salvador, specialized in responding to COVID-19, was completed in June 2020.

➤ Ministry of Public Works and Transportation (MOPT): 26,350,000 USD

[Use of funds: Construction of Hospital El Salvador (renovating a convention center into a hospital specialized for COVID-19), renovation of medical facilities country-wide, transport of medicines and food, provision of transportation for medical workers and patients with chronic diseases, etc.¹⁷]

Hospital El Salvador was constructed by renovating an existing convention center as a 1,000-bed COVID-19 specialized hospital to receive COVID-19 patients with moderate to severe symptoms from all over the country. Special considerations related to ventilation and such were required for it to function as a specialized COVID-19 hospital, so the Ministry of Health (MINSAL) assisted with the design and other aspects. Construction of the hospital began in March 2020 and was completed in late June of the same year. According to Hospital El Salvador, without this hospital, there is a possibility that many deaths would have occurred, and triage would have been necessary due to a lack of medical equipment and oxygen, as in Ecuador and Guatemala. (See attached column for details)

In addition, the Project funds were also used to renovate medical facilities in various locations, transport medicines and food, and provide transportation for medical workers and patients with chronic diseases. Transportation services were carried out using trucks and other vehicles owned by the Ministry of Public Works and Transportation (MOPT), as well as requesting cooperation from private bus companies. Given that there was a curfew and no public transportation available, this helped in preventing infections to patients at high risk of developing severe symptoms and also provided a safe means of transportation for medical workers.

For these reasons, it is considered that the Project has made a significant contribution to preventing the spread of COVID-19 in the country and maintaining its medical system.

➤ Ministry of Agriculture and Livestock (MAG): 595,000 USD

[Use of funds: Food distribution to households left impoverished due to COVID-19]

Many lost jobs due to the COVID-19 lockdown and were no longer able to afford the food they needed. Food was distributed for three months to such impoverished households, which totaled 3.2 million. The Project funds were used to purchase vegetable oil to be distributed, as well as for distribution transportation costs, cleaning costs, packaging costs, assembly and storage costs, and so on. The Ministry of Agriculture and Livestock (MAG) continued such food distribution project for about two years from March 2020. Funds were procured from JICA, as well as from the general budget and other international assistance. Food distribution was carried out in cooperation with local governments (departments and municipalities) and the DGPC, targeting the most vulnerable areas and people in each area. (See "Other Positive and Negative Impacts")

From the above, it is considered that the food distribution provided by the Project directly contributed to the recovery of the livelihoods of particularly vulnerable people.

➤ Ministry of Tourism (MITUR): 4,055,000 USD

[Use of funds: Construction of isolation facilities and accommodation for medical workers]

Isolation facilities were set up at borders and airports for quarantine purposes, and throughout the country for those with mild symptoms, while dedicated accommodation facilities were also secured for medical personnel. These comprised 105 locations nationwide, with facilities being rented from private hotels.¹⁸ JICA funds were used to rent hotels, and to procure medicines, consumables such as masks and disinfectants, equipment, food, and water. By setting up isolation facilities

¹⁷ Support for outpatient visits for kidney disease, heart disease, cancer patients, etc.

¹⁸ Only the facilities were leased, with no employees; maintenance and security were the responsibility of the military and police.

throughout the country in addition to quarantine at airports and borders, facilities were secured to process those with mild symptoms, allowing hospitals around the country, including Hospital El Salvador, to focus resources toward treating patients with more severe symptoms. Securing accommodation for medical personnel also served to reduce the risk of infection for their families.

Based on the above, it is considered that the isolation facilities and medical worker accommodation supported by the Project acted to reduce the risk of further spread of COVID-19 in the country.

For these reasons, it is considered that the Project contributed to stabilizing El Salvador's medical system and the lives of citizens through each ministry's COVID-19 countermeasures.

[Impact of Loan Use: Response to Hurricane Eta (occurred in November 2020)]

➤ Ministry of Agriculture and Livestock (MAG): 200,000 USD

[Use of funds: Distribution of food to victims of Hurricane Eta (fisheries workers in affected areas, etc.)]

Two months' supply of food was distributed to 73,000 households, mostly fishermen, in the areas affected by Hurricane Eta.

Normally, when a hurricane or tropical storm strikes, an early warning is issued and Civil Protection Commissions are convened at the national, departmental, municipal and community levels to respond to the disaster. (See "El Salvador's Disaster Response System"). During the Hurricane Eta, the DGPC, the Ministry of Agriculture and Livestock (MAG), and other relevant ministries and agencies exchanged information with affected municipalities through their local offices in the affected departments and conducted needs assessments. Based on this information, the DGPC then selected recipients for support. The Ministry of Agriculture and Livestock (MAG) was in charge of food distribution, and applied for FOPROMID for the project, and a part of the funds from the Project were used. In addition to the information gathering stage, the Ministry of Agriculture and Livestock (MAG), DGPC, and each municipality worked together to distribute food.

For these reasons, the usual disaster response system was put in place for the Hurricane Eta, a Civil Protection Commission being established under the Ministry of Interior (MIGOBDT) with its DGPC serving as secretariat and playing a leading role.

The funds from the Project were used to distribute food to victims of the Hurricane Eta for two months, which is considered to have directly contributed to stabilizing their lives after the disaster.

• Other Positive and Negative Impacts

➤ Environmental impact

The Project was classified as Category C in accordance with the *JICA Guidelines for Environmental and Social Considerations* (published in April 2010) for sensitive sectors because it was likely to have a minimal adverse impact on the natural environment. No adverse impacts on the environment due to the Project were reported.

➤ Caring for vulnerable people

It was not possible to specifically confirm whether consideration was given to vulnerable groups, including the impoverished, and gender perspectives in the activities for community disaster prevention capacity and mainstreaming disaster prevention in the Project, and whether the vulnerable were able to benefit. On the other hand, according to DACGER, among JICA-related projects, a part of activities constituting the Project for Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure, Phase II (GENSAI 2) aimed to provide comprehensive and prioritized care to those who were most vulnerable in the event of a disaster, and activities for risk management of river and stream banks, slopes, etc. directly benefited impoverished citizens living in these areas.

As mentioned above, the Ministry of Agriculture and Livestock (MAG), in cooperation with DGPC and local government of departments and municipalities, selected the most vulnerable areas and people for the food distribution carried out in the Project. During Hurricane Eta, fishing businesses in the affected coastal areas were the main recipients. For food distribution during the COVID-19 pandemic, those groups deemed more vulnerable were selected at the department level.

From the above, it can be reasoned that consideration was given to vulnerable groups in some JICA-related projects as well as in disaster response and COVID-19 response efforts which utilized funds from the Project.

• Summary of Effectiveness and Impacts

The policy action matrix and monitoring under the Project served to confirm the progress of each JICA-related project, which was being implemented independently, and did not promote anything beyond what was planned for each JICA-related project. The monitoring might have strengthened the commitment of each executing agency to project implementation and contributed to the steady implementation of each JICA-related project. Furthermore, even after the completion of the Project, the initiatives that were started in each JICA-related project continued to be developed at each executing agency until the time of the ex-post evaluation. However, the role of the monitoring conducted in the Project was limited to confirming the progress of each JICA-related project, and the impacts of each individual project cannot be considered as impacts of the Project.

On the other hand, while the loan funds for the Project, which were provided as a COVID-19 countermeasure, were not

considerable in amount compared to El Salvador's enormous funding needs during 2020, they were disbursed quickly and constituted extremely timely assistance. This allowed funds to be utilized for COVID-19 countermeasures that were a high priority for each ministry, particularly the construction of a specialized COVID-19 hospital for which there was high demand, and thus the loan is considered to have contributed to the stabilization of healthcare and people's lives in the country.

<Evaluation Result>

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

3 Sustainability

• Sustainability of Policy Actions

According to the Ministry of Finance, because formulation of the policy action matrix and monitoring were carried out annually until the completion of the Project as agreed in the L/A,¹⁹ no such cross-agency efforts on disaster risk management were conducted following the completion of disbursement.

At each executing agency, initiative for respective JICA-related project continued to develop. However, as this is attributed to the fact that each project was implemented independently, much like the impacts of each project, it cannot be considered as the sustainability of the effects of the Project which monitored the JICA-related projects during implementation.

• Sustainability of Loan Funds

Half of the Project funds (50%) were used to build Hospital El Salvador which specializes in COVID-19 response. The hospital was initially envisioned as a temporary facility, but it was later decided to be put to use as a general hospital and is now the country's top referral hospital.²⁰ It is currently managed by the Ministry of Health (MINSAL). In addition to the various facilities built for COVID-19, there are plans to further expand with new facilities in the future, including a blood center, and to expand the number of medical departments. (See the Column for details.) According to a site visit, the hospital is being properly maintained. As a result, the hospital built with the loan funds is expected to continue to be used as the country's only general hospital capable of providing advanced medical care.

Following the Project, the hospital implemented the JICA technical cooperation project "Project for Capacity Development of ICU Using Telemedicine under COVID-19 Pandemic" (September 29, 2021, to February 28, 2023).²¹ Online sessions were held on diagnostic techniques for ICU patients, including those with COVID-19, with the participation of doctors, nurses, and technicians. As a result of the Project, the hospital's intensive care capabilities are considered to have improved, with remote diagnosis between Hospital El Salvador and other hospitals in the country now being implemented.

• Summary of Sustainability

After the disbursement was completed, no similar cross-agency efforts on disaster risk management akin to the policy action matrix monitoring meetings have been made. Some JICA-related project efforts have since continued in an expanded manner, but the effects of these efforts have been due to the independent implementation of each project. Meanwhile, the El Salvador National Hospital (Hospital El Salvador), which was built with half of the loan funds of the Project, while built as a COVID-19 specialized hospital, is expected to remain the only quaternary referral hospital in the country, and continue to be utilized as a general hospital specializing in advanced medical care.

III. Recommendations & Lessons Learned

• Recommendations to Executing Agency: None

• Recommendations to JICA: None

• Lessons Learned

The importance of incorporating mechanisms to promote cross-ministerial efforts on disaster prevention

In the Stand-by Loan for Natural Disaster Recovery, the policy matrix monitoring meetings that are held can generally be a valuable opportunity for relevant ministries and agencies to work as one to advance disaster prevention efforts (mainstreaming disaster prevention). In the Project, each executing agency appreciated that through monitoring meetings, they could deepen understanding about the projects of others, and therefore, it is considered that mutual understanding concerning cross-ministerial efforts for disaster prevention was enhanced. However, this did not develop into specific action, and monitoring meetings ended alongside completion of the loan. In order to achieve greater project effect, it is important to take advantage of the monitoring meetings and incorporate mechanisms from the beginning that would maintain and develop such networks even after the loan is completed. As an example, alongside feeding back the results of monitoring meetings to relevant ministries and agencies right after the meetings, setting up a forum for reporting the results to the general public as a

¹⁹ Until either the loan amount is fully disbursed or the disbursement period has expired.

²⁰ Currently, El Salvador has medical institutions ranging from primary to tertiary care, depending on the number and scale of medical departments. Hospital El Salvador is the only quaternary medical institution that provides advanced medical care, but in principle it is a referral hospital that does not accept general outpatients or emergency patients.

²¹ The project linked intensive care doctors and nurses in Japan via a remote ICU communication system, providing remote doctor-to-doctor and nurse-to-nurse training as well as technical advice on intensive care medicine, and has been carried out in numerous countries around the world.

part of the government’s disaster prevention public relations activities would increase incentives for making cross-ministerial efforts.

IV. Non-Score Criteria

- Performance
 - Objective Perspective
- According to JICA’s Regional Department, when distributing the loan for the Project, Japan’s Ministry of Foreign Affairs and JICA officials meticulously confirmed the procedures in advance, prepared materials in both Japanese and Spanish, and shared information with the executing agency officials thoroughly from an early stage. Such detailed and prompt responses from the Japanese side led to alignment with the executing agency, making it possible to disburse the loan swiftly.

Column: About Hospital El Salvador

El Salvador had been gathering information about COVID-19 from around the world, including China, Spain, Italy, and Ecuador, and had been planning countermeasures from the early stages of the pandemic. In early 2020, in light of the infection situation and countermeasures in China, it was thought that a large medical facility capable of responding to the spread of infection within the country was needed, and so the construction of Hospital El Salvador was planned. Since there was no time to build a new hospital from scratch large enough to cater for the entire population, it was decided to renovate the International Fair and Convention Center (Centro Internacional de Ferias y Convenciones) in the capital, San Salvador, which was the only facility large enough to support such a large number of people. Around February 2020, doctors with expertise in hospital facilities from the Ministry of Health (MINSAL) and architects from the Ministry of Public Works and Transportation (MOPT) began designing the facility, and construction began on March 15, with the large-scale hospital having a total of 1,000 beds being completed on June 21. At the time, each country was competing for medical equipment. By using the Japanese ODA Loan, it was made possible to build the hospital promptly and secure the necessary medical equipment.



Front view of Hospital El Salvador
(photo by the evaluator)



Inside the hospital (left: ICU)
(photo by the evaluator)

The first COVID-19 patient in El Salvador was confirmed on March 18, 2020, and the infection spread despite border closures and a nationwide lockdown. While taking measures such as renovating existing hospitals and canceling non-essential surgeries, hospitals around the country accepted COVID-19 patients, but the burden on hospitals and medical workers nationwide was great. According to the director of Hospital El Salvador, the completion of the hospital was a “real relief” for the doctors.

The hospital was the only COVID-19 specialized hospital in El Salvador, having 1,000 beds and more than 100 intensive care units (ICUs), as well as diagnostic imaging equipment. In addition, to function as a COVID-19 specialized hospital, it was equipped

with ECMO and oxygen inhalers. Two 15,000-liter liquid oxygen tanks were installed so as to prevent oxygen shortages occurring as in neighboring countries. In addition, a remote diagnostic system with cameras was installed to aid in preventing the spread of infection.²²

Since its opening in June 2020, all patients from across the country experiencing moderate to severe symptoms have been transported to Hospital El Salvador. At its peak, 936 patients were hospitalized, but the hospital was able to accept all patients during the pandemic, including those at high risk of developing severe symptoms. Over the course of two years, the hospital has accepted a total of more than 20,000 patients, with approximately 75% recovering and being discharged. One San Salvador resident said, “The hospital is really good. My family members have received treatment here and recovered. We are truly grateful for Japan’s support.”

At the hospital’s peak, it employed 300 doctors (including 35 specialists in ICU, internal medicine, etc.), 800 nurses, 100 respiratory therapists, 120



Oxygen tanks
(photo by the evaluator)



Remote diagnostic monitoring room
(photo by the evaluator)

²² The hospital’s remote diagnostic system involves installing cameras on each bed and conducting remote diagnosis in a monitoring room within the hospital. Currently, this remote diagnostic network is connected to major medical facilities in the country, with remote diagnosis between hospitals also being carried out, based on the results of the JICA technical cooperation “Assistance for Capacity Development of Intensive Care Utilizing Telemedicine under COVID-19 Pandemic” (September 29, 2021, to February 28, 2023).

radiologists, 40 nutritionists, and 100 nutrition assistants to assist with meals.²³ Many of these medical workers did not return to their homes so as to prevent infection spreading, rather staying in special accommodations to treat and care of patients. According to Hospital El Salvador “They were all very dedicated and brave.”

El Salvador’s government initially intended to use the hospital as a temporary medical facility, but as the COVID-19 situation began to subside around March 2022, it was decided to keep it open as a specialized hospital for advanced medical care. In addition to the fact that the facilities set up as a COVID-19 countermeasure could still be utilized for a long time, there was a need for a medical institution that could provide advanced medical care for national afflictions such as severe diabetes and high blood pressure, which had yet to be established. At the time of the field survey (July 2024), the hospital was operating with a scale of over 70 intensive care beds for each medical department, 75 beds for moderate to severe cases, and about 200 general beds. Medical departments include neurosurgery, neurology, cardiology, and hematology, and there are plans to expand further in the future. As the only quaternary medical institution in the country²⁴, it offers not only advanced medical care but also provides remote diagnoses to various medical institutions in the country, and is expected to contribute to medical care in El Salvador as a referral hospital into the future.



Diagnostic imaging center
(photo by the evaluator)

(End)

²³ Many patients lost their appetite due to long-term hospitalization, and many required assistance with meals during their recovery.

²⁴ Currently, El Salvador has medical institutions ranging from primary to tertiary care, depending on the number and scale of medical departments. As the only quaternary care institution, Hospital El Salvador provides advanced medical care in cooperation with other medical institutions, and does not accept general outpatients or emergency patients.

Action Matrix - Republic of El Salvador
Stand-by Loan for Natural Disaster Recovery

Target Area	Policy Actions Achieved (2016-2018)	Policy Actions Achieved (2019-2020)	Policy Actions (as of 2024)
(1) Strengthening community- based disaster risk management capacities Responsible organization: MIGOBDT/ DGPC JICA related cooperation: -BOSAI ²⁵ -BOSAI Phase 2 ²⁶	【1. Plan and Policy】 1-1. Medium-term Integrated Risk Reduction Management Dissemination Plan has been prepared and approved in April, 2017. 【2. Information】 2-1. The El Salvador Country Report on integrated management for disaster risk reduction (the name changes to “Municipal Risk and Capacity Report”) is in the process of being prepared, with the first report to be finalized in 2019. The computer application (software) that will allow collecting the information for this document has been created. 2-2. Two (2) guides for the DGPC Commissions have been printed and distributed (Community Civil Protection Plan Guide and Family Emergency Plan Guide). 【3. Organization】 3-1. The organization has been strengthened through workshops to the Commissions and municipal technicians on regulations and knowledge in risk management (4 regional workshops held in 2018). 【5. Training】 5-1. 166 technicians in 2017 and 143 DGPC technicians have been trained in 2018, in the operation and responsibility of	【1. Plan and Policy】 1-1. The National Civil Protection, Disaster Prevention and Mitigation Plan aligned with Sendai is updated. 1-2. Institutional Dissemination Strategy is elaborated. 【2. Information】 2-1. Municipal Risk and Capacity Report is prepared. 【3. Organization】 3-2. The fourth national earthquake drill is carried out. 【5. Training】 5-1. Conducted risk management training. 5-2. Developed and published printed, radio, television and digital materials to raise	【1. Plan and Policy】 1-1. The National Civil Protection Plan aligned with the Sendai Framework is completed and to be published in August 2024. 1-2. Guidelines for disaster prevention poster is drafted and distributed. 【2. Information】 2-1. Disaster risk information of all municipalities is entered in the Municipal Risk and Capacity Identification Tool (HIRCM), but under update following the reorganization of municipalities. 【3. Organization】 3-2. National earthquake drill is carried out (every October). (Disaster prevention week; National disaster prevention drill is carried out with public and private sectors, universities, public schools, etc.) 【5. Training】 5-1. Annual training is conducted for representatives of Civil Protection Commissions at community, municipal

²⁵ BOSAI: Project on Capacity Development for Disaster Risk Management in Central America, Phase 1 (2007-2012)

²⁶ BOSAI Phase 2: Project on Capacity Development for Disaster Risk Management in Central America, Phase 2 (2015-2020).

Target Area	Policy Actions Achieved (2016-2018)	Policy Actions Achieved (2019-2020)	Policy Actions (as of 2024)
	the Civil Protection Commissions. 262 members of the Municipal Commissions, have received the “Rules of Operation of the Commissions of the National System of Civil Protection, Disaster Prevention and Mitigation” in 2017. 5-2. The dissemination campaign for the 2017 and 2018 medium-term Comprehensive Risk Reduction Management Dissemination Plan (Summer Plan, Winter Plan, Plan Salvador del Mundo, Forest Fire Prevention Plan, Plan Belén, orientations and actions for the 3rd National Simulation (printed and digital material, radio in 2018) has been carried out. 5-3. The “Matrix of Indicators for Prevention, Risk Reduction and Disaster Response Capacities of El Salvador” was socialized to technicians of the DGPC and workshops were held for representatives of the municipal commissions of the eastern part of the country in 2018.	public awareness on risk management issues.	and prefecture levels based on the annual training program. Disaster response training for technicians and officials of each municipality is being planned. 5-2. Issued alerts through TV, radio, social media, etc. and conducted an awareness raising campaign through interviews. Conducted a seasonal awareness raising campaign (daily reminders during weather forecast in the rainy season, warnings against constructing buildings on slopes, etc.). Implemented other disaster prevention promotion activities within budget.
(2) Capacity development of the institutions for strengthening public infrastructure Responsible organization: MOPTVDU /DACGER	【1. Plan and Policy】 1-1. The draft disaster risk reduction and climate change policy has been prepared and reviewed by MOPTVDU. 【2. Information】 2-1. A Manual of Hydrological and Hydraulic Technical Considerations for Road Infrastructure in Central America has been prepared and was approved by COMITRAN in 2016. Six (6) Central American and two (2) national regional	【1. Plan and Policy】 1-1. Disaster Risk Reduction and Climate Change Policy is approved. 1-3. One (1) Master Plan for sustainable stormwater management of the AMSS is elaborated. 【2. Information】 2-1. One (1) Manual of Geotechnical Guidelines and Seismic Criteria, with Risk Management Approach for Central American Road Infrastructure is approved by COMITRAN. 2-2. Six (6) projects in which seismic resistance standards for bridges and road	【1. Plan and Policy】 1-1. Risk Management Guidelines is incorporated in MOPTVDU’s public procurement TOR. 【2. Information】 2-1. At a Central American level conference, “Manual of Planning and Designing Guidelines for Bridges and Crossing Works with a Focus on Climate Change Adaptation and Risk Management in Central America” is drafted. “Manual of Hydrological and Hydraulic Technical

Target Area	Policy Actions Achieved (2016-2018)	Policy Actions Achieved (2019-2020)	Policy Actions (as of 2024)
JICA related cooperation: -GENSAI²⁷ -GENSAI Phase 2²⁸ -Economic Infrastructure Rehabilitation Assistance Project (2012-2013)	workshops have been held for dissemination. 2-2. Seismic resistance standards for bridges and road slopes have been established through the development of standard design and construction specifications and tools for geohazard assessment and cost-benefit estimation. 【3. Organization】 3-1. The Regional Commission for Preventive Risk Management and Adaptation to Climate Change (CR-GRACC) has been established and DACGER officials are part of this commission, enhancing the impact of products generated from GENSAI in neighboring countries. 3-2. Four “GENSAI Phase 2” Joint Coordinating Committee meetings have been held from 2016 to 2018. 【4. Operation】 4-1. One hundred and twenty-four (124) technical risk diagnoses (rainfall and seismic) have been prepared by DACGER from 2016 to date. 4-2. Twenty-four (24) works planned by executing directorates (DPOP, FOVIAL, DMCOP) for bridges, roads, secondary and primary drainage were implemented through consultation with DACGER. 4-3. Eight (8) pilot risk reduction projects have been selected for implementation. 4-4. The capacities of DACGER technicians have been strengthened through training of INSEP/Honduras officials.	slopes are applied. 2-3. Six (6) projects in which standard specifications, design guidelines and cost estimating bases are applied. 【3. Organization】 3-2. Document is drafted on systematization of GENSAI Project. 【4. Operation】 4-1. Sixty (60) technical risk assessments (rainfall and earthquake) are prepared. 4-2. Four (4) pilot projects are implemented in compliance with defined specifications and regulations. 4-3. Twenty (20) bridge, road, secondary and primary drainage works are prioritized and planned.	Considerations for Road Infrastructure in Central America” is also updated. “Manual of Geotechnical Guidelines and Seismic Criteria, with Risk Management Approach for Central American Road Infrastructure” is referred to in MOPT projects; this is to be incorporated in MOPT’s public procurement TOR in the future. 【3. Organization】 3-2. Some of the systematized results of GENSAI are utilized in the HASHIMORI technical cooperation project being developed from 2023 to 2025. 【4. Operation】 4-1. DACGAR technicians trained under GENSAI continue risk assessments for both hydrometeorological and seismic phenomena. Technical risk assessments (rainfall and earthquake) are continued. 4-2. Monitoring of pilot projects is continued. (1) Bridge over the Motochico River: Construction management inspection is carried out. (2) Road at Hermano Bienvenido a Casa (bypass road): Periodic monitoring of seismograph and rain gauge is underway. Reinforcement works project is under preparation.

²⁷ GENSAI: Project for Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure, Phase 1 (2012-2015).

²⁸ GENSAI Phase 2: Project for Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure, Phase 2 (2016-2021).

Target Area	Policy Actions Achieved (2016-2018)	Policy Actions Achieved (2019-2020)	Policy Actions (as of 2024)
	【5. Training】 5-1. Four (4) national conferences have been organized from 2016 to date by the GENSAI project and DACGER. One (1) regional conference has been organized in 2018. Forty (40) presentations have been made by DACGER officials to publicize GENSAI results, through 18 events, 10 of which are international. Two (2) regional workshops have been held for the development of the Manual of Geotechnical Guidelines and Seismic Criteria, with Risk Management Approach for Central American Road Infrastructure.	【5. Training】 5-1. Two (2) regional workshops and four (4) national conferences are held by the GENSAI II Project. 5-2. Six (6) events in which DACGER officials participated as speakers. 5-3. Five (5) articles on infrastructure risk management are published on the DACGER website. 5-4. Two (2) MOPTVDU officials participated in international courses, such as KIZUNA in Chile and Japan.	【5. Training】 5-1. Virtual workshops are held for dissemination of manuals in the Central America region.
(3) Strengthening institutional capacity to analyze and respond to disasters effectively Responsible organizations: MARN/DGOA, MIGOBBDT/ DGPC	【2. Information】 2-1. The instrumental intensity map is already in operation and has been improved at local, national and regional scales. During 2016 to 2017 new technologies have been used in the measurement of earthquakes and tsunamis with support from the Japanese expert: use of focal mechanism (CMT) and calibration of the crustal model for El Salvador. The results are published on Twitter and web page. 2-2. The seismic catalog has been continuously revised and updated. 2-3. The procedure manual for issuing information on earthquakes and tsunamis is periodically updated. Protocols for seismic and tsunami actions have been approved. Procedures supporting the execution of the protocols have been developed.	【2. Information】 2-1. Instrumental intensity map is in the process of improvement. 2-2. Seismic Catalog is in the process of revision. 2-3. Procedure manual for the issuance of seismic information is in the process of updating.	【2. Information】 2-1. Instrumental Intensity Map is improved. 2-2. Seismic Catalog is revised. 2-3. Procedure manual for the issuance of seismic information is updated.

Target Area	Policy Actions Achieved (2016-2018)	Policy Actions Achieved (2019-2020)	Policy Actions (as of 2024)
	【3. Organization】 3-1. The number of natural hazards monitoring stations, including a network of weather radars is increased. 3-2. The 24-hour natural hazard monitoring center is established. 3-3. The local capacity of the communities is strengthened through the creation of the Network of local observers with 600 people. 【4. Operation】 4-1. Monitoring on earthquakes and tides is performed; and related information is issued, using the equipment, accelerographs (11), broadband stations (5), GPS stations (3), tide measuring stations (1) and monitoring webcam (2) that have been installed by the end of July 2014. 【5. Training】 5-1. Four (4) workshops have been held in November/2016, November/2017, August/2018 and July/2019 to strengthen coordination mechanisms between DGPC and MARN. In the 2018 workshop, the seismic and tsunami guide prepared for the DGPC was presented. 5-2. One (1) training and capacity building plan for earthquake and tsunami monitoring was developed and implemented in 2017 by the Japanese expert. On the part of the General Directorate of the Environmental Observatory, training activities have been carried out in 2018. The training plan continued to be executed in 2018. Nine training days were held, one per month (March to November).	【3. Organization】 3-1. Three (3) upgraded seismic stations and five (5) digital links are installed. 【4. Operation】 4-1. Four (4) earthquake and tsunami drills are conducted, one every two months. 【5. Training】 5-1. One (1) workshop per year, and one (1) inter-institutional drill are carried out by MARN and DGPC to strengthen inter-institutional capacity. 5-2. Two (2) trainings per year are conducted as part of the seismic and tsunami monitoring capacity building training plan. 5-3. One (1) MARN staff member participated in international courses, such as KIZUNA in Chile and courses in Japan.	【3. Organization】 【4. Operation】 4-1. Earthquake and tsunami drills are carried out once every two months. The frequency is planned to be increased next year. 【5. Training】 5-1. One (1) workshop per year, and one (1) inter-institutional drill by MARN and DGPC are continuing to be carried out. 5-2. Training based on all research results is conducted in the dry season for seismic and tsunami monitoring capacity building.

Target Area	Policy Actions Achieved (2016-2018)	Policy Actions Achieved (2019-2020)	Policy Actions (as of 2024)
(4) Mainstreaming disaster risk management Responsible organizations: Ministry of Finance, MIGOBDT/ DGPC, MOPTVDU/ VMVDU (Vice Ministry of Housing and Urban Development)/ DACGER, MARN, SAV (Secretariat for Vulnerability Issues)	【1. Plan and Policy】 1-1. Risk management plans such as the Winter Plan are created annually. 【3. Organization】 3-1 The Secretariat for Vulnerability Issues was created by presidential decree in January 2011. 3-2 The DACGER was created in the MOPTVDU in December 2010 to strengthen public infrastructure against risks caused by climate change through an executive agreement issued by the MOPTVDU. 3-3 The Urban Risk Management and Public Investment Commission has been established. 3-4 The National Environmental Sustainability Council was formed in March/2016.	【3. Organization】 3-1. National seismic design standard and Structural Safety Regulation for buildings are updated by the Technical Committee for Urban Risk Management. 3-2. The post-earthquake damage survey form is prepared by an inter-institutional effort of the public and private sectors. <i>Note: The Executive Decree creating the Secretariat for Vulnerability Issues has been repealed and its functions have been assumed by the DGPC.</i>	【3. Organization】 3-1. El Salvador's Instrumental Intensity Map is improved, and seismic standards for the Building Standard Law are updated. 3-1. In line with the updating of the post-earthquake damage survey form, MIGOBDT conducted training to utilize the form for relevant government organizations.

- 【1. Plan and Policy】 Formulation and updating of plans and policies
- 【2. Information】 Systematization of information
- 【3. Organization】 Strengthening of the organization
- 【4. Operation】 Operation and implementation
- 【5. Training】 Training and dissemination

Republic of Peru

FY2023 Ex-Post Evaluation Report of Japanese ODA Loan Project

"Rural Amazonia Water Supply and Sanitation Project"

External Evaluator: Hajime Sonoda, Global Group 21 Japan, Inc.

0. Summary

The "Rural Amazon Water Supply and Sanitation Project" (hereinafter referred to as "the Project") was implemented to expand and improve the quality of water supply and sanitation services in rural areas of the Amazon region of the Republic of Peru (hereinafter referred to as "Peru") by establishing and improving water supply and sanitation facilities and strengthening organizations for operation and maintenance, thereby contributing to the improvement of the living and sanitation environment of the local residents.

The Project aligns well with Peru's development plan, development needs, both at planning and ex-post evaluation stages, and with Japan's cooperation policy at planning stage. Its efforts to continuously refine approaches based on implementation experience are highly regarded. There was no particular coordination or collaboration with other JICA projects or other donor projects that led to the results of the Project. Therefore, its relevance and coherence are high.

The Project encountered various challenges, including limited access to target communities, the Amazon region's natural conditions, indigenous cultural practices, and a shortage of experienced consultants and contractors. As of July 2024, around 70% of the outputs have been achieved, and the executing agency expects full completion by the end of 2025. However, the project cost is projected to exceed six times the initial estimate, with a duration that is more than triple. Therefore, efficiency of the Project is low.

The number of connections to water supply and sanitation facilities is expected to exceed the target, and chlorination is generally adequate. Residents report high satisfaction with consistent access to safe water at home and safe facilities for defecation and bathing. Many have gained knowledge on proper water use and hygiene, and positive impacts, such as reduction in child malnutrition and anemia caused by diarrhea and parasites, are evident. Therefore, effectiveness and impacts of the project are high.

There are no sustainability issues in terms of policies and systems, organization, environmental and social considerations, and risk management. There are some challenges in the technical continuity through the rotation of Municipal Technical Office (hereinafter referred to as "MTO") staff and Water and Sanitation Management Associations (hereinafter referred to as "JASS") members, as well as in the operation and maintenance of certain sanitation facilities by residents. On the financial side, there are also some challenges related to the budget of the MTOs. Each situation has ample potential for improvement through continuous training provided by the National Program for Rural Sanitation of the Ministry of Housing, Construction, and Sanitation (hereinafter referred to as "PNSR"), as well as through securing new funding sources for the MTOs. Therefore, sustainability of the project

effects is high.

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

1. Project Description



Project location map

(Prepared by evaluator using Google map)



Rainwater-based water supply facility¹

1.1 Background

Peru's geography divides it into three main regions: the coastal region, the mountainous Andean highlands, and the Amazon region. The Amazon spans the eastern slopes of the Andes at elevations below 2,000 meters, covering about 60% of Peru's land area (roughly 750,000 square kilometers, or 1.7 times the size of Japan) and is characterized by extensive tropical rainforests.

The population of the five departments that make up the Amazon region (Amazonas, Loreto, San Martín, Ucayali, and Madre de Dios) is approximately 2.54 million (2007), with more than 10% being indigenous people who continue to maintain their own culture and way of life. In 2007, the poverty rate in the region was 43.4%, exceeding the national average of 39.3%, with particularly high rates of 55.0%, 54.6%, and 44.5% in Amazonas, Loreto, and San Martín, respectively.² In rural communities in the Amazon region, the importance of water supply and sanitation facilities has not been well recognized by the residents, and the coverage rate for these facilities in 2008 was very low at about 10%. In many communities, untreated surface water and groundwater are used for drinking, and untreated wastewater and excreta are discharged around houses, causing health problems.

The Humala administration, which took office in July 2011, prioritized the improvement and expansion of water supply and sanitation services across Peru as a key policy. In this

¹ All photographs in this report were taken by the external evaluator (either himself or a local assistant) during the site visit, unless otherwise noted.

² Source: "Preparatory Study on Potable Water and Sanitation Program in Rural Amazon" (JICA, January 2011)

context, the development of water supply and sanitation facilities in the Amazon region was identified as an urgent issue. Against this backdrop, in 2012, a public investment project consisting of three phases was planned to provide water supply and sanitation facilities to 1,500 communities in five departments of the Amazon region, with populations ranging from 200 to 2,000. The loan agreement for the first phase of the Project targeting 162 communities was signed.

1.2 Project Outline

The objective of the Project is to expand and improve the quality of water supply and sanitation services in the rural areas of the Amazon region by constructing and improving water supply and sanitation facilities and strengthening the organization for operation and maintenance³, thereby contributing to improving the living and sanitation conditions of the local residents.

Loan Approved Amount / Disbursed Amount	3,210 million yen / 3,010 million yen
Exchange of Note Date / Local Agreement Signing Date	February 2012 / March 2012
Terms and Conditions	Interest Rates: 0.01% Repayment Period: 25 years (Grace Period: 7 years) Conditions for Procurement: General untied
Borrower / Executing Agency	Republic of Peru / National Program for Rural Sanitation (PNSR), Ministry of Housing, Construction and Sanitation (MVCS)
Project Completion	Under implementation (scheduled for completion in June 2025)
Target Area	7 districts in the departments of Loreto, Amazonas and San Martín ⁴
Main Contractor (Over 1 billion yen)	None
Main Consultants (Over 100 million yen)	NIPPON KOEI LATIN AMERICA-CARIBBEAN CO., LTD. (Japan) / NIPPON KOEI CO., LTD. (Japan) / ADERCONSULT S.R.L. (Peru), CONHYDRA S.A.E.S.P. SUCURSAL DEL PERU (Colombia), ARTELIA VILLE & TRANSPORT (France) / ECOPROJET S.A.C. (Peru),

³ The objective of the Project was stated as "Improvement of the quality of water supply and sanitation services" in the ex-ante evaluation sheet, and the expansion of services was not explicitly stated. However, since the expansion of water supply and sanitation services was included in the Project's objectives from the time of planning, this ex-post evaluation was conducted in accordance with the actual objective, "expansion and improvement of the quality of water supply and sanitation services".

⁴ Loreto (Nauta, San Juan Bautista, Balsa Puerto), Amazonas (Imaza), San Martín (Moyobamba, Nueva Cajamarca, Jepelacio)

	TECAMB S.A.C. (Peru)
Related Studies (Feasibility Studies, etc.)	Preparatory Study for Rural Amazonia Water Supply and Sanitation Project (JICA, 2011)
Related Projects	National Rural Water and Sanitation Program (PRONASAR) (World Bank, 2002-2013), Integral Rural Water and Sanitation Program (PIASAR) (Inter-American Development Bank, 2018-)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hajime Sonoda, Global Group 21 Japan, Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: November 2023 - February 2025

Duration of the Field Study: June 4 - July 2, 2024 and September 30 - October 5, 2024

2.3 Constraints During the Evaluation Study

During the first field survey, subprojects in the seven target districts were inspected, but due to the deteriorating security situation, the external evaluator was unable to visit the target district (Imaza) in the department of Amazonas. Therefore, the subproject visit to this district was conducted through the local assistant.

3. Results of the Evaluation (Overall Rating: B⁵)

3.1 Relevance / Coherence (Rating: ③⁶)

3.1.1 Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Peru

Peru's *2021 Plan* and *National Development Strategic Plan* announced in 2011 by the Humala administration, which took office in July 2011, aimed to guarantee access to safe water and sanitation and to expand access to quality water and sanitation services to the rural population, with special attention to vulnerable populations. Rural initiatives in the *National Sanitation Plan 2006-2015* formulated by the Ministry of Housing, Construction and Sanitation (MVCS) emphasized efforts to meet the demand for water supply and sanitation facilities, promote public participation in decision-making related to services, and establish and strengthen water management associations.

The Pedro Castillo administration, which came into power in 2021, stated in its *General*

⁵ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁶ ④: Very High, ③: High, ②: Moderately Low, ①: Low

Government Policy 2021-2026 that it would reduce disparities in water and sanitation services. Peru's *Multi-Year Strategic Sectoral Plan 2016-2026* aims to ensure that all citizens have access to safe drinking water by 2040. The *National Sanitation Plan 2022-2026* emphasizes environmental protection, economic efficiency, and attention to the poor and rural areas, and aims to improve sanitation in rural areas and introduce sustainable technologies. Furthermore, to provide universal water and sanitation services, including to people in rural areas and other populations living in poverty or vulnerable conditions, while ensuring service quality, equity, and sustainability, and promoting environmental protection and social inclusion, sector reforms were initiated in June 2024 with the promulgation of *the Law Establishing Measures to Ensure Universal Access to Potable Water* (Ley No. 32065).⁷

In addition, *the Amazon Investment Promotion Law* (Ley No. 27037) has been enacted in the Amazon region as a special consideration to promote economic and social development while balancing environmental protection.⁸

Based on the above, the Project is consistent with Peru's development policy at the time of planning and ex-post evaluation.

3.1.1.2 Consistency with the Development Needs of Peru

As described in "1.1 Background," the coverage rate of water supply and sanitation facilities in rural villages in the Amazon region is extremely low, and the poor sanitary conditions caused by the use of unsanitary water and improper disposal of waste water and excreta have led to health problems such as diarrhea, skin infections, poor nutrition, and parasitic infection. Due to the urgent need to improve the living and sanitation conditions of local residents, a plan was established in 2012 to develop water supply and sanitation facilities in a total of 1,500 communities. As part of the first phase of this initiative, the Project covered 162 communities. Therefore, there are still many communities in the Amazon region that do not have water supply and sanitation facilities, leaving major development needs unmet. The water supply and sanitation facilities developed by the Project are well utilized during the ex-post evaluation, and the needs of the target communities continue to be met.

Based on the above, the Project is consistent with Peru's development needs at the time of planning and ex-post evaluation.

⁷ The law is expected to go into effect nationwide in 2025, with implementing regulations approved by the end of 2024.

⁸ The law, enacted in 1998, aims to promote investment in the Amazon region with an emphasis on environmental conservation through tax exemptions, infrastructure development to improve the quality of life of residents, and medical and educational services. Furthermore, it stipulates respect for the identity, culture, and organizational forms of indigenous farmers and indigenous communities.

3.1.1.3 Appropriateness of the Project Plan and Approach

Lessons learned from the ex-post evaluation of similar projects in the water supply and sanitation sector highlighted the importance of establishing effective systems for the operation, maintenance, and management of small-scale infrastructure in rural areas. To ensure smooth and sustainable facility operations after project completion, securing adequate funding and implementing a robust management structure are essential. In this regard, social interventions led by consultants were incorporated into the Project, both during construction and for six months post-completion. These interventions included proper operation and maintenance management by JASS and involved training and hygiene education for residents to promote the correct use of facilities and enhance hygiene practices. Additionally, drawing from the Project's implementation experience, innovative initiatives such as "JASS Classrooms," "JASS Stores," and "Environmental Protection Teams" were introduced and integrated. The consultant responsible for the social intervention stayed in the target communities for six months, steadily promoting changes in the residents' awareness and behavior. It was an important component in realizing the effectiveness and impact of the Project and ensuring its sustainability. Additionally, organizational strengthening consultants were assigned to each municipality's technical office to support the water management associations. This approach contributed to long-term sustainability by enhancing the technical and management capacities of these associations.⁹ Adequate social intervention was essential to ensuring the proper use and maintenance of facilities by residents, particularly in communities where water supply and sanitation facilities were being introduced for the first time.

In remote communities, the direct construction method was adopted, whereby resident groups contracted directly with the implementing agencies to undertake the construction work. The fact that the subprojects were implemented in remote and outlying areas where the market for small-scale civil works is not well developed, and it is difficult for construction companies to implement the subprojects can be positively evaluated from the perspective of Leave No One Behind. Through the construction experience, the residents have enhanced their capacity for operation and maintenance of the facilities, and the leftover materials from the construction were used for repairs. On the other hand, it was found that proper supervision and monitoring by the executing agency were necessary for the success of such subprojects, and useful lessons were learned for the second phase of the project.

The Project targeting 162 communities represents the first phase of the entire project planned to cover 1,500 communities across the Amazon region in three stages. It is also the

⁹ There are three levels of local government in Peru: Department, Province, and District. Each District has a municipality, which is responsible for public services for the entire region. In addition, communities exist within District, and some communities, especially indigenous communities, may be granted a certain degree of autonomy. Municipalities are responsible for supporting the welfare of these communities.

first water supply and sanitation project implemented in rural areas of the lowland rainforest within the Amazon region. As this was the pilot phase¹⁰, rain-fed water supply facilities, improved septic tanks, and other infrastructure were initially introduced and tested under the Project, with adjustments made based on insights gained during implementation. In particular, in the second half of the implementation period, new mechanisms such as JASS Classrooms, JASS Stores, and Environmental Protection Corps were introduced and contributed to the effectiveness, impact, and sustainability of the project.¹¹ Thus, the Project's efforts to continuously improve its approach through experience during the implementation phase should be highly regarded. It is expected that the various lessons learned from the Project will be fully utilized in its second phase.

During the Project's planning phase, the unique business and labor practices of the local area, particularly those of the indigenous communities, were not well understood. Furthermore, the implementation plan did not fully account for the specific characteristics of the target area, such as natural conditions heavily influenced by weather, geographical remoteness, and the limited number of consultants and contractors with experience in public works projects in this region. As a result, the cost and duration of the Project exceeded the plan by a large margin, which affected the efficiency evaluation. While this may be seen as an issue related to planning and approach, it did not reduce the relevance of the project. Given that it was in its pilot phase, these factors did not significantly impact the Project's effectiveness, impact, or sustainability.

3.1.2 Coherence (Rating: ②)

3.1.2.1 Consistency with Japan's ODA Policy

During the planning phase, the *Rolling Plan* attached to the *Japan's Country Assistance Policy for Peru* identified three key areas of focus for assistance: "poverty reduction and disparity correction," "establishment of economic and social infrastructure for sustainable development," and "addressing global issues." The improvement of water supply and sanitation was one of the most important development issues in the "poverty reduction and disparity correction" priority area. Therefore, the Project is consistent with Japan's development cooperation policy at the time of planning.

3.1.2.2 Internal Coherence

Although JICA has provided numerous yen loans and technical assistance under Peru's *Water Program*, there were no plans for specific linkages with the Project. In addition, no specific synergies were identified. Therefore, there were no planned or unplanned linkages

¹⁰ In the preparatory study for the Project, the first phase of this project was positioned as a pilot phase.

¹¹ See "3.3.2.2 Other Positive and Negative Impacts" and "3.4.3 Technical Aspect."

or synergies with other JICA projects.

3.1.2.3 External Coherence

At the time of planning, the World Bank was developing support for the water supply and sanitation sector in the Amazon region under its "National Rural Water and Sanitation Program" (PRONASAR), which included the Amazon region as a target area, but there is no overlap with the target communities for the Project. There were no specific plans to link the Project with other donor projects in the water supply and sanitation sector.

On the other hand, the "Integral Rural Water and Sanitation Program" (PIASAR), supported by the Inter-American Development Bank, has been implemented since 2018 in nine departments across the country, including the three departments covered by the Project. While this program is similar to the Project, the second phase, which started in 2023, reflects new initiatives devised under the Project, such as "JASS Classrooms," "JASS Stores," and "Environmental Protection Teams." There is no overlap with the target communities of the Project. One of the target districts (Imaza, Amazonas Department) of the Project overlaps with this program, but capacity strengthening of the MTO is being implemented in coordination with the Project. Meanwhile, this is not linked to the outputs of the Project.

There are no planned or unplanned linkages or synergies with other donor projects.

Thus, the Project was consistent with Peru's development plans and needs at both the time of planning and ex-post evaluation, and with Japan's development cooperation policy at the time of planning. There was no coordination or collaboration with other JICA projects or other donor projects that led to the outputs of the Project. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

The Project included consulting services for new and improved water supply and sanitation facilities through 146 subprojects covering 162 communities in seven districts of Loreto, Amazonas, and San Martín, as well as organizational strengthening of communities and local governments. The planned and actual outputs are shown in the table below. At the time of the ex-post evaluation, the Project was not yet completed.

After the start of the Project, Sauce, San Martín, which includes a protected area, was excluded from the target area and the administrative district of Jepelacio, San Martín, was added instead. The number of target communities was maintained at 162 as planned and organized into 146 subprojects. Pre-investment studies for each sub-project were conducted sequentially, followed by detailed design after obtaining approval from the Ministry of

Economy and Finance. Civil works were then carried out either through contracts with contractors or via direct implementation methods. As of July 2024, 108 of the 146 subprojects had been completed (74% of the planned total). According to PNSR, another 38 subprojects will be completed by June 2025 and 146 subprojects will be completed as planned.

Table 1: Planned and actual outputs

	Planned outputs	Actual outputs
Civil works	Construction and improvement of water supply and sanitation facilities through 146 subprojects at 162 communities in 7 districts in 3 target departments	Same as plan (Not completed as of July 2024: 108 subprojects out of 146 completed; all 146 subprojects to be completed by June 2025.)
Consulting services	- Community Status Survey - Community organization strengthening (social intervention) - Supervision of direct construction method - Pre-investment study, detailed design, and construction management of subprojects - Capacity strengthening of local government - Project management support for executing agency	Same as plan

Source: Prepared from materials provided by JICA and PNSR

The Project was a pilot phase, and a trial effort was made to introduce new technologies. In addition to being the first public project to introduce rain-fed water supply facilities, the pilot project also included rain-fed water supply facilities that do not require pumps, and improved septic tanks combined with flush toilets (which can be installed regardless of groundwater level, geology, soil absorption capacity, and other factors). The following is an overview of the water supply and sanitation facilities constructed by the Project.

Water supply facilities

- About 60% of the subprojects are water supply facilities that take water from springs, seeps, streams, and other surface water sources, treat it by slow filtration (filtration performed slowly by gravity), add chlorine for disinfection at distribution reservoirs, and distribute the water to individual households. Most of them were implemented in San Martín and Amazonas.
- Approximately 30% of the subproject is rainwater-based water supply facilities, where rainwater is collected by a large ceiling and stored in tanks. These are installed separately for each household, and residents are responsible for their own chlorine

disinfection. There are manual or electric pumps to pump water to the tanks installed at the top. Most of these were implemented in Loreto.

- Approximately 10% of the subproject is water supply facilities that pumps groundwater and distributes it using only chlorine disinfection. Depending on the quality of the groundwater, necessary treatment facilities are added.



(Left) Electric pumps installed by residents at a rainwater-based water supply facility



(Right) Distribution reservoir at a water supply system using surface water



(Left) Elevated water distribution reservoir (water supply facility that pumps up groundwater)



(Right) Materials stored in JASS Stores

Sanitary facilities

- All households were provided with a "Basic Sanitation Unit (BSU)" combining a toilet, shower, washroom, and multipurpose washing area. About 90% of the toilets are composting toilets, in which only feces, excluding urine, is accumulated in a dry state and composted over time. To keep these toilets dry, ash, wood chips, and other materials must be added every time a person goes to the toilet.

- About 10% of them combine a flushing toilet with a septic tank, and there are normal type septic tanks and two types of improved septic tanks. Infiltration tanks / trenches are also installed to allow the soil to absorb treated water from the septic tank.



(Left) BSU (brick construction)



(Middle/Right) Interior of BSU (tin construction)



(Left) Composting toilets (separate urinal and feces), material for drying (ash and sawdust)



(Right) Conventional toilets (example located away from the house)

The following consulting services were provided under the Project.

- Project management support: In total 58 consultants (as of November 2024) were employed at the PNSR headquarters in Lima and a total of 33 consultants (as of November 2024) at the three regional operating units to support the implementation of the Project in technical, social, project management and other aspects.¹²

¹² The regional operating units were established in Iquitos in Loreto Department, Moyobamba in San Martín Department, and Chiriaco in Amazonas Department. These units conducted management of studies and construction, and strengthened the capacities of municipalities and communities in the target districts of each department. However, as the Balsa Puerto district in Loreto Department is closer to Moyobamba, it was managed by the regional operating unit in Moyobamba.

- Study, design, and supervision: Pre-investment studies and detailed designs for each subproject were contracted to three consultant firms. In addition, the supervision of the work of these consultants and the supervision of the construction work by the contractors were outsourced to one consultant firm.
- Social intervention: One or two social experts (consultants) were assigned to each community. These experts stayed in each community from the start of construction until six months after its completion, confirming residents' acceptance of the subprojects, promoting understanding of the constructed water and sanitation facilities, and providing residents with education on the proper use of these facilities. This included hygiene education covering handwashing, bathing, cleaning, toilet and kitchen sanitation, boiling drinking water, and disease prevention, as well as capacity building for the establishment, operation, and maintenance of JASS.
- Municipal support: Consultants in charge of municipal capacity building were hired at each regional operating unit, and training and support were provided to the MTOs, which are responsible for supporting JASS, on administrative (including securing municipal budgets through the preparation of annual activity plans), technical and social aspects related to strengthening JASS, as needed by each municipality. In addition, intersectoral and interinstitutional actions were promoted to enhance the sustainability of water and sanitation services.

According to the responses to the questionnaire to PNSR, interviews at PNSR headquarters and regional operating units, and site visits, the following challenges to the implementation of the Project were identified, which were the reasons for the significant increase in the implementation period and project cost.

- Accessibility of the communities: One-third of the target communities cannot be accessed by land routes alone, requiring water transportation such as boats. Ten percent require access on foot. The average travel time from each regional operating unit to the community is approximately 4.4 hours, with a maximum of up to 3 days (about 66 hours). Notably, the travel times are particularly long for Balsa Puerto in Loreto (average 10.5 hours) and Imaza in Amazonas (average 8.7 hours). Such difficult access has led to delays and increased costs in pre-investment studies, detailed design, and civil works for the subprojects. It has also complicated the assurance of quality in studies and civil works through supervision and monitoring.
- Natural conditions in the Amazon region: The water level of the Amazon River varies greatly with the seasons, and in Iquitos of Loreto Department it fluctuates nearly 10 meters per year. During periods of high water, not only access roads but also communities themselves can be inundated, with some communities being inundated

for up to four months. On the other hand, during periods of low water levels, it is difficult to move goods by water transportation. In some cases, rainfall and flooding make roads so muddy that materials cannot be transported by wheelbarrow, but must be carried by hand. This led to construction delays and increased costs.

- Indigenous culture and customs: Since indigenous communities do not easily allow outsiders to enter, it is necessary to rely mostly on the residents for the labor required for civil engineering work. Therefore, the working conditions have to be in accordance with the residents' requests. However, the indigenous people lack experience in providing services based on contracts, and common practices in other regions may not apply to them. For example, the cost of transporting materials by water or by wheelbarrow may be several times higher than the amount at the time of study, or they may demand the same high compensation as outside engineers for simple labor, or they may have the custom of not working during rainfall or only working in the morning. In some areas, communication in Spanish was difficult and interpreters had to be hired. These factors led to increased costs and construction delays.
- Lack of consultants / contractors with adequate capacity: Water supply and sanitation projects had never been implemented in the Amazon region, especially in rural areas of the lowland rainforest where many indigenous communities are located, and there were few consultants / contractors with experience in the region. Few are willing to undertake surveys and construction in difficult areas, forcing the use of contractors with little experience. As a result, many of the consultants / contractors contracted for the Project did not have sufficient experience to adequately address the issues described above, and faced many difficulties in ensuring the quality of the studies and civil works, and in maintaining contractual construction schedules and costs.¹³
- Issues in the pre-investment study and preparatory study: As for the Project, a pre-investment study was conducted in 2008 to form the entire project targeting 1,961 communities.¹⁴ Based on this, a preparatory study was conducted in 2010 to formulate the entire project targeting 1,500 communities. The 40 communities sampled in the pre-investment study were all "communities easily accessible," and they were also the target of the preparatory study. This bias in the survey sample may have been behind the failure to accurately anticipate the various difficulties that could occur in the inaccessible communities.

¹³ Furthermore, it was necessary to accept workers from outside the region to address the local labor shortage, and responding to demands from the civil construction union for improved employment conditions also impacted the progress of the construction work.

¹⁴ The pre-investment study for the entire project was conducted by Japanese consultants with the support of Japan Bank for International Cooperation.

- Challenges of subproject pre-investment study and detailed design: Although the contract packages with the three consultants each included approximately 30 or more subprojects, it was not possible to proceed with work on all subprojects simultaneously due to inadequate study staffing at each company, as well as staffing of PNSR for supervision. In addition, implementation took a long time.¹⁵ The consultant in charge of Loreto was terminated due to their inability to submit the pre-investment study report and detailed design on time. Subsequently, PNSR commissioned individual studies for each subproject to proceed. In general, according to PNSR, the quality of the pre-investment studies was not high, and many reports were prepared with the same content as other communities, or required redoing of the studies during detailed design. The quality of detailed design was also generally not high, with many design changes and additional work required during the implementation phase.
- Challenges of the direct construction method: In the direct construction method, a consultant hired by PNSR supervises the civil works done by the community group. Consultants are required to be stationed in the community, but due to the remote location of the community, they were sometimes not stationed in the community, and PNSR was not able to visit frequently enough to ensure accurate reporting by the consultant. In some cases, the work was reported as completed when it was not, and additional work was later required. As a result, there were many cases where the direct construction method was abandoned in favor of the contracting method. In total 47 subprojects were started under the direct construction method, but only 26 were completed as they were. Most subprojects that began with direct construction methods in Loreto and Amazonas were unable to be completed as planned. On the other hand, in San Martín, where access to target communities is relatively easier than in Loreto and Amazonas, many of the direct-construction subprojects were successful.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The project cost was planned at 5,311 million yen, but the final estimated amount as of July 2024 was 32,901 million yen (619% of plan), and significantly exceeded the plan. The amount of yen loans was 3,010 million yen (94% of the plan), compared to the planned 3,210 million yen.

The planned project cost for the Project was estimated at 156,180 thousand soles by the preparatory study (March 2010).¹⁶ After the start of the Project, the pre-investment study

¹⁵ According to PNSR, it took an average of 293 days to prepare the pre-investment study report and 271 days for detailed design for subprojects.

¹⁶ The planned project cost amount (5,311 million yen) is considered to include a reserve (about 5% of the cost

and detailed design of each subproject began, and it was found that the actual project cost would be much higher than originally planned, as the project cost was underestimated in the preparatory study. Therefore, in May 2016, PNSR submitted an application to increase the project cost to 599,816 thousand soles (384% of the original estimate), which was approved by the Ministry of Economy and Finance. Subsequently, after construction began, the project cost increased for various reasons, and PNSR applied several times to increase the project cost and got approval by the Ministry of Economy and Finance. The latest total project cost (estimated as of July 2024) is 982,429 thousand soles, which is more than six times higher than the amount of original project approval. The Peruvian government's commitment to the Project is strong, and the entire increase was funded by the Peruvian government budget.

Table 2: Planned and actual project cost

(Millions of yen)

	Planned amount		Actual amount (as of July 2024) (Final estimated amount)	
	Total	Yen loan	Total	Yen loan
Civil works	2,578	1,723	21,650	1,721
Strengthening community organizations	452	452	960	373
Consulting services	1,035	1,035	1,272	916
Administrative expenses	318	0	3,508	0
Taxes (VAT)	832	0	4,641	0
Other	80	0	869	0
Interest during construction	16	0	unknown	0
Total	5,311	3,210	32,901	3,010

Source: Prepared from materials provided by JICA and PNSR

Notes: Other includes COVID-19 response costs, training, pilot projects, anthropological surveys (survey for social, cultural, and anthropological support on the diversity of ethnic groups and language families in rural Amazonian areas), etc.

Exchange rate Plan: 1 Sol = 32.3 yen (July 2010)

Actual: 1 Sol = 33.5 yen (average rate from 2013 to July 2024)

Factors contributing to the increase in project cost include;

- The BSU was planned as a wooden building with only toilets, but the planning standards were revised and showers, washbasins, and multipurpose washing stations were added. The material of the building was changed to more expensive concrete, brick, or tin due to the difficulty of procuring large quantities of wood. This increased the cost of BSU, which in some communities increased tenfold over the plan.

of civil works, community organization strengthening, and consulting services). Note that the project cost in yen was not calculated in the preparatory survey.

- At the time of the preparatory study, about 40% of the water supply facilities were planned to be developed by rehabilitating some of the existing water supply facilities, but in fact there were no rehabilitations and all were newly constructed.¹⁷
- Most of the communities covered in the preparatory study were easily accessible, and freight and other costs were underestimated. In particular, the estimated cost of hauling construction materials was greatly underestimated, and the actual cost was more than 10 times the estimate. According to PNSR, it is possible that freight rates that are standard for utility estimates in other regions were used as is.
- Costs for various construction and ancillary facilities identified during the pre-investment study and detailed design of the subprojects, as well as those deemed necessary after construction began, were added. For example, additional work was included during the detailed design phase or after the construction began for the following: a water bridge for the water pipeline to cross a river, the construction of access roads to transport materials to the water source, interpretation services for the indigenous communities, and modifications to transportation methods based on the condition of the transport routes.
- Price increases due to delays in the start of construction, material price fluctuations, and increased administrative costs; consumer prices in Peru increased by 60% between 2010 and 2023. In addition, the project cost increased due to the impact of natural conditions, significant price increases in labor and transportation costs and inefficiencies in work due to residents' demands, inadequate capacity of consultants and contractors, and suspension and redoing of studies and construction due to the failure of direct construction methods, etc.
- There was an increase in costs due to the procurement of sanitary supplies and other items for COVID-19 prevention.

3.2.2.2 Project Period

The Project was planned to be implemented over 36 months from the signing of the loan agreement in March 2012 to the start of facility operations in February 2015 (see figure above). In fact, the loan agreement was signed in March 2012 as planned, but as of July 2023, only 103 out of 146 subprojects have been completed, and the Project is not yet complete. The Project will be completed by June 2025, at which time the project period will reach 150 months. Due to the COVID-19 pandemic, a lockdown was declared throughout Peru from late March to the end of June 2020, which suspended or stalled the implementation of the Project for approximately two years. Since this was the result of a force majeure, the actual

¹⁷ According to PNSR, one of the reasons the existing water supply facilities were not repaired was that they used public faucets and did not have individual house connections.

150 months minus 24 months is used as the actual value for the evaluation, which is 126 months. This amounted to 350% of the plan, and the project period significantly exceeded the plan.

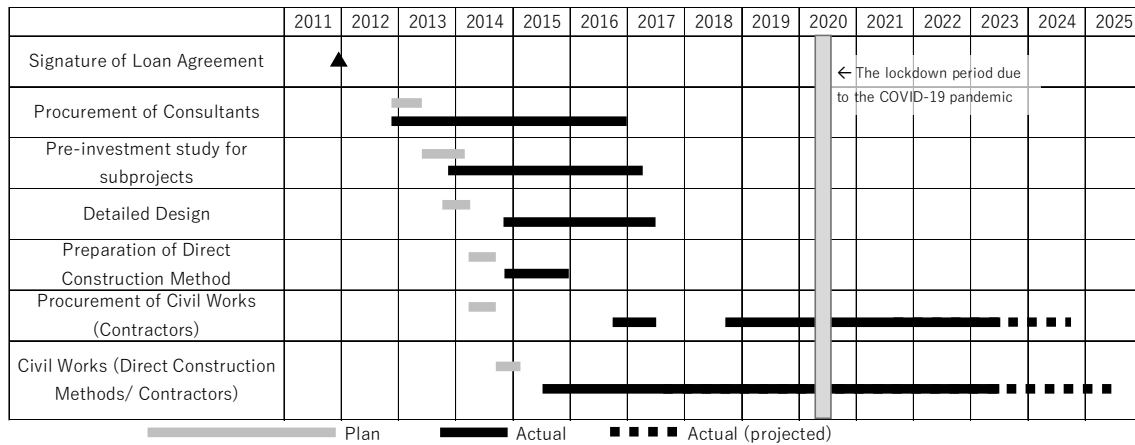


Figure 1: Planned and actual project period

Source: Prepared from materials provided by JICA and PNSR

The consultant was contracted for the Project in July 2013, with plans to complete the pre-investment study and detailed design of the subprojects in about 9 months, begin procurement of civil works in March 2014, contract the works around September 2014, and complete them in February 2015 with a construction period of about 6 months. The pre-investment study was supposed to take 8 months to conduct and approve, and the detailed design was supposed to start 2 months later and take 6 months to conduct and approve.

In reality, the pre-investment study took 37 months and the detailed design took 28 months. In addition, the construction period was expected to be 6 months, but in reality, the subprojects completed to date took an average of approximately 17 months (493 days), with the longest taking 33 months. Furthermore, although the plan was for all 146 subprojects to proceed simultaneously, in reality, the subprojects were started sequentially, starting with those that were ready. The number of completed subprojects increased over the years as shown in Figure 2. Progress slowed from 2020 to 2021 due to the COVID-19 pandemic.

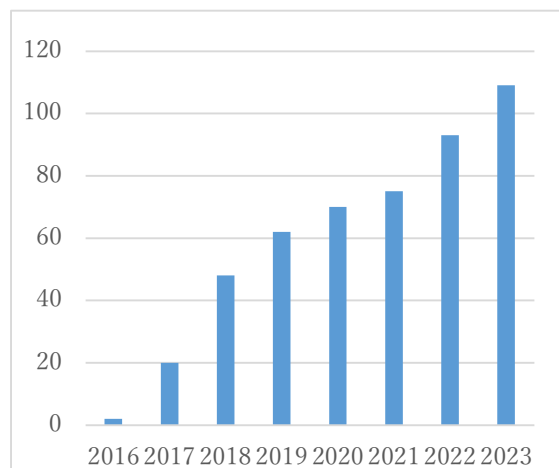


Figure 2: Number of subprojects completed
(Source: Prepared from materials provided by PNSR)

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

In the Project, the economic internal rate of return (EIRR) for the water supply component was calculated during the selection of subprojects, with plans to select those with an EIRR of 10% or higher. The pre-investment study for each subproject calculated the EIRR based on the following assumptions;

Cost:	Initial investment cost, operation and maintenance cost
Benefits:	Reduced water fetching labor, increased water use benefits (based on willingness to pay)
Project Life:	20 years

In the ex-post evaluation, EIRR was recalculated using the actual initial investment cost and actual number of beneficiaries for the six subprojects for which sufficient information could be collected among the subprojects visited in field survey, and the range was 10.2% to 19.3%. EIRR increased when the increase in the number of beneficiaries outweighed the rise in initial investment costs, while it decreased in the opposite scenario. EIRR averaged over the six subprojects decreased from 15.8% in the pre-investment study to 13.9%.

To summarize the efficiency, as of July 2024, the output achievement rate of the Project based on the number of completed subprojects is approximately 74%, while the executing agency plans to achieve 100% by the end of 2025. The project cost is projected to be over six times the initial plan, and the project period is expected to be more than three times longer than planned. Therefore, efficiency of the Project is low.

3.3 Effectiveness and Impacts¹⁸ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The project indicators included "the number of households newly connected to the water supply," "the number of households newly connected to sanitation facilities," and "the ratio of communities with residual chlorine levels in drinking water of 0.5 ppm or higher." The achievement status of each indicator is as follows.

¹⁸ When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 3: Achievement of operational and effectiveness indicators

Indicator	Baseline value 2010	Target value (2017: 2 years after completion)	Actual values
Number of households newly connected to water supply	0	11,600 households* (45,174 persons)	11,287 households (February 2024) (achievement rate:97%) 16,403 households (projected upon completion)** (achievement rate:141%)
Number of households newly connected to sanitation facilities	0	10,000 households* (39,081 persons)	12,587 households (February 2024) (achievement rate:126%) 16,731 households (projected upon completion)** (achievement rate:167%)
Ratio of communities with residual chlorine levels in drinking water of 0.5 ppm or higher	unknown	100%	Approx. 80% (July 2024) (Based on interviews during the site survey)

Source: Prepared based on materials provided by PNSR, municipalities in the target districts, and interviews with communities surveyed in the field.

Notes: * Figures in the ex-ante evaluation sheet were headcounts and were therefore converted to households based on information on household size in the target communities. The actual figures represent the number of newly connected households at the time of completion of each subproject and do not include the number of additional households connected thereafter.

** Projected figure at completion of all 146 subprojects by the end of 2025

(1) Use of water supply and sanitation services

According to the field survey¹⁹, the following conditions were found regarding the provision and use of water supply services by the Project.

- In subprojects that use spring water, the location of the springs may shift over time, resulting in insufficient water supply, or water volume may decrease during dry periods. However, in the majority of subprojects, adequate water supply is maintained throughout the year. When rainwater is the source in Loreto, it is necessary to conserve water during the dry season (June to October). If this is still insufficient, previous water sources (such as wells or streams) may also be used.
- The BSU installed in each household has a shower along with a faucet, which is used by all households. Many households draw water from the basic sanitation unit into the house at their own expense.

¹⁹ In this ex-post evaluation, the technical offices of the seven target municipalities were visited and interviews were conducted with the staff (engineers, etc.) in charge of each municipality. In addition, a total of 14 subprojects (5 in Loreto, 5 in San Martín, and 4 in Amazonas) were visited, and interviews were conducted with JASS members and water users (residents) in each community. Interviews with water users were conducted in groups or individually. The opinions of 3 to 6 JASS members and 3 to 10 water users were interviewed in each community. In addition, an inspection of the water supply facilities and the use of the BSUs installed in each household were conducted in each community.

- Rain-fed water supply facilities have manual pumps to pump water to the upper tanks, which need to be run for 20 to 30 minutes each time the tanks are empty. Some households have replaced them with electric pumps. Facilities designed without pumps were constructed on a trial basis in several subprojects.
- Due to factors such as easy accessibility, some communities experience significant increases in the number of households, while others see a decrease in household numbers due to migration or outflow. After the completion of the Project, there are fluctuations in the number of households in each community. When water is distributed through pipelines, new households can be added. However, rain-fed water supply facilities and BSUs are installed for each household, which can lead to situations where these facilities become unused due to residents moving away, or new households are unable to utilize them.²⁰
- Composting toilets installed in 90% of the subprojects are sometimes unable to maintain dryness and produce foul odors. Children and others accidentally urinate on them, the water pipes leak, and they become damp due to condensation. In addition, strong winds and rain can cause water intrusion. Careful use of the composting toilet requires adding drying materials (sawdust and ashes) each time, but purchasing drying materials is expensive and often there is no place nearby to purchase them. Some do not understand how to dispose of it when it is full. As a result, many residents have stopped using composting toilets, although this varies from community to community.²¹ Many residents prefer the convenience of a flush toilet, and many have retrofitted at their own expense (replacing the toilet bowl and installing a septic tank directly below or away from the toilet). Residents who cannot afford to retrofit use the existing manure dump toilets located away from their homes. However, other functions of the BSU, such as showers, sinks, and multipurpose washing areas, are used. Unused spaces are sometimes used for other purposes such as material storage. According to interviews with municipalities and communities in the seven districts visited, it is estimated that only about half of all households use composting toilets without renovation.
- The flush toilets with improved septic tanks, which were introduced in 10% of the subprojects, require the removal and disposal of the accumulated sludge when they become full. Similarly, composting toilets also need to have the full compost removed. Such work will be necessary one to two years after the start of use, depending on the

²⁰ In order to add BSUs and rainwater-based water supply facilities, the municipality must apply to the Ministry of Economy and Finance for a "Public Investment to Optimization, Expansion, Repair, and Replenishment" for existing infrastructure facilities.

²¹ In some of the communities visited, nearly all residents were properly using composting toilets, while in others, nearly all had converted to flush or were no longer using them.

number of families. On the other hand, since the social intervention of the Project only lasted for 6 months after its completion, there was no opportunity to provide practical guidance on such work. Some residents do not know what to do and leave or stop using the system.²²

Based on Table 3 and the above, the achievement level (97%) for the "number of households newly connected to water supply" is considered to be "high". If the 146 subprojects are completed as planned, the achievement level will increase to 141%. The achievement level of "number of households newly connected to sanitation facilities" (126%) is already above 100% as of February 2024. If the usage rate of composting toilets installed in 90% of the subprojects is around 50%, while the usage rate of other types of toilets is 100%, the actual achievement level can be considered approximately 70%.²³ However, considering that there are households using retrofitted composting toilets and that the facilities other than toilets (such as showers, sinks, and multipurpose wash areas) in the basic sanitation units are universally utilized, the achievement level is deemed to be "generally high." If the 146 subprojects are completed as planned, the achievement rate will reach approximately 92%, taking into account the utilization rate of composting toilets.²⁴

(2) Chlorination of water

All JASSs reported to PNSR that they are properly chlorinating their water. However, based on interviews with communities and relevant municipal units during the field survey, it appears that the "ratio of communities with residual chlorine levels in drinking water of 0.5 ppm or higher" is not necessarily 100%, as shown below;

- In communities where rain-fed water supply facilities are provided, JASS purchases and distributes chlorine disinfectants to each household, but it is up to each household to decide whether or not to use them.²⁵ JASS operators monitor residual chlorine levels in each household, but in one of the communities we visited, only half of the households were constantly chlorinated. Note that procurement of chlorine disinfection materials was difficult in areas where rain-fed water supply facilities had been constructed, but with PNSR's assistance, a mechanism was established for multiple JASSs to communicate with each other to procure the materials from the capital city of Lima.

²² For this reason, PNSR is considering a longer duration of social intervention in the second phase.

²³ The actual achievement is estimated to be approximately 6,923 households (about 70% of the target of 10,000 households), based on the following calculation:

$12,587 \text{ households} \times (90\% \times 50\%) + 12,587 \text{ households} \times (10\% \times 100\%) = 6,923 \text{ households.}$

²⁴ $16,731 \text{ households} \times (90\% \times 50\%) + 16,731 \text{ households} \times (10\% \times 100\%) = 9,202 \text{ households.}$

²⁵ Chlorine disinfectant is added each time a manual pump fills the upper tank at the water supply facility of each household.

- In systems that use surface water or groundwater as the source of water, chlorinating materials are dosed at the water distribution reservoir. The original chlorination equipment utilized large tablets, but since tablets can only be purchased in the capital city of Lima, most systems have switched to dripping liquid chlorine disinfectant using municipal funds. Chlorine disinfection material is purchased and procured by JASS, but some municipalities distribute it to JASS. Operators adjust the drip rate to maintain the proper concentration. Most of the 10 communities visited had chlorine disinfection in place, but one community with poor access in Imasa (Amazonas Department) had run out of chlorine disinfection material and had not purchased it, and chlorine disinfection had stopped.
- In rain-fed water supply facilities, JASS operators regularly measure the residual chlorine concentration at each household faucet. In other water supply systems, operators measure once a week at the distribution reservoir. Health posts, outpatient healthcare facilities under the jurisdiction of the Ministry of Health, also monitor residual chlorine levels. Simple testing in some communities during the field survey revealed that some households in the rain-fed water supply system had stronger chlorine residuals, but otherwise the residual chlorine levels were generally adequate.
- Some residents (especially indigenous people) do not like the smell of chlorine, and JASS has solved this problem by adjusting the chlorine level in consultation with the municipal unit. It was also reported that in some cases, JASS has responded to requests from residents who do not want chlorine to be added to the water for agricultural purposes, such as washing coffee harvested from the fields. On the other hand, according to interviews during the field survey, most of the residents understand the importance of chlorination through the social intervention of the Project.

Based on the above, assuming that the achievement level is about 50% for rain-fed water supply facilities, where chlorine disinfection is left to each household, and about 90% for other water supply systems, the overall achievement level weighted by the beneficiary population is about 80%. Therefore, the achievement level of the "ratio of communities with residual chlorine levels in drinking water of 0.5 ppm or higher" is judged to be "generally high."

Although the septic tank for human waste and household wastewater drainage systems constructed by the Project are installed in distance from residences, most of the water sources for the Project's water supply system come from rainwater or distant springs and streams, making the risk of contamination from wastewater or household drainage low. Groundwater is incorporated as a water source in some subprojects, but the wells are far away from the sewage and domestic wastewater layers and are deep, so the possibility of contamination is

low.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The overall goal of the project was to "contribute to the improvement of the living and sanitation conditions of local residents." Most communities did not have water supply services prior to the Project. Some communities had aging water supply systems, but there was no water purification process, and many had only communal taps. As a result, many residents used water from wells and streams. With the construction of the water supply system under the Project, each household now has access to water whenever they want. In addition, water quality was improved through water purification and chlorination. Furthermore, through social intervention, residents learned how to properly handle water, wash their hands, bathe, etc. The communities visited during the field survey reported the following changes regarding the availability of safe water at their fingertips. All residents expressed satisfaction and appreciation for the Project, indicating a high level of resident satisfaction with its outcomes.

- Daily fetching of water is no longer necessary. Previously, women and children would walk to the water source several times a day, starting as early as 3 to 4 a.m., with each trip taking up to 30 minutes each way to fetch water. With this need eliminated, women can now work in the fields and do household tasks, while children can spend their time attending school and completing homework. In addition, fetching water used to be a dangerous task because of the possibility of falling into the water, but such danger has been eliminated.
- Having a constant supply of water at home has greatly improved convenience. Residents can bathe and do laundry whenever they like, and the increased availability of water has led to more frequent handwashing, bathing, and cleaning. Dishes can be washed right after meals, and there's no need to store and reuse water, which has also reduced the presence of flies and mosquitoes.
- Before the Project, many residents had to use simple pit latrines located far from their homes for sanitation. Bathing and laundry were often done at wells, streams, or even from canoes on the river. During rains, these latrines would overflow, causing problems, and there were safety concerns with snakes and venomous insects outdoors. Women, fearing sexual violence, had to bathe discreetly while worrying about being watched. After the Project, with the BSU, residents can use restrooms and bathe safely and comfortably at any time. However, many have expressed a preference for flush toilets over composting toilets, as the latter can be challenging to use correctly.

Most communities and several health posts visited in the field survey reported significant improvements in health due to access to safe water and improved hygiene practices, especially a reduction in child malnutrition and anemia caused by diarrhea and parasites. In some villages, the number of anemic children decreased from 10 to zero in the three months after the Project was completed. Some residents noted a reduction in health care costs. As an example of the impact of the Project, the following is an example of the changes before and after the Project in the village of Santa Catalina, Moyobamba, San Martín (population 604, 160 households, surface water + water treatment, composting toilets).²⁶

Table 4: Changes before and after the project in the village of Santa Catalina

	Before Project	After Project
Percentage of households with knowledge and practice of proper water use	0%	70%
Percentage of households with knowledge of proper handwashing with soap and water, towels, etc.	69%	95%
Percentage of households practicing proper handwashing	42%	96%
Percentage of households with knowledge of proper hygiene practices for bathing, eating, and housing	34%	74%
Percentage of households consuming safe water*	22%	100%
Percentage of households that properly dispose of excreta	2%	78%
Percentage of children under 5 years of age with symptoms of acute diarrheal disease	24%	2%

Source: Prepared from materials provided by PNSR

Notes: Before project: After construction starts (Before completion: January 2020)

After project: 6 months after completion (December 2020)

* Boiled or chlorinated water

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the environment

According to interviews with PNSR and field survey, the Project was implemented in accordance with *the JICA Guidelines for Environmental and Social Considerations* (April 2002) and does not include subprojects classified under Category "A". For some subprojects that were determined to have minor environmental impacts, an Environmental Technical Sheet, a simplified environmental impact assessment based on *the Environmental Impact Assessment Law*, was prepared and approved by the State Water Management Bureau. Mitigation measures based on the environmental impact analysis were proposed in the pre-

²⁶ This is based on a PNSR document that summarizes the results of the social intervention conducted by the Project. The Project received the Tajimat Pujut Award, which recognizes efforts for good management and policies in the public sector for these results. The award is given by Ciudadanos al Día (CAD), a Peruvian NGO that aims to promote transparency, efficiency, and responsible management in the public sector.

investment study of each subproject and implemented during the implementation phase.²⁷ No significant environmental or social impacts were reported.

Since it takes time for the target communities to adjust to new customs, the Project recently launched an initiative called "Environmental Protection Corps," which provides hygiene and environmental education for school children. As part of their activities, they pick up trash in the village and contribute to environmental conservation. In addition, some communities are working with the municipal government to plant trees near water sources to conserve water resources, which is considered to be a contribution to the preservation of the natural environment.

(2) Resettlement and land acquisition

All land for the construction of water supply and sanitation facilities under the Project was provided free of charge by the beneficiary communities and residents, and no problems were encountered. There was no resettlement due to the Project.

(3) Other positive and negative impacts

The Amazon region has one of the highest poverty rates in Peru (see "1.1 Background"). Among the targeted communities of the Project, many that are hard to access or belong to indigenous groups are considered to be left behind in development and are likely to be experiencing more severe poverty. The Project is an investment in meeting the basic needs of the residents of these communities that have been left behind in development, and is a highly significant support from the perspective of "Leave No One Behind."

In the communities visited during the field survey, services are provided equitably to households with water supply facilities installed or connected. In some communities, the poor and the physically challenged are given discounts or exemptions from water charges.

According to PNSR, there was an economic impact on the target population due to the provision of labor during project implementation. In the communities visited, it was noted that women received more benefits than men due to the reduced water fetching labor. In addition, the field survey showed examples of rain-fed water supply facilities with large ceilings to catch the rain, and the space under the ceilings was used as work and living areas.

In summary, the number of connections to water supply and sanitation facilities has generally met the target values at the time of the ex-post evaluation and is expected to ultimately exceed those targets. While composting toilets are not being utilized to their full

²⁷ Various measures were implemented depending on the types of potential impacts, such as avoiding nighttime construction to mitigate noise, spraying water on the ground to control dust, and designating a temporary storage site for waste and regularly removing it.

potential, the water supply facilities and other sanitation facilities are being adequately used. Chlorine disinfection is being carried out appropriately in general. Residents express a very high level of satisfaction with having access to safe water at home at any time and being able to use restrooms and bathe safely and comfortably. Many residents have gained knowledge about the proper use of water and appropriate sanitation practices. There has been a noticeable impact, such as reduction in child malnutrition and anemia caused by diarrhea and parasites. Therefore, effectiveness and impact of the Project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Policy and System

As mentioned in "3.1.1.1 Consistency with the Development Plan of Peru," the Peruvian government attaches great importance to village water supply services, and the sector reform initiated in 2024 allows the MVCS to enhance the management and sustainability of drinking water and sanitation services through a "Capacity Strengthening Scheme" aimed at local governments, JASS, residents, and others. This scheme will facilitate ongoing capacity building in the operation and maintenance of the systems, as well as the management of drinking water and sanitation services. Based on the above, there are no policy/system issues regarding the sustainability of the Project.

3.4.2 Institutional / Organizational Aspect

In Peru, municipalities are responsible for providing water supply and sanitation services in urban and rural areas. Upon completion, the facilities under the Project are transferred from PNSR to the municipalities. Each municipality has a technical office to support the operation and maintenance of rural water supply and sanitation facilities. Each of the MTOs in the seven targeted administrative regions has an engineer and several technicians and assistants. The technical office prepares annual activity plans and obtains budgets, provides technical advice to JASS, conducts training on operation, maintenance, and sanitation education, and periodically supervises and evaluates the operational status. In addition to providing chlorine disinfection materials, the technical office staff also provides facility maintenance through the municipal budget as needed, and often participates in JASS's periodic maintenance of the water treatment plant (cleaning of filter media). However, the technical office staff tends to be replaced frequently depending on the mayor's wishes, which affects the sustainability of the technical aspects of the Project.

In rural areas, facilities are transferred to JASSs established in each community.²⁸ JASS's

²⁸ The JASS consists of a chairman, vice-chairman, secretary, treasurer, and auditor, all of whom are volunteers appointed by the village assembly for a term of two years. JASS is established for each community. When the same water supply system serves multiple communities, a central JASS is established consisting of

annual activity plans, water rates, and other fee structures are approved by village assemblies, and JASS employ one or two operators who are responsible for operating the facilities. All of the JASS visited during the field survey have appropriate organizational structures and are properly operated in accordance with the relevant legal systems. However, because they require volunteers to perform complex tasks, the number of potential participants is small, and member turnover occurs frequently. In addition, many JASS do not have an appropriate work environment and storage space for documents, tools, and materials.

The rain-fed water supply facilities and basic sanitation units provided by the Project on a household-by-household basis will be gifted to each household by each municipality that receives the transfer from PNSR, and each household will be responsible for the operation and maintenance of these facilities.

From the above, it can be said that the institutional / organizational aspect of the sustainability of the Project is generally adequate, although there is a tendency for low continuity of staff in the MTO and JASS.

3.4.3 Technical Aspect

The water supply systems constructed under the Project, which utilize surface water and groundwater, are typical in rural Peru and do not require particularly advanced technology for their operation and maintenance. The Project strengthened the capacity of MTOs through consulting services, focusing not only on technical advice but also on securing municipal budgets through the formulation of annual activity plans. Interviews conducted during the field survey indicated that, in general, the staff in the technical offices of the Project's target municipalities possess adequate technical skills to support the operation and maintenance of the water supply system managed by JASS. However, retraining may be required and information may not be properly transferred due to a change in staff in the MTO. Furthermore, some target communities are difficult to access, and MTOs are limited to using motorcycles and other equipment, which hampers their ability to conduct community visits.

The Project provided training to JASS and operators for operation and maintenance. When members are replaced, new training is provided by the MTO or information is shared from the old members. The operation and maintenance of the water supply system does not require advanced technology, and according to interviews conducted during the field survey, the technical capabilities of JASS are generally considered adequate. On the other hand, some JASSs reported problems such as insufficient information sharing from the old members and lack of communication after the replacement of the technical office staff.

To address the small number of potential JASS members and concerns about losing

representatives from each community's JASS, and the overall operation and maintenance system is decided by consensus.

knowledge and skills as current members and operators are replaced, the Project has launched the "JASS Classroom" initiative in all target communities since 2021. This initiative aims to prepare future JASS members and operators by recruiting approximately 10 young residents interested in water and sanitation and providing them with ongoing training in the operation and maintenance of water supply facilities and JASS management. The training is integrated into the social intervention, involving specialized staff from the MTO, and is planned to continue twice a year following the completion of the social intervention.

Some communities were situated in remote areas, making it difficult to purchase materials and tools for repairing facilities and installing or fixing water pipes in homes, which hindered their ability to respond quickly when needs arose. To address this issue, the Project launched the "JASS Store" initiative, where JASS stockpiles a certain number of materials to use or sell as needed. In communities where the direct construction method was employed, residents actively participated in the construction process, allowing them to acquire sufficient knowledge about the facilities. This involvement enabled them to utilize their surplus stockpile of materials effectively for facility repairs.

Sanitation facilities, such as composting toilets and improved septic tanks, represent new technologies for the target population, and many residents are unfamiliar with them, which may lead to reduced usage or difficulties in proper operation and maintenance. While social interventions in each community will conclude six months after the project completion, ongoing training is deemed necessary for 2 to 3 years post-completion. However, it remains unclear at the time of ex-post evaluation who will continue the training and how it will be implemented after the Project ends.

In the Project, social interventions were conducted to train residents on the proper handling of water, hygiene practices such as handwashing, bathing, and cleaning, as well as the maintenance of composting toilets and septic tanks, and the chlorine disinfection process for rainwater supply facilities. According to PNSR, the adoption of new habits takes time, especially in rural areas and indigenous communities. Based on interviews conducted during the field survey, it is believed that residents have a sufficient understanding of these practices, with the exception of the operation and maintenance of composting toilets and septic tanks.

Based on the above, regarding the technical aspects of the Project's sustainability, there are some challenges related to the decline in technical continuity due to the frequent turnover of MTO staff and JASS members, as well as in the operation and maintenance of sanitation facilities by residents. The Project has taken steps to ensure the sustainability of these technical aspects by providing training to the MTO whenever personnel are replaced and by initiating JASS Classes to prepare reserve personnel under the guidance of consultants. It is considered that there is ample potential for improvement in the situation if, after the Project's

completion, PNSR continues to provide training to the MTOs, JASS, and residents through a follow-up project (Phase 2) or by utilizing the “Capacity-Building Scheme.”²⁹

3.4.4 Financial Aspect

In addition to collecting water charges, JASS also collects late fees, new connection fees, and fines for missed meetings and community-maintained work. Water rates are set according to the standards of the National Superintendence of Sanitation Services (SUNASS), which supervises and regulates water and sanitation services in Peru, and range from 3 to 5 soles (approximately 120 to 200 yen) per month for non-pumped systems. If fees are not paid within a specified period, JASS will disconnect the service. Fee collection generally does not present major problems, except in communities that have recently completed the subproject where service may not yet be stable, as well as in some indigenous communities that are not accustomed to paying for public services. When coherent repairs are needed, such as when the water supply system is damaged by rainfall or landslides, JASS will use accumulated funds or specific amounts allocated by residents on a case-by-case basis to carry out the necessary repairs. Support from the municipality is occasionally requested. In some instances, JASS has accumulated sufficient funds to purchase chairs and loudspeakers for meetings.

The MTOs in the seven administrative regions covered by the Project have developed annual activity plans for supporting JASS with the assistance of capacity-building consultants. Notably, some municipalities have secured municipal budgets for the implementation of these plans for the first time.³⁰ Other sources of funding for the MTO are the budgets provided by the Ministry of Economy and Finance based on the performance of local governments.³¹ The capacity strengthening consultant for the Project is assisting in securing these funds; however, this support is not a permanent financial resource. While it is clear that the MTOs in the targeted administrative districts will receive increased financial resources from the Project's support, interviews with these offices indicate that their budgets are still insufficient to continuously support all the communities targeted by the Project.

²⁹ The second phase, which PNSR is preparing, will include five of the seven districts targeted by the project. In addition, PNSR has sub-branches of its Service Delivery Technical Unit throughout the country to provide technical assistance and training. In addition, during the interview with PNSR, a very high level of commitment to the Project was demonstrated.

³⁰ Obtaining a municipal budget requires council approval; as of October 2024, four of the seven MTOs had obtained budgets. The other three MTOs are in the process of preparing to obtain budgets by the end of the Project.

³¹ An additional budget will be provided to the selected target communities in each district (including the target communities of the Project) that achieve the target. The indicators change annually, and the three indicators for 2024 are (1) the percentage of households with access to properly chlorinated drinking water, (2) the number of water supply systems that are maintained and in good condition, and (3) the percentage of households that clean their sanitation facilities. In the first period of 2024 (January to April for indicator (1), January to May for indicators (2) and (3)), among the seven target municipalities, Nauta, Moyobamba, and Jepelacio achieved the target values for all indicators.

On the other hand, as part of the sector reform initiated in 2024, it was clarified that the "Investment Fund for Safe Water" managed by the MVCS can be used not only for the construction of water supply and sanitation facilities, but also for their operation and maintenance. It is expected that, in the future, the MTOs will be able to secure new funding from the same fund to support JASS.

Based on the above, in terms of financial sustainability for the Project, some challenges remain regarding funding for the MTOs. However, if new funding sources become available through sector reform, there is a high potential for improvement in the situation.

3.4.5 Environmental and Social Aspect, Preventative Measures to Risks

In most communities, a system has been established whereby JASS immediately reports any environmental and social problems, damage to facilities caused by natural disasters or complaints from residents to the MTO. Some communities have spare pipes in case of damage to water pipes due to landslides. Therefore, there are no particular issues regarding environmental and social aspects and preventive measures to risks.

3.4.6 Status of Operation and Maintenance

Operators hired by JASS will be responsible for the daily maintenance and upkeep of the water supply system, as well as monitoring residual chlorine concentrations. For rainwater-fed water supply systems installed at individual households, operators are tasked with periodically cleaning storage tanks, repairing water supply facilities, and regularly monitoring residual chlorine levels. It is estimated that only about 80% of all residents have access to properly chlorinated water (see Effectiveness).

All of the water supply facilities visited during the site survey were in proper working order, although some valve damage at the water purification facility remained unrepaired. In water supply systems that utilize pumps, voltage fluctuations have the potential to cause failures in operation panels and motors.³² If a water purification facility (slow filtration facility) is in place, the filter media should be removed and cleaned every few months. This task requires manpower and is carried out with the cooperation of the villagers. The MTO assists by providing necessary transportation and tools. The water purification facilities inspected in the field survey were functioning properly, with no issues observed in water turbidity after purification, except for one location that experienced muddy water inflow immediately following a rainfall.

The BSUs are managed by individual households, with renovations made according to each household's financial capacity and preferences. These renovations included painting

³² The target area of the Project is one of the most voltage-variant areas in Peru.

washbasins and bathrooms, converting composting toilets to flush toilets, and installing electric pumps. Except for composting toilets, which were observed to be underutilized in nearly half of the cases, no significant problems with operation and maintenance were identified.

In summary, there are no issues regarding the sustainability of the Project in terms of policy / system, institutional / organization, environmental and social aspects, and preventive measures to risks. On the technical side, there are some challenges with the decline in technical continuity due to the frequent turnover of MTO staff and JASS members, as well as with the operation and maintenance of certain sanitation facilities by residents. On the financial side, there are also some challenges with the budget of the MTOs. However, for both sets of challenges, there is ample potential for improvement in the situation through continuous training provided by PNSR and the securing of new funding sources for the MTOs in line with sector reform. Therefore, sustainability of the Project effects is high.

4. Conclusions, Lessons Learned and Recommendations

4.1 Conclusion

The Project was implemented to expand and improve the quality of water supply and sanitation services in rural areas of the Amazon region of Peru by establishing and improving water supply and sanitation facilities and strengthening organizations for operation and maintenance, thereby contributing to the improvement of the living and sanitation environment of the local residents.

The Project aligns well with Peru's development plan, development needs, both at planning and ex-post evaluation stages, and with Japan's cooperation policy at planning stage. Its efforts to continuously refine approaches based on implementation experience are highly regarded. There was no particular coordination or collaboration with other JICA projects or other donor projects that led to the results of the Project. Therefore, its relevance and coherence are high.

The Project encountered various challenges, including limited access to target communities, the Amazon region's natural conditions, indigenous cultural practices, and a shortage of experienced consultants and contractors. As of July 2024, around 70% of the outputs have been achieved, and the executing agency expects full completion by the end of 2025. However, the project cost is projected to exceed six times the initial estimate, with a duration that is more than triple. Therefore, efficiency of the Project is low.

The number of connections to water supply and sanitation facilities is expected to exceed the target, and chlorination is generally adequate. Residents report high satisfaction with consistent access to safe water at home and safe facilities for defecation and bathing. Many have gained knowledge on proper water use and hygiene, and positive impacts, such as

reduction in child malnutrition and anemia caused by diarrhea and parasites, are evident. effectiveness and impacts of the project are high.

There are no sustainability issues in terms of policies and systems, organization, environmental and social considerations, and risk management. There are some challenges in the technical continuity through the rotation of MTO staff and JASS members, as well as in the operation and maintenance of certain sanitation facilities by residents. On the financial side, there are also some challenges related to the budget of the MTOs. Each situation has ample potential for improvement through continuous training provided by PNSR, as well as through securing new funding sources for the MTOs. Therefore, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

- (1) To further increase the impact and sustainability of this project, PNSR/MVCS needs to address the following;
 - The civil works of the 146 subprojects will be completed by June 2025 as planned, and the social intervention will be completed by December 2025 to complete the Project.
 - To accommodate staffing changes in the MTO, training will continue to be provided to the MTO as needed after completion of the Project, and training will continue to be provided to JASS through the MTO. The scope of training for the MTO will include the use of the "Investment Fund for Access to Safe Water and Sanitation Services" for operation and maintenance, which is operated by MVCS, and the use of "Public Investment to Optimization, Expansion, Repair, and Replenishment," which will be submitted by municipalities to the Ministry of Economy and Finance, to meet the increased demand due to population growth and other factors after completion of the subproject in the target communities. Additionally, guide the MTOs to conduct regular monitoring to assess whether each JASS is implementing proper operation and maintenance.
 - Check the status of each community at the appropriate time, one to two years after the completion of each subproject, regarding the proper operation and maintenance of composting toilets and septic tanks, and provide practical training to residents as needed. Additionally, it is necessary to consider appropriate training content while taking into account the residents' preferences regarding whether to promote the use of the generated compost as fertilizer.

- Consideration will be given to providing the above training to the MTO, JASS, and residents through the second phase of the Project or the "Capacity Strengthening Scheme".
- (2) Given the large number of communities remaining in rural areas of Amazonia that do not have access to adequate water and sanitation services, as well as the high effectiveness and impact of the Project, PNSR / MVCS should implement the second phase of the Project as soon as possible. In doing so, the experience of the Project should be fully utilized, and the following points should be noted;
- Ensure that there is no bias in the target areas for the studies at preparatory stage and conduct appropriate investigations based on the experience gained from the Project.
 - Set realistic construction unit prices, budgets, and project timelines.
 - The use of the direct construction method should be limited to cases where the community is easily accessible and continuous monitoring is possible.
 - Ensure a staffing structure that can fully utilize the experience accumulated in the Project.
 - Prepare appropriate technical options based on the experience of the Project (e.g., rainwater-based water supply facilities that do not require pumps, sanitation facilities that replace composting toilets, etc.).
 - Extend the period of social intervention after completion and provide practical training for the appropriate use and maintenance of sanitation facilities as much as possible.
 - Consider including in the scope of the project the provision of facilities and equipment for JASS and the provision of transportation (vehicles and boats) for the MTO.

4.2.2 Recommendations to JICA

JICA will facilitate the implementation of the above recommendations by the Peruvian side.

4.3 Lessons Learned

Sufficient social intervention is important to promote the use of new infrastructure facilities.

The Project provided water and sanitation facilities, such as rainwater-based water supply facility, compost toilets, and septic tanks, which were the first of their kind for many residents. Additionally, during the construction period and for six months after completion, consultants were stationed in each community to conduct social interventions. These interventions included confirming residents' acceptance of the subprojects, promoting

understanding of the constructed water and sanitation facilities, educating residents on the appropriate use of these facilities and hygiene practices (such as handwashing, bathing, cleaning, toilet use, kitchen hygiene, boiling drinking water, and disease prevention), and strengthening the capacity for the establishment and operation of JASS. As a result, many residents gained knowledge about the proper use of water and appropriate sanitation practices, and they are generally using the water and sanitation facilities correctly. This has led to the expected impacts, such as reduction in child malnutrition and anemia caused by diarrhea and parasites. However, six months after completion, the compost toilets and septic tanks were not full, and practical guidance on compost and sludge extraction could not be provided. There were also indications that it takes time for indigenous residents to change their habits, suggesting that six months is insufficient for this process.

Therefore, to maximize effectiveness of such project through the appropriate use of unfamiliar new infrastructure, sufficient social intervention is essential. Additionally, it should be considered to extend the intervention period or to conduct repeated interventions at critical times when important maintenance work is required.

Preparation and implementation of projects in pilot phase

The Project was the first initiative focused solely on the Amazon region for the development of water and sanitation facilities and was planned as the first phase of the entire project in three-phases, serving as a pilot phase. The project cost, which initially targeted 162 communities, increased to more than six times the original plan and faced various implementation challenges, resulting in a project period that was more than three times longer than planned, taking over ten years. Contributing factors for these increases included a bias in the preparatory phase surveys toward easily accessible communities, a failure to adequately consider the natural conditions of the target area and the culture and habits of indigenous peoples which lead to unrealistic estimates for construction costs and timelines, as well as a shortage of experienced consultants and contractors. On the other hand, the Project introduced new approaches based on the experiences gained during the implementation phase, which contributed to enhancing project effectiveness and sustainability.

From this, it can be concluded that when undertaking a project with few precedents, it is advisable to first conduct a limited-scale pilot project to rapidly gain experience before scaling up. The scale of the pilot project needs to be considered based on the overall project size, the anticipated degree of diversity, and the types of uncertainties involved. Additionally, when preparing for a pilot project, it is crucial to collect and analyze experiences from previous initiatives as comprehensively as possible, ensure that the survey subjects are not biased, and set realistic unit costs and timelines for construction considering the various

conditions of the target area.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective (none in particular)

5.2 Additionality (none in particular)

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
① Output <u>Civil works</u>	New and improved water supply and sanitation facilities through 146 subprojects in 162 communities in 7 districts in the target 3 departments	Same as plan (108 subprojects out of 146 completed as of September 2024; all 146 subprojects to be completed by June 2025.)
<u>Consulting Services</u>	- Community Status Survey - Community organization strengthening (social intervention) - Supervision of direct construction method - Pre-investment study, detailed design, and construction management of subprojects - Capacity strengthening of local government - Project management support for executing agency	Same as plan
② Period	March 2012 - February 2015 (36 months)	March 2012 - June 2025 (planned) (150 months)
③ Project cost Total amount Of which, yen loans exchange rate	5,311 million yen 3,210 million yen 1 sol = 32.3 yen (July 2010)	32,901 million yen ^(Note) 3,010 million yen 1 sol = 33.5 yen (Average rate from 2013 to July 2024) (Note) Final estimated amount as of July 2024
④ Loan Completion	May 2018	