

Republic of Peru

FY2020 External Ex-post Evaluation Report of Japanese ODA Loan

“Cajamarca Water Supply and Sewerage Improvement and Expansion Project”

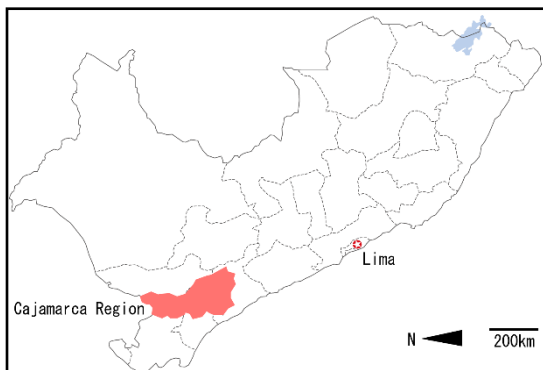
External Evaluator: Hajime Sonoda, Global Group 21 Japan, Inc.

0. Summary

“Cajamarca Water Supply and Sewerage Improvement and Expansion Project” (hereinafter referred to as “the Project”) was implemented for the purpose of improving water supply and sewerage services in Cajamarca Region by rehabilitating and expanding the water supply and sewerage facilities in small and medium-sized cities in the Region, thereby contributing to the improvement of the living environment of the residents. The Project is highly relevant to the development policies, plans and development needs of the Republic of Peru (hereinafter referred to as “Peru”) and Cajamarca Region both at the time of planning and ex-post evaluation. The Project is also highly consistent with Japan's aid policy at the time of planning, and therefore, the relevance of the Project is high. Both the project cost and project period are much larger than planned, and, as of June 2021, the Project is not completed having some sewage treatment plants (hereinafter referred to as “STP”) not being constructed. Therefore, the efficiency of the Project is low. The achievement level of the Project on the coverage of water supply and sewerage services is high, but the achievements related to water supply time and sewage treatment are moderate. While the residents are not much satisfied with the improvement of water supply service in the already-connected water supply areas but are highly satisfied in the areas where water supply services were newly expanded. While, the residents are highly satisfied with the improved sewer service in general. It was also confirmed that the Project contributed to the improvement of water-related convenience and the improvement of the residents’ sanitary environment. Based on the above, the effectiveness and impact of the Project are fair. The transfer of ownership of the completed facilities to the cities and the transfer of operation rights of the water supply and sewerage facilities from the cities to the Water Supply and Sewerage Public Corporation (hereinafter referred to as “EPS”) have not yet been completed, so the institutional / organizational setup of operation and maintenance of this Project remains uncertain. In addition, the cities, which may operate and maintain some of the facilities in the future, face technical and financial challenges. Therefore, the sustainability of the Project is fair.

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

1. Project Description



Project Location



Water Treatment Plant in Jaén

1.1 Background

In Cajamarca Region (regional population 1.34 million in 2017, including 200,000 in the regional capital: Cajamarca City), located in the mountainous area of northern Peru, water supply and sewerage facilities were established in the 1960s - 1970s, but since then there has been no significant investment in new construction or renewal of the facilities. As a result, by the latter half of the 2000s, the facilities were aging, and insufficient services were being provided in terms of quality and quantity to meet the growing demand caused by population growth. In addition, many cities outside the regional capital did not have STPs, and untreated sewage was discharged into rivers, raising concerns about the impact on the living environment of local residents and agriculture. The Garcia administration of Peru, which took office in 2006, had launched the “Water for All” program to strengthen state investment in the water and sewerage sectors. The Regional Government of Cajamarca, which took office in 2007, positioned the water and sewerage sector as a regional issue and proposed a policy that the regional government would improve its water and sewage systems through external loans, using mining royalty revenues as the source of repayment. Against this background, the Peruvian government requested an ODA loan project from Japan in 2007 to improve the water supply and sewerage systems in the local cities of Cajamarca Region, and a loan agreement for the Project was signed in 2009.

1.2 Project Outline

To improve water supply and sewerage services in Cajamarca Region by rehabilitating and expanding the water supply and sewerage facilities in small and medium-sized cities in the Region, thereby contributing to the improvement of the living environment of the residents.

Loan Approved Amount / Disbursed Amount	4,995 million yen / 4,717 million yen
Exchange of Notes Date / Loan Agreement Signing Date	November 2008 / March 2009
Terms and Conditions	Interest Rate: Water: 0.8%, Sewerage: 0.4% Consulting services 0.01% Repayment Period: 15 years (Grace Period: 5 years) Conditions for Procurement: General Untied
Borrower / Executing Agencies	Republic of Peru / Cajamarca Region Program Implementation Unit (PROREGION)
Project Completion	Not yet completed as of October 2021
Target Area	11 local cities in Cajamarca Region ¹
Main Contractors	BM3 Obras y Servicios S.A. (Spain), Cobra Instalaciones y Servicios S.A. (Spain), HV Contratistas S.A. (Peru) / Obras de ingeniería S.A. (OBRAINSA) (Peru)
Main Consultant	NJS Co., Ltd. (Japan)
Related Studies	Feasibility Study by Cajamarca Region (2008)
Related Projects	None

2. Outline of the Evaluation Study

2.1 External Evaluator

Hajime Sonoda (Global Group 21 Japan, Inc.)

2.2 Duration of Evaluation Study

The ex-post evaluation study for the Project was conducted over the following period.

Duration of the Study: December 2020 - March 2022

Duration of the Field Survey: May and September 2021 (by local consultants)

2.3 Constraints During the Evaluation Study

Due to the pandemic of COVID-19, the external evaluator did not travel to Peru, but conducted interviews with the executing agencies, the field inspection of the water supply and sewerage facilities constructed by the Project, and interviews with water users and others through the local assistants. The collected information and data were carefully examined, and evaluation analysis and judgment were conducted by the evaluator.

¹ Celendín, Cajabamba, San Marcos, San Pablo, San Miguel, Hualgayoc, Contumaza, Chota, Bambamarca, Cutervo, and Jaén.

3. Results of the Evaluation (Overall Rating: D 2)

3.1 Relevance (Rating: ③ 3)

3.1.1 Consistency with the Development Plans of Peru

As mentioned in “1.1 Background,” at the time of planning of the Project, the Garcia administration, which was inaugurated in 2006, was emphasizing the water supply and sewerage sectors, and the Regional Government of Cajamarca, which was inaugurated in 2007, was proposing a new scheme in which the Region would be responsible for infrastructure improvement of water supply and sewerage sectors.

At the time of the ex-post evaluation, Peru’s “National Sanitation Policy” (2017-2021) was based on such policy axes as increasing water supply and sewerage coverage, financial sustainability, strengthening the capacity of service providers, applying optimal technologies, coordination with relevant organizations, and educating and enlightening the public about water and sanitation. The “National Sanitation Plan” (2017-2021) prepared in line with the policy has the main objective of “universal and sustainable access to quality water supply and sewerage services” and aims at achieving 100% urban water supply coverage, 22 hours/day of water supply, 100% sewerage coverage, and 100% sewage treatment by 2021.

Based on the above, the Project is highly consistent with the development plans of Peru both at the time of planning and ex-post evaluation.

3.1.2 Consistency with the Development Needs of Peru

As described in “1.1 Background,” the water and sewerage facilities in Cajamarca Region were not able to provide sufficient services in terms of quality and quantity. In addition, in many cities outside of Cajamarca City, there were concerns about environmental impacts due to the untreated direct discharge of sewage around residences or into rivers.

At the time of ex-post evaluation, the facilities constructed under the Project have been utilized and have resulted in the increase of water supply and sewerage service coverage, improvement of water supply service quality and increase of sewage treatment in the 11 target cities (see “3.3.1 Effectiveness”). However, the indicators such as water supply and sewerage service coverage rate, water supply time, and sewage treatment rate have not reached the above policy targets, and the need for water supply and sewerage service improvement is still high at the time of ex-post evaluation.

Based on the above, it is concluded that the Project is relevant with the development needs of the Cajamarca Region at the time of planning and that the need for the Project

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

³ ③: High, ②: Fair, ①: Low

is maintained at the time of the ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

At the time of planning, JICA had positioned the reduction of poverty and disparity as one of the priority areas in its assistance to Peru and was working on water supply and sewerage system development as one of the priority issues. As the implementation of the Project was in line with this policy, the Project was found to be consistent with Japan's ODA policy at the time of planning.

3.1.4 Appropriateness of the Project Plan and Approach

At the time of planning, water supply and sewerage services in three of the 11 cities were operated by the two EPSs of Cajamarca Region⁴. In the other 8 cities, they were directly operated by the relevant departments / units of each city⁵. It was planned that, after the completion of the Project, the operation rights of water supply and sewerage facilities, including the facilities to be constructed by the Project, would be transferred to one EPS which was considered to have higher operational capacity, and EPS and the mayors of each city had agreed to this in writing through the letters addressed to the regional government. For the transfer to be realized, each city needed to sign a transfer agreement with EPS after obtaining approval of the respective city council, but this was not done.

After the start of the Project, the mayors of all cities were changed in the elections. Many of the mayors at the time of the ex-post evaluation were negative toward the operation by EPS in consideration of the opposing opinions of the residents who feared the fee increase after the transfer, and it is unclear when the transfer to EPS would be realized⁶. Training was provided by the Project to the city staff in charge of operation and maintenance management, and once the transfer of the facilities constructed by the Project to EPS was realized, the staff who had received the training were scheduled to continue to be employed by EPS. However, while the transfer was not realized, most of the staff in charge were replaced, and the results of the training were lost. Therefore, the technical capability of the cities for the operation and maintenance of the facilities remains an issue. In this way, although it was planned that the operation rights of the water supply and sewerage services in the eight cities of the Project would be transferred

⁴ EPS SEDACAJ operated the water supply and sewerage services in San Miguel and Contumaza, and EPS MARAÑON operated the water supply and sewerage services in Jaen.

⁵ Celendín, Cajabamba, San Marcos, San Pablo, Hualgayoc, Chota, Bambamarca, and Cutervo.

⁶ Prior to the transfer from the cities to EPS, the ownership of the Project's facilities must be transferred from PROREGION to the cities. However, at the time of the ex-post evaluation, this process had not yet been completed. It should be noted that Peruvian law allows cities to operate water and sewage services under certain conditions. (For details, please refer to "3.4 Sustainability")

to EPS, the Project proceeded without concrete transfer agreements being finalized, and this has left issues of sustainability. In view of the above, it can be considered that there were insufficient aspects in the planning and preparation of the operation and maintenance arrangement of the Project, but it cannot be said that this has undermined the Project's relevance.

Based on the above, the Project has been highly relevant to the Peru's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.



Figure 1 Location of the Cities Targeted by the Project

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

In the Project, water supply and sewerage facilities in 11 target cities were constructed or rehabilitated. The planned and actual outputs are shown in Table 1. There were various changes in the scope of the Project due to (i) the differences from the natural conditions (geology, topography, amount of spring water production, etc.) assumed at the time of planning, (ii) the differences from assumptions about the conditions of existing facilities, (iii) the intentions of landowners and surrounding residents, and (iv) the results of technical re-examination (see Table 1).

Table 1 Planned and Actual Outputs of the Project (as of June 2021)

	Planned outputs	Actual outputs	Differences and remarks
Water Supply			
Water intake	Rehabilitation: 13 facilities (211 l/s) Construction: 1 facility (11.0 l/s)	Rehabilitation: 13 facilities (225 l/s) Construction: 3 facilities (38 l/s)	Total intake capacity of rehabilitated / constructed facilities is 118% of the plan. Some locations were changed due to inability to obtain land.
	9 cities	11 cities	
Conduit	Rehabilitation: 57.0 km Construction: 19.1 km	Rehabilitation: 43.0 km Construction: 24.4 km	Total length of the conduit rehabilitated and constructed was 89% of the plan. Locations and extension of the conduit were adjusted to match with the current condition of the facilities.
	10 cities	10 cities	
WTP	Rehabilitation: 2 facilities (35 l/s) Construction: 2 facilities (305 l/s)	Rehabilitation: 2 facilities (35 l/s) Construction: 2 facilities (305 l/s)	As planned
	4 cities	4 cities	
Distribution reservoir	Rehabilitation : 11 facilities (3,934 m³) Construction: 7 facilities (7,440 m³)	Rehabilitation: 9 facilities (3,884 m³) Construction: 7 facilities (7,440 m³)	Construction was as planned. Rehabilitation was 81% of the plan.
	8 cities	8 cities	
Water main / distribution pipes	Rehabilitation: 65.4 km Construction: 191.0 km	Rehabilitation and Construction: 286.3 km	Total length of rehabilitated and constructed pipes was 112% of the plan.
	11 cities	11 cities	
House connection	Rehabilitation: 21,033 Construction: 9,332	Rehabilitation and construction: 33,741	Number of rehabilitated and constructed connections was 111% of the plan.
	11 cities	11 cities	
Sewerage			
House connection	Rehabilitation: 18,383 Construction: 12,168	Rehabilitation and construction: 30,896	Number of rehabilitated and constructed connections was 101% of the plan.
	11 cities	11 cities	
Sewer pipes	Rehabilitation: 191.9 km Construction: 81.1 km	Rehabilitation and Construction: 285.0 km	Length of rehabilitated and constructed pipes was 104% of the plan.
	11 cities	11 cities	
Pumping station	Construction 3 facilities	Construction 1 facility	Partially cancelled because relevant STP was not built.
	2 cities	1 city	
STP	Construction: 8 facilities (18,517 m³/day)	Construction: 5 facilities (14,809 m³/day)	Not completed in three cities due to opposition from residents (see note). In one city where it was constructed, treatment capacity was expanded to meet the demand. Total treatment capacity was 80% of the plan.
	8 cities	5 cities	

(Source) Prepared by the evaluator based on materials provided by JICA and PROREGION.

(Note) Five STPs were constructed in Celendín, Cajabamba, Hualgayoc, Cutervo, and Jaén, and three STPs were planned but not constructed in San Pablo, Chota, and Bambamarca.

In particular, the construction of STPs of the oxidizing pond type (anaerobic oxidizing pond + aerated pond), which requires a large area of land, was suspended or cancelled in three of the four cities where this type of STP was planned, as it was difficult to secure land for such plants and / or it was difficult to obtain the consent of

the surrounding residents from the standpoint of odor and aesthetics⁷.

The background, current status, and future outlook for the planned and actual results are as follows.

- In the Project, the 11 target cities are divided into 3 groups (6 southern cities: Celendín, San Marcos, Cajabamba, San Miguel, San Pablo, and Contumaza; 4 central cities: Bambamarca, Cutervo, Chota, and Hualgayoc; and 1 northern city: Jaen), and the construction contracts for each group were signed in June 2010.
- The construction period for the six cities in the southern area was planned to be 360 days. However, disputes arose between the construction contractor (a Peruvian company) and the residents who wanted more favorable compensation conditions and the residents who did not want privatization by EPS after the Project. The construction works were significantly delayed due to the time required for mediation and site compensation talks, interruptions due to rainfall, and design changes in response to the actual geology. The contract was terminated by 2015 with a progress rate of about 85%. According to PROREGION, a dispute arose with the construction contractor over the power supply required for the construction, and after PROREGION won the case, the construction contractor withdrew. The contractor started with the construction in those areas that did not require consultation with the residents, leaving only the works in the areas that required consultation with the residents. Regarding the completed works, there was no adequate response to the defects, nor testing and commissioning.
- The construction period for the four cities in the central area was planned to be 360 days, but construction was significantly delayed due to difficulties in negotiating the land acquisition with residents who seek additional compensation in all cities, interruptions due to rainfall, and design changes based on actual geology and changes in construction sites. The contract was terminated by 2015 with a progress rate of about 76%. According to PROREGION, the contract was terminated as the construction contractor (a Spanish company) applied for termination of the contract due to its financial problems. Some part of the work was abandoned in the middle of execution, and even for the completed works, there was no adequate response to the defects, nor testing and commissioning.

⁷ As for the unconstructed STPs, based on the discussion with JICA, PROREGION is considering removing them from the scope of the Project and implementing it as new projects, because it is necessary to find a new site and start from the planning study again.

- The construction period for one city in the northern area was planned to be 360 days. Due to the time required to acquire the land for the STP, design changes in accordance with the actual geology, changes in the site for the STP, and additional works required by technical examinations, the construction work was significantly delayed and was completed in November 2013. The construction contractor was a Spanish company.
- Since the initial contracts were terminated without completion in the southern and central areas, PROREGION has been addressing remaining works and defects since 2015 through 22 contracts in the southern area, 10 contracts in the central area, and the works by direct management. The reason for the large number of contracts is that PROREGION has been implementing the works sequentially, starting from the works for which coordination with the residents has been completed in each city. As of September 2021, the works have been completed in eight out of 11 cities, while the detailed design for the construction of the unfinished STPs in two cities (Chota and Bambamarca) had started at new candidate sites. However, these activities have been suspended in both cities due to opposition from residents. In addition, the construction of the STP in San Pablo has been suspended since 2017 due to the opposition of the residents and there is no prospect for its completion, therefore, based on the discussion with JICA, PROREGION decided not to complete it under the scope of the Project.
- PROREGION is progressively transferring the completed facilities to the cities (see “3.4 Sustainability”), but new defects may be found out in the process, and additional repair works might be required.
- As for the STPs in eight cities, the feasibility study of the Project (2008) identified the specific construction site and the basic design of each facility. According to PROREGION, at that time, the landowners of the planned site for the STPs and the access roads, as well as the residents in the vicinity, were briefed on the Project, and there were no particular oppositions from the residents. In most of the cases where opposition arose afterwards in the implementation stage, the residents demanded higher compensation for the land⁸. In addition, the existing STP had been experiencing problems such as bad odors, which led to distrust of the STP itself, which made it difficult to discuss with the residents.

⁸ According to PROREGION, some of the residents demanded compensation several times the amount stipulated by law. This is no longer a social issue, but a legal one, but the prosecuting authorities have not intervened and the matter has been resolved through discussion.

- In three of the 11 cities covered by the Project, the two EPSs of the Cajamarca Region (EPS SEDACAJ and EPS MARAÑON) operated the water supply and sewerage services, while in the remaining eight cities, the municipal governments operated the services. It was assumed that, after the completion of construction of the water supply and sewerage facilities through the Project in these eight cities, the right to operate the facilities would be transferred to EPS SEDACAJ. In order for EPS to receive the facilities, it is necessary that the facilities have specifications and construction quality that are acceptable to EPS. Therefore, in the Project, EPS dispatched engineers to PROREGION and the consultant to support the detailed design and implementation. However, according to PROREGION and EPS, this support was mainly provided in regard with the three cities where EPS were already in charge of the operation of the water and sewerage facilities, while limited support was provided to the other eight cities where the water supply and sewerage service transfer contracts had not yet been concluded.



STPs constructed and in operation under the Project

Left: Celendín (oxidation pond method) Right: Cajabamba (tricking filter method)

- In the interviews conducted with each city at the time of the ex-post evaluation⁹, several cities pointed out problems with the water supply facilities and raised questions about the construction capacity of the contractors and the management capacity of the consultant (a Japanese company). However, it appears that some of the problems pointed out are operation and maintenance issues (see “1.4.4 Technical Aspects of Operation and Maintenance”), and not all of them are

⁹ In the ex-post evaluation, interviews were conducted with all 11 cities, and the water and sewage facilities of each city constructed by this project were inspected through the local consultants.

necessarily considered as weaknesses in design and construction. On the other hand, the consultant of the Project received a warning by JICA because inadequate procedures related to documents and drawings were pointed out by the Government of Peru. In addition, PROREGION expressed doubts about the consultant's performance in design, construction supervision, payment management, etc., and terminated the contract in November 2017 due to the consultant's failure to fulfill some of contractual obligations. It was also found out that there was a period when PROREGION did not report to JICA the fact that various problems occurred in the Project and many contract changes were made, and JICA, after it became aware of the problems, repeatedly sent to the field its staff and independently hired local engineers to support the implementation of the Project.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total cost of the Project was planned to be 11,133 million yen (yen loan: 4,995 million yen); as of June 2021, the actual project cost was 19,871 million yen (178% of the plan). The outputs at this moment do not include the uncompleted STPs, and the project cost is expected to increase further when their cost is considered. Therefore, it is judged that the efficiency of the cost of the Project is low.

Table 2 Planned and Actual Project Costs (as of June 2021)

(Unit: Millions of yen)

	Planned cost			Actual cost		
	Total	ODA loan	Peruvian Funds	Total	ODA loan	Peruvian Funds
Civil works	7,740	3,877	3,863	13,714	3,862	9852
Consulting services	876	876	0	1,714	855	859
Price escalation	4	4	0	-	-	-
Contingency	431	238	193	-	-	-
Land acquisition	14	0	14	33	0	33
Administration cost	272	0	272	1,388	0	1,388
Tax	1,720	0	1,720	2,938	0	2,938
Others	76	0	76	84	0	84
Total	11,133	4,995	6,138	19,871	4,717	15,154

(Source) Prepared by the evaluator based on materials provided by PROREGION and JICA.

(Notes) Exchange rate: planned 1 sol = 35.13 yen, actual 1 sol = 33.64 yen (average rate for 2011-2020)
The tax amount is estimated from the cost of civil works and consulting services.

Total contract value of the first three civil works contracts in the northern, central and southern areas subject to the ODA Loan had increased by 12% up to October 2013 due to contractual modifications. The main reasons for this increase included additional costs due to geological and other conditions in the target areas different from those assumed in the design stage, additional facilities which were not considered in the detail design, design changes based on technical examinations¹⁰. In the south and central areas, the initial construction contractors terminated the contract without completing the works, and PROREGION has carried out the remaining works and repairs of defects under a number of contracts and direct management since 2016. According to the management system of public investment projects of the Peruvian Ministry of Economy and Finance, by June 2021, the total cost of civil works had increased by 33% from the value of the first contracts. According to PROREGION, the increase in costs was due to the inefficient implementation of the remaining works due to the large number of small contracts in each city, the repair of numerous defects left by the first contractors, and repairs that became apparent after the start of construction.

3.2.2.2 Project Period

The Project was planned to be implemented in 31 months from the signing of the loan agreement in March 2009 to the start of operation of all facilities in September 2011. In fact, the loan agreement was signed in March 2009 as planned, but as of June 2021, the Project is not yet completed because some STPs are not yet in operation or unconstructed. By June 2021, the project period reached 11 years and 4 months (136 months, 439% of the planned period), and the efficiency of the project period is judged to be low.

Of the 11 target cities, the earliest construction completion was in Jaen of the northern area, which was completed in November 2013. After that, the remaining works in six cities in the southern and central areas were completed successively between 2018 and 2021, but three cities (San Pablo, Chota, and Bambamarca) that have not yet constructed STPs are still incomplete. In each city, excluding some STPs, the completed facilities have been operated successively by PROREGION, the respective cities and EPS, but the process of transferring the facilities to a permanent operation and maintenance entity (EPS or city) has not been completed in any of the cities (see “3.4 Sustainability”).

The main reasons for the delay in the project implementation were, as mentioned above, the time required for land acquisition and consultation with local residents in the

¹⁰ According to PROREGION, the detailed design of the Project was carried out in a short period of time with little involvement of the city, which left numerous technical weaknesses. In addition, the geological survey was not sufficiently carried out.

first contracts, the time required for technical examinations and design changes according to the geology and local conditions, and the interruption of construction due to rainfall and other factors ¹¹. After that, a number of contracts were made with different contractors for the remaining work by PROREGION.

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

At the time of planning, the financial internal rate of return (FIRR) and economic internal rate of return (EIRR) for the Project were calculated to be 6.5% and 11.9%, respectively, based on the following assumptions.

Costs	FIRR:	Initial investment and operation and maintenance costs
	EIRR:	Initial investment and operation and maintenance costs (economic costs)
Benefits	FIRR:	Fee revenue
	EIRR:	Decrease in health care costs due to improved sanitation
Project life:	20 years from the start of operation	

In this ex-post evaluation, no recalculation was carried out because the Project is not yet completed, the details of the calculation process at the time of planning were unknown, and the data necessary for recalculation were not available.

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

3.3 Effectiveness and Impacts ¹² (Rating: ②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The purpose of the Project is to improve the water supply and sewerage services in the 11 target cities, and the indicators listed in Table 3 had been set for the 11 target cities as a whole. Below, the project effects are analyzed from the perspective of water supply service coverage, water supply time, sewerage service coverage and sewage treatment.

¹¹ According to PROREGION, the most significant factor contributing to the increased project period was the time required for land acquisition and consultation with residents.

¹² The impact is also taken into account in determining the effectiveness of the rating.

(1) Coverage of water supply services (level of achievement: high)

The number of water supply connections in the 11 cities increased from 32,754 in 2007 to 53,768 in April 2021. This is 164% of the number of connections in 2007 and 103% of the target of 52,197 for 2020. The increase from 2007 to April 2021 was 21,014. The Project has contributed to this increase by constructing about 200 km of water distribution network and about 10,000 connections¹³. The water supply coverage rate in the 11 cities increased from 67.5% in 2007 to 87.9% in 2020. This is 92% of the target of 95.4% for 2020. Based on the above, it is judged that the achievement of the target for the coverage of water supply services is high.

Table 3 Plan and Achievements of Operation and Effectiveness Indicators

Indicator	Baseline value (2007)	Target value*** (2020)	Actual value (2020)	Rate of achievement (2020)
Water supply:				
Population served (11-city total)	113,912	190,065	194,064**	102%
Water supply time (11-city average)	13.7 hr/day	24 hr/day	17.5 hr/day	73%
Coverage rate (11-city average)	67.5%	95.4%	87.9%	92%
No. of connections (11-city total)	32,754	52,197	53,768*	103%
Sewerage:				
Population served (11-city total)	106,940	188,186	181,583**	96%
Sewage treated (11-city total)	7,599 m ³ /day	Unknown	Unknown	-
Coverage rate (11-city average)	63.3%	94.4%	82.2%	87%
No. of connections (11-city total)	29,918	52,069	50,310**	97%
BOD concentration (after treatment)	-	-	(See text.)	(See text.)

(Source) Based on data provided by JICA for baseline and target values, data provided by PROREGION and interviews with each city for the actual results in 2020.

(Note) * Number of service contracts as of the end of April 2021.

** Estimates based on each city's water and sewage connection rates, total population, and average household size (persons/household).

*** At the time of ex-post evaluation, the target year (in this case, 2013, two years after the planned completion of the Project) and target values set at the time of planning are usually used, but since this Project is not yet completed, the 2020 target values in the feasibility study report of each city were used.

¹³ A breakdown of the actual construction and actual rehabilitation was not available. Therefore, estimation was made based on the planned breakdown figures and the actual total figure. It should be also noted that, regarding the number of water supply connections, most of the increase of some 11,000 over the Project's direct contribution of some 10,000 was added by each city after the construction of connections by the Project.

(2) Water supply time (achievement level: moderate)

The water supply time increased from 13.7 hours/day in 2007 to 17.5 hours/day in 2020 (13.8 hours/day during dry period from May to September and 20.1 hours/day during other periods). The plan was to achieve 24-hour water supply in all cities in 2013, but only two cities, Bambamarca and Jaén, actually achieved 24-hour water supply throughout the year. Five cities, namely Cajabamba, San Miguel, Hualgayoc, Contumaza and Cutervo, achieved 24-hour water supply except during dry periods, while the other four cities did not achieve 24-hour water supply throughout the year. The achievement rate of water supply time is 73% (17.5 hours ÷ 24 hours), and the achievement of the target is judged to be moderate.

Each ESP and each city, which operates waterworks, controls water supply hours according to water demand and supply conditions. It was pointed out in several cities that the reason for the limited water supply hours is that some residents waste a lot of water by leaving the faucets open or using the water supply for irrigating crops. One of the reasons why residents do not make efforts to conserve water is that water rates are generally kept low, many residents have fixed rate contracts that do not depend on the amount of water used, and some residents still do not agree to pay¹⁴. This is the result of the city's political decision to operate the water and sewage systems in accordance with the residents' requests. In the Project, water meters were installed in conjunction with the rehabilitation and construction of the connections, and the plan was to have 100% meter coverage. However, some residents refused to do so, and some cities were hardly able to install meters.

Another factor limiting the water supply time is that there are many leaks due to defects in the pressure reducing valves¹⁵. In the demand forecast at the time of planning, non-revenue water ratio was expected to improve to an average of 27% by 2020, but the same ratio reported by the seven cities at the time of the ex-post evaluation was in the range of 25% to 45%¹⁶.

From the above, it is considered that the non-revenue water ratio is higher than planned due to water wastage and leakage, which is leading to the reduced water supply time¹⁷. In this ex-post evaluation, detailed data on the water quality of each

¹⁴ Water rates in the target cities ranged from 150 - 350 yen (1.3 - 3.0 USD equivalent) per month. Two of the 11 cities had a fee collection rate of less than 5%.

¹⁵ Although the Project is believed to have reduced leakages by replacing many of the aging pipelines and house connections, interviews with the target cities indicated that the pressure-reducing valves used to adjust water pressure were not functioning due to lack of maintenance, and water was distributed with high water pressure, leading to pipeline damage and leakage.

¹⁶ No information was available for the other four cities.

¹⁷ While it was pointed out that the water supply population exceeded projections due to the influx of people from rural areas to cities, the estimated water supply population was only 2% higher than planned. Therefore, this is unlikely to be a major factor in limiting water supply hours.

city's water supply system was not obtained. In each city, disinfection with chlorine is carried out at WTPs or distribution reservoirs. In the Project, WTPs were constructed in two of the 11 cities, and existing WTPs were expanded and improved in two cities. According to EPS MARAÑON, which operates the water supply and sewage system in Jaén, there has been a significant improvement in water quality in the city where a new WTP was constructed under the Project.

(3) Coverage of sewerage services (level of achievement: high)

The number of sewer connections in the 11 cities increased from 29,918 in 2007 to 50,310 in 2020. This is 168% of the number of connections in 2007 and 97% of the target of 52,069 in 2020, and the increase since 2007 until April 2021 is 20,392. The Project has contributed to this increase by constructing about 285 km of sewer pipes and about 12,000 new connections¹⁸. The sewerage coverage rate of the 11 cities increased from 63.3% in 2007 to 82.2% in 2020. This is 87% of the target of 94.4% for 2020. From the above, it can be concluded that the achievement of the target for the coverage of sewerage services is high.

(4) Sewage treatment (achievement level: moderate)

The Project had planned to construct STPs with a total treatment capacity of 18,517 m³/day in eight cities, and to increase the volume of sewage treated in 11 cities from 7,599 m³/day in 2007 to 17,807 m³/day in 2013. In reality, so far, STPs have not been completed in three cities, and STPs with a total treatment capacity of 15,085 m³/day have been constructed in five cities. Of these, as of May 2021, the STP in Hualgayoc (with a treatment capacity of 147 m³/day) was not in operation as it was immediately after completion, and the STP in Cutervo (with a treatment capacity of 3,430 m³/day) was not in operation due to opposition from residents who dislike the foul odor. Therefore, the total treatment capacity of the STPs constructed under the Project and in operation at the time of the ex-post evaluation is only 11,232 m³/day in the three cities (Celendín: 3,940 m³/day, Cajabamba: 2,972 m³/day, and Jaén: 4,320 m³/day). This is equivalent to 61% of the planned capacity of 18,517 m³/day.

In Jaén, it was reported that the existing STP (treatment capacity: 4,320 m³/day) and the new STP constructed by the Project (treatment capacity: 4,320 m³/day) are already receiving sewage more than their capacity, but the actual treatment volume data for each STP could not be obtained. On the other hand, the total number of sewer

¹⁸ A breakdown of the actual construction and actual rehabilitation was not available. Therefore, estimation was made based on the planned breakdown figures and the actual total outputs. It should be noted that, regarding the number of sewer connections, most of the increase of some 8,400 over the Project's direct contribution of some 12,000 was added by each city after the construction of connections by the Project.

connections in the three cities where sewage is treated is estimated to be about 30,000, and based on this, the sewage treatment rate for all 11 cities is estimated to be about 60%. At the time of planning, the target was to achieve a 100% treatment rate, so the degree of achievement of the sewage treatment rate is judged to be moderate.

Information on BOD concentrations of untreated sewage and effluent of the STPs in operation in the three cities was not obtained from PROREGION, while the information in Table 4, which is sourced from dissertations, is available for reference. The STP at Celendín is generally operating without problems, but there are no chlorine disinfection facilities, and the bacteria removal efficiency is low. Coliform counts exceed environmental standards for effluent. The STP at Cajabamba and the existing STP at Jaén have low treatment efficiency and BOD concentrations exceed environmental standards. The existing STP at Jaén is an oxidation pond system, but the treatment efficiency is considered to have decreased due to the accumulation of sludge in the treatment ponds, which reduced the effective capacity. No information was available on the treatment efficiency of the STP constructed by the Project in Jaén. In addition to the waterworks operated by EPS MARAÑON, there are a number of unofficial private waterworks in Jaén, which discharge sewage into the sewerage system of EPS MARAÑON. Therefore, it is believed that the STPs are already receiving more sewage than they can accept. The STP of Cajabamba is a combination of an Imhoff tank (two-story initial settling basin) and a tricking filter, and although the filter material seems to be too small, the cause of the low treatment efficiency needs further investigation. The chlorination facility at the STP in Cajabamba is not in operation.

Table 4 Treatment Efficiency of STPs

	Treatment capacity	BOD: untreated sewage	BOD: effluent (Standard: 100 mg/l or less)	Treatment efficiency
Celendín	3,940 m ³ /day	324.5 mg/l	87.7 mg/l	83%
Cajabamba	2,972 m ³ /day	256.1 mg/l	196.7 mg/l	33%
Jaén (the existing STP)				
Dry season	4,320 m ³ /day	1,840 mg/l	1,200 mg/l	35%
Rainy season		216 mg/l	190 mg/l	12%

(Source) Dissertations on the treatment efficiency of sewage treatment plants in Cajamarca Region: Franklin Quispe Cotrina (2019), Dr. Mariela Nuñez Figueroa (2019), Luis Alberto Cabrera Garcia and Lixon Alfredo Zevallos Julca (2019)

In summary, the treatment capacity of the STPs constructed under the Project and in operation is 61% of the planned capacity, and the sewage treatment rate is 60% of the

plan. In addition, since there are still some cities with incomplete or inoperative STPs, and that the treatment may not be adequate at the STPs in Cajabamba and Jaén, the degree of achievement of sewage treatment in the Project is judged to be moderate.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The Project was expected to contribute to the improvement of the residents' living environment through the improvement of water and sewage services. As a qualitative survey, 52 residents of 5 cities were interviewed by the local assistants¹⁹. The following is an analysis of the impact based on the results of the qualitative survey.

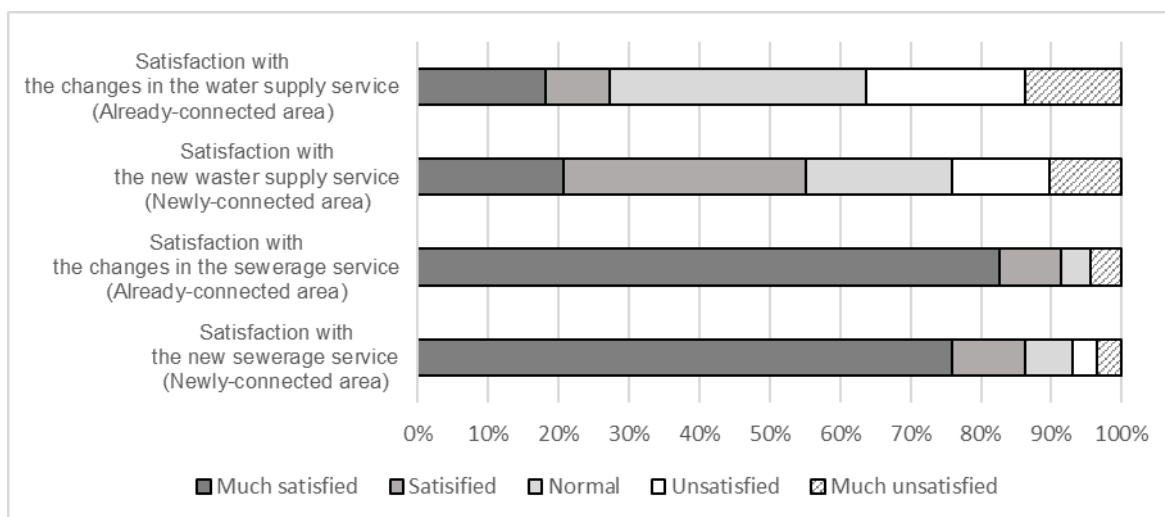
(1) Improvement in water supply services

According to the residents who already had connection to water supply before the Project, the improvement of water supply service was limited, and they are not much satisfied with the Project. They pointed out that, even after the Project, the water supply time is short, the water becomes muddy, and the water pressure is too high. On the other hand, newly connected residents are highly satisfied with the Project (Figure 2). Before the Project, the residents in the newly connected area were using public water taps operated by the water associations (untreated spring water) or receiving water from neighbors who had piped water.

(2) Improvement of sewerage services

Satisfaction with improved sewerage services is high in both already-connected and newly-connected areas (Figure 2). They reported that sewage no longer overflows in houses and on streets during rainfall which cause bad odors, and that they no longer use outdoor toilets and cesspits which cause bad odors, flies, pollution and the danger of going outside in the dark.

¹⁹ The target cities are Cajabamba, Celendín, Cutervo, Chota, and Jaén which have large population and the Project's outputs among the 11 cities. The interviewees were 52 residents who were purposively selected from the already-connected and newly-connected areas (23 from the already-connected area and 29 from the newly-connected area: 21 males and 31 females).



(Source) Interviews conducted with 52 residents of five cities (qualitative survey)

Figure 2 Level of Satisfaction with Water and Sewage Services

(3) Improvement of living environment

Nearly half of the residents reported positive changes in water use and two-thirds of the residents reported positive changes in water-based hygiene behaviors. In newly connected areas, easy access to water and the ability to bathe and do household chores whenever they want is welcomed. Many residents reported being able to use water to clean thoroughly and to wash clothes, bathe, wash hands more often. Some reported an increase in the frequency of hand washing due to the pandemic of COVID-19 since last year. Many residents also reported a decrease in clogged or overflowing sewage, bad odors, and flies and mosquitoes. Two-thirds of the residents think that diarrhea had decreased after the Project, but no concrete information was available to support this. Many residents were careful to save water, for example by using water used for washing food to use the toilet, while others said the piped water is useful for watering their gardens and vegetables.

In the interviews conducted with 12 restaurant / hotel owners apart from the residents, positive comments were heard such as water now reaches the upper floors of the hotels / restaurants, the frequency of cleaning with water has increased, and the frequency of hand washing has increased.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on Natural Environment

At the time of planning, the Project was judged to have no significant undesirable impact on the natural environment and to fall under Category B in accordance with the “JBIC Guidelines for Confirmation of Environmental and Social Considerations”

(April 2002). The environmental impact assessment of each city for the Project was approved by the Environmental Bureau of the Ministry of Housing, Construction and Sanitation in August 2010, and the environmental permit was granted. The environmental impact assessment included air, noise, water, and soil monitoring and an environmental management plan to prevent pollution. According to PROREGION and the consultant, it is believed that the removed asbestos cement water pipes were properly disposed of in accordance with the hazardous waste handling procedures in the plan. The sludge from the STPs in operation in the three cities has all been properly disposed of in accordance with Peruvian laws and regulations. In Celendín and Cajabamba, organic fertilizer is produced from the sludge and distributed to farmers free of charge. In Jaén, sludge is landfilled at the final disposal site, but sanitary landfill with soil cover is not made. No particular environmental problems have been reported in relation to the implementation of the Project.

One of the impacts on the natural environment that was not examined in the environmental impact assessment of the Project is the possibility that the amount of untreated sewage discharged increased. The Project was expected to reduce environmental pollution caused by the discharge of untreated sewage by promoting sewage treatment. In fact, at the time of the ex-post evaluation, STPs had been realized and were in operation only in three of the planned eight cities, and untreated sewage were still discharged into rivers in five cities. In these five cities, the amount of sewage generated is thought to have increased in response to the increased number of water users, and there is concern that the amount of untreated sewage discharged into rivers has increased. PROREGION is aware of this problem and is continuing its efforts to bring the inoperable STPs into operation and to complete the incomplete STPs.

(2) Social Impacts

According to PROREGION, the Project involved the acquisition of land for water intake facilities, reservoirs, and STPs in the cities of San Miguel, San Marcos, Chota, and Cutervo. No resettlement occurred. As the construction and operation of the STPs was opposed by residents who were concerned about odors and who wanted more compensation, PROREGION and the city explained the environmental standards for the STP, odor control measures, and legal standards for compensation, and the discussions were repeated. According to PROREGION, the amount of compensation paid to the residents was much higher than the original plan.

To summarize the effectiveness and impact of the Project, the degree of achievement

on the coverage of water supply and sewerage services through the Project is high, but the degree of achievement on water supply time and sewage treatment is moderate. While the residents are not much satisfied with the improvement of water supply service in the already-connected areas but are highly satisfied in the areas where water supply services were newly expanded. The residents are highly satisfied with the improved sewer service in general. It was also confirmed that the Project contributes to the improvement of water-related convenience and the improvement of the residents' sanitary environment. Based on the above, the effectiveness and impact of the Project are fair.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspects of Operation and Maintenance

In Peru, the 2016 “Basic Law on Provision and Management of Sanitation Service” established that urban water and sewerage systems are basically to be operated by EPSs. However, in smaller cities with a population of 15,000 or less, it is allowed to be operated by a “Municipal Administration Unit” established by the city or a “Specialized Operator” contracted by the city as an exception and as a temporary measure under the approval of National Superintendency of Sanitation Services (hereinafter referred to as “SUNASS”).

As of September 2021, the water supply and sewerage systems of eight cities other than the three cities (San Miguel, Contumaza, and Jaén) that were operated by EPSs prior to the Project are operated by their respective cities²⁰. The facilities completed and in operation under the Project, although before the transfer, are operated and maintained by EPS in the three cities where EPSs operate, and by the municipal department / unit relevant on water supply and sewerage in the other eight cities. In addition, PROREGION is operating and maintaining the STPs constructed by the Project in Celendín and Cutervo, and the facilities other than the water supply and sewerage network (secondary pipeline network) in Cajabamba on a temporary basis²¹.

In order to transfer the facilities of the Project to EPS, the ownership of the facilities must first be transferred from PROREGION to the city, and then the city must transfer the right to operate the entire water and sewerage facilities, including the facilities of the Project, to EPS. As of September 2021, three cities (Jaén, San Miguel, and Contumaza) and two other cities (San Pablo and San Marcos) that have been operated by EPS have begun the process of transferring their water and sewerage facilities to the

²⁰ According to PROREGION, the city tends to be reluctant to spend money on pre-transfer facilities, i.e. facilities that are not officially owned by the city, and only minimal repairs are done.

²¹ The water and sewer department / unit in each city is not a SUNASS-approved municipal administration unit.

city. In the other six cities, PROREGION and the cities are coordinating to start the transfer process²².

On the other hand, according to the interviews with each city by the local assistants, seven of the eight cities that were supposed to transfer their water and sewerage operation rights to EPS, except for San Pablo, do not want to do so. Many residents are opposed to the operation by EPS because they fear that the privatization will result in a large increase in fees, and it is thought that the cities are making political decisions based on the wishes of these residents. Of these seven cities, five cities with populations of 15,000 or more are originally required to transfer their operation rights to EPS based on the Basic Law. However, since the Basic Law does not set a deadline for the transition to the stipulated operation system, it is effectively left to the discretion of each city to realize it. PROREGION is continuing its efforts to promote understanding of the purpose and details of the Basic Law among the cities to realize the transfer to EPS as planned at the time of planning.

In view of the above, the operation and maintenance system of the Project at the time of ex-post evaluation is still provisional, and there is no clear prospect for the establishment of the operation system in accordance with laws and regulations, remaining some issues.

3.4.2 Technical Aspects of Operation and Maintenance

SUNASS has established a multifaceted index to evaluate the performance of each EPS, which is based on annual results and an overall assessment of provision of water supply and sewerage services and their management of each EPS. In the ranking based on 2019 results, EPS SEDACAJ was ranked sixth out of 14 EPSs of similar size, and EPS MARAÑON was ranked 6th out of 16 EPSs of the same size group. Therefore, it can be considered that both EPSs have maintained relatively good performance in Peru²³.

EPS SEDACAJ in 2018 and EPS MARAÑON in 2020, receiving support by the Technical Authority for Sanitation Services Administration (hereinafter referred to as

²² In order to start the transfer procedure, it will take time to complete the liquidation procedures with the construction contractors, organize the technical and accounting information of the facilities built by several contractors, and prepare the official documents with signatures. The impact of the spread of the new coronavirus infection has also been significant, as activities have been constrained. In addition, many cities have opinions about the design of the facility, defects and problems that have arisen since it became operational, and PROREGION has been forced to respond to them with its limited staff.

²³ The water utilities are divided into four sizes, with EPS SEDACAJ being the second from the largest and EPS MARAÑON the third. Indicators include water supply and sewerage service coverage, water supply hours, water pressure, number of complaints, number of leaks, non-revenue water rate, meter coverage, number of sewage clogs, compliance with environmental standards, energy efficiency, financial indicators (e.g. operating margin), and corporate governance indicators in accordance with Peruvian legislation.

“OTASS”) which provides technical and operational support to EPSs across the country, procured various equipment for operation and maintenance (equipment for leak detection, pipeline repair, water quality testing, PC, etc.) and provided related technical training to their staff. In the interviews with the two EPS, no particular constraints or problems related to the technical aspects of operation and maintenance were reported. Based on the above, it is considered that there are no problems in the technical aspects of operation and maintenance by the two EPSs.

In all the eight cities where the city operates water and sewerage systems rather than EPS, personnel are assigned to the water and sewerage departments / units to operate and maintain the facilities and collect fees. Depending on the size of the city, about 20 to 40 people are assigned to this department / unit. According to the interviews with each city during the field visit, the technical capabilities of the staff in charge are found not necessarily high. In addition, after every five-year election, there is a significant turnover of personnel, making it difficult for them to accumulate experience. In fact, according to the field inspection, there are cities where existing WTPs and sewage treatment plants are not properly operated and maintained²⁴. Based on the above, the technical level of the cities in general is judged not high. It should be also noted that the Project provided training for city staff on operation and maintenance, but the results were not sustained due to frequent staff turnover.

In 2018, PROREGION prepared a plan to ensure the sustainability of infrastructure projects, including the Project, by transferring facilities to the responsible agencies, while strengthening capacity for operation and maintenance through communication between relevant organizations. For the Project, a series of workshops on the Basic Law of 2016, technical training for eight cities (eight cities not operated by EPSs were targeted, but only five were implemented), and a sanitation education workshop for 11 cities were conducted²⁵. PROREGION reported that the technical level of the staff in charge in each city was low, and that hygiene education was a new topic that they were not familiar with.

From the above, it is considered that there are some issues regarding the technical aspects of operation and maintenance by the cities.

3.4.3 Financial Aspects of Operation and Maintenance

In 2018 and 2019, both EPS SEDACAJ and EPS MARAÑON generated operating profits (surpluses) (Table 5). EPS MARAÑON, while supported by OTASS in 2019, has

²⁴ The existing WTPs in the cities of San Pablo and Hualgayoc, and the existing STPs in the cities of San Marcos and San Miguel are not operational. These facilities were not included in the scope of the Project.

²⁵ Apart from this, according to PROREGION, sanitation education has been added to the scope of the consulting service for the Project, following the “National Sanitation Policy” (2017-2021).

taken measures such as optimization of contracts with water users (updating contract categories when commercial use begins), strict implementation of measures against delinquency by suspending water supply, and detection and legalization of illegal connections, which led to an increase in revenues. In the 2020 assessment by OTASS, EPS MARAÑON did not report any major technical or financial challenges. EPS SEDACAJ's Annual Report for 2019 shows that in 2019 operating margin, current ratio, and debt ratio were all at adequate levels and the financial health of EPS was moderate. No specific financial constraints were reported in the interviews with both EPS during the field visit. Based on the above, no financial issues were found in the operation and maintenance of the Project by the two EPS.

Table 5 Financial Status of EPS

	(Unit: thousand soles)			
	EPS SEDACAJ		EPS MARAÑON	
	2018	2019	2018	2019
Operating revenue	23,642	25,576	6,602	7,823
Operating expenses	23,143	25,004	5,385	7,293
Operating profit	499	572	1,217	530

(Source) Annual reports of each EPS

No specific financial information was available for the eight cities where EPS is not involved in the operation. The following situations related to financial aspects were reported through the interviews.

- Many residents object to pay-for-use charges based on water meters and pay a fixed amount. This leads to a lot of water wastage. Many residents do not pay the fee, for example, in Hualgayoc, no one pays, and in San Pablo, only 5% of residents pay.
- The city of Hualgayoc wants to entrust the operation of the water and sewerage system to EPS considering its financial difficulties, but the residents need to be convinced.

These cities are operating water and sewage systems while supplementing them with municipal financial resources in response to residents' requests due to political decisions. Since this is not the operation in accordance with the laws and regulations at the time of the ex-post evaluation, it is necessary to improve the financial sustainability while working to realize the planned transfer to EPS, creation of municipal administration units or outsourcing to specialized operators.

Based on the above, the eight cities have financial challenges in the operation and maintenance of the Project.

3.4.4 Status of Operation and Maintenance

Regarding the operation and maintenance of the facilities constructed under the Project, following issues were reported by PROREGION, EPSs, and the cities.

- The water dissemination network has many problems with pressure reducing valves in many cities, and where water pressure is too high, leaks frequently occur in distribution pipelines. According to the visual inspection during the site visit and the interview with the city staff in charge, it is considered that, in many cases, pressure reducing valves are not properly inspected and maintained. In addition, valve failures were also frequently observed in some cities.
- In many cities, the sewage network is often clogged with garbage. This is because the residents dump household waste into the sewers, and PROREGION and the cities believe that residents need to be educated.
- Rainwater flows into the sewer during the rainy season and overflows the manholes and damages the manholes due to excessive flow in many cities²⁶. Many of the manholes in Hualgayoc need repair, but this is likely due to the vibrations from blasting at a nearby mine.
- In general, including the facilities other than those constructed in the Project, the pumps in the WTPs and the sludge pumps in the STPs often break down, and some of them are not in operation. According to the visual inspection during the site visit and the interview with the city staff, the reason behind is believed that the inspection and maintenance of the pumps are not properly carried out.
- Among the STPs constructed under the Project and in operation, the STP in Celendín is properly operated and has high treatment efficiency, but the STP in Cajabamba has very low treatment efficiency. Some of the sludge pumps, chlorine disinfection facilities, and rotary sprayers in the sprinkling filter beds are out of order.

To summarize on sustainability of the Project from the above, since the completed

²⁶ Although the sewerage facilities of the Project are not supposed to accept rainwater. Although using the sewerage system for stormwater drainage is prohibited by the city, according to PROREGION, residents habitually use the sewerage system to drain rainwater since the drainage facilities are inadequate.

facilities have not yet been transferred to the city and EPS, there are still uncertainties in the operation and maintenance system of the Project. The city government, which may operate and maintain some of the facilities, is considered to have technical and financial challenges. Therefore, sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project was implemented for the purpose of improving water supply and sewerage services in Cajamarca Region by rehabilitating and expanding the water supply and sewerage facilities in small and medium-sized cities in the Region, thereby contributing to the improvement of the living environment of the residents. The Project is highly relevant to the development policies, plans and development needs of the Republic of Peru (hereinafter referred to as “Peru”) and Cajamarca Region both at the time of planning and ex-post evaluation. The Project is also highly consistent with Japan's aid policy at the time of planning, and therefore, the relevance of the Project is high. Both the project cost and project period are much larger than planned, and, as of June 2021, the Project is not completed having some sewage treatment plants (hereinafter referred to as “STP”) not being constructed. Therefore, the efficiency of the Project is low. The achievement level of the Project on the coverage of water supply and sewerage services is high, but the achievements related to water supply time and sewage treatment are moderate. While the residents are not much satisfied with the improvement of water supply service in the already-connected water supply areas but are highly satisfied in the areas where water supply services were newly expanded. While, the residents are highly satisfied with the improved sewer service in general. It was also confirmed that the Project contributed to the improvement of water-related convenience and the improvement of the residents’ sanitary environment. Based on the above, the effectiveness and impact of the Project are fair. The transfer of ownership of the completed facilities to the cities and the transfer of operation rights of the water supply and sewerage facilities from the cities to EPS have not yet been completed, so the institutional / organizational setup of operation and maintenance of this Project remains uncertain. In addition, the cities, which may operate and maintain some of the facilities in the future, face technical and financial challenges. Therefore, the sustainability of the Project is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency and the Operation and

Maintenance Agencies

- PROREGION needs to complete the entire Project as soon as possible while ensuring proper operation and finish the transfer of the facilities to the cities. Even if the unconstructed STPs are excluded from the scope of the Project, they should be constructed through separate projects as soon as possible.
- PROREGION, with the cooperation of the Ministry of Housing, Construction and Sanitation, EPS SEDACAJ, EPS MARAÑON, SUNASS and OTASS, will consult with the eight cities that have not signed an operation transfer agreement with EPS, and will examine the most appropriate operation and maintenance system for each city while aiming at transferring operation right to EPS as originally planned, and will promote the realization of such operation and maintenance system. It is necessary to provide training to the cities on the relevant laws and regulations and the procedures for transferring operation right to EPS based on them, the actual situation of operation by EPS (including the method of calculating water and sewage rates), and the merits and demerits of the transfer. At the same time, it is desirable to disseminate information to residents and provide education on water conservation and sanitation.
- PROREGION will investigate the causes of low treatment efficiency at the STP in Cajabamba and make necessary improvements.
- EPS MARAÑON needs to improve the quality of treated water by properly maintaining the STP in Jaén, i.e. restoring its functionality by removing sludge.

4.2.2 Recommendations to JICA

JICA will encourage the implementation of the above recommendations by the Peruvian side and will monitor their implementation status.

4.3 Lessons Learned

Ensuring the preparation of a new operation and maintenance system

In the Project, it was assumed that the operation and maintenance by EPS would be carried out on the premise that the Project would be transferred to EPS for the eight cities where the city was operating the water and sewerage facilities at the time of planning. The mayors of each city at the time of the planning agreed in writing that the operation would be transferred. In order for this to happen, each city needed to sign an operation transfer agreement with EPS after getting approval from the city council, but

no such agreement was signed by any of the cities before the Project began. Subsequently, all mayors were replaced by elections. On the other hand, the new law stipulated an operational structure basically by EPS. However, at the time of the ex-post evaluation, the mayors of seven of the eight cities did not want to transfer the operation right to EPS due to political decisions based on the wishes of the residents, and the operation and maintenance system is unclear.

In view of the above, when assuming an operation and maintenance system that differs from that at the time of planning, it is important to confirm the conditions necessary to realize the planned structure based on a close examination of the relevant legal system, analyze the procedures and risks involved in setting it up, and then evaluate the feasibility of the structure and take measures to realize it.

Comparison of the Original And Actual Scope of the Project (as of June 2021)

Item	Plan	Actual
① Output Water supply		
Water intake	Rehabilitation: 13 facilities (211 l/s) Construction: 1 facility (11.0 l/s) 9 cities	Rehabilitation: 13 facilities (225 l/s) Construction: 3 facilities (38 l/s) 11 cities
Conduit	Rehabilitation: 57.0 km Construction: 19.1 km 10 cities	Rehabilitation: 43.0 km Construction: 24.4 km 10 cities
Water treatment plant	Rehabilitation: 2 facilities (35 l/s) Construction: 2 facilities (305 l/s) 4 cities	Rehabilitation: 2 facilities (35 l/s) Construction: 2 facilities (305 l/s) 4 cities
Distribution reservoir	Rehabilitation: 11 facilities (3,934 m ³) Construction: 7 facilities (7,440 m ³) 8 cities	Rehabilitation: 9 facilities (3,884 m ³) Construction: 7 facilities (7,440 m ³) 8 cities
Water main / distribution pipes	Rehabilitation: 65.4 km Construction: 191.0 km 11 cities	Rehabilitation and Construction: 286.3 km 11 cities
Connection	Rehabilitation: 21,033 Construction: 9,332 11 cities	Rehabilitation and construction: 33,741 11 cities
Sewerage		
Connection	Rehabilitation: 18,383 Construction: 12,168 11 cities	Rehabilitation and construction: 30,896 11 cities
Sewer pipes	Rehabilitation: 191.9 km Construction: 81.1 km 11 cities	Rehabilitation and Construction: 285.0 km 11 cities
Pumping station	Construction 3 facilities 2 cities	Construction 1 facility 1 city
Sewage Treatment Plant	Construction: 8 facilities (18,517 m ³ /day) 8 cities	Construction: 5 facilities (14,809 m ³ /day) 5 cities
② Project period	March 2009 - September 2011 (31 months)	March 2009 - Not completed as of June 2021. (136 months, 439% of plan)
③ Project cost		
ODA loan	4,995 million yen	4,793 million yen
Peruvian funds	6,138 million yen	14,438 million yen
Total amount	11,133 million yen	19,231 million yen
Exchange rate	1 Sol = 35.13 yen (October 2008)	1 Sol = 33.21 yen (Average rate from 2009 to 2020)
④ Final disbursement	May 2015	