Republic of Panama

FY2018 Ex-Post Evaluation of
Japanese ODA Loan and Technical Assistance Project Related to ODA Loan
ODA Loan, "Panama City and Panama Bay Sanitation Project"
Technical Assistance Project Related to ODA Loan, "Panama Metropolitan Area Wastewater Management Improvement Project[1]"

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0. Summary

This project was implemented to improve the water quality of Panama Bay and heavily contaminated rivers by constructing and repairing the sewage treatment system and the network of interceptor and collectors and sewage pipes, thereby contributing to the amelioration of life and the hygienic environment of the people within the Panama metropolitan area. This will also contribute to the development of the tertiary industry, such as the promotion of tourism, which is the core industry of the country.

This project is consistent with the development policy of the government of Panama that aims to improve the hygienic condition of the people and its development needs to alleviate the contamination and bad smell of the Panama Bay and rivers, as well as Japan's ODA policy to consider environmental conservation an important area. Thus, the relevance is high. Regarding the effectiveness, most of the operational and effective indicators were achieved. Positive impacts are seen in the improvement of water quality and daily life environment as well as tourism, which is the country's main industry.

Owing to the implementation of the Technical Assistance Project Related to ODA Loan, the capacity to supervise the operation and maintenance of the facilities was strengthened, the necessary budget was secured, and the facilities were maintained and managed properly. On the other hand, since the executing agency of this project was established within the Ministry of Health, the bill to transform the agency to the public enterprise was submitted in order to secure its stable status, but it was not approved. However, most of the stakeholders related to wastewater management recognize this agency as the only organization that can be responsible for this sector, and its organizational stability is

[1] "Panama Metropolitan Area Wastewater Management Improvement Project" was implemented as a Technical Assistance Project Related to ODA Loan project, "Panama City and Panama Bay Sanitation Project". Technical assistance project related to ODA Loan is implemented through training, the dispatch of experts, the related survey, etc. borne by JICA's finance and investment cooperation account, aiming to implement or accomplish the finance and investment cooperation swiftly and smoothly by ODA loan or private-sector investment finance, or to improve the development effect. (MOFA HP: https://www.mofa.go.jp/mofaj/gaiko/oda/files/000243837.pdf).

secured with a certain level for a while. In light of the above, the sustainability is high.

Meanwhile, the project cost was significantly higher than planned, and the project period also exceeded the plan. So the efficiency is low.

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

1. Project Description

Project Location　　Juan Diaz Wastewater Treatment Plant

1.1 Background

At the time of appraisal, the coverage rate of the sewage facility was far behind that of the drinking of water, which deteriorated the hygienic environment of the Panama metropolitan area. Consequently, the scene of Panama Bay was bad, and the image of the Republic of Panama was also damaged significantly, whose core economy is the service industry, including tourism. To avoid such a situation, JICA has been engaging in the project formulation since 2001, collaborating with IDB (Inter-American Development Bank, hereinafter, IDB), who had already started the sewage collector improvement project, and whose development effects are supposed to appear; thus, this project, the construction of the interceptor and the wastewater treatment plant, was highly prioritized.

1.2 Project Outline

This project was implemented to improve the water quality of Panama Bay and the heavily contaminated rivers by constructing and repairing the sewage treatment, interceptor, and collectors system, thereby contributing to the amelioration of life and the hygienic environment of residents within the metropolitan area as well as the improvement of Panama's image.

In this project, the Technical Assistance Project Related to ODA Loan was also conducted to increase the development effect and its sustainability attributed to the ODA Loan project. Thus, both projects, combined as one, are the target of the evaluation.

[ODA Loan Project] "Panama City and Panama Bay Sanitation Project"

Loan Approved Amount/ Disbursed Amount	19,371 million yen/19,346 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	June 2007/June 2007
Terms and Conditions	Interest 1.2% Repayment Period 25 years (Grace period 7 years) Conditions for Procurement General untied
Borrower / Executing Agency	Republic of Panama/Ministry of Health (hereinafter, MINSA (Ministerio de Salud Pública))
Project Completion	May 2017
Target Area	Panama metropolitan area
Main Contractors (Over 1 billion yen)	Lot 1(Wastewater Treatment Plant): Constructora Noberto Odebrecht (Brasil)/Degremont SA (France) Lot 2 (Interceptor system): Construtora Noberto Odebrecht (Brasil)
Main Consultants (Over 100 million yen)	Nippon Koei LAC, Inc. (Japan)/Nippon Koei Co., Ltd. (Japan)
Related Study (Feasibility Studies, etc.)	Special Assistance for Project Formulation for "Panama City and Panama Bay Sanitation Project" (2007) (hereinafter, SAPROF)
Related Projects	・Technical Assistance Project Related to ODA Loan "Panama Metropolitan Area Wastewater Management Improvement Project" (2015-2018) ・IDB, "Panama City and Bay Sanitation Project (I)" ・Development Bank of Latin America (hereinafter, CAF[2]) "Proyecto de Saneamiento de la Ciudad y Bahía de Panamá" ・European Investment Bank (hereinafter, EIB), "Design, construction, operation and maintenance of a wastewater treatment plant"

[2] At the time of ex-post evaluation, the abbreviation "CAF" is used to express this bank, based on its previous official name, "Corporación Andina de Fomento." In this report, "CAF" is used to refer to the bank.

[Technical Assistance Project Related to ODA Loan] “Panama Metropolitan Area Wastewater Management Improvement Project” (hereinafter, Technical Assistance Project Related to ODA Loan)

Overall Goal		Mitigation measures for Panama Bay’s pollution are conducted sustainably in Panama Metropolitan Area.
Project Purpose		UCP (Unidad Proyecto Saneamiento de la Ciudad y la Bahía de Panama, hereinafter UCP)'s capacity of administration and O&M management for the facilities constructed by "the Panama City and Panama Bay Sanitation Project" is improved.
Output	Output 1	Roles of organizations related to sanitation of Panama Bay are determined and a procedure to improve the institutional structure of implementation is improved.
	Output 2	Periodical water quality monitoring for wastewater pollution sources discharged into Juan Diaz Wastewater Treatment Plant (JDWWTP) is started.
	Output 3	UCP's ability to manage the sewerage facilities (JDWWTP and the rest, i.e. sewerage networks, collectors, pumping stations and interceptors) is improved.
	Output 4	UCP's capacity of education and beneficiaries awareness of water saving and proper use of sewerage facilities is improved.
Executing Agency		Ministry of Health (MINSA)
Project Period		June 2015 – November 2018
Project Cost		384 million yen

2. Outline of the Evaluation Study

2.1 External Evaluator

Keiko Asato, Foundation for Advanced Studies on International Development (FASID)

2.2 Duration of Evaluation Study

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

Duration of the Study: October, 2018 – October, 2019

Duration of the Field Study: March 10 – April 2, 2019, June 5 – 13, 2019

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

3.1 Relevance (Rating:③[4])

[ODA Loan Project]

3.1.1 Consistency with the Development Plan of Republic of Panama

The development plan of the Panama, at the time of appraisal, "The Strategic Vision For Economic Development and Employment for 2009 (2005-2009)[5]," focused on four issues: 1) alleviation of the poverty and improvement of income distribution, 2) economic growth and employment, 3) sound finance, and 4) human resource development, national reform, and modernization. To achieve one of these four issues, "Human resource development," the most important issue was considered to improve the hygienic condition so that the people can be sound in psychology and body. The political pledge promised this project would be started by 2009.

The development strategy, at the time of ex-post evaluation, *National Strategic Plan 2015-2019*,[6] is composed of two parts: "economic strategy" and "social strategy". In "the drinking water and sanitation" sector in the "social strategy", the expansion of water and sewage services is considered an important policy. In the *100/0 plan (2014-2019)* announced by the Varela president, the 100% provision of drinking water and 0% of septic toilets by transforming to sanitary toilets, are set as a target. These prove that the promotion of the sanitation project is a national concern.

Moreover, the development plan of the water resource sector *National Water Security Plan 2015-2050: Water for all*[7] sets five long-term objectives, one of which is "achievement of the access of the sanitary facilities to all the households." The transformation to flush sanitary toilets, the renovation of decrepit existing sewage facilities, and the construction of a new sewage network and wastewater treatment plant are the necessary means to achieve this objective. In this regard, this project is consistent with the sector plan.

3.1.2 Consistency with the Development Needs of Republic of Panama

At the time of appraisal, the coverage of drinking water was 98% in the urban area and 92% in the rural area in the Republic of Panama. Meanwhile, the coverage of the sewage system in the urban area was 67% and 2% in the rural area. As this figure shows, the sewage system was significantly behind.

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[4] ③: High, ②: Fair, ①: Low
[5] Visión Estratégica de Desarrollo Económico y de Empleo hacia el 2009
[6] Plan Estragégico de Gobierno 2015-2019, un sólo país de Panamá
[7] Plan Nacional de Seguridad Hídrica (2015-2050)

Moreover, at that time, there was no full-scale wastewater treatment plant with the secondary-level treatment in Panama. So, 330,000 m^3 wastewater per day, drained to the existing sewage system, or to the river and trench where the sewage system was not installed, were released directly to Panama Bay. As a result, the contamination of the water and the bad smell of Panama Bay were terrible, and the Panama citizens did not dare visit the bay.

At the time of ex-post evaluation, the water quality and its smell have improved, but a lot of area still remains that is not connected to the sewage system. Such a condition, *Master Plan for Sewage System for Panama City and Panama Bay (-2045)*, renovated in 2015, points to the necessity of the sewage system and the wastewater treatment system. It also suggests the following expansion: 490 km of sewage networks and 130 km of interceptors by 2045.[8]

In this regard, this project is consistent with the development needs of Panama.

3.1.3 Consistency with Japan's ODA Policy

According to the *Japan's ODA Data* (2007), Japan is the third largest user of Panama Canal, following the U.S. and the Republic of China. 70% of Japanese commercial ships register in Panama, which utilizes the system of flags of convenience ships.[9] As such, Japan has a strong relationship with Panama, especially in the economic area. One of the four important areas of ODA cooperation with Panama, as agreed in the political consultation in March 2005, was the "Environmental Conservation," and the "Improvement Programme of Environmental Administration" was established.

In the *Implementation policy for Overseas Economic Cooperation Operations (2006-2007)* of JICA (the formerly the Japan Bank for International Cooperation, hereinafter JBIC), "Cooperation to the global issues and peace construction" was listed as one of the important areas, and the measures against the destruction of the ecosystem and the air and water contamination were prioritized. Incidentally, the consistency with Japan's ODA Policy is high.

3.1.4 Appropriateness of the Project Plan and Approach

This project was co-financed by JICA and IDB.[10] IDB was responsible for the upper

[8] Hazen and Sawyer, "Actualización del Plan Maestro de Alcantarillado para el Proyecto de Saneamiento de la Ciudad y Bahía de Panamá," 2015

[9] This system allows the ships owned by the foreign individual or corporation to be registered to the country that has this system. With this system, the owner can get the benefits, such as the employ of foreign sailors with low salary and the tax exemption to the profit gained using the mentioned ship. (Source: Nippon Export and Investment Insurance). Panama introduces this system.

[10] In this project, the IDB project was indispensable to achieve the purpose of the ODA loan project. So, IDB's

part, such as the construction and repair of the sewage network in San Miguelito district where the poor resides and the collectors along the rivers which flow into the Panama Bay. JICA was responsible for the lower part, such as the construction of the interceptor and pressure mains that carry wastewater collected by the collectors to the Juan Diaz Wastewater Treatment Plant (hereinafter, JDWWTP),[11] and construction of JDWWTP. Other than the areas that were to be targeted at the time of appraisal, the wastewater treatment facilities that run to the JDWWTP were constructed by the funding of CAF, EIB and Tocumen International Airport Company, and the government of Panama. Figure 1 shows the segmentation of the projects by these donors (please refer to "4.3.2 Impact" for details of the projects by donors other than JICA and IDB).

These projects were constructed with no duplication in the areas or in its function, with a mutually supplementary relationship. As such, the wastewater treatment system in Panama metropolitan area was expanded efficiently, which facilitated the increase of the effectively population treated. Therefore, the project plan and approach were appropriate.

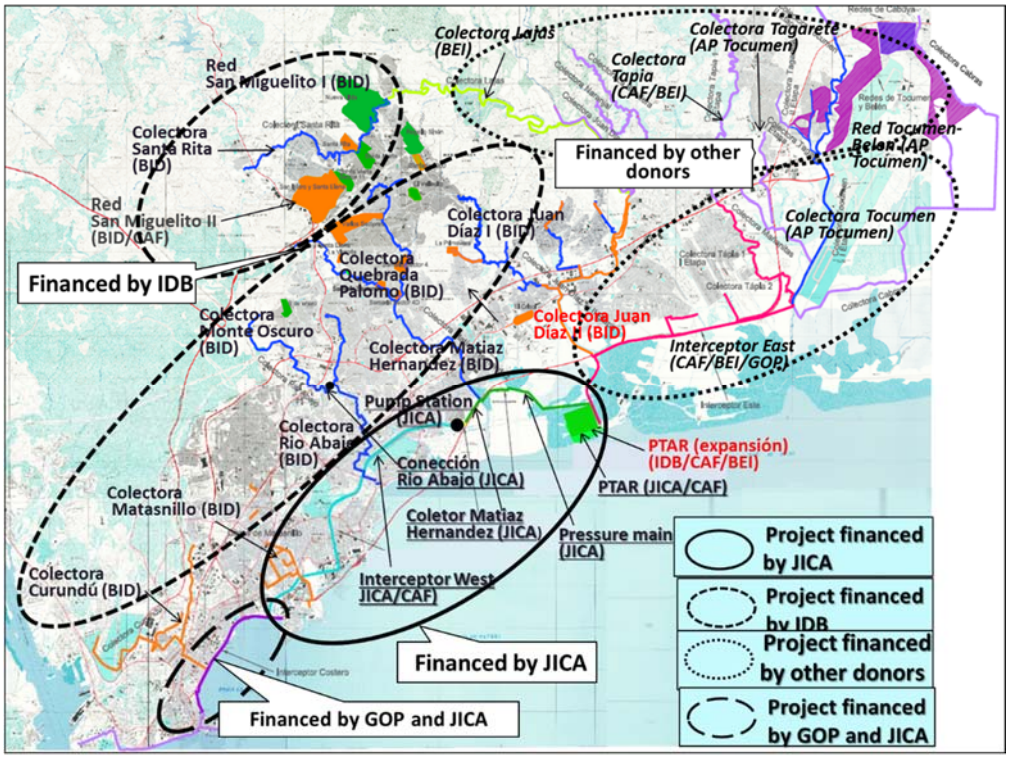


Figure 1: The segmentation of project area by different donors

Source: Elaborated by the evaluator based on the JICA internal documents

project is also part of this evaluation's target (from JICA documents).

[11] JDWWTP is an abbreviation of Juan Diaz Wastewater Treatment Plant.

[Technical Assistance Project Related to ODA Loan]

3.1.5 Relevance of Technical Assistance Project Related to ODA Loan

At the time of appraisal, the organization to whom the sewage facilities were supposed to be transferred when this project completed was “Instituto de Acueductos y Alcantarllados Nacionales (hereinafter, IDAAN).” However, their capacity to operate and maintain the sewage facility was considered insufficient. Thus, it was planned that the capacity building to IDAAN would be done by IDB and that the facility transfer would go into effect (refer to “4.2.1 Output”, “Project responsible by IDB”). However, even at the time of project completion, IDAAN’s capacity for the operation and maintenance of the sewage facility was not sufficient. Therefore, the 2015 agreement between MINSA and IDAAN concluded that UCP, which was established within MINSA to manage the process during the project, would take care of the operation and maintenance for 10 years since this agreement. Meanwhile, UCP neither had experience operating nor maintaining the sewage network and sewage treatment system. Moreover, this was Panama’s first full-scale wastewater treatment plant with secondary-level treatment.[12] Therefore, UCP’s capacity building was also indispensable, and the implementation of the Technical Assistance Project Related to ODA Loan became relevant.

As suggested above, this project fully coincided with the development plan and the development needs of Panama, and Japan’s ODA policy. The projects funded by the different donors were segmented properly in its area and function by supplementary roles but with no duplication. Therefore, the approach of the project was also appropriate. UCP, which would be the organisation to manage and operate the facilities after the project completion, the Technical Assistance Project Related to ODA Loan was also indispensable, and its implementation was appropriate. In light of the above, the relevance of this project is high.

3.2 Efficiency (Rating: ①[13])

[ODA Loan Project]

3.2.1 Project Outputs

(1) Plan and Actual

The achievement of the Outputs by JICA and IDB is as follows.

[12] Secondary treatment in wastewater treatment means deleting the organic substance in the wastewater using microorganisms. The first treatment involves deleting the solid materials in the wastewater. It is composed of a screen, such as a mesh or bar, to delete the big solid bodies (i.e., through the primary sedimentation tank to immerse sands and through the final sedimentation tank to immerse sludge).

[13] The outputs for the Technical Assistance Project Related to ODA Loan will be explained in “3.3.3 Effectiveness and Impact.”

Table 1: The plan and actual of Outputs

Plan	Actual
Responsibilities by JICA	
Interceptor System	
・West Interceptor: 13,473 m	・As planned
・Balboa Collector: 3,883 m	・Conducted by Government of Panama
・Rio Abajo Collector: 1 Connection	・As planned
・Matias Hernandez Collector: 1,900 m	・Collector Matias Hernandez: 733 m
Wastewater treatment Plant:	
・Pump Station: Main pump x 1 set (3 units)	・Main Pump 2 sets (5 unit and 4 unit)
・Pressure Main : 5,150 m	・4,860 m
・Treatment Plant: Avg./day: 2.20 m^3/sec (190,000 m^3/day) Max./day: 2.75 m^3/sec (238,000 m^3/day)	・Volume to be treated: As planned ・Incorporated a main flow distribution chamber (not planned originally)
Consulting Service	
・Designing and Preparation of tender document, Support for tender and contract, Supervision of construction process and its operation (873MM)	・The same duties, but the engaged MM has increased to 1,349MM.
Responsibilities by IDB	
Construction and Repair of the Network and Collectors	
・Sewage Network: 58 km	・88.3 km
・Collectors: 47 km	・77.94 km
・Pump Station: 9 sites	・2 sites
・Main Pressure: 8 km	・As planned
Institutional Strengthening for IDAAN	
・User registry	・As planned
・Installation of house meters	・As planned
・Study on rate policy setting (tariff study)	・As planned
・Communication and education activities	・As planned
・Training for IDAAN staff, etc.	・Training for IDAAN staff, etc.
Government of Panama	
Not planned	Balboa Collectors: ・Collectors: 4,830 m ・Pump station: 3 pump stations ・Inspection Chambers: 30

Data source: Prepared by evaluator

(2) Main Points to be changed

The main points of Outputs to be changed and their reasons are as follows.

JICA Outputs

1) The shortening of length of collector of Matiaz Hernandez

Due to the change of installation route, its length was shortened.

2) The Pump Station

The number of pumps installed was changed from one to two. The wastewater flows into the pump station from both the eastern and western side. The volume of wastewater flowing in either direction varies, and in order to treat this wastewater accordingly, according to the volume from each side, two pump sets were separately installed.

3) Installation of a main flow distribution chamber at JDWWTP

A main flow distribution chamber was installed at JDWWTP. At the time of ex-post evaluation, the construction of the expansion of JDWWTP is also occurring in the next lot. When it is completed, the wastewater flowing into the sedimentation tank constructed by this project must be distributed separately to each wastewater treatment plant. For this purpose, this chamber is necessary. This change of design was for the efficient operation and maintenance of JDWWTP after the expansion of the facility.[14]

4) Balboa Collector

This collector and the pump station were installed along the Balboa avenue, where the "Cinta Costera"[15] project was progressed by the Ministry of Public Works. It was considered that the construction of the Balboa collector by the same company responsible for "Cinta Costera" would be efficient, which made the government of Panama shoulder its funding.

5) Consulting Service

The additional work caused by the various design changes mentioned above increased the MM of consulting service from 873 (foreign 235, domestic 638) to 1,349 (foreign 360, domestic 989).

[14] This chamber is set between the existing JDWWTP and expanded JDWWTP. Once the expanded JDWWTP is in operation, the wastewater would be flushed equally to both plants. The capacity and diameter of the influent pipe to both plants are the same size. So, the distributed amount was designed to be equal.

[15] Cinta Costera is the 7-km recreation complex zone developed along the Balboa avenue nearby the Panama Bay. It includes the promenade, the tree planting area, the cycling road, the sports area for basketball, futsal, and tennis, and the playground equipment for children, in addition to vehicle exclusive lanes with the double passage of 6 lanes (i.e. one side passage of 3 lanes). Later, Cinta Costera II and Cinta CosteraIII were continuously constructed. They were the big public projects to revitalise the Panama Bay.

IDB Projects[16]

1) Expansion of sewage network

At San Miguelito district, the population increased rapidly, which increased the demand to install the sewage network. At the same time, this project required an additional loan due to increased project cost resulted from the drastic inflation and other reasons (refer to "4.2.2.1 Project Cost" for details). So, to respond to these new demands, IDB decided to increase its loan amount, and it expanded the sewage network in San Miguelito district.

2) Extension of installation length of collectors

IDB funded the installation of new collectors along the rivers[17] running in the centre of Panama City, as well as the repair of existing collectors.

Regarding the Juan Diaz collector, it was revealed after the commencement of the construction work that its installation route and other public works'[18] locations coincided, which caused a detour in the route of this project of collectors. This doubled the project cost, and the bedrock of the detoured route made the construction more difficult because it lengthened the project period so much. Due to these reasons, the construction was divided into two phases. The second phase's construction of the Juan Diaz collector is still occurring and will be completed by 2020. Because of these situations, the installation length of the Juan Diaz collector in this project became shorter than originally planned, but the changes to the other 6 collector routes made the total length of the collectors longer than originally planned.

The projects by other donor (EIB/government of Panama)

Lajas collector

Originally, the Santa Rita collector was planned to connect to the Matiaz Hernandez collector through the pump station. However, the location of its installation was not safe from the security aspect, so the route was changed so that the natural drowning might work. After examining the project cost, project period, and the difficulty of the construction work, the connection to the Juan Diaz collector was found to be rational. Since the installation of a new collector between Santa Rita and Juan Diaz collector was necessary to realise the connection, the Lajas collector was installed.

Summing up the above, even though some changes in the design were recognized, their reasons were appropriate, and the originally planned outputs were almost achieved.

[16] This section describes the changes only related to the target projects for evaluation.
[17] The target rivers were Crundú, Matasnillo, Río Abajo, Monte Oscuro, Matiaz Hernandez, and Juan Diaz rivers.
[18] Other public works include the construction of Metro Mall and Santa Maria Golf course, as well as the expansion of Corredor Norte.

3.2.2 Project Inputs

[ODA Loan Project]

3.2.2.1 Project Cost

Contrasting with the total project cost of 32,561 million yen, planned at the time of appraisal, the actual amount is 68.672 million yen. The project cost shouldered by each donor is as follows.

Table 2: Planned and actual project cost

(unit: million yen)

	JICA	IDB	CAF/OFID [19]	GOP	total
Plan (a)	19,371	5,266	0	7,924	32,561
Actual (b)	22,427*	7,463	16,365	22,417	68,672
Difference	3,056	2,197	16,365	14,493	36,111

Source: documents submitted by JICA and executing agency Exchange rate: ¥99.54 per dollar[20]

The reasons for the drastic increase of project cost are 1) price escalation of materials and equipment during the project period (accumulated inflation rate from 2007 to 2017 is 46%[21]), 2) personnel cost escalation of the construction workers (due to the competition with other public works conducted in the same period of this project), 3) design changes mentioned above, and 4) increase of consulting service accompanying these changes. The increase in the project cost was compensated by 1) additional loan by IDB, 2) additional funds by other donors, such as CAF and OFID, and 3) additional budget allocation by the government of Panama.

Summing up the above, the project cost was 211% of the original plan, which is significantly higher than planned. Among the actual cost, the amount shouldered by the ODA Loan is 22,427 million yen.[22]

3.2.2.2 Project Period

At the time of appraisal, the project period was planned to last 104 months (from March 2007 to November 2015). However, the actual period was 120 months (from June 2007

[19] OFID is the abbreviation of OPEC fund for International Development, hereinafter called OFID.

[20] The average exchange rate from the International Financial Statistics Yearbook (IMF) during the years of project is applied.

[21] According to IMF - World Economic Outlook Databases (October 2018)

[22] This figure is calculated based on the average exchange rate for the years of project implementation. However, if the calculation is done based on the actual exchange rate of each year of disbursement, the project cost would be 19,346 million yen, 99.9% of the planned cost.

to May 2017), which is 115% of the original plan, thus exceeding the plan.

This project introduced the DBO (Design – Build – Operation) approach, which defines the "completion of project" as "time to transfer the facilities after 4 years; operation and maintenance by the commissioned private company, after the construction of the sewage facilities." So, the project period was completed in May 2017, after four years of operation and maintenance of the facilities by the private company. The facilities' construction was terminated in May 2013.

The project period was exceeded due to the need for additional time 1) for the prerequisite appraisal to select the construction company, 2) to coordinate other donors who could compensate the exceeding budget because of the increased cost as stated in "3.2.2.1 Project Cost," and 3) for the approval of an additional budget by the government, coinciding with its turnover timing (2009), 4) for additional construction caused by the expansion of the project domain, and other reasons.

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

Regarding the FIRR (financial internal rates of return), in SAPROF, it was calculated that the cost would be for the construction, operation and maintenance, and the benefit would be by the sewage collection fee. However, the feasible sewage fee, calculated by the average income and the amount of "willingness to pay," cannot cover the cost, which would require the subsidy. So the FIRR was not set up.

As for the EIRR (Economic Internal Rates of Return), it was calculated that the project life is 40 years, the cost is for the construction, operation and maintenance, and the benefit is the sewage collection fee and tourism income attributed to the sanitation of Panama Bay. With this assumption, EIRR turned out to be 14.74%. The EIRR, calculated at the time of appraisal with the same method (same definition of cost and benefit), was 10.1%. The detailed calculation formula at the time of appraisal has not been revealed, so the restrict comparison is difficult. However, the tourism income was calculated based on the technical report prepared in 2003 at the time of appraisal, but the actual number of tourists and the related income since 2008 has significantly increased (refer to "3.3.2.1 Impact," (4) influence on the tourism industry, p. 19), which would be the reason for the difference of EIRR.

[Technical Assistance Project Related to ODA Loan] (for the reference)

3.2.3 Project Cost and Period of Technical Assistance Project Related to ODA Loan

The actual project cost for the Technical Assistance Project Related to ODA Loan is 378 million yen, 108% of the plan, which was 350 million yen. The actual project period

is 42 months (from June 2015 to November 2018), 100% of the plan, which is the same as the actual period.

In the light of the result of ODA Loan Project (Technical Assistance Project Related to ODA Loan is the reference), the project cost significantly exceeded the plan and project period exceeded the plan. Therefore, the project of the project is low.

3.3 Effectiveness and Impacts[23] (Rating: ③)

[ODA Loan Project]

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The achievement of the operational indicators established in this project is as follows.

Table 3: Achievement of operational indicators

Indicator	Target	Actual	
	At the time of completion of project (2017[24])	At the time of completion of project (2017)	At the time of ex-post evaluation (2019)
Population treated (persons)	748,171	572,674	684,028
Amount of wastewater treated(m^3/day)	190,080	136,546	237,600
Rate of facility utilization (%)	100	88	100
BOD*[1]/SS*[2] (mg/l) Influent: BOD/SS Effluent: BOD/SS	 180/180 35/35	 140/119 35/32	 160/166 14/10

BOD*[1] Biochemical oxygen demand SS*[2] Suspended Solids

Source: documents submitted by JICA and executing agency

Considering the above, other than the population treated, amount of wastewater treated, rate of facility utilization, and water quality (BOD/SS concentration) achieved the target values.

The reason the target for population treated did not achieve is that the Juan Diaz collector has not gone through (refer to "3.2.1 Outputs"). The part for which construction

[23] Sub-rating for Effectiveness is to be set with consideration of Impacts.

[24] Originally, completion period was established as 2015. However, as stated in "4.2.2.2 Project Period," the project was completed in 2017, and the target year also shifted to 2017.

is not completed is the last part to connect to JDWWTP. So even though the construction in the first phase of the Juan Diaz, Santa Rita, and Lajas collectors has been completed, the wastewater cannot be sent to JDWWTP, and the population treated related to these collectors cannot be counted. The expected number of people treated by the completion of second phase of the Juan Diaz collector will be 204,190. Therefore, in 2020, when the construction has been completed, the expected number of people who will have been treated will be 888,218. This number also includes the population treated in the eastern area, 114,471, not planned at the time of appraisal. Even though the achievement time will be delayed, the target is expected to be accomplished in 2020, and the beneficiaries will be expanded up to the area that was not originally in the plan (eastern area).

The significant increase in the amount of wastewater treated since 2017 is attributed to the completion of the sewage pipe system in the eastern area (Tocumen, Tagarete, Tapia, and Belén collector network areas) and the increase in water consumption per person.

The amount of wastewater treated is already near the maximum capacity of the facility (238,000 m^3/d) with 684,028 beneficiaries. However, the construction of an expanded facility in the next lot of the JDWWTP is going on, so at the time of completion of the facility, the possible treated amount by both facilities would increase up to 380,160 m^3/d on average, and 475,200 m^3/d maximum. This capacity can absorb the expected increased wastewater amount.

[ODA Loan Project]

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact to the water quality, people's hygiene environment, and the tourism industry is as follows.

(1) Improvement of the water quality

Table 4: The achievement of the water quality target

Indicator	At the time of appraisal (2006)	Target	Actual	
		At the time of completion of project	At the time of completion of project (2017)	At the time of ex-post evaluation (2019)
Water quality improvement status in public water bodies/E. coli (average in ocean) MPN*/100 mL	10,000	3,000	2,590	N.A.

MPN*:Most Probable Number(most probably suspected number by presumption of number of bacteria of sample based on estimation）

| Source: documents submitted by JICA

The indicators regarding the water quality set at the time of appraisal were attained at the time of completion of the project (2017). However, the criteria of water quality set by the Ministry of Environment (COPANIT 35-2000) is “Coliform Total,” instead of “Escherichia.Coliform" (hereinafter, E. Coli),” so the E. coli was not measured at the time of ex-post evaluation.

On the other hand, since 2014, the executing agency has been monitoring[25] and judging the water quality by the indicator of “Coliform Fecal” (hereinafter, Coli. Fecal). Even though the Ministry of Environment designated Coli. Total as a water quality indicator, the main water contamination of target areas of this project is attributed to human sewage, so Coli. Fecal can indicate the effect of this project more accurately than Coli. Total.[26] Therefore, the executing agency monitors the water quality by Coli. Fecal. The criteria to judge the water quality are “less than 250: good,” “250 or more and less than 450: medium,” and “450 or more: bad.” As a result of monitoring by the criteria, the water quality of the coast and offshore of the Matasnillo and Matiaz Hernandez rivers, running through the centre of the Panama City, is as follows. Other than the figure in the dry season in 2019 in the Matasinillo coastal area, all the indicators are categorized as “good.” Based on these figures, we can say the water quality in Panama Bay has generally improved.

Table 5: Figure of Coli. Fecal

(unit: UFC/100 ml)

Sampling place		2014	2018	2015	2019
		Rainy season		Dry season	
Matasnillo River	S3(Coast)	600	< 10	6,200	18,000
	S4(Offshore)	600	< 10	160	190
Matiaz Hernandez River	S7(Coast)	---	30	---	180
	S8(Offshore)	420	150	100	40

Source: elaborated by the evaluator based on documents submitted by the executing agency

[25] Informe de Avance Semestral, “Programa de Monitoreo de las condiciones sanitarias y ambientales de los cuerpos de agua continentales superficiales y las aguas marinas de la Calidad y Bahía de Panamá”

[26] In this monitoring, Coli Total is also measured, but the target figure is not set, so the judgement if it is good or not is not done.

The executing agency recognizes the reason the water quality of the coastal area at S3, where the river Matasnillo runs, was not good during the dry season of 2019 as follows: First, there are still many areas where the sewage system is not connected along the Matasnillo River. It takes time to improve the water quality around the coastal area. Second, there must be a peculiar case that deteriorated the water quality based on this unusual increase in 2019. However, the peculiar case had not been identified by the time of ex-post evaluation.

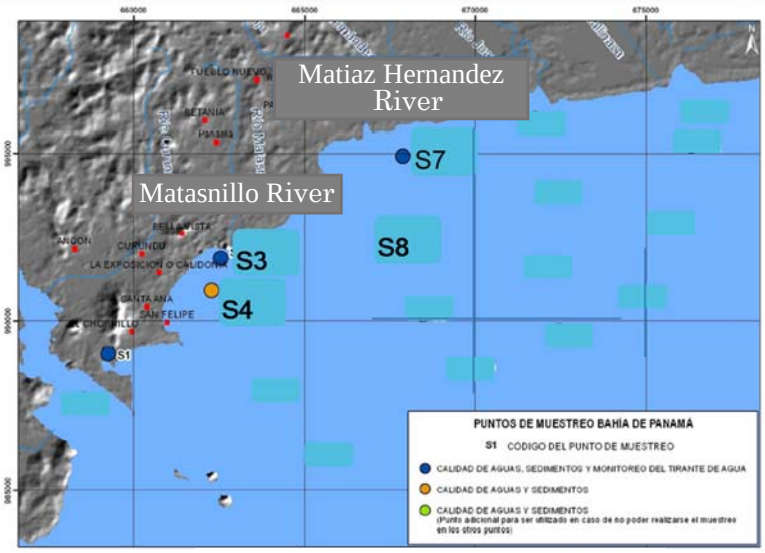


Figure 2: Sampling place for monitoring

(2) Changes in the daily life and hygiene environment of the population

Changes in the community

In this project, the public awareness activities were implemented in the poor residential area (San Miguelito district), where the sewage network was also installed. According to the answers to the questionnaire administered to the residents who engaged in the public awareness activity[27], the most significant change due to the installation of the sewage facility was “a decrease in the bad smells from the river and trench” (76%). Other than this, a “decrease of mosquitoes and mice” and “reduction of garbage” (both 12%) were pointed out. Regarding the impact in the daily life owing to participation in the awareness activities, approximately 80% of the participants responded that “they have changed their daily habits.” For example, they “refrain from throwing garbage in the river and trench” (82%). Changes in these habits that affect the quality of river water have been seen, as well as in the way the sewage is used.[28]

Some residents said, “We did not know, until participating the awareness activity, that some materials are prohibited to throw into a sewage.” However, some residents said that

[27] The questionnaire was administered to 5 residents in the Cerro Batea area (on March 29) and 12 residents in the Samaria district (on April 11).

[28] The actual changes in their habits relating to how to use the sewage were that they stopped dumping the following materials: “cooking oil,” “food” (55%), “soil,” “sanitary products” (36%), “hair,” “gasoline,” “plant” (27%), and others.

even though they were given such information, it would take time to change their habits." They explained the reasons for this saying, "If the habits of neighbours would not change, I hesitate to change it," and "I am not sure that the environment would be improved if we change our habits, without seeing a successful example." We want to see the results first, before we change our habits." These comments from the residents made us understand how difficult it is to promote a change in habits of the population. Some said that deterrence of throwing garbage into the river and trench would also be hard because periodic garbage collection service is not in effect. Thus, with no place to throw the garbage, people might keep throwing it into the river.

Questionnaires were also administered to the residents of the area where the sewage system was not installed.[29] The most significant difference between the residents with and without a sewage system was the recognition of "the possibility for the river water to be improved again in the future." More than half of the residents with the sewage system (with awareness education) foresaw that the river contaminated currently might become clean again in the future; meanwhile, many of the residents without a sewage system believed the river would continue to be dirty. Only the minority believed that the river would become clean again. It would be difficult for people with no hope of the river becoming clean again to change their habits. Public awareness to facilitate people being conscious to change their habits is important.

Moreover, both people with and without the project recognized that the most significant influence of the direct wastewater flow to the river is a "bad smell." The influence on the people's health was recognized differently (10% at the site without the project and 40% at the site with the project), which shows the general low understanding of the influence on wastewater to their own health.

(3) Utilization of Panama Bay area

The Panama Bay area was notorious due to its terrible smell before this project was implemented. People could not pass without covering their nose, and cars could not pass with the windows open. However, since the "Cinta Costera" recreation zone was completed in 2009, and the direct flush of wastewater to the Panama Bay has been reduced, the utilization of this area has drastically changed.

According to the answers to the questionnaires about the smell of Panama Bay administered to the residents[30] who make use of Cinta Costera, the condition before the

[29] The questionnaire was administered to 15 residents in the Alcalde Diaz area on the morning of March 26 and 11 other residents in the afternoon of the same day.

[30] Questionnaire was administered to 6 residents on March 17 and 2 residents on March 24. For the respondents to

project was “Bad” or “Not good,” but at the time of ex-post evaluation, the majority of them responded “Good” (63%) or “Very good” (13%).

On weekday mornings, many residents enjoy walking and running before going to the office, and during the day on the weekends, various social events are held. In the evenings, families and friends get together and enjoy time at Panama Bay. Previously, this area was where most people wanted to escape, but now they are willing to come to participate in diverse events; enjoy playing sports such as tennis, basketball, and soccer with their friends; and make use of playground equipment for children. As such, Cinta Costera is utilized significantly.

Other than these daily uses, the carnival parade that used to be held around February or March every year at Via España (the avenue, centre of the city, a certain distance from the bay area) is now organized at Cinta Costera. In January 2019, “The World Youth Day” hosted by Panama, welcoming a visit from the Pope, was also held at Cinta Costera. The main reason the Panama Bay area is used for relaxation of residents and various social events is the existence of Cinta Costera. However, if that area were covered by a bad smell, the facility could not be fully utilized. This project might also considerably contribute to the use of Panama Bay as an indispensable recreation area for the civil life.

Residents walking before going to work

Residents enjoying the weekend social events

(4) Influence on the tourism industry

The Casco Viejo district, next to Cinta Costera, is the leading tourist area in Panama City, full of restaurants and gift shops.[31]

the questionnaires, the residents were selected who had lived in Panama City before the project, and could compare the situation before and after the project.

[31] According to the tour guides in Panama City, Casco Viejo is one of the top 3 most popular sightseeing areas (Panama Canal, Casco Viejo, and Amador are the top 3).

Tourists who visited this area were interviewed about smell from the Panama Bay,[32] and roughly 80% said that the bad smell was not recognized. Regarding the question "Would you like to visit Panama again?" approximately 60% of tourists answered "Yes." The reason for not answering positively regarding revisiting Panama was that they had already visited the places to see; nobody referred to the bad smell or bad hygiene conditions.

Tourists at Casco Viejo

<Column: The significance of this project for tourism industry in Panama>

Tourism is the leading industry in Panama, following transportation, which includes the management and operation of the Panama Canal, and international finance. According to the World Tourism and Travel Council Committee, the contribution of tourism to the GDP in Panama is 10.4% (2019) (Panama, 2019 Annual Research: Key Highlights). Moreover, the number of tourists has increased by roughly 60%, and the income due to tourism has tripled in the last 10 years (2008-2017). Based on this evidence, we can say that tourism is an important and growing industry.

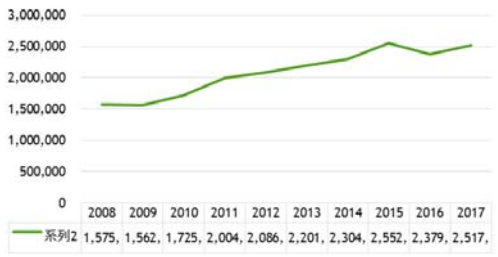
According to the tourist guide in Casco Viejo, tourists used to stay in the area for a short duration, but now, they spend more time there. As stated before, most of the tourists who visited Casco Viejo do not recognize the sewage issues, such as bad smell, which proves that Casco Viejo has recovered its charm as a sightseeing site.

The installation of a wastewater treatment plant does not directly contribute to the development of tourism industry. However, no tourists would feel like visiting Panama again if the city were insanitary and full of bad smells. According to the "Travel and Tourism Competitiveness Report 2017," one of the indicators to rank a tourist city is "Access to improved sanitation." The development of sewage system is an important factor for tourism development.

Good hygiene and a good sewage situation are given conditions to support the growth of tourism industry. The impact of this project on the tourism industry would be crucial.

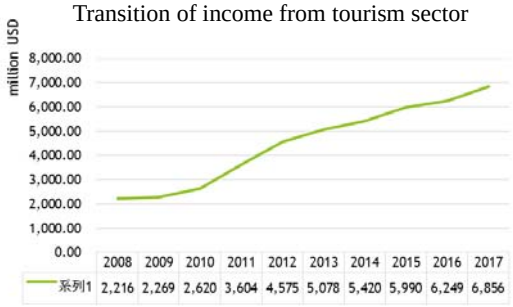
[32] Eight tourists in Casco Viejo were interviewed (3 males and 5 females), as well as 2 tourists in Cinta Costera (1 male and 1 female).

Transition of number of tourists



Source: demanda 2008-2017, Panama Tourism Authority

Transition of income from tourism sector



Source: demanda 2008-2017, Panama Tourism Authority

(5) Additional projects by other donors

The construction of JDWWTP in this project triggered the construction of other new sewage treatment systems funded by other donors (such as EIB, CAF, Tocumen International Airport Company, and Government of Panama).

1) Tocumen Belen regional sewage network, Tocumen collectors, and Tagarete collectors (funded by Tocumen International Airport Company)

Tocumen Airport is an international airport located in the eastern suburb of Panama City. It serves as a gateway to enter Panama. Tocumen International Airport Company was producing a surplus constantly around 2010[33], so the government of Panama requested that the company install a sewer system around the airport using the surplus. Tocumen Airport Company accepted the request and installed a sewer network and collectors around the eastern area of Panama City.

2) Eastern interceptor and Tapia collectors (CAF, EIB)

When the budget for this project proved to be insufficient, CAF provided additional funds (refer to "3.2.2.1 Project Cost"). Since then, sewage area has become an important sector for CAF in Panama.[34] Other than this project, CAF funded the project of installing collectors along the Tapia River, as well as the sewer network and east interceptor to JDWWTP in the eastern area of Panama City.

[33] The profit of Tocumen International Airport Company was 28,723 thousand dollars in 2010, 36,051 thousand dollars in 2011, and 39,680 thousand dollars in 2012.

[34] The drinking water and sewage area is one of the top 2 target areas of loans from CAF, equal to the transportation area. Approximately 30% of the budget is lent to the drinking water and sewage area.
CAF HP https://www.caf.com/es/proyectos/?c=panam%C3%A1&s=&a=&fd=2007&td=2019

EIB also increased its investment in Panama, starting with an investment in the expansion of the Panama Canal.[35] Now, it invests in the sewage treatment system in the eastern area of Panama City.

3) Expansion of wastewater treatment plant (IDB, CAF, and EIB)

Due to the installation of a sewage network and collectors in the eastern area of Panama City, the expansion of the sewage network in San Miguelito district[36], and the repair of the existing network and collectors, the demand for treatment of wastewater in Panama City has increased, and the actual volume necessary to be treated will exceed the capacity of existing JDWWTP[37] in 2020, when the Juan Diaz collector will be completed. To respond to this overwhelming demand, the expansion of JDWWTP began in 2015, funded by IDB, CAF, and EIB.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the natural environment

The JDWWTP was constructed in the middle of a mangrove, next to protected marshland registered to the Ramsar Convention. To construct the JDWWTP, 1 ha of mangrove had to be cut, which necessitated planting mangroves in the same logging area to replace the cut trees.[38] The planting of mangroves in 11.23 ha in the Pedregal area in the Chiquiri Province, and in 12.2 ha in Chame Bay in the West Panama Province, was confirmed by the Ministry of Environment in March 2017.

SUEZ, the private company, commissioned the operation and maintenance of the JDWWTP, reports monthly, every half year, and annually the condition of rubbish from the construction site, noise and vibration, labour safety and hygiene conditions, environmental education, response to residents, impact on an ecosystem (such as movement of migratory birds), etc.. UCP monitors the situation based on this information, and no specific problem had been found at the time of ex-post evaluation. In case that the inflow wastewater increases suddenly, the installation of bypass prevents the wastewater from overflowing. The small-scale power generation is put into practice, utilizing the methane

[35] The expansion of the Panama Canal was approved with the majority in favour through the national referendum in 2006, the construction started in 2007, and its operation initiated in June 2016.

[36] In 2015, the new project to extend the sewage network project in San Miguelito district financed by CAF was approved (San Miguelito III).

[37] It is clear that the amount of treated wastewater at the JDWWTP was near to maximum capacity at the time of ex-post evaluation, when the Juan Diaz collector was not connected, according to “Table 3: Achievement of operational indicators” in “3.3.1.1 Quantitative Effects.”

[38] In total, 10.93 ha of mangrove was necessary to be cut, including the lot for the construction of the expanded wastewater treatment plant, next to the current JDWWTP. There was an agreement with the Ministry of Environment that trees would be planted in another area if there was not enough room next to the lot where the mangrove was cut.

gas produced in the process of sludge treatment. This generation system is approved as a CDM project, and its power provides with 18% of what used in JDWWTP. The Ministry of Environment did not recognize any bad influence on the ecosystem around the project site and public water bodies of wastewater.[39]

Moreover, JDWWTP is inspected by public citizens. One of the participants, the president of Asociación Panameña de Aventura y Excursionism[40] (hereinafter APAVE), participated in the inspection tour organized jointly with the environmental NGO Audobon and revealed his opinion that the influence of this project on the ecosystem, such as on the birds and mangrove, is minimum, and no specific issue was found.

(2) Other positive and negative impacts

This project did not require the transfer of residents to acquire the land, nor were other minimum negative impacts seen.

[Technical Assistance Project Related to ODA Loan]

3.3.3 Effectiveness and Impacts

In this project, a private company is responsible for the operation and maintenance, at the site, of the wastewater treatment plant and the sewage network, collectors, and interceptors. UCP is in a position to supervise their performance. To strengthen UCP's capacity in this responsibility, a Technical Assistance Project Related to ODA Loan was implemented for three years (from 2015 to 2018).

3.3.3.1 Effectiveness

Achievement of the Outputs

The achievement of each output is as follows.

(1) Output 1: Roles of organizations related to sanitation of Panama Bay are determined and a procedure to improve the institutional structure of implementation is improved

Indicator ①: Improvement of the organization, personnel to implement the tasks in UCP is proposed.

Indicator ②: Human resource development plan (draft) of UCP is created.

Both indicators have been achieved. The suggestion to improve the organizational

[39] According to the interview with the Ministry of Environment on March 25, 2019.

[40] APAVE is the abbreviation of "Asociación Panameña de Aventura y Excursionismo." This president has a certification of tour guide mainly for bird watching and organizes small-scale bird-watching tours.

structure, assignment of staff, and business plan was presented, and the staff fostering plan was also elaborated. UCP showed its willingness to put this suggestion into practice. The Technical Assistance Project Related to ODA Loan finished in 2018, and following this, IDB was supposed to strengthen the organizational strategy, and CAF tried to foster commercial-related areas (such as tariff setting, the way to collect tariffs, and others). Proposals were given to realise these plans.

At the beginning, Output 1 was designed to suggest a plan to foster the organizational capacity of UCP, but later, as the bill of transformation of UCP to the public enterprise, the results of Output 1 were expected to be utilized in alignment with this movement (regarding the UCP's transformation to public enterprise, please refer to "3.4 Sustainability, 3.4.1 Institutional/Organizational Aspects of Operation and Maintenance"). However, this bill was not approved during the Varela administration (until the end of June 2019). Due to this situation, some of the suggestions presented in Output 1 cannot be put into practice, but most of them are necessary for the organization responsible to implement the sewage business. Therefore, the suggestion can still be seen as effective.

(2) Output 2: Periodical water quality monitoring for waste water pollution sources discharged into Juan Diaz Waste water Treatment Plant (JDWWTP) is started.
Indicator ①: A database on large-scale wastewater sources is created.
Indicator ②: Draft guidelines for water quality monitoring of large-scale wastewater sources are created.
Indicator ③: Water quality monitoring plan for large-scale wastewater sources is created.
Indicator ④: The pilot project for wastewater treatment of large-scale wastewater sources is planned and implemented.
Indicator ⑤: Mitigation measures on large-scale wastewater sources based on the pilot activity are formulated.
Indicator ⑥: Water quality monitoring for large-scale wastewater sources is implemented.

1) Wastewater quality monitoring of the large-scale wastewater sources

Indicators ①-④ have been achieved. The capacity building to the counterpart (hereinafter, CP) was done based on the elaborated database, guidelines, and monitoring plan (draft). With CP, the database for 75 entities (large-scale wastewater sources) was elaborated, and based on that, 25 entities were asked to monitor the quality of wastewater. Among them, 6 entities agreed to present a sample of wastewater. Three of the 6 entities were monitored jointly by CP and Japanese experts, and the rest by CP, by themselves.

2) Pilot project

Indicator ⑤ has not achieved since the pilot project had been suspended.

The septic tank was installed at Nicolas Solano Hospital in Chorrera city. However, after 3 months of use, it was broken. At the time of ex-post evaluation (June 2019), the septic tank was not being used, waiting for spare parts ordered from the U.S. to repair it. It was out of order because some foreign objects (such as diapers, food, clothes, and others), not to be put into sewage, had been thrown in. After being given thorough instructions to the medical staff at the hospital on how to use sewage, the nurses provided guidance to the patients and their families. The nurses monitor its use. Also, posters for public awareness were put in the hospital.

At the time of ex-post evaluation, the mixing of foreign objects had been reduced (according the periodic check on wastewater through utility holes). However, the hospital continuously receives new patients, so it is difficult to thoroughly prevent foreign objects from being mixed up in the sewage. Therefore, UCP plans to install a shredder in the septic tank to such cases in the future.

Panama law only specifies that the entity responsible for the water quality monitoring of large-scale wastewater sources is “the one capable of doing it.” This allows us to interpret that UCP can be the entity responsible for this duty. However, the law does not clearly grant UCP the authority to execute its responsibility. That is why the activity for Output 2 is owed to the spontaneous cooperation by the related entities, and the priority of this activity in UCP is not high. The staff member who received the capacity building majored in environmental engineering and is capable of executing the tasks taught by the Japanese expert, but the institutional system is not sufficient to execute this duty.

(3) Output 3: UCP's ability to manage the sewerage facilities (JDWWTP and the rest, i.e., sewage networks, collectors, pumping stations, and interceptors) is improved.

Indicator ①: Items of sewerage facility management are identified.

Indicator ②: Terms of Reference (TOR) are drafted for the next O&M contract for sewerage facilities.

Indicator ③: A mid- and long-term O&M plan (including the renovation plan and financial plan) for sewerage facilities is drafted.

Indicator④: OJT on the investigation and diagnosis methods for existing sewers is implemented.

Indicator ⑤: O&M plan (draft) of existing sewer pipe network is created

Indicator ⑥: The recycling system of treated wastewater and sludge is studied.

1) Capacity to supervise the operation and maintenance of the sewage facility

Indicators ①-⑤ were accomplished. The suggestion for the necessary items to be monitored for the sewage facility, administration plan, and suggestions for improvement to the current practices were presented by the Japanese experts, and UCP accepted them and intends to utilize them in their daily work.

As for how to supervise the operation and maintenance of the sewage facility, OJTs to learn the actual practice of this work, utilizing the portable equipment, were implemented 5 times in FY2016, 18 times in FY2017, and 5 times in FY2018. One of the participants said that these trainings were useful and enabled him to understand and judge appropriately the contents of periodical reports submitted by the private operation company, even though he, by himself, does not operate and maintain these facilities at the site (according to the interview with CP staff).

As for the administration plan of sewage facilities (for existing and new networks), before, without this plan, UCP just responded to the complaints and prioritized issues for which it was easy to take action. However, with this plan, UCP can plan the administration activities, foreseeing the future (according to the interview with CP staff).

Regarding the way to supervise the performance of the private operation company, UCP plans to change from activity-based to objective-oriented supervision. The items to be monitored were suggested by the Japanese experts, and UCP will establish a feasible numerical indicator, based on the actual situation of Panama, referring to the actual records since 2013, knowledge of specialists, and the results of additional surveys.

UCP started to supervise the operation and maintenance of the facilities in 2015 and was still on the way to strengthen its capacity through practice at the time of ex-post evaluation. In this regard, their capacity is still not enough to supervise the performance of the private operation company at the site, but they are competent to execute necessary duties for daily operation and maintenance.

2) Reuse of sludge

UCP is still discussing the method for reusing sludge. One option is to use it as a raw material to produce cement, but it has not yet been decided, and UCP has not put it into practice.

(4) Output 4: UCP's capacity of education and beneficiaries awareness of water saving and proper use of sewerage facilities is improved.

Indicator ①: UCP's activities of environmental education and public awareness are continuously carried out.

Indicator ②: Public understanding about water saving and sewerage management is

improved.

Indicator ① and ② are achieved.

During the implementation of the Technical Assistance Project Related to ODA Loan, UCP, with the Japanese experts, deployed the environmental education and public awareness to the general public, primary school, and business entities, elaborated on the teaching materials, arranged the implementation body, and diversified the public awareness activities. Moreover, the wastewater is deeply related with garbage and cleanliness issues, so awareness activities in collaboration with the volunteer of Japan Overseas Cooperation Volunteers (hereinafter, JOCV) dispatched to the Authority of Urban and Home Cleanliness (hereinafter, AAUD) has been promoted.

As for the indicator ②, to measure the understanding of the general residents, the public awareness survey was conducted at the time of starting the project (in 2016) and ending the project (in 2018) to see if the understanding was deepened regarding the meaning of the sewage system, the way it is used, and its influence and effect on their daily life[41].

(5) Project Purpose: UCP's capacity of administration and O&M management for the facilities constructed by "the Panama City and Panama Bay Sanitation Project" is improved.

Indicator ①: Organizational structure, duties and necessary staffing of UCP are drafted.
Indicator ②: Monitoring of wastewater quality is conducted regularly.
Indicator ③: The sewerage facilities are managed based on the plans developed in the Project (i.e, the monitoring plan, O&M plan, etc.).

Indicator ① and ③ are achieved, as stated in Outputs 1 and 3. Indicator ②, regarding the management of large-scale wastewater sources, is not fully accomplished, as stated in Output 2. The assessment of water quality at the influent and effluent points is implemented, as stated in 4.3.1.1.

In the light of above, project objective is considered to be largely achieved.

3.3.3.2 Impacts [Technical Assistance Project Related to ODA Loan]

(1) Overall Goal: Mitigation measures for Panama Bay's pollution are conducted sustainably in Panama Metropolitan Area.

[41] "The public awareness survey report" (June 2018), the Panama Metropolitan Area Wastewater Management Improvement Project.

Indicator: The situation of wastewater management is periodically reported.

It is highly expected that the overall goal will be accomplished. The water quality of the rivers is supposed to be monitored periodically by the Ministry of Environment and is actually put into practice. The quality of public water at Panama Bay is monitored at a fixed point by the private laboratory contracted by UCP. This system is considered to continue from now on.

(2) Other indirect impact

UCP is now instructing to the business entities (such as restaurant), in addition to the large-scale wastewater sources guided during the project, which is evidence of UCP's voluntary activity to improve water quality. Also, the Technical Assistance Project Related to ODA Loan influences the cooperation of other donors. For example, the method to study and judge the condition of the existing sewage network proposed by the Technical Assistance Project Related to ODA Loan is now utilized for the Terms of Reference of the soft component of the loan project by World Bank.

This project (ODA Loan and Technical Assistance Project Related to ODA Loan) has largely achieved its objectives as planned. Therefore, the project's effectiveness and impacts are high.

3.4 Sustainability (Rating: ③)[ODA Loan Project] [Technical Assistance Project Related to ODA Loan]

From now on, the sustainability attributed to both ODA loan project and the Technical Assistance Project Related to ODA Loan will be explained.

At the time of project formulation, the facilities were expected to be transferred to IDAAN when the project was completed. However, IDAAN's organizational capacity was not enough to manage the sewage facilities, so UCP, which was supposed to be CP only during the construction of the facility, is still responsible for its operation and maintenance as an executing agency. The actual operation and maintenance at the site are commissioned to the private company, and UCP is responsible for monitoring its performance.

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

At UCP, 100 staff members are engaged in their job in 9 departments (at the time that the responsibility to supervise the facility's operation was transferred to UCP from a privately commissioned company in 2014, the staff consisted of 26 members). None of

the staff members have experience supervising the operation of the secondary-level wastewater treatment plant. However, the staff members, with the capacity to be strengthened to bear the duty, have been recruited through public announcement by setting the specific requirement in their professional and academic career necessary to execute their job. Through this recruitment system, the institutional system is ready to respond to the technical demands. The department with insufficient number of staff executes the duties without problems, hiring the temporary staff. As the UCP expanded, the new staff with less experience in the sewage system participated. However, in the system that includes senior staff with more experience, the staff can judge the issues appropriately. UCP has acquired 3 types of ISO (9001 (quality management), 14001 (environment management), and 18001 (labour safety and hygiene), and makes effort towards organizational capacity building.

Table 7: Staff allocation in each department of UCP and required expertise at the time of recruitment (at the time of February 2019)

Department	Number of staff	Allocation of staff number*	Required job/academic background at the time of recruitment
Project management	17	Insufficient	Engineering/Experience in construction and execution of contracts/Project management
Operation and maintenance	15	Sufficient	Engineering/Management/Operation and Maintenance experience
Engineering	7	Insufficient	Engineering/Experience in study and projects design/Geographic information system knowledge
Social and Environmental consideration	15	Insufficient	Engineering/environmental impact assessment/Sociology/Industrial and occupational security
Accounting and Finance	23	Sufficient	Administration careers/Finance and Accounting/ Experience in Government purchases
Publicity and communication	5	Sufficient	Communication and Journalism/Publicity and marketing experience/Digital design
Legal and Contract	7	Sufficient	Law and political science/Fidic contracts experience/Experience in making contract with public institutions
Planning	6	Sufficient	Administration careers/Industrial engineering/ ISO international standards experience
Coordination	5	Sufficient	Business Administration/Industrial engineering/ Project management
Total	100		

Source: documents presented by executing agency

* Sufficient or not sufficient is the recognition of CP at the time of ex-post evaluation

UCP was set up to be an executing agency for ODA Loan, “Panama City and Panama

Bay Sanitation Project." Recognizing its competency to execute the duties, it is responsible for the operation and maintenance of the facilities, instead of IDAAN, after the project's completion. However, to secure its organizational stability to be involved in the sewage business, the bill to make UCP a public enterprise was presented and approved by the cabinet. Then, it was passed to the congress for discussion, but it could not be approved during the Valera administration. Even though UCP could not be transferred to the public enterprise, UCP provides the sewage service to the residents in the Panama metropolitan area, which occupies roughly 60% of the customers in the whole country at the time of ex-post evaluation. Also, UCP is expected to be responsible for the operation and maintenance of the new sewage treatment system in the Arraijan and Chorrera cities from now on. Considering these facts, it can be said that the donors' appreciation towards UCP's performance is high[42], and no organization other than UCP can shoulder the responsibility for the sewage business in effect.

The convention between MINSA and IDAAN defines that UCP will be responsible for the operation and management of the sewage facility up to 2025. However, considering the IDAAN's situation (refer to" 3.4.5 Organizational, Technical and Financial Aspect and Status of Operation and Maintenance of IDAAN"), many stakeholders consider it difficult for IDAAN to bear the duties to operate and maintain the sewage facility in 2025, and it would be practical for UCP to keep shouldering the current responsibility for a while afterwards.[43]

Based on these situations, as for the institutional/organizational aspect of operation and maintenance, even though UCP is not a permanent organization, its stability as an organization responsible for the sewage business can be admitted.

3.4.2 Technical Aspect of Operation and Maintenance

The technical capacity of UCP was fostered as stated in "3.3.3.1 Effectiveness of Technical Assistance Project Related to ODA Loan". The necessary capacity to supervise the operation and maintenance of the facilities (e.g., wastewater treatment plant, sewage network, collectors, and interceptors) of the privately commissioned company is acquired through the organizational creativity and effort. The technical level of the private company is also enough to operate and maintain the facilities, even though some room for improvement still remains.[44] Public awareness towards the general people is planned annually and executed actively by the Social & Environmental department, such as the

[42] According to the interview with JICA, IDB, and CAF.
[43] According to the interview with IDB, CAF, IDAAN, and JICA.
[44] According to the interview with the Japanese experts assigned to the Technical Assistance Project Related to ODA Loan.

awareness programmes at communities and others collaborating with schools and AAUD, as well as the inspection visit at JDWWTP. In these activities, the pamphlets created by the project were utilized, and the video was also created based on the pamphlets to be distributed to the residents and schools。 In the space where the expanded wastewater treatment facility is constructed, a facility for public relations is to be established to receive the inspection visitors.

On the other hand, monitoring of the large-scale wastewater sources is stagnate without an implementing body.

3.4.3 Financial Aspects of Operation and Maintenance

The following is UCP's budget and expense amount in the last three years, as well as the contract amount with the private company that operates and maintains the facility.

Table 8: UCP's budget and expense amount in last 3 years

(Unit: thousand dollars)

Items	2016	2017	2018	2016	2017	2018
	Budget			**Expense**		
Administrative expenses	4,491,	5,935	6,386	3,497	2,701	5,441
Civil works	65,338	84,050	80,741	55,996	59,851	61,915
Designs and Supervision	14,264	17,225	14,724	11,859	11,584	12,080
Institutional strengthening	3,207	4,327	1,029	3,131	2,654	713
Operation and maintenance	31,011	39,352	48,714	17,373	35,467	33,672
Total	**118,311**	**150,888**	**151,593**	**91,855**	**112,258**	**113,820**

Source: Documents presented by executing agency

Table 9: Contract amount for operation and maintenance of JDWWTP and sewage network, collectors, and interceptors

(unit: thousand dollars)

	2016	2017	2018
SOAP[45](for sewage network collectors and interceptors)	9,271,119	19,882,269	26,134,099
SUEZ[46] (for JDWWTP)	8,101,545	15,585,182	7,537,991
Total	**17,372,664**	**35,467,451**	**33,672,091**

Source: Documents presented by executing agency

[45] Servicios Operativos de Alcantarillado de Panamá
[46] https://www.suez.com/en

All the budget for UCP is shouldered by MINSA under investment budget, whose amount occupies 5% of the total budget. While, some stakeholders are sceptical that MINSA can keep bearing this amount, and the donors who provide the fund to UCP consider that the budget necessary to maintain the current situation would be secured for a while.

3.4.4 Status of Operation and Maintenance

The entity who operates and maintains the sewage treatment system at the site is the private company specialized in that task. The duty to manage JDWWTP is borne by SUEZ, and the sewage network, collectors, interceptors, and pump station are borne by SOAP.

Management of facility by SCADA

SUEZ is the multinational company specialized in hygiene, environment, and waste management, whose headquarters is located in France. The recruitment and capacity building according to the headquarters' policy are observed in any branch in the world, as it is in Panama. The appropriate recruitment system to hire the competent staff, the on-the-job training, and the proper promotion are put into practice. The operation and maintenance of JDWWTP are done by SCADA[47], which is the system administration and process control by computer. The capacity-building programmes, aligned with the demands, are offered through online trainings by the University of California Los Angeles (hereinafter UCLA), Sacrament School, one of which is the acquisition of how to use SCADA. The manual and guideline related to the operation and maintenance of the JDWWTP are equipped at the office, which can be utilized when necessary. Through these system and capacity building, 40 permanent staff and 13 temporary staff operate and maintain the facility for 24 hours for 365 days.[48]

[47] Abbreviation of Supervisory Control And Data Acquisition. Supervisory Control and Data Acquisition is one of the industrial control systems. Most of them are related to the production process or infrastructure facilities to manage the system and control the process through computer. In this project, this system is introduced to manage and control the wastewater treatment plant.

[48] 9 departments are established, such as administration, finance, human resources, procurement, maintenance, operation, process coordination, water quality monitoring, and total coordination to execute their duties.

SOAP has taken care of the sewage network, collectors, interceptors, and pump station since 2015 (from 2013 to 2015, SUEZ was responsible for that). SOAP, utilizing 140 staff, takes care of the 300-km sewage system (network, collectors, and inceptors) controlled by UCP for its preventive inspection. SOAP also responds to the residents' complaints in UCP's control area, as well as those in IDAASN's control area, which covers 1200-km. Half of the 140 staff in SOAP belong to the department of operation and maintenance to execute its duty.[49]


SOAP staff fixing the clog in sewage

Both SUEZ and SOAP elaborate on the activity plan weekly, monthly, and annually, sharing with UCP to execute their duty. These private companies and UCP share the issues and discuss the measures to be taken accordingly through the communication, such as monthly, quarterly, half a year, and annual report, as well as assign the resident staff of UCP at JDWWTP and the weekly meeting. No communication problem has been found.

3.4.5 Organizational, Technical and Financial Aspect, and Status of Operation and Maintenance of IDAAN

Originally, the sewage business was to be borne by IDAAN. However, it is mainly engaged in the drinking water business, and not enough resources are allocated to the sewage business.

Several donors have performed the capacity building of IDAAN's staff, primarily by IDB, but still the number of staff engaged in the operation and maintenance of the sewage business is few (i.e., 44 staff at the time of ex-post evaluation), and the budget allocation is not enough. These staff's main business has been to respond to the residents' complaints about sewage system.

Even though the capacity building of IDAAN' staff has been completed, it has been difficult for the new technology to take root in the organization, and the staff members who participated in the training were likely to rotate to the other section. Even though the revised tariff table to the sewage service was suggested, it could not have been put into practice due to political reasons.

[49] Other than these departments, the technique, monitoring, contract, and social and environment department are established.

The opportunity to strengthen the staff and organization of IDAAN has been presented, but these efforts could not show their effects, and the financial situation has not improved.[50]

In light of the above, UPC, which will be responsible for this project from now on, has no major problems in the institutional/organisational, technical, financial aspects, as well as in the current status of the operation and maintenance system. Therefore, the sustainability of the project's effect is high.

Colum: Appropriate selection of CP and project formulation through discussion

In Panama, since the beginning of the 1990s, the expansion of the sewage facilities has been tackled head-on. Many sector studies have been conducted. The IDAAN, which is responsible for the sewage business by law, had some organizational problems, so supports, such as the organizational analysis and its strengthening, have been offered. However, it has been difficult to see the effect.

Around 2000, there were different opinions regarding the sewage business. One opinion was that Panama should construct a first-level wastewater treatment facility to start instead of a costly secondary-level facility (idea of IDB). Another idea was that, in order to let Panama progress as an international state making use of its geographical advantage, the secondary-level wastewater treatment facility should be constructed with certain burden as an investment (government of Panama's idea).

During such a discussion, in December 31, 1999, the government of Panama regained the right to administer and operate the Panama Canal from U.S. Obtaining this right, the movement has been growing so that the Panama will achieve economic growth through activation of the tertiary industry, such as international finance, real estate, and tourism (including organizing the international convention), as well as the logistic industry, mainly with the operation of the Panama Canal.

This project was formulated in such a mood and background.

At the beginning, the government of Panama and IDB had different ideas regarding the specification of the wastewater treatment plant (the first- or the secondary-level facility), as well as regarding the executing agency. The government of Panama preferred to establish the new

[50] The donors suggested a revised tariff table for sewage service with a metered rate. However, after political consideration, its system has not been put into practice. (Most of the households are not equipped with the meter. Even if they are equipped, they are not used) In practice, 6.2 dollars per household are charged across the board, but not with the metered rate (with the assumption of 400 gallons of drinking water per day per 5-member household; 80% will be wastewater). In addition, the fee for sewage service can be collected only from the residents who voluntarily come to the office to pay. So, the fee corresponding to the cost is not collected.

organization attached to the MINSA (which is UPC) in order to assign the sewage business to improve the hygiene condition in the metropolitan area, instead of IDAAN, which could not significantly improve its ability, even with the capacity-building programme. On the other hand, IDB had an idea that IDAAN, which is expected to take care of the sewage business, should strengthen its capacity, and ought to be the CP as an executing agency.

JICA (JBIC at that time) took an intermediary role in this situation from the partial position to facilitate the discussion in order to consider how the hygiene improvement and sewage business should be in the Panama. As the government of Panama (Ministry of Finance and Economy, and MINSA), IDB, and JICA continued this hot discussion for a long time, they reached the common opinion that this "Panama City and Panama Bay Sanitation Project" would be one of the means to formulate the new county. Finally, the idea to construct the secondary-level wastewater treatment plant was developed. At the same time, the consensus that the executing agency should be the new agency, UCP, established as an affiliation of MINSA, instead of IDAAN, which had no improvement despite the long-term support for organisational reformation, was arisen among the three parties.

At the time of ex-post evaluation, UPC is designated as an executing agency of the new sewage-related project by many donors, such as IDB, CAF, EIB, and so on.

4. **Conclusion, Lessons Learned and Recommendations**

4.1 Conclusion

This project was implemented to improve the water quality of Panama Bay and heavily contaminated rivers by constructing and repairing the sewage treatment system and the network of interceptor and collectors and sewage pipes, thereby contributing to the amelioration of life and the hygienic environment of the people within the Panama metropolitan area. This will also contribute to the development of the tertiary industry, such as the promotion of tourism, which is the core industry of the country.

This project is consistent with the development policy of the government of Panama that aims to improve the hygienic condition of the people and its development needs to alleviate the contamination and bad smell of the Panama Bay and rivers, as well as Japan's ODA policy to consider environmental conservation an important area. Thus, the relevance is high. Regarding the effectiveness, most of the operational and effective indicators were achieved. Positive impacts are seen in the improvement of water quality and daily life environment as well as tourism, which is the country's main industry.

Owing to the implementation of the Technical Assistance Project Related to ODA Loan, the capacity to supervise the operation and maintenance of the facilities was strengthened,

the necessary budget was secured, and the facilities were maintained and managed properly. On the other hand, since the executing agency of this project was established within the Ministry of Health, the bill to transform the agency to the public enterprise was submitted in order to secure its stable status, but it was not approved. However, most of the stakeholders related to wastewater management recognize this agency as the only organization that can be responsible for this sector, and its organizational stability is secured with a certain level for a while. In light of the above, the sustainability is high.

Meanwhile, the project cost was significantly higher than planned, and the project period also exceeded the plan. So the efficiency is low.

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

4.2 Suggestions

4.2.1 Suggestion to the Government of Panama

・For the Panama city, whose key industry is the tertiary industry, such as international finance and tourism, it is indispensable that to offer the hygienic environment by the sewage business. Even though the bill to transform UCP to the public enterprise was not approved, it is expected to establish the organization who can continuously execute their responsibility of sewage business so that the hygiene condition in the Panama metropolitan area can be maintained and improved from now on.

4.2.2 Suggestion to the executing agency (UCP)

・It is expected that UCP measures the effect of the sewage business by periodical monitoring of the water quality. In case that the abnormal figure be found in the indicator, it is recommended to specify the contamination source and take any action necessary to continue and expand the effect currently appeared.

4.2.3 Suggestion to JICA

It would be important to take any action necessary so that the effect of this project might be continue (improvement of the capacity of the executing agency, the continuous operation and maintenance of the facilities, and improvement of the hygiene situation of the general public), grasping the discussion to establish the organization responsible for the sewage business stably.

4.3 Lessons

The selection of effective and suitable CP

The current effect produced by this project is attributed to the capacity of the executing

agency, UCP. However, originally UCP is not the permanent organization who executes the duties of sewage business. Appreciated their performance during the period of construction of the facility, they were assigned to shoulder the responsibility to operate and maintain the facilities, even after completion of the project (construction of facility), and also designated to be an executing agency for the new project. On the other hand, the IDAAN, who should originally be responsible for the sewage business, cannot play the significant role in this area without allocating the enough resources. If IDAAN would have been selected as an executing agency, it is sceptical to what extent the effect of this project could be appeared.

Meanwhile, it is true that the selection of UCP as an executing agency responsible for the operation and maintenance of the facility after completion of the construction, is now causing the issue how to secure the organizational stability.

In this project, the executing agency was selected by prioritising the production of the effects since it was difficult to attain the compatibility both holding organisational stability as well as producing the effects. As a result, UCP produced the effects, which brought the movement to change UCP into the organisationally stable institution. At the time of the ex-post evaluation, UCP has not achieved to become the public enterprise. However, the actual performance by UCP has brought the legitimacy to its own existence, and the more appropriate form to allow UCP to work is searched for. Consequently, if the appropriate implementing system be established, we can say that this project has contributed to the improvement of the hygiene condition and the creation of the base of the development of the tertiary industry.

The background how the UCP was selected as an executing agency was stated in Column. To judge which approach is appropriate, the utilization of the existing agency or the establishment of the new agency, depends on the situation of the target country. We do not have a universal solution which can be applied to any country. However, what is important is to discuss seriously what should be done in that country considering its situation, and try to find the best and suitable solution, referring the other success cases.

Comparison of the Original and Actual Scope of the Project

Items	Plan	Actual
Project Output		
Project borne by JICA		
Interceptor system	・West interceptor: 13,47 m ・Balboa collector: 3,883 m ・Rio Abajo collector: One connection ・Matiaz Hernandez collector: 1,900 m	・As planned ・Conducted by Government of Panama ・As planned ・733 m
Sewage treatment system	・Pump station: Main pump 1 (3 units) ・Pressure main: 5,150 m ・Sewage treatment system: Average per day: 2.20 m^3/s (190,000 m^3/d) Maximum per day: 2.75 m^3/s (238,000 m^3/d)	・Main pump 2 sets (5 units and 4 units) ・4,860 m ・Volume of treatment: As planned ・Installation of a main flow distribution chamber
Consulting service	・Designing and Preparation of tender document, Tender and support for contract, Supervision of construction process and its operation (873MM)	・duties are the same. Engaged MM has increased to 1,349.
Project borne by IDB		
Construction and repair of collector system	・Sewage network: 58 km ・Collector: 47 km ・Pump station: 9 sites ・Pressure main: 8 km	・88.3 km ・77.94 km ・2 sites ・As planned
Capacity building of IDAAN	・user registry ・Installation of house meters ・Study on rate policy setting (tariff study) ・Communication and education activities ・Training for IDAAN staff and so on	・As planned ・As planned ・As planned ・As planned ・As planned
Government of Panama		
	No plan	Balboa collector: ・Collector: 4,830 m ・Pump station: 3 sites ・Inspection manhole: 30 sites
②Project Period	March 2007-November 2015 (104 months)	June 2007-May 2017 (120 months)
③Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	24,637 million yen 7,924 million yen (68 million dollars) 32,561 million yen 19,371 million yen 1 dollar=117 yen (November 2006)	46,255 million yen 22,417 million yen (225.2million dollars) 68,672 million yen 22,427 million yen 1dollar=99.54 yen (Average between 2007-017)
④Final disbursement	October 2016	