

Republic of Indonesia

FY2018 Ex-Post Evaluation of Japanese ODA Loan

“Denpasar Sewerage Development Project (II)”

External Evaluator: Kenichi Inazawa, Octavia Japan Co., Ltd.

## **0. Summary**

This project involved the expansion of existing sewage treatment facilities (culverts) and development of implementation system related to sewage treatment by the local government, in order to improve the living environment and conserve the natural environment, by expanding the sewerage service coverage rate and establishing an operation and maintenance system led by the local government in the Denpasar, Kuta and Sanur areas on the island of Bali. The importance of developing basic sanitation infrastructure is indicated through *the National Medium Term Development Plan* formulated by the Government of Indonesia and *the Bali Provincial Medium Term Development Plan* formulated by the Bali Provincial Government, and consistency with Japan’s ODA policy and the development needs for sewerage and sanitation facilities in Southern Bali is confirmed. Thus, relevance of this project is high. As for efficiency, project outputs exceeded the initial plan slightly, but project cost was within the initial plan mainly due to the influences of foreign exchange rate fluctuations. The project period exceeded the initial plan due to delays, etc., in sewerage and connection works for homes, etc. Consequently, efficiency is fair. In regard to quantitative effect indicators (wastewater treatment population, wastewater treatment volume, tariff collection rate, and BOD/COD at discharge, etc.), while a certain degree of improvement is observed, most indicators fell short of the initial target figures. In addition, at the time of the ex-post evaluation, no improvement is observed in the disposal of garbage at sewerage facilities in Southern Bali, and thus it cannot be determined whether progress has been made with environmental conservation. Based on the above, the project’s effectiveness and impact is fair. Given some concerns about the institutional and maintenance situation of the project due to a shortage, etc., of maintenance workers in charge of operation and maintenance, sustainability of the effects realized through this project is fair.

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

## 1. Project Description



Project Location



Manhole-type Pump Station  
Developed under this Project

### 1.1 Background

Denpasar, Kuta areas, and Sanur areas, the main cities in Southern Bali, have had a high concentration and growing number of commercial facilities, along with robust population growth. As urbanization progressed, huge volumes of wastewater were produced by commercial facilities and homes, but sewerage and sanitation facilities were underdeveloped. There were concerns that wastewater would flow directly into waterways or the ocean, raising further concerns about major impacts on the marine environment, a tourism resource for the island, along with the natural environment and living environment that could occur in the future. Amidst this situation, JICA approved an ODA loan for the Phase I project in November 1994 that involved the laying of sewerage lines as well as the construction of a pump station and sewage treatment facilities for Denpasar, Sanur area and Legian/Seminyak area, which had particularly urgent needs. Meanwhile, following further economic development, population growth and urbanization, there was growing demand for the development of additional sewerage and sanitation facilities in regions with urgent needs that had many commercial facilities and regions with strong requests made by residents, both of which were not covered by the Phase I project. As a result, this project was implemented as a continuation of the Phase I project.

### 1.2 Project Outline

The objective of this project is to expand the sewerage service coverage rate and establish local government-led operation and maintenance system related to the sewage project, by extending the existing sewage treatment facilities (culverts) and implementing sewage treatment project implementation system in the Denpasar, Kuta areas and Sanur areas, thereby contributing to

improve the living environment in the areas and conserve the natural environment.

Loan Approved Amount/ Disbursed Amount	6,004 million yen/ 5,847 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 28, 2008 / March 28, 2008
Terms and Conditions	<p>Main: Interest rate 0.65%  Repayment Period : 40 years  (Grace Period: 10 years)  Conditions for Procurement: General Untied</p> <p>Consultant: Interest rate 0.01%  Repayment Period: 40 years  (Grace Period: 10 years)  Conditions for Procurement: General Untied</p>
Borrower / Executing Agencies	The Directorate General of Human Settlements (hereinafter, “DGHS”) under Indonesia’s Ministry of Public Works and Housing is the executing agency, but the DGHS Bali Branch (hereinafter, “PPLP BALI”) is responsible for duties locally. In addition, the sewage management and technology department of the Bali Provincial Government (hereinafter, “UPT-PAL <sup>1</sup> ”) is in charge of the operation and maintenance.
Project Completion	This project is judged as ongoing at the time of ex-post evaluation <sup>2</sup>
Target Area	Denpasar, Sanur and Kuta areas, in Bali Island
Main Contractor (Over 1 billion yen)	<ul style="list-style-type: none"> <li>• PT. WaskitaKarya (Indonesia) / PT. WijayaKarya (Indonesia) / PT.AdhiKarya (Indonesia) (JV)</li> <li>• PT. PemBangunanPerumahan (Indonesia) / Tokura Corporation (Japan) / Toa Corporation (Japan) (JV)</li> </ul>
Main Consultant (Over 100 million yen)	• Yachiyo Engineering Co., Ltd. (Japan)
Related Studies (Feasibility Studies, etc.)	「 Master Plan for Denpasar Sewerage Development Plan 」 (1993, JICA)
Related Projects	<b>【ODA Loan】</b> Denpasar Sewerage Development Project I (1994, JICA)

<sup>1</sup> Bali’s provincial public sewerage services company (hereinafter, “BLUPAL”), which was the entity responsible for operation and maintenance changed its name to UPT-PAL in April 2011.

<sup>2</sup> The situation will be explained in 3.2.1 Efficiency and Outputs.

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

### 2.2 Duration of Evaluation Study

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

Duration of the Study: October 2018—November 2019

Duration of the Field Study: 6—19 January 2019 and 7—14 April 2019

## 3. Results of the Evaluation (Overall Rating: C<sup>3</sup>)

### 3.1 Relevance (Rating: ③<sup>4</sup>)

#### 3.1.1 Consistency with the Development Plan of Indonesia

Prior to the start of this project, the Government of Indonesia formulated *the National Medium Term Development Plan (2004 - 2009)*, which called for an increase in the supply of efficient, high quality and basic sanitation services on a country-wide scale at a fair price for all levels of society. In addition, the plan cited the need to improve the frequency of use of human waste treatment facilities and sewerage treatment facilities, more rapidly develop wastewater treatment services, and expand in stages the coverage of the urban collective sewage treatment system. In addition, the government emphasized the strengthening of the financial capacity of sewerage systems, etc., citing the need to improve access to sewerage treatment facilities in urban areas and rural areas, as a basic policy for the sewerage sector.

At the time of the ex-post evaluation, *the National Medium Term Development Plan (2015 - 2019)* formulated by the Government of Indonesia has stated that environmental impacts will be reduced through the management of sewage and solid waste, along with controls placed on environmental pollution. Meanwhile, the Bali Provincial Government has formulated *the Bali Provincial Medium Term Development Plan (2013 - 2018)*, which advocates for policy planning considerate of the environment and basic sanitation as well as the development of infrastructure taking into account conservation of the natural environment. This plan also states the need for protection of reservoirs, national borders (roads, rivers, gorges, coastlines), and protected areas of gorges. As one specific measure, the plan considers the management and reinforcement of solid waste and wastewater facilities of importance.

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<sup>3</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>4</sup> ③: High, ②: Fair, ①: Low

In light of the above, at the time of the project's appraisal through to the time of the ex-post evaluation, the need for considering the environment and basic sanitation as well as the development of sewerage infrastructure was considered important nationwide in Indonesia and Bali Province. Consequently, at the time of both the project's appraisal and ex-post evaluation, the consistency of this project with policy and measures is acknowledged through the national plan and sector plan.

### 3.1.2 Consistency with the Development Needs of Indonesia

Prior to the start of this project, the Denpasar, Kuta areas and Sanur areas, the main cities in Southern Bali, had a high concentration and growing number of commercial facilities, along with robust population growth. Urbanization resulted in a large volume of wastewater. The development of sewerage and sanitation facilities was insufficient and there were concerns that wastewater would flow directly into waterways or the ocean, impacting the marine environment, a tourism resource for the island, along with the natural environment and living environment. Therefore, JICA approved a yen loan for the Phase I project in November 1994 that involved the laying of sewerage lines as well as the construction of a pump station and sewage treatment facilities for Denpasar, Sanur areas and Legian/Seminyak areas, which had particularly urgent needs. Meanwhile, following further economic development, population growth and urbanization, there was strong demand for the development of additional sewerage and sanitation facilities in regions with urgent needs that had many commercial facilities and regions with strong requests made by residents, both of which were not covered by the Phase I project.

As a result of this project, the sewerage coverage area has been expanded in Southern Bali (Denpasar city, Sanur area, Kuta area). The island's tourism industry and economy up to the time of the ex-post evaluation experienced strong growth, and with the number of commercial facilities, such as hotels and restaurants, and homes in Southern Bali also growing, there is growing demand for the additional development of environmental infrastructure. As one example, reviews are underway on a subsequent project (Phase III project<sup>5</sup>) with the purpose of expanding the sewerage coverage area and increasing the capacity of sewage treatment plants. Additionally, reviews are underway regarding additional development in areas of the island outside of Southern Bali. Specifically, this area includes Tanjung Benoa, Tanah Lot, and Ubud, where there is a high

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<sup>5</sup> The target areas of the project are Denpasar and vicinity (Denpasar, Sanur areas), Badung Regency (Kuta area, Legian area, and Seminyak area). These areas are not covered in the first and second phases and expect to see population growth and industrial development in the future.

concentration of visiting tourists.

In light of the above, at the time of the project's appraisal through to the time of the ex-post evaluation, the development of sewerage facilities on Bali was recognized as a major issue, and this project is judged to have a high consistency with development needs both at the time of the project's appraisal and at the time of the ex-post evaluation.

### 3.1.3 Consistency with Japan's ODA Policy

In the Country Assistance Program for Indonesia formulated by Japan's Ministry of Foreign Affairs in November 2004, "democratic and fair social development" was cited as a key field and includes management of natural resources and development of urban environment. Additionally, *the Overseas Economic Cooperation Operation Policy* prepared by JICA in April 2005 positioned "infrastructure development for sustainable economic growth" as a key field and stated assistance will be provided in order to promote sustainable economic growth through economic and social infrastructure development, including water supply and sewerage.

In light of the above, this project aligns with the said principles and key items, and is acknowledged to be consistent with Japan's ODA policy, since it assists with economic and environmental infrastructure in the Denpasar vicinity on the island of Bali, which has seen sewerage development needed for sanitation and environmental conservation lag behind and experienced rapid urbanization and tourism development.

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

## 3.2 Efficiency (Rating:②)

### 3.2.1 Project Outputs

This project provided assistance in Denpasar, Kuta areas and Sanur area for the laying of sewerage culverts and procurement of related equipment as well as capacity building for the operation and maintenance system using consulting services. Table 1 presents the project's output plan and results.

Table 1: Planned Outputs and Actual Results of this Project

Plan at the time of the appraisal (2007)	Results at the time of the ex-post evaluation (2018)
<b>1) Details of civil works and procurement of equipment</b>	
<p>a) Laying of sewerage culverts (main pipes, secondary pipes, and connections to homes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: main pipes and secondary pipes (27,500m) and connections to homes, etc. (1,900 units)</li> <li>• Sanur: main pipes and secondary pipes (8,000m) and connections to homes, etc. (3,200 units)</li> <li>• Kuta: main pipes and secondary pipes (22,980m) and connections to homes (3,600 units)</li> </ul> <p>b) Procurement of equipment for operation and maintenance *Detailed information not available</p> <p>c) Procurement of other related equipment (manholes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: manholes (800), manhole-type pump stations (hereinafter, “Wet Pits”) (5)</li> <li>• Sanur: manholes (155) and Wet Pits (2)</li> <li>• Kuta: manholes (480) and Wet Pits (4)</li> </ul>	<p>a) Laying of sewerage culverts (main pipes, secondary pipes, and connections to homes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: main pipes and secondary pipes (34,350m; increased versus the plan) and connections to homes, etc. (about 2,800 units; increased versus the plan)</li> <li>• Sanur: main pipes and secondary pipes (19,762m; increased versus the plan) and connections to homes, etc. (around 1,100 units; decreased versus the plan)</li> <li>• Kuta: main pipes and secondary pipes (50,789m; increased versus the plan) and connections to homes, etc. (about 2,600 units; decreased versus the plan)</li> </ul> <p>b) Procurement of equipment for operation and maintenance (1 water jet cleaner [4-ton class], 1 vacuum cleaner [4-ton class], 1 water tanker [4-ton class], 6 sewerage vacuum cars, 2 dump trucks for carrying sludge [4-ton class], 2 trucks with cranes [4-ton class], 1 forklift [1.5-ton class], 2 mobile gas detectors, 4 pickup trucks, 5 sewerage cleaners, 2 ventilation fans, and 2 tripods, etc.)</p> <p>c) Procurement of other related equipment (manholes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: manholes (713; decreased versus the plan), Wet Pits (3; decreased versus the plan)</li> <li>• Sanur: manholes (511; increased versus the plan), Wet Pits (1; decreased versus the plan)</li> <li>• Kuta: manholes (1,128; increased versus the plan), Wet Pits (6; increased versus the plan)</li> </ul>
<b>(2) Consulting services</b>	
<p>Assistance for bidding, construction supervision, and support for capacity building of operation and maintenance system</p>	<p>Implemented as planned. (However, in addition to at left, additional consulting was provided on the detailed design of the Phase III project expected to take place after this project)</p>

Source: Document provided by JICA, UPT-PAL’s answers to the questionnaires and site survey (actual at the time of ex-post evaluation).

The following provides analysis concerning the differences between the plan at the time of the

appraisal and the results at the time of the ex-post evaluation appearing in Table 1:

1) Details of civil works and procurement of equipment

a) Of the sewerage culverts, the laying of the main pipes and secondary pipes generally increased compared to the initial plan. The reason for this increase is cited as the expansion of target areas and extension in pipe laying at the time of the detailed design based on expectations of rising sewerage demand after the start of the project. In contrast, as for connections to homes, etc., first, connections did not achieve the plan in the Sanur area under the jurisdiction of Denpasar. The main factor for this is that the Bali Provincial Government and Denpasar City Government were late in allocating the budget needed for sewerage and connection works for homes, etc., which caused these works to be delayed. According to UPT-PAL, in charge of the operation and maintenance of the project, at the time of the ex-post evaluation, progress has been made with budget allocation and there are no impacts on the progress of construction. The same connection work is being carried out in conjunction with the expansion of the target area in Denpasar<sup>6</sup>. In regard to the Kuta area under the jurisdiction of Badung Regency, according to the regency's government office, the necessary budget has already been allocated, but time is required for the procedures and implementation of these works<sup>7</sup>. It expects these works to be completed within several years. Taking the above situation into account, at the time of the ex-post evaluation this project is not judged to be complete.

(Supplemental explanation: Number of sewerage and connection works for homes, etc.)

According to JICA documents, the total number of sewerage and connection works under Phase I and this project (Phase II) is 16,200 units. The results at the time of the ex-post evaluation (as of December 31, 2018) indicated this number to be about 14,000 units. The composition ratio of connections up to the time of the ex-post evaluation is around 87% for homes, about 3% for hotels, 1% for restaurants, 6% for commercial facilities, and about 3% for public institutions and others, indicating the ratio for homes is the highest. In principle, the cost required for these connection works is borne each by the Bali Provincial Government, Denpasar City Government, and Badung Regency.

Table 2 shows changes in the number of sewer connections (cumulative total) from the Phase

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<sup>6</sup> According to Denpasar City Government, the sewerage and connection works for homes, etc., will be completed by between 2020 and 2021.

<sup>7</sup> According to a person in charge at Badung Regency, there are many commercial areas in Kuta and local residents claim that sewerage and connection works inhibit the smooth movement of people and cars, while retail business owners of shops have indicated concerns about their business operations. As such, this is a factor behind the time needed for negotiations and procedures.



I and II projects. The number of works is increasing each year.

(Reference) Table 2: Changes in the Number of Sewer Connections (cumulative total) \*Note

(Unit: cumulative total unit)

2014	2015	2016	2017	2018
7,624	10,371	12,211	13,350	About 14,000

Source: UPT-PAL

Note: This table indicates the total value of Phase I and II project areas.

b) Procurement of equipment for operation and maintenance

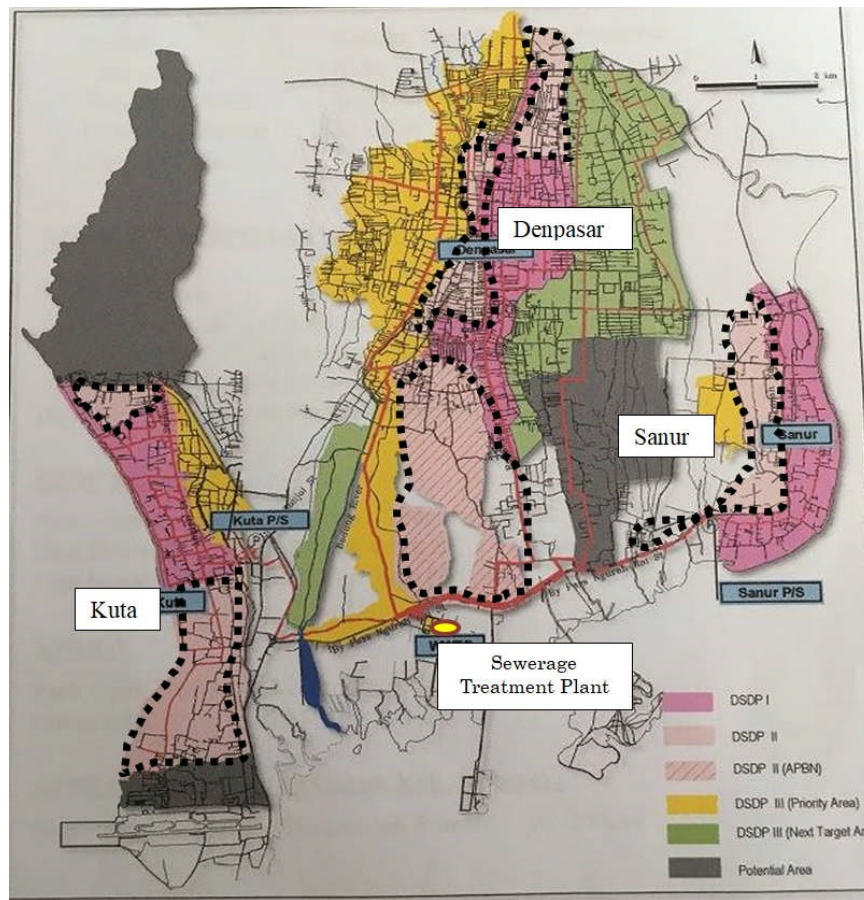
Although no detailed procurement scope was established at the time of the project's appraisal, procurement was narrowed down through the detailed design and the equipment shown in Table 1 was procured.

c) Procurement of other related equipment (manholes, etc.)

The difference between the plan and the results is due to changes made at the time of the detailed design. In regard to the number of manholes and Wet Pits, a difference was observed due to expanded sewerage demand as discussed above, as well as the results of further detailed surveys of the topography and height differences, etc. of the sites at the time of the detailed design.

(2) Consulting services

The scope at the time of the project's appraisal was implemented as planned. The detailed design of Phase III was added as the TOR of the same service. The detailed scope includes an expansion of the sewerage target areas in Denpasar, Sanur and Kuta (1,278ha), expansion of existing sewerage treatment capacity (currently: 51,000 m<sup>3</sup>/day to 81,000 m<sup>3</sup>/day in Phase III), and additional connections to sewerage, etc.



Source: PPLP BALI and UPT-PAL

Figure 1: Locations of Project Sites (Target Project Areas)  
 (The area inside the black dotted line indicates the target area of this project [Phase II]). The dark pink area indicates the area developed in the Phase I project. Yellow and green colored areas indicate the area expected to be developed in the Phase III project.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The total project cost at the time of the project's appraisal was planned to be 8,004 million yen (of this 6,004 million yen was covered by yen loans). The actual total project cost was 7,229 million yen (of this 5,847 million yen was covered by yen loans), which became within the plan (approx. 90% of the plan). The main reason for this is fluctuations in the foreign exchange rate. Although the number of sewerage culvert extensions increased, the total project cost was within the initial plan mainly because of the influence of the strong yen and weak rupiah during the project implementation.

### 3.2.2.2. Project Period

Table 3 shows the project’s initially planned and actual periods. At the time of the project’s appraisal, the project period was planned for the 6 years 4 months from February 2008 to May 2014 (76 months). However, the actual project period was the 10 year 11 month period from March<sup>8</sup> 2008 to January 2019 (131 months), exceeding the plan (approx. 172%<sup>9</sup> of the plan). Of this, the civil works in Denpasar and the Sanur areas were completed by April 2012 and by July 2013 for the Kuta area. At the time of the ex-post evaluation, however, as discussed above, given that connections to homes with the cost borne by local institutions have not been completed, the overall project must be considered incomplete per the definition of project completion, “the time of completion of construction (timing when construction is complete and the connections are officially registered),” and JICA’s rating standards for ex-post evaluation. In addition, regarding work on branch lines (tertiary), approval procedures inside the Bali Provincial Government are also delayed. Furthermore, consulting services were also extended<sup>10</sup>.

Table 3: Planned and Actual Periods

	Planned	Actual
(Whole project)	February 2008– May 2014 (76 months)	March 2008– January 2019 (131 months)
1) Consulting services	October 2009 – May 2014	July 2009 – March 2016
2) Procedures of bidding and contract	October 2008 – September 2009	January – October 2009
3) Civil Works	October 2009 – May 2014	October 2009 – December 2017

Source: JICA’s documents, Project Completion Report (PCR), UPT-PAL

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

#### Financial Internal Rate of Return (FIRR)

At the time of the project’s appraisal, the Financial Internal Rate of Return (FIRR) was expected to be 11.6%, taking revenue from sewerage tariffs as the “benefits”, the operation and maintenance costs (including upgrading of equipment) as the “costs” and assuming a project life after the start of services of 20 years. FIRR was recalculated using the same conditions and yielded

<sup>8</sup> The signing of the loan agreement took place in March 2008. The project period set forth in the ex-ante evaluation was said to start in February 2008. Although there was one-month gap, this is because the latter was the expected timing of the signing prior to the project’s appraisal, while the former was the actual timing of the signing. In other words, the start time for the project period is March 2008.

<sup>9</sup> This is compared to the case calculated at the time of the ex-post evaluation (January 2019). This is recognized as incomplete at the time of the ex-post evaluation; thus, the end of the project period is set as the time of the ex-post evaluation. Therefore, in actuality the project period is judged to be 172% or more of the plan.

<sup>10</sup> As discussed above, this means that the addition of the detailed design for the Phase III project also resulted in an extension of the project period.

14.3%, which is slightly higher than the figure at the time of the project’s appraisal (11.6%). This result is believed to be influenced by the significantly lower “costs” than expected at the time of the project’s appraisal along with benefits remaining generally as expected.

[Summary of Efficiency]

In regard to this project’s outputs, the number of sewerage culverts (main and secondary pipes) exceeded the initial plan. Project costs were within the initial plan mainly due to the influence of foreign exchange rate fluctuations (strong yen; weak rupiah). The project period exceeded the initial plan due to delays in sewerage and connection works for homes, etc. Based on the above, the project cost was below the plan and the project period exceeded the plan. Therefore, efficiency of the project is fair.

### 3.2 Effectiveness and Impacts<sup>11</sup> (Rating:②)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

Table 4 shows quantitative effect indicators (baseline, target and actual) of this project.

Table 4: Operation and Effect Indicators (baseline, target and actual) of This Project.

Indicators	Baseline (Actual in 2007)	Target *Note 1 (2016: two years after completion)	Actual				
			2013 (At the completion of the sewer construction)	2014 (After one year of the sewer construction)	2016 (After two years of the sewer construction)	2017 (After three years of the sewer construction)	2018 (After four years of the sewer construction)
Wastewater Treatment Population (Unit: number of people)	-	142,600	104,000 (73%)	106,300 (75%)	119,900 (84%)	124,000 (87%)	121,800 (85%)
Wastewater Treatment Volume (Unit: m <sup>3</sup> /day)	-	41,000	23,300 (57%)	23,843 (58%)	26,891 (66%)	27,800 (68%)	27,318 (67%)
BOD Concentration at Discharge <sup>12</sup> (Unit: mg/l)	-	20	No more than 50(Not achieved)	No more than 50(Not achieved)	No more than 50(Not achieved)	40.76 (Not achieved)	63.10 (Not achieved)
Tariff Collection	-	95	20 (21%)	20 (21%)	30 (32%)	37.36 (39%)	36.42 (38%)

<sup>11</sup> Sub-rating for Effectiveness is to be put with consideration of impacts.

<sup>12</sup> BOD stands for biochemical oxygen demand. BOD indicates the amount of oxygen required to decompose organic matter in water.

Rate (Unit: %) *Note2			N/A	N/A	N/A	70-80 (73-84%)	70-80 (73-84%)
Water Quality Improvement (Sindhu Beach, Sanur) (Unit: COD <sup>13</sup> at discharge= mg/l)	17.8	5.0	10.0 (Not achieved)	8.0 (Not achieved)	6.5 (Not achieved)	13.9 (Not achieved)	N/A
Water Quality Improvement (Reef Beach, Sanur) (Unit: COD at discharge= mg/l)	16.3	5.0	10.0 (Not achieved)	8.5 (Not achieved)	7.5 (Not achieved)	12.7 (Not achieved)	N/A
Water Quality Improvement (Kuta Beach, Kuta) (Unit: COD at discharge = mg/l)	12.4	5.0	9.0 (Not achieved)	7.5 (Not achieved)	6.5 (Not achieved)	9.2 (Not achieved)	N/A
Water Quality Improvement (Legian Beach, Kuta) (Unit: COD at discharge = mg/l)	15.8	5.0	9.0 (Not achieved)	7.5 (Not achieved)	6.5 (Not achieved)	N/A	N/A

Source: Baseline and Target are from JICA's documents. Actual figures are from Project Completion Report (PCR), answers from UPT-PAL, and Environmental Bureau of Bali Provincial Government (BLHD).

\*Note 1: Target value is including the effect in the Phase I project.

\*Note 2: The upper row of the actual value shows the collection rate based on the number of contracts, and the lower row shows the fee collection rate on the levy basis.

### 【Wastewater Treatment Population, Wastewater Treatment Volume】

According to UPT-PAL, the main factor was that the initial target for sewerage and connection works for homes, etc., was not attained, and actual figures have not reached target figures since 2013. As discussed above, however, within the next several years these works are expected to be completed; thus, the wastewater treatment population and treatment volume are expected to increase.

### 【BOD Concentration at Discharge】

At the time of project appraisal, the target value (20 mg/l) was initially set lower than the Bali government's environmental standard (100 mg/l). According to UPT-PAL, it was assumed that 20 mg/l was discharged without the accumulation of sewage sludge in the stabilization pond which is a part of sewage treatment facilities constructed under the Phase I project. The actual values in the table meet the governmental standard value, but in any case the target value is not achieved. The reason is that sewage sludge etc. has been accumulated at the time of ex-post evaluation (January 2019). Therefore, the BOD concentration tends to rise year by year. As of the time of the

<sup>13</sup> COD stands for chemical oxygen demand. COD indicates the amount of oxygen required to oxidize the oxidizable substances in water.

ex-post evaluation, UPT-PAL has plans for removal and disposal methods<sup>14</sup>, but it is desirable to proceed with sewage sludge removal and disposal promptly.

#### **【Tariff Collection Rate】**

The collection rate is nearly 100% from commercial facilities other than homes, etc., such as hotels and restaurants, etc., but the collection rate is low for homes at around 10%; thus, the tariff collection rate inside the top of the table remains stagnant. According to UPT-PAL, which is in charge of tariff collection operations, since 2016 a payment system was developed for ATMs and the Internet, while awareness is being raised through payment reminders by telephone to those who do not pay and regular information sessions for local residents, but these efforts have not led to fundamental improvements. The monthly sewerage tariff for homes is set low at 15,000 rupiah<sup>15</sup>, but people's awareness toward participation in administrative services or their awareness of sewerage projects or environmental issues could also be low. The Bali Provincial Government should work to review collection methods while continuing to engage in these initiatives. As one example, it is worth considering introducing a payment method that combines<sup>16</sup> this tariff with other public tariffs, such as water supply and sewerage or electricity and sewerage<sup>17</sup>. Furthermore, the lower tier of actual figures "70 - 80%" is the figure on a levy basis. As explained above, the collection rate is high for users other than homes. There are many hotels, restaurants and commercial facilities in Denpasar, Sanur and Kuta, and as one example, hotels are levied based on size and number of rooms and the collection amount is far and away high.

#### **【Water Quality Improvement of Each Point (COD)】**

The actual figure for COD (average figure) at four measurement points set up along the southern coast of Bali was below the actual figure at the time of the project's appraisal, but has still yet to reach the target figure. However, it is difficult to clearly state the correlation between COD changes and this project. Interviews with the Environmental Bureau of Bali Provincial Government (hereinafter, "BLHD"), UPT-PAL, Denpasar City Government, and Badung

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<sup>14</sup> As at the time of the ex-post evaluation of this project, UPT-PAL estimates that there is around 5,800m<sup>3</sup> of sludge to be removed.

<sup>15</sup> Approximately 120 yen (foreign exchange rate as of January 2019)

<sup>16</sup> In the case of a local government in Japan, most require the payment of water and sewerage tariffs together every two months. Costs related to sewerage connections are also levied based on land area, etc., and required to be paid by beneficiaries.

<sup>17</sup> Since shutting off water supply or electricity services will immediately and adversely impact people's lives, this approach can be expected to increase the collection rate. Furthermore, initiatives to increase the collection rate by stipulating penalties for non-payment of sewerage tariffs are not considered to be highly effective. The reason is because this could result in increased incidence of illegal dumping of waste from homes in residential areas, hurting the environment. As discussed above, Bali Province has robust population growth and many cases of people from Eastern Java and other islands migrating there for work, which is believed to be why there is a relatively low awareness among residents.

Regency did not receive clear answers regarding the connection between COD and sewerage projects. One consideration that is fully possible is that the inflow of population and tourists to the Southern Bali area has caused large amounts of infrastructure to be developed. As a result, a sewerage project alone cannot fully improve the sanitation environment. Also, rapid development could have caused a drop-in river water volume, which is impacting water quality in the ocean.



Photo 1: Cleaning Vehicle Procured in This Project (Water jet cleaner)



Photo 2: Developed Sewerage Area by This Project

### 3.3.1.2 Qualitative Effects (Other effects: Establishment of local government-led operation and maintenance system)

This project planned to establish an operation and maintenance system related to a sewerage project led by the provincial government (Bali Provincial Government). In actuality, the executing agency, through the consulting services of this project, gained knowledge concerning the setting of sewerage tariffs and financial planning. Interviews with PPLP BALI and UPT-PAL yielded the following comment, “The financial plan, including the operation and maintenance budget for the next fiscal year, etc., is formulated based on the amount of electricity used and cost to power pump facilities and sewage treatment facilities, etc. The formulation process method was obtained from the consulting services (Japanese experts) during the project implementation. We believe this experience will be beneficial when revising sewerage tariffs.” In addition, as for collection method of sewerage tariffs, as discussed above a certain degree of results from initiatives is confirmed, such as building a framework making payments easier for beneficiaries, such as payment methods by ATM and Internet. As discussed above, however, the collection rate from homes is not high. UPT-PAL obtained knowledge on formulation of financial plans, etc., but it

still needs to continue working to increase the collection rate and continually strive to reinforce the operation and maintenance system.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

Contribution to improvement of living environment and conservation of natural environment around the target areas of this project

As indicated in Table 4's wastewater treatment population and wastewater treatment volume, given that both indicators are rising each year, thanks to this project, effluent and wastewater entering the ocean through rivers that flow through urban areas is presumed to be declining compared to before the start of this project. On the other hand, as indicated in Tables 5 to 8 provided as reference (population of Bali [entire island], number of in-bound foreign visitors, gross regional domestic product [GRDP], changes in revenue of hotels and restaurants [trailing 8 years]), the target areas of this project (the three areas such as Denpasar, Sanur, and Kuta area) have seen robust growth in urbanization and tourism development, and various infrastructure development is moving forward rapidly from the inflow of population and tourists that exceeds the expected wastewater treatment population and treatment volume. In other words, it is believed that at the same time as growth in urbanization and tourism, consideration for sanitation and the environment will become more important in the future. During the project and after completion, PPLP BALI and UPT-PAL regularly held information sessions for residents and worked to promote understanding about the collection of sewerage tariffs along with the prevention of garbage dumping. According to UPT-PAL, residents indicated satisfaction toward the developed sewerage facilities and shared opinions that this project contributed to improving the living environment (mainly sanitation environment) during these information sessions. At the time of the ex-post evaluation, however, it is difficult to say that dramatic improvements have been made in garbage dumping by residents. Local visits confirmed the chronic nature of garbage accumulating at intermediary pumps and sewerage culverts around manholes and Wet Pits. An employee of UPT-PAL responsible for cleaning commented that "Cleaning is performed frequently, but the garbage remains. While depending on the type of garbage, there are concerns that the intense flow of garbage will affect maintenance of sewerage facilities or equipment<sup>18</sup>."

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<sup>18</sup> As one example, screens are installed at locations prior to Wet Pits and while this stops garbage to some degree, sometimes large amounts of garbage accumulate, impeding the flow of water and causing the pump unit inside the Wet Pit to run faster than normal because of a lack of water flow, and sometimes wear is sped up leading to damages. UPT-PAL staff strive to remove garbage at screens, but say there are times when they cannot keep up with the flow of garbage.



Consequently, it can be said the current challenge is how to reduce the flow of garbage in order to improve the sanitation and living environments as well as conserve the natural environment.

(Reference) Table 5: Population of Bali [Entire province]

(Unit: million people)

2010	2011	2012	2013	2014	2015	2016	2017
3.91	3.96	4.01	4.06	4.11	4.15	4.20	4.25

Source: Bali Branch Office, Indonesia Central Bureau of Statistics (BPS)

(Reference) Table 6: Number of In-bound Foreign Visitors to Bali Province

(Unit: million people)

2010	2011	2012	2013	2014	2015	2016	2017
2.58	2.83	2.95	3.23	3.77	4.00	4.93	5.70

Source: Bali Branch Office, Indonesia Central Bureau of Statistics (BPS)

(Reference) Table 7: Bali Province's Gross Regional Domestic Product (GRDP)

(Unit: Billion Rupiah)

2010	2011	2012	2013	2014	2015	2016	2017
93,749	99,992	106,951	114,103	121,779	129,138	137,193	144,964

Source: Bali Branch Office, Indonesia Central Bureau of Statistics (BPS)

(Reference) Table 8: Changes in Revenue of Hotels and Restaurants in Bali Province

(Unit: Billion Rupiah)

2010	2011	2012	2013	2014	2015	2016	2017
17,923	19,160	20,656	22,288	23,808	25,309	26,949	29,443

Source: Bali Branch Office, Indonesia Central Bureau of Statistics (BPS)

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

The Environmental Impact Assessment (EIA) report for this project was approved by the Bali Provincial Government in September 2007 prior to the start of the project.

According to interviews with PPLP BALI and UPT-PAL, and answers to questionnaires, this survey confirmed that there have been no particular negative impacts during the project implementation and after completion, with regard to impacts on the natural environment caused by each project (air pollution, noise/vibrations, impacts on ecosystem, etc.).

As reference, Table 9 provides a comparison of environmental monitoring results (top) observed at the sewerage treatment facilities of this project and the environmental standards of Bali Provincial Government (bottom). The inspection figures are within the province's environmental standards and no particular problems are believed to be present. UPT-PAL is responsible for the environmental monitoring for this project. A water quality testing lab is located

inside the sewage treatment facilities<sup>19</sup> developed in the Phase I project. Every month the results of water quality testing of treated water is reported to BLHD. BLHD recommends corrections or takes corrective actions in case there is a problem with water quality. There have not been any major problems in particular since the completion of the project. In case negative impacts are found, UPT-PAL will share information with BLHD and address the problem.

Table 9: environmental monitoring results (top) observed at the sewerage treatment facilities of this project and the environmental standards of Bali Provincial Government (bottom)

Indicators	Total Suspended Particulate Matter (TSS)	PH	BOD	COD
Water quality test values measured at sewage treatment facilities *Note 1	0	7.06	19.2	48.4
Environmental Standard of Bali Province *Note 2	100mg/l	6.0-9.0	100mg/l	100mg/l

Source: UPT-PAL

Note 1: March 20, 2018 measured data on March 20, 2018 (the most current data). The BOD actual values in Table 4 are averages measured throughout the year, and the COD actual values are similar averages measured at each coast. Therefore, the data shown in Table 4 is different from the one measured on March 20, 2018 at the sewage treatment facilities in Table 9.

Note 2: Environmental Standard of Bali Province (Per. Gubernur Bali Lab. No.16. Tahun 2016)

## 2) Resettlement and Land Acquisition

There was no land acquisition or resettlement by developing each output under this project.

### [Summary of Effects and Impacts]

In regard to quantitative data, actual figures for wastewater treatment population and wastewater treatment volume have not attained the target figure, but are half way and more there. BOD concentration at discharge has not fulfilled the target figure mainly because sewage sludge, etc., has been accumulated in the sewage treatment plant's stabilization pond. As for tariff collection rate, the target has not been met in terms of the number of contracts because the collection rate from homes is low, but since collections from hotels and restaurants are large on a levy basis, the target has been met to some extent. COD concentration has improved over the standard figure at the time of the project's appraisal, but it has yet to achieve the target figure. However, it is difficult to clearly state the correlation between COD changes and this project. In

<sup>19</sup> The nearest residential area from the sewage treatment plant is 500 meters away and no complaints have arisen regarding foul odors or noise. The vicinity is not surrounded by a dense community of homes. Furthermore, treated water that has undergone sewage treatment processes is discharged from the treatment plant's drainage channel into a river that flows through Southern Denpasar and into Benoa Bay.

addition, at the time of the ex-post evaluation, no improvement is observed in the disposal of garbage at sewerage facilities in Southern Bali. Based on a holistic review of the above, the effectiveness and impact of the project is fair.

### **3.4 Sustainability (Rating: ②)**

#### **3.4.1 Institutional/Organizational Aspects of Operation and Maintenance**

UPT-PAL is responsible for the operation and maintenance of this project. UPT-PAL is an organization under the control of the Bali Provincial Government. It is comprised of three departments: the management department, engineering department and monitoring department. It is mainly responsible for formulation of the project plan and progress management, maintenance and repairs of sewerage facilities, and collection of sewerage tariffs<sup>20</sup>, etc. At the time of the ex-post evaluation (December 2018), UPT-PAL employed a workforce of 80 persons. Of this, there are 10 persons in charge of sewerage culverts and 6 persons in charge of manholes and Wet Pits, who serve as maintenance staff for the facilities and equipment of this project. Staff carry out inspections, monitoring, cleaning, and repairs on daily basis, but it was confirmed through interviews with UPT-PAL and site visits that the size of the workforce is somewhat lacking compared to the scale of this sewerage operation. In actuality, the shortage of workers means that UPT-PAL cannot keep up with garbage removal, cleaning and repairs. At the time of the ex-post evaluation, UPT-PAL requested an increase in technical staff (mainly electrical and mechanical engineers) from the provincial government, the organization supervising it. The hiring division of the government and decision makers have not taken any clear action regarding UPT-PAL's headcount at the time of the ex-post evaluation (January 2019). Therefore, it is believed that there is a need to allocate the necessary personnel as quickly as possible, while striving to understand the appropriate workforce number for the sewerage facilities<sup>21</sup>.

In light of the above, it is judged that there are slight problems with the operation and

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<sup>20</sup> The provincial assembly of Bali approved a bill on organizational development and sewerage tariff collection in April 2011, which clarifies UPT-PAL's organizational structure and responsibilities and commences the collection of sewerage tariffs. However, the entities in charge of the sewerage and connection works for homes, etc. are Denpasar City Government for Denpasar and Sanur area and Badung Regency for the Kuta area. Both local governments are responsible for sewerage and connection works for homes, etc. through their departments in charge of sewerage.

<sup>21</sup> As stated in 3.4.3 Financial Situation of Operation and Maintenance, the budget for operation and maintenance has been secured to some degree, but this has not led to an immediate increase in hiring at UPT-PAL. This is because Bali Provincial Government, the supervising organization, has the authority to hire employees. Furthermore, PPLP BALI also recognizes it has a shortfall in maintenance staff required for sewerage operations. PPLP BALI has mentioned that it wants to reinforce UPT-PAL's maintenance operations by transferring its own specialist staff, but at the time of the ex-post evaluation (January 2019) it remains uncertain as to whether this is feasible or not.

maintenance institution for this project taking into account the shortage of UPT-PAL personnel and its impacts on maintenance operations.

### 3.4.2 Technical Aspects of Operation and Maintenance

UPT-PAL employs a large number of staff with extensive operational experience. This field survey confirmed through interviews with these UPT-PAL employees that they recognize the importance of operation and maintenance work. UPT-PAL also employs a large number of employees with at least a degree from a technical school or four-year university or a master's degree. In addition, during the project implementation, the construction management consultant regularly supervised and provided instructions to these employees with regards to the operation of facilities, electrical machinery and sewerage treatment facilities, striving to secure and improve the technical level of operation and maintenance. On-the-job training (OJT) is also provided to newly hired employees as needed. Operation and maintenance manuals on sewerage facilities and equipment were distributed to UPT-PAL with the assistance of the construction management consultant for this project. It is confirmed that manuals are being utilized for operations as necessary.

However, as discussed in the 3.4.4 Condition of Operation and Maintenance, technical training for these employees is being carried out at the time of the ex-post evaluation, which is perhaps tied to the problem of physical handling of operations due to UPT-PAL's manpower shortage. It cannot be clearly determined whether this is because of an assumed lack of technical skills (or both), but it cannot be said that the technical aspects of maintenance at the time of the ex-post evaluation are necessarily solid.

### 3.4.3 Financial Aspects of Operation and Maintenance

Table 10 shows operation and maintenance costs of UPT-PAL. According to UPT-PAL, "The operation and maintenance costs are not necessarily sufficient, but the necessary budget is being allocated." Furthermore, the reason why costs increased dramatically from 2017 to 2018 in the table is because the process was switched from UPT-PAL requesting a budget from the Bali Provincial Government, which was then allocated per above, to the budget being allocated based on the calculation of collected sewerage tariffs using a certain percentage<sup>22</sup>.

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<sup>22</sup> UPT-PAL's annual budget is approved by the finance bureau of Bali Provincial Government and spending approval is made by the provincial government's public works bureau. Each year, UPT-PAL estimates and requests the budget needed for the following year, which is then reviewed and inspected inside the provincial government, and typically the requested amount is allocated.

Table 10: Operation and Maintenance Costs of UPT-PAL

(Unit: million Rupiah)

2015	2016	2017	2018
4,172	4,302	4,814	7,488

Source: UPT-PAL

Table 11 shows changes in sewerage tariff collection amounts as reference. Collection amounts are rising since collection began. As discussed above, in actuality revenue from commercial facilities such as hotels and restaurants occupies a majority.

(Reference) Table 11: Amount of Sewerage Tariff Collection (2012-2018)

(Unit: million Rupiah)

2012	2013	2014	2015	2016	2017	2018
1,028	2,539	4,301	5,617	9,735	11,956	14,315

Source: UPT-PAL

In light of the above, no particular points of concern are observed in terms of the financial aspects of this project's operation and maintenance.

#### 3.4.4 Status of Operation and Maintenance

Maintenance related to this project's sewerage facilities and equipment is carried out periodically and daily. UPT-PAL is also focusing on garbage prevention measures, by establishing a budget every year to regularly hold awareness-raising activities and information sessions on garbage dumping for residents with sewerage service. Spare parts for facilities and equipment are procured and stored appropriately. According to UPT-PAL, while there are cases where procurement takes time, this does not cause delays in maintenance work.

On the other hand, at sewerage culverts and manhole-type pump stations, concerns have not been eliminated in terms of garbage types<sup>23</sup> flowing down from sewerage service areas and clogging up the lines, etc. According to UPT-PAL, there have been no complaints or voices of dissatisfaction from residents over the sewerage facilities, but occasionally, UPT-PAL's customer service center receives phone calls about blocked sewer lines. Field staff immediately travel to the site to remove garbage and clean the area.

(Concerns over maintenance situation at the time of the ex-post evaluation)

In 2018, there was a damage accident in the sewer line area developed in the Phase I project. The detailed cause of the explosion is unknown at the time of the ex-post evaluation, but it is

<sup>23</sup> According to interviews with field staff, "Various types of garbage flow down and sometimes large household tableware or pieces of wood make it to the manhole-type pump station, which negatively affects pump operations."

believed that sulfuric acid was generated from the sewage and drainage water flowing down inside the drain pipe, and the deterioration of the iron drain pipe has been progressing beyond imagination. According to PPLP BALI and UPT-PAL, the concentration of sulfuric acid is high, which is causing degradation of the iron sewer lines to progress faster than expected. The sewerage line area developed in this project (Phase II project) has not experienced a similar incident to date, but the situation facing sewerage operations is the same, which will require UPT-PAL to strive for thorough maintenance.

Aerators<sup>24</sup> were installed in the sewerage facilities through the Phase I and II projects, but many have been damaged to some extent. According to UPT-PAL, the exact cause is unknown, but it pointed out the possibility that too much garbage accumulated in the screens inside sewer lines or that aerator motors were damaged after overheating due to a lack of water flow over the motor or fan because maintenance workers could not keep up with cleaning. Up to the time of the ex-post evaluation, however, UPT-PAL has replaced all of the aerator units that were damaged. (1) Thoroughly cleaning the inside of lines after stopping sewage flow and (2) applying a generous coating inside the sewerage lines as rust protectant are believed to be fundamental countermeasures for resolving this issue<sup>25</sup>. In addition, JICA is implementing countermeasures, including providing engineering training for maintenance staff related to sewerage projects in January 2019, etc<sup>26</sup>. In either case, however, while these maintenance conditions are being addressed at the time of the ex-post evaluation, it cannot be judged that there are no concerns in terms of the condition of operation and maintenance to sustain the project's effects in the future.

Based on the above, some minor problems have been observed in terms of the institutional, organizational, technical aspects and status of the operation and maintenance. Therefore, sustainability of the project effects is fair.

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<sup>24</sup> A water purification method where water is foamed and exposed to the air to detoxify waste and wastewater. Installed as an auxiliary part of sewerage facilities. Air is injected into the wastewater to expose particles comprising waste to oxygen. Wastewater is mechanically agitated promoting oxidation and activating decomposition by microorganisms in the water. A total of 21 units were installed through the Phase I and II projects (breakdown: 11 units in Phase I and 10 units in Phase II project).

<sup>25</sup> As for other countermeasures, it is worth (despite the cost involved) reviewing switching sewer pipes from iron to concrete (PVC). UPT-PAL is already moving ahead with countermeasures such as replacing some sewer pipes with concrete ones.

<sup>26</sup> According to UPT-PAL, a training program was held in which seven Japanese experts were dispatched locally for a period of one week. This training program was held using a workshop format and mainly taught sewer line maintenance methods, skill building, response to problems such as accidents, workshops, and maintenance monitoring methods. However, detailed information was not obtained on the results of the training, etc.

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

### **4.1 Conclusion**

This project involved the expansion of existing sewage treatment facilities (culverts) and development of implementation system related to sewage treatment by the local government, in order to improve the living environment and conserve the natural environment, by expanding the sewerage service coverage rate and establishing an operation and maintenance system led by the local government in the Denpasar, Kuta and Sanur areas on the island of Bali. The importance of developing basic sanitation infrastructure is indicated through *the National Medium Term Development Plan* formulated by the Government of Indonesia and *the Bali Provincial Medium Term Development Plan* formulated by the Bali Provincial Government, and consistency with Japan's ODA policy and the development needs for sewerage and sanitation facilities in Southern Bali is confirmed. Thus, relevance of this project is high. As for efficiency, project outputs exceeded the initial plan slightly, but project cost was within the initial plan mainly due to the influences of foreign exchange rate fluctuations. The project period exceeded the initial plan due to delays, etc., in sewerage and connection works for homes, etc. Consequently, efficiency is fair. In regard to quantitative effect indicators (wastewater treatment population, wastewater treatment volume, tariff collection rate, and BOD/COD at discharge, etc.), while a certain degree of improvement is observed, most indicators fell short of the initial target figures. In addition, at the time of the ex-post evaluation, no improvement is observed in the disposal of garbage at sewerage facilities in Southern Bali, and thus it cannot be determined whether progress has been made with environmental conservation. Based on the above, the project's effectiveness and impact is fair. Given some concerns about the institutional and maintenance situation of the project due to a shortage, etc., of maintenance workers in charge of operation and maintenance, sustainability of the effects realized through this project is fair.

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

### **4.2 Recommendations**

#### **4.2.1 Recommendations to the Executing Agency**

- The sewerage tariff collection rate from homes is low. The Bali Provincial Government should review collection methods while collaborating and coordinating with project stakeholders Denpasar City Government and Badung Regency. While continuing with awareness-raising activities and promoting understanding of sewerage projects using regular information sessions for residents, efforts should also be made to increase the collection rate, such as considering

introducing a mechanism for collection of sewerage tariffs together with other public service tariffs (e.g. water and sewerage or electricity and sewerage).

- There is a shortage of UPT-PAL staff in charge of the operation and maintenance for sewerage facilities and equipment (field staff comprising mainly electrical and mechanical engineers) and garbage removal, cleaning and repairs at pump facilities and sewerage culverts are not keeping pace. As at the time of the ex-post evaluation, UPT-PAL is requesting an increase in technical staff from Bali Provincial Government, the organization supervising it, and the provincial government should allocate the necessary personnel as quickly as possible, while striving to understand the appropriate workforce number for the sewerage facilities.

- Sewage sludge has been accumulating in the stabilization pond inside the sewage treatment plant constructed during the Phase I project. As a result, concerns are arising, such as rising BOD concentration at discharge. UPT-PAL should establish sewage sludge removal and disposal methods and take action promptly.

- The number of connections to home has not reached the initial expectation because the budget allocation required for sewerage and connection work by the Bali Provincial Government and Denpasar City Government was delayed, etc. However, at the time of the ex-post evaluation, budget allocation has progressed and there will be no influence on the progress of connection work. On the other hand, delays in connection work also lead to delays in project effects, therefore it is desirable to deal with the connection work promptly.

#### 4.2.2 Recommendations to JICA

- During the consulting services for this project, the detailed design of the Phase III project was carried out. If reviews of the phase III project move ahead in the future, JICA should engage in discussions with DGHS taking into account the above recommendations.

### **4.3 Lessons Learned**

(Importance of increasing sewerage tariff collection rate at an early stage)

The sewerage tariff collection rate from homes is low. It is believed that project stakeholders (Bali Provincial Government, Denpasar City Government, Badung Regency) should have worked closely at an early stage to identify and develop the optimal collection system and method for sewerage tariffs. Generally, it requires considerable administrative costs to review collection methods already in place and seek the understanding of residents. Therefore, it is believed that close coordination between stakeholders aimed at sewerage tariff collection was needed from an



initial stage of the project based on the characteristics of beneficiaries.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	<p>① Details of civil works and procurement of equipment</p> <p>a) Laying of sewerage culverts (main pipes, secondary pipes, and connections to homes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: main pipes and secondary pipes (27,500m) and connections to homes, etc. (1,900 units)</li> <li>• Sanur: main pipes and secondary pipes (8,000m) and connections to homes, etc. (3,200 units)</li> <li>• Kuta: main pipes and secondary pipes (22,980m) and connections to homes (3,600 units)</li> </ul> <p>b) Procurement of equipment for operation and maintenance *Detailed information not available</p> <p>c) Procurement of other related equipment (manholes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: manholes (800), manhole-type pump stations (hereinafter, “Wet Pits”) (5)</li> <li>• Sanur: manholes (155) and Wet Pits (2)</li> <li>• Kuta: manholes (480) and Wet Pits (4)</li> </ul> <p>② Consulting services Assistance for bidding, construction supervision, and support for capacity building of operation and</p>	<p>① Details of civil works and procurement of equipment</p> <p>a) Laying of sewerage culverts (main pipes, secondary pipes, and connections to homes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: main pipes and secondary pipes (34,350m; increased versus the plan) and connections to homes, etc. (about 2,800 units; increased versus the plan)</li> <li>• Sanur: main pipes and secondary pipes (19,762m; increased versus the plan) and connections to homes, etc. (around 1,100 units; decreased versus the plan)</li> <li>• Kuta: main pipes and secondary pipes (50,789m; increased versus the plan) and connections to homes, etc. (about 2,600 units; decreased versus the plan)</li> </ul> <p>b) Procurement of equipment for operation and maintenance (1 water jet cleaner [4-ton class], 1 vacuum cleaner [4-ton class], 1 water tanker [4-ton class], 6 sewerage vacuum cars, 2 dump trucks for carrying sludge [4-ton class], 2 trucks with cranes [4-ton class], 1 forklift [1.5-ton class], 2 mobile gas detectors, 4 pickup trucks, 5 sewerage cleaners, 2 ventilation fans, and 2 tripods, etc.)</p> <p>c) Procurement of other related equipment (manholes, etc.)</p> <ul style="list-style-type: none"> <li>• Denpasar: manholes (713; decreased versus the plan), Wet Pits (3; decreased versus the plan)</li> <li>• Sanur: manholes (511; increased versus the plan), Wet Pits (1; decreased versus the plan)</li> <li>• Kuta: manholes (1,128; increased versus the plan), Wet Pits (6; increased versus the plan)</li> </ul> <p>② Consulting services Implemented as planned. (However, in addition to at left, additional consulting was provided on the</p>

	maintenance system	detailed design of the Phase III project expected to take place after this project)
2.Project Period	February 2008 – May 2014 (76 months)	March 2008 – January 2019 (131 months)
3.Project Cost Amount Paid in Foreign Currency	2,900 million yen	1,219 million yen
Amount Paid in Local Currency	5,104 million yen	6,010 million yen
Total	8,004 million yen	7,229 million yen
ODA Loan Portion	6,004 million yen	5,847 million yen
Exchange Rate	1 Rupiah=0.0133 yen 1USD=122 yen (As of September 2007)	1USD=87.71 yen (civil works for laying of sewerage culverts), 1 USD=101.91 yen (sewage and connection work for households, etc.), 1 Rupiah=0.0091 yen (civil works for laying of sewerage culverts), 1 Rupiah=0.0086 yen (sewage and connection work for households, etc.) (Note: With respect to actual payment period, the average value is based on which the exchange rate is divided by the IMF's International Fiscal Statistics (IFS) 2009-2013 (civil works for laying of sewerage culverts), 2011-2018 (sewage and connection work for households, etc.)
4. Final Disbursement	July, 2016	