NATIONAL DEVELOPMENT PLANNING AGENCY (BAPPENAS)
MINISTRY OF PUBLIC WORKS (PU)
BALI PROVINCIAL GOVERNMENT

THE PREPARATORY SURVEY ON APPLICATION OF WASTEWATER RECLAIMING IN SOUTHERN BALI WATER SUPPLY SYSTEM IN THE REPUBLIC OF INDONESIA

FINAL REPORT

VOLUME I

EXECUTIVE SUMMARY

JUNE 2012

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

TOYOTA TSUSHO CORPORATION
NIHON SUIDO CONSULTANTS CO., LTD.
METAWATER CO., LTD

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Currency Exchange Rate (Effective as of August 2011)

1 IDR ＝ 0.00909 JPY

Abstract

1. Backgrounds

In Bali Province having population of 3.89 million in 2010, Denpasar City and surrounding area in Badung Regency enjoy high growth in economy mainly in tourism industries. The population is also increasing due to migration from other islands in Indonesia. Growing in the economy and population, increasing in the water demand in the region. But an imbalance between the water demand and the water supply capacity causes more serious water shortages. This is because difficulties in developing of appropriate water resources and delay in developing of infrastructures such as public water supply facilities.

To response requests by Bali Provincial governments and Indonesian central governments to tackle the water shortage situations, JICA has conducted the following studies, "The Comprehensive Study on Water Resources Development and Management in Bali Province" in 2006, and "Preparatory Study for Southern Bali Water Supply Development Project" in 2009. The water supply projects in the Southern Bali were proposed but have not been implemented.

As one of measures solving the serious water shortage situation, Japanese three companies (JV partners) proposed an reclaimed water projects to JICA using the effluent at the Denpasar Wastewater Treatment Plant (WWTP) which is being developed by the Japanese ODA loan. A preparatory survey has been conducted according to TOR prepared based on the scope and surveys conditions agreed between Indonesian Governments and JICA, to identify the scope of projects and to examine feasibilities of proposed projects under a PPP framework in the Survey.

2. Reclaimed Water Demand

In the first survey in Indonesia, an interview survey was conducted to persons responsible for water utilities in the organizations which were expected to become prominent reclaimed water users, to identify present water use conditions and public water supply conditions, present reclaimed water use by their own way, and willingness to use and pay for reclaimed water supplied by a third party. But the reclaimed water demand for toilet flushing is limited due to difficulties in an introduction of additional service pipe system for the reclaimed water, and the demand for irrigation water is also limited and the willingness to pay for such water is very low because effluents of on-site or off-site sanitation facilities by their own are being used or tried to use for such irrigation water.

The Survey team estimates a potential reclaimed water demand targeting hotels in Nusa Dua area and the vicinity area. The potential demand is estimated by using the water use and public water supply data provided by the hotels interviewed, actual public water supply data to hotels in Nusa Dua area by PT.TB (water supply company by a BOT contract), reference data available in the water use surveys in hotels in Okinawa by the Ministry of Social Welfare at that time.

Two cases of the reclaimed water intended use are set: In Case 1 it is used mainly for toilet flushing and in Case 2 it is used for other purposes except drinking and cooking. The reclaimed water is planned to supply to the hotels in Nusa Dua, Benoa and Swangan area in the Southern Bali. The Case 2 project is prepared considering Indonesian ideas, especially Balinese ideas of expanding the intended reclaimed water use, which have been shown in the previous Indonesian reclaimed water studies.

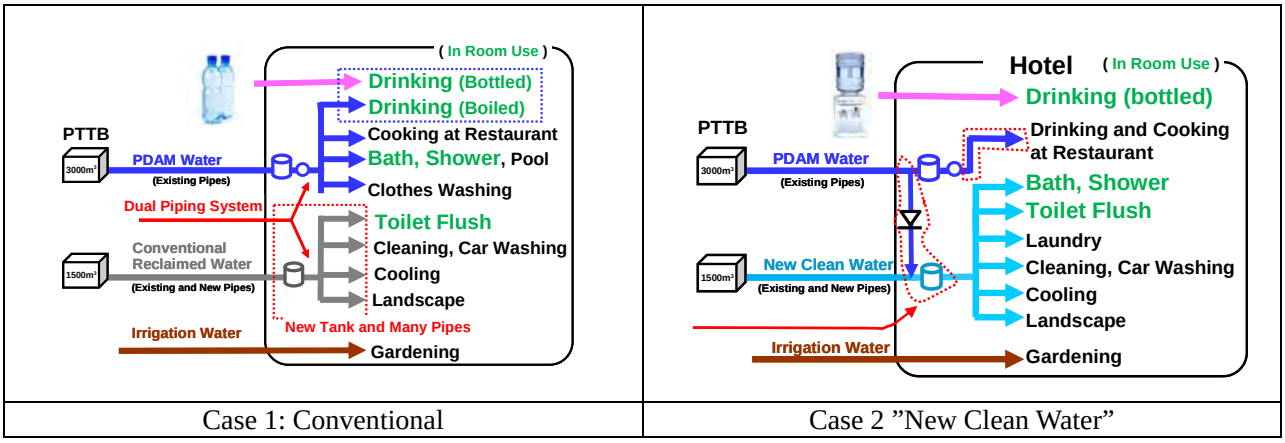

Figure 1 Two Cases for Reclaimed Water Use

3. Proposed Two Cases Projects

Outline of proposed projects are summarized in the following table.

Table 1 Outline of Proposed Projects

Item	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
Service	Bulk Supply of Reclaimed Water to PDAM Badung	Bulk Supply of Reclaimed Water to PDAM Badung
PPP Contract	BOT-25years (Service provision period: 2016 to 2038)	BOT-25years (Service provision period: 2016 to 2038)
Reclamation facility	SPC will construct and operate.	SPC will construct and operate.
Capacity	4,500 m^3/day (Maximum daily flow)	9,000 m^3/day (Maximum daily flow)
Treatment Process	Biological filter + Ozone + Coagulation + UF (Ceramic Filter) + Chlorination	Biological filter + Ozone + Coagulation + UF (Ceramic Filter) + Chlorination
Transmission facility	SPC will construct and operate.	SPC will construct and operate.
Pump	Planned flow: 4,500 m^3/day (Maximum daily flow) Capacity 3.4 m^3/min, 2 units (incl. one on standby)	Planned flow: 9,000 m^3/day (Maximum daily flow) Capacity 3.4 m^3/min, 3 units (incl. one on standby)
Pipe	Dia. 300 mm, Length 16 km, HDPE Pipes, Pressure pipeline	Dia. 400 mm, Length 16 km, HDPE Pipes, Pressure pipeline
Raw Water	Biologically treated wastewater at the Denpasar WWTP without charge	Biologically treated wastewater at the Denpasar WWTP without charge
Customer of bulk supply	PDAM Badung	PDAM Badung
Designed Volume	Supply: 4,100 m^3/day (average daily flow) Usage: 3,700 m^3/day (average daily flow)	8,200 m^3/day (average daily flow) 7,400 m^3/day (average daily flow)
Water use purposes and target customer	Toilet flushing, washing gardening etc., mainly. The reclaimed water is planned to provide to existing hotels in the Nusa Dua, Benoa, and Suwangan areas, including hotels planned in near future in the Suwangan and surrounding areas. The reclaimed water is provided mainly for toilet flushing by new reclaimed water service pipe system.	Non-drinking water purposes: bathing, showering, washing, etc., The reclaimed water is planned to provide to existing hotels in the Nusa Dua, Benoa, and Suwangan areas, including hotels planned in near future in the Suwangan and surrounding areas. The reclaimed water is mixed with the PDAM water equally (1:1) at the service pipe system in the hotels.

Item	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
		Separate service pipe system for supplying for drinking and cooking water shall be established by the hotels.
Implementation Schedule	Financing, permits and licenses, and PPP contract will be completed in 2013. Construction would be completed in one stage from 2014 to 2015, with the supply of the reclaimed water to start in 2016.	Financing, permits and licenses, and PPP contract will be completed in 2013. Construction would be completed in one stage from 2014 to 2015, with the supply of the reclaimed water to start in 2016.
Construction Cost	Approximately IDR 225.7 billion (approximately JPY 2.05 billion)* in total. Approximately IDR 170.9 billion (approximately JPY 1.55 billion)* for SPC.	Approximately IDR 257.4 billion (approximately JPY 2.34 billion)* in total. Approximately IDR 206.8 billion (approximately JPY 1.88 billion)* for SPC.
Capital Investment by SPC	Approximately IDR 303.3 billion (approximately JPY 2.76 billion)*, including construction cost, engineering service cost, contingencies, VAT, and interest of loan.	Approximately IDR 355.5 billion (approximately JPY 3.23 billion)*, including construction cost, engineering service cost, contingencies, VAT, and interest of loan.
O&M Cost	Approximately IDR 8.3 billion/year (2016 price). (Approximately JPY 75 million /year)*. The annual O&M costs is estimated based on average annual increase in CPI of 5.3%.	Approximately IDR 11.9 billion/year (2016 price). (Approximately JPY 108 million/year)* The annual O&M costs is estimated based on average annual increase in CPI of 5.3%.
Financing		
Ratio	Equity vs. loan is 30 to 70	Equity vs. loan is 30 to 70
Equity of SPC	Investment is approximately IDR 91.0 billion (JPY 827 million)*. Japanese companies, Indonesian company, and Balinese government agency jointly establish the SPC. Balinese government agency will join the SPC to provide the land.	Investment is approximately IDR 106.7 billion (JPY 970 million)*. Japanese companies, Indonesian company, and Balinese government agency jointly establish the SPC. Balinese government agency will join the SPC to provide the land.
Debt loan	Debt loan is about IDR 212.3 billion (JPY 1.93 billion)*. Foreign loan of bilateral or multilateral agencies under PSIF is expected.	Debt loan is about IDR 248.9 billion (JPY 2.26 billion)*. Foreign loan of bilateral or multilateral agencies under PSIF is expected.
Loan conditions	Period of 25 years including grace period of 5 years	Period of 25 years including grace period of 5 years
	Annual interest rate at 2.5%. Assumed no payment of the interests during the grace period. The interests are incorporated into the original principal.	Annual interest rate at 2.5%. Assumed no payment of the interests during the grace period. The interests are incorporated into the original principal.
Others:		
Distribution facilities Distribution tank and pipes	PDAM Badung shall rehabilitate the existing reservoir and pipes to be use as distribution facilities of the reclaimed water to the hotels in the Nusa Dua area. It also shall construct new distribution pipes to the Benoa and Sawungan areas. The cost shall be provided by PDAM Budung.	PDAM Badung shall rehabilitate the existing reservoir and pipes to be use as distribution facilities of the reclaimed water to the hotels in the Nusa Dua area. It also shall construct new distribution pipes to the Benoa and Sawungan areas. The cost shall be provided by PDAM Budung.
Water service pipe system in hotels	The reclaimed water service pipe system should be established in the hotels. The service pipe should be installed in each customer's rest room to provide a toilet flush water.	A separate water supply system to provide drinking water to restaurants and bars shall be constructed using their own budget. The free bottled water or water dispensers for drinking would be provided in the guest rooms and other areas of the hotel.

Note: The symbol of * indicates that the JPY price is calculated with the exchange of 1 IDR = 0.00909 JPY, on August 2011.

4. Comparison and Evaluation of the Proposed Projects

The results of comparing the two cases are shown in the following table.

Table 2 Comparison and Evaluation of the Two Cases

Criteria	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
1. Technical Aspects		
1) Simplicity of Construction and Installation	The renovation of service pipes in the hotels is more difficult than the work for Case 1, because new service pipes have to be installed in each guest room to supply the reclaimed water for flushing toilets. The hotel may be required to close the operation by the renovation.	Although the installation of new service pipes to each guest room is not required, an independent service pipe system should be established to supply drinking/cooking for restaurant, bars and necessary places. The new drinking water service pipe system is easier to install because locations where modifications are required will be relatively limited.
2) Ease of O&M	Know-how accumulated in the O&M of the conventional reclaimed water supply system can be used for the O&M for Case 1 Project. Thus appropriate O&M in this case can be easily achieved.	This case is required to provide more safe reclaimed water than that of Case 1, the O&M is difficult and requires accumulation of more sophisticated technical know-how.
3) Water Quality Management	Know-how accumulated in the water quality control and monitoring the produced reclaimed water can be used for the O&M for Case 1 Project. An appropriate water quality management in this case can be easier than that of Case 2 Project.	Establishment of water quality management and monitoring system and their exact execution are essential to secure safety of the reclaimed water. Preventive measures against accidental ingestion or wrong usage are also required as well as emergency measures.
4) Reclaimed water quality standards	Indonesian reclaimed water quality standards for this case can be developed, refer to Japanese reclaimed water quality standards for different use purposes.	To create the reclaimed water quality standards suitable for bathing and showering requires detailed scientific studies and discussions among stakeholders, because no actual practices for such reclaimed water use purposes. The early creation of the standards is difficult.
3) Risks related to Accidental Ingestion	Risks related to accidental ingestion of the reclaimed water are quite limited as long as there are no cross-connections between the service pipes for reclaimed water and PDAM water.	Preparation and exact execution of preventive measures against accidental ingestion and wrong use of the reclaimed water are pre-requisites for the implementation of the Case 2 Project. But the accidental ingestion and wrong use could not be completely avoided.
2. Economic Aspects		
2.1 Financial Analysis	Analysis is based on IDR.	Analysis is based on IDR.
1) Evaluation criteria	Financial parameter of Equity IRR >15%, and Minimum DSCR (Debt Service Coverage Ratio) >1.2 are applied to minimum requirements for showing financial feasibility.	Financial parameter of Equity IRR >15%, and Minimum DSCR (Debt Service Coverage Ratio) >1.2 are applied to minimum requirements for showing financial feasibility.
2) Analysis Results	To satisfy the above financial evaluation criteria, one of the following results should be accepted: - Reclaimed water bulk supply price of 19,300 IRD /m^3 (at 2016 price)	To satisfy the above financial evaluation criteria, the reclaimed water bulk supply price of 12,000 IRD /m^3 (at 2016 price) is accepted.

Criteria	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
	- About 54% of total construction cost is covered by a public financial assistance (VGF), in case of the price of 12,000 IRD /m^3 (at 2016 price)	
3) Evaluation	- The price of reclaimed water without public financial assistance is much higher than the affordable price discussed in Chapter 11. - Application of public financial assistance is the matter of Indonesian governments based on evaluation of public benefits generated by the Project.	The reclaimed price of IDR 12,000/m^3 is within 70% of the price range between the PDAM water tariff to hotels and irrigation water tariff with assumption of 10% annual increase. When the price and the sales are guaranteed, the Case 2 Project is financially feasible.
2.4 Economic Analysis	Analysis is based on IDR.	Analysis is based on IDR.
1) Benefits	Alternative costs with the provision of reclaimed water at 4,100 m^3/day are estimated as the economic benefits	Alternative costs with the provision of reclaimed water at 8,200 m^3/day are estimated as the economic benefits.
2) Analysis Results	EIRR: 12.91% Net Benefit: IDR 564,648	EIRR: 13.65% Net Benefit: IDR 685,564
3) Evaluation	Considering intangible benefits, the economic analysis results show the Project has high economic values.	Considering intangible benefits, the economic analysis results show the Project has high economic values.

5. Conclusion and Recommendations

5.1 Conclusion

It is concluded that the proposed two projects have different difficulties each to implement because of following issues:

In Case 1 Project, the proposed project is not feasible financially due to the reclaimed water demand as low as 3,700 m^3/day with the customers' affordable reclaimed water price range. It is demonstrated that the project could be financially viable when it is covered about more than 54% of total construction cost by a public financial assistance (VGF).

In Case 2 Project, in which the reclaimed water is extended to use bathing and showering purposes, the project shows the financially feasible with the customers' affordable reclaimed water price range. But this project cannot be implemented technically due to following reasons: this extended use purposes have not been practiced so far in Japan and other countries, then the reclaimed water quality standards cannot be established easily, severe water quality monitoring and control are required in the operation of reclaimed water treatment and supply facilities, the safety in use of reclaimed water cannot be secured completely, and risks related to accidental ingestion and wrong use cannot be avoided completely.

5.2 Recommendations

To realize the Case 1 Project as an Indonesian PPP Infrastructure Project, it is necessary to increase the reclaimed water demand and/or to receive any public financial assistance.

First, it is recommended the following three points to increase the demand for Case 1 Project.

- To formulate promotion programs and execute continuous promotion activities on reclaimed

water use through deepening the understanding of the stakeholders

- To establish reclaimed water quality standards suitable for the intended uses
- To prepare law and regulations for promoting the introduction of dual pipe system in target hotels, i.e. installation of pipes for providing the reclaimed water

Finally, regarding the public financial support (VGF), a possibility to apply VGF to the proposed Case 1 Project seems very low because the final users are not domestic users but hotels of tourism industries, based on the comments of Indonesian central government. The Case 1 Project will provide benefits to the domestic users as well as the direct benefits to the hotels and tourism industries, i.e., the same volume of water with the reclaimed water used could be used by domestic users, and the Case 1Project is expected to contribute the pollutants reduction to the seashore near the Denpasar WWTP. Considering these public economic benefits, the possibility of applying the public financial support should be further discussed as well as promotion to increase the reclaimed water demand.

THE PREPARATORY SURVEY ON APPLICATION OF WASTEWATER RECLAIMING IN SOUTHERN BALI WATER SUPPLY SYSTEM IN THE REPUBLIC OF INDONESIA

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ABBREVIATION

Abbreviation	Description
ACP	Asbestos Cement Pipe
APBD	Anggaran Pendapatan dan Belanja Daerah
APBN	Anggaran Pendapatan dan Belanja Negara
AMDAL	Analisis Mengenai Dampak Lingkungan
ANDAL	Analisis Dampak Lingkungan
BALH	Bali Environmental Board
BAPEDAL	Badan Pengendalian Dampak Lingkungan
BAPPEDA	Badan Perencanaan Pembangunan Daerah
BAPPENAS	Badan Perencanaan Pembangunan Nasional
BKPM	Badan Koordinasi Penanaman Model
BLU	Badan Layanan Umum
BLUPAL	Badan Layanan Umum Pengolahan Air Limbah
BOT	Build, Operate and Transfer
BPPSPAM	Badan Pendukung Pengembangan Sistem Penyediaan Air Minum
BPS	Badan Pusat Statistik
BTDC	Bali Tourism Development Corporation
BUMD	Badan Usaha Milik Daerah
BUMN	Badan Usaha Milik Negara
BUPI	Badan Usaha Penjaminan Infrastruktur
C/P	Counterpart
CPI	Comsumer Price Index
DCIP	Ductile Cast Iron Pipe
DGHS or Cipta Karya	Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum
Dinas PU	Dinas Pekerjaan Umum Provinsi Bali
DPRD	Dewan Perwakilan Rakyat Daerah
DSCR	Debt Service Coverage Ratio
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement, and Construction
F/S	Feasibility Study
GOI	Government of the Republic of Indonesia
GOJ	Government of Japan
GRP	Glassfiber Reinforced Plastic
HDPE	High-Density Polyethylene
IUCN	International Union for Conservation of Nature
IDC	Interest During Construction
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IRR	Internal Rate of Return
JICA	Japan International Cooperation Agency
KA-ANDAL	Kerangka Acuan - Analisis Dampak Lingkungan
KKPI	Komite Kebijakan Penyediaan Infrastruktur
M/P	Master Plan
MM	Minutes of Meeting
MDG	Millennium Development Goals
NPV	Net Present Value
O&M	Operation&Maintenance
P3CU	PPP Center Unit
PAC	Poly Aluminium Chloride

Abbreviation	Description
PDAM	Perusahaan Daerah Air Minum
PPP	Public Private Partnership
PT PII （IIGF）	PT. Penjamina Infrastruktur Indonesia (Indonesia Infrastructure Guarantee Fund)
PT SMI	PT SARANA MULTI INFRASTRUKTUR (PERSERO)
PT TB	PT. Tirta Artha Buana Mulia
PU	Kementerian Pekerjaan Umum
PVC	Polyvinyl Chloride
RENSTRA	Rencana Strategi
RKL	Rencana Pengelolaan Lingkungan
RPJMN	Rencana Pembangunan Jangka Menengah Nasional
RPJPN	Rencana Pembangunan Jangka Panjang Nasional
RPL	Rencana Pengelolaan Lingkungan
PreFS	Pre-Feasibility Study
SEA	Strategic Environmental Assessment
SOP	Standard Operating Procedures
SPAM	Sistem Penyediaan Air Minum
SPC	Special Purpose Company
UKL	Upaya Pengelolaan Lingkungan
TOR	Terms of Reference
UNEP	United Nations Environment Programme
UPL	Upaya Pemantauan Lingkungan
UPT	Unit Pelaksana Teknis
VAT	Value Added Tax
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

S1. Background and Objectives

S1.1 Background

Bali Province has a population of 3.89 million in 2010. In Southern Bali, Denpasar City and Badung Regency, the regional economy of mainly tourism industries are in good health and the population is also increasing rapidly due to migration from other islands in Indonesia. The economic and population growth increase the water demand. However, because an appropriate water sources is not available, the infrastructure development such as water supply facilities lags behind the economic and population growth. The water shortage becomes more serious problems in the region. Groundwater has been used for mitigating the water shortages. Overuse of groundwater has led to dry wells and salt water intrusion in coastal areas. The water shortage gives an adverse impact to the regional economy as well as to the peoples' ordinary life.

According to Indonesian government request for solving the problems, Japan International Cooperation Agency (referred as JICA) had done "The Comprehensive Study on Water Resources Development and Management in Bali Province" in 2006 and "Preparatory Study for Southern Bali Water Supply Development Project" in 2009 to prepare water supply projects. But the projects have not been implemented because the projects are regional water supply scheme and required huge investment.

A sewerage development project has been implemented by Japanese ODA loan in Denpasar City and the surrounding area where most densely populated area in the Province. The collected wastewater is treated at the Suwung Wastewater Treatment Plant (WWTP); the treated wastewater of about 10,000 m^3/day or 115 L/s is discharged to the sea. The third phase project will expand the capacity of the WWTP to 51,000 m^3/day(590 L/s). Some studies on effective uses of the treated wastewater from the Suwung WWTP have been done by Indonesian governments, but any reclaimed water projects have not been realized. Japanese companies proposed to JICA to conduct a preparatory study to formulate a reclaimed water project in Southern Bali as a Public-Private Partnership (PPP) Project.

S1.2 Objectives of the Survey

The preparatory survey prepares a basic project plan for reclaimed water use in Southern Bali and assesses the appropriateness, effectiveness, and efficiency of the project, under the assumption of using Japanese ODA financing sources and the Indonesian PPP infrastructure assistance scheme.

S2. Present Conditions of Southern Bali and Recent Trends related to Water Supply Project

S2.1 Survey Area

The survey targets the Southern Bali area covering Denpasar City and Badung Regency, where a stable source of reclaimed water can be supplied by transmission pipes or other reasonable transportation means, after further treatment of the wastewater from the Suwung WWTP in Denpasar.

Figure S2.1 Survey Area

S2.2 Socio-economic Conditions

The Indonesian Government conducted population censuses in 1971, 1980, 1990, 1995, 2000 and 2010. The results of these population censuses are shown in Figure S2.2. The population in Bali increased by an average of 1.71% per year from 1995 to 2000, the rate of increase rose to 2.13% per year from 2000 to 2010.

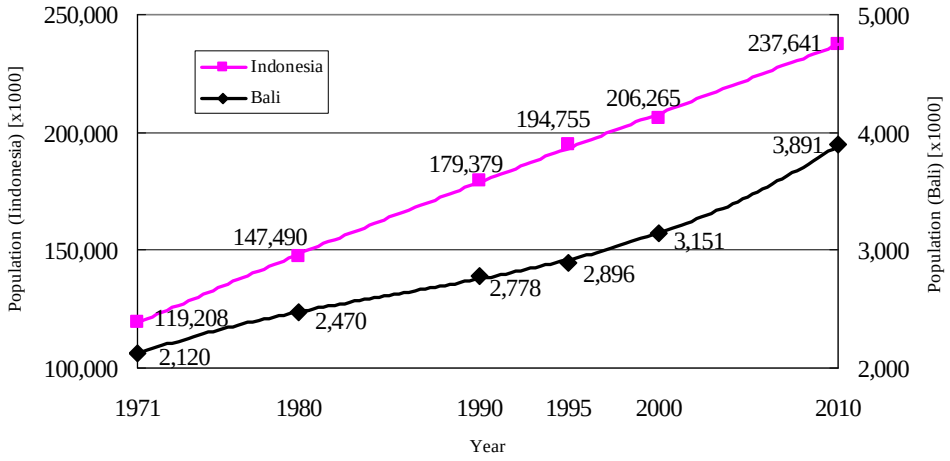

Figure S2.2 Population in Bali Province

The growth of GRDP in Bali province is 15.34%, inflation rate is 8.1%, and unemployment rate is 3.13%.

Annual number of foreign tourists from 1997 to 2010 is shown in Figure S2.3. From 1997 to 2006, the number of tourists remained roughly constant at about 1.5million. Since then it has increased sharply and reached over 2.5 million by 2010.

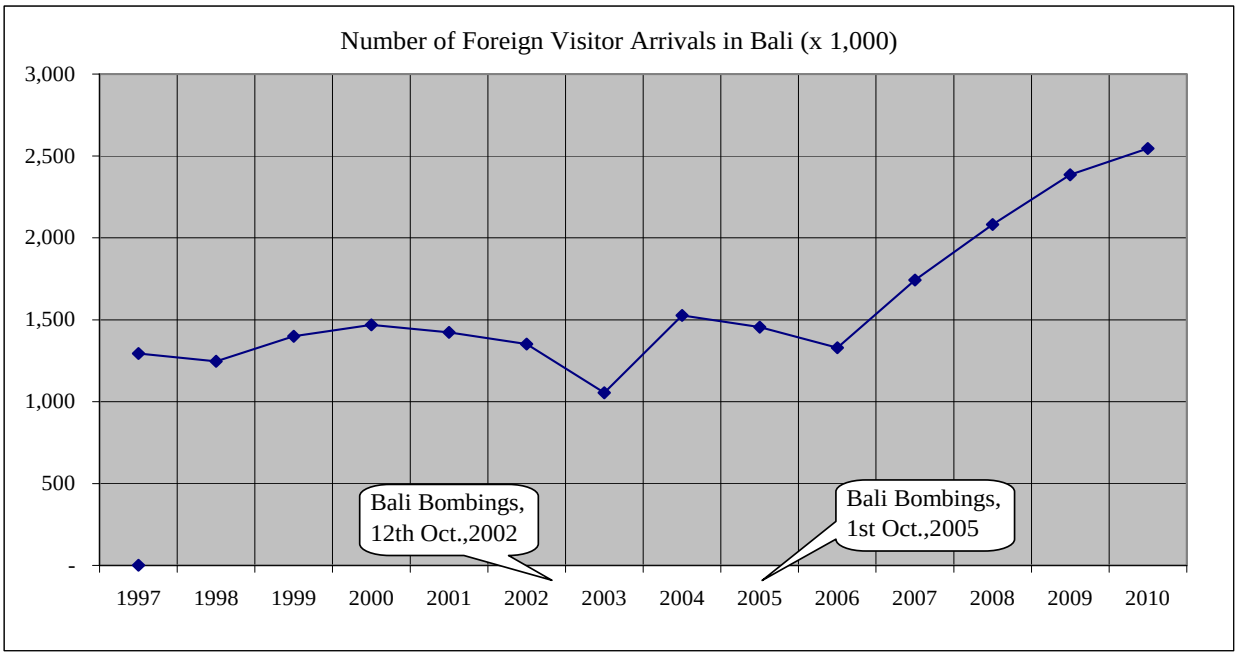

Figure S2.3 Number of Direct Foreign Tourist Arrivals

Source: BPS Bali Province

S2.3 Present Water Supply Conditions in Southern Bali and Review of Water Supply Plan Made by the Previous Studies

(1) Present water supply conditions

The capacity and the water supply record of the two PDAMs which cover Southern Bali as well as the water supply situation are shown in the following tables.

Table S2.1 Present water supply conditions in PDAM Denpasar and PDAM Badung

Item	Unit	PDAM Denpasar	PDAM Badung (including PT.TB)
Population	Person	674,361	384,153
Service Population	Person	338,235	285,138
Water Demand (Ave. Daily)	m^3/day	73,335	76,792
Service Ratio	%	50.16	74.2%
Per capita water consumption	lpcd	197	142*

Note: The figures are based on Data 2010 obtained from the PDAM
PT.TB stands for PT Tirta Arta Buana Mulia, which is a special purpose company (SPC) for provide a water supply service under the concession contract of BOT Project.

Table S2.2 Production Capacity and Supply Record by PDAM Denpasar and PDAM Badung in2010

Water Sources	Production and Supply Capacity		Production and Supply Record	
	(l/s)	(m^3/day)	(l/s)	(m^3/day)
A. PDAM Denpasar				
1) Surface Water	750	64,800	698	60,310
Ayung III WTP	500	43,200	488	42,160
Package Plant*	50	4,320	37	3,200
Waribang WTP	200	17,280	173	14,950
2) Deep Wells	454	39,230	448	38,710
3) Subtotal	1,204	104,030	1,146	99,020
B. PDAM Badung				
1) Surface Water	900	77,760	738	63,770
Ayung I & II WTP	600	51,840	420	36,290
Estuary WTP	300	25,920	318	27,480
2) Deep Wells	369	31,880	311	26,870
PDAM Badung	344	29,720	286	24,710
PT.TB	25	2,160	25	2,160
3) Spring	99	8,560	94	8,120
4) Subtotal	1,368	118,200	1,143	98,760
Total	2,572	222,230	2,289	197,780

Note: The figures are based on Data 2010 obtained from the PDAM

In both PDAMs, production and supply are slightly lower than the capacity.

(2) Review of Water Supply Plan

The water demand and supply plan in the following three studies for Denpasar City and Badung Regency are specifically reviewed.

- The Comprehensive Study on Water Resources Development and Management in Bali Province (hereinafter referred to as JICA Study 2006)
- Feasibility Study SPAM SARBAGITAKU. (hereinafter referred to as F/S Report 2008)
- Preparatory Study for Southern Bali Water Supply Development Project (hereinafter referred to as JICA Study 2009)

Figure S2.4 shows a comparison of future water demand projected by three studies.

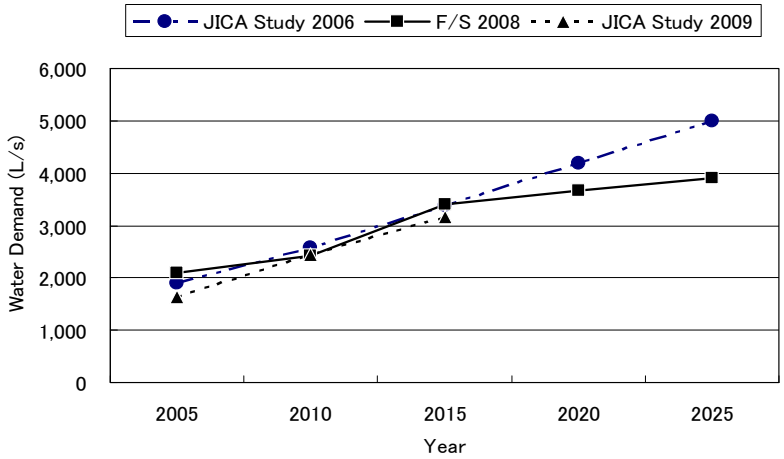

Figure S2.4 Comparison of Water Demand Projected by the Previous Studies

Until 2015, the three water demand projections are similar (around 3,100 to 3,400 L/s). The projections for 2025 differ significantly by as much as 1,000 L/s. This calls for a review of the parameters for the demand projections.

Tables S2.3 and S2.4 show the results of the population projections from 2010 to 2025 for Southern Bali (Denpasar City and Badung Regency), and the population record of BPS (Statistic Center) Bali Province, based on the registered population.

Table S2.3 Population Projection of Denpasar City (Kota)

Source	2000	2005	2010	2015	2020	2025
F/S 2008	532,000	575,000	619,000	667,000	721,000	774,000
JICA Study 2006	532,000	600,000	704,000	778,000	865,000	951,000
BPS Record	532,440	574,955	**788,589**	-	-	-

Table S2.4 Population Projection of Badung Regency (Kabupaten)

Source	2000	2005	2010	2015	2020	2025
F/S 2008	346,000	375,000	402,000	444,000	493,000	542,000
JICA Study 2006	346,000	379,000	425,000	460,000	500,000	540,000
BPS Record	345,863	374,377	**543,332**	-	-	-

The population record of BPS in 2010 shows that the actual population is significantly higher than the projected population. The main reason is that people are emigrating from the islands around Bali province to seek employment where economic prospects are better.

The per capita domestic water demand (liters per capita per day: lpcd) for each previous study, which is an important design parameter for estimating future domestic water demand, is summarized in Table S2.5. and compared to the present demand.

Table S2.5 Per Capita Domestic Water Demand Applied in the Projection (lpcd)

PDAM	F/S 2008 (based on 2007 water consumption data)	JICA Study 2006			Present
		2004	2010	2025	2010
Denpasar	185	210	220	220	197
Badung	109	170	180	210	111
PT.TB	Not applicable	200	210	210	Not applicable

Note: JICA Study 2009 used the figures of the F/S 2008

Table S2.6 compares future water supply service ratios set in the F/S 2008 and JICA Study 2006 to the present ratio. In order to achieve the urban area target of 87% set in MDGs, the F/S 2008 recommends higher service ratios than that used in the JICA Study 2006.

Table S2.6 Future Service Ratio Applied for the Projection

PDAM	F/S 2008		JICA Study 2006			Present
	2010	2015	2004	2010	2010	2010
Denpasar	67.9 %	78.2 %	45 %	55 %	60 %	50.2
Badung	64.5 %*	74.4 %*	35 %	45 %	53 %	66.4%*
PT.TB	-	-	65 %	70 %	80 %	95.8%

Note: The * means that the figures only for Badung not include those for the PT.TB service area.

In the previous water supply studies, the difference between the water demand and the water supply capacity (present and planned capacity) is estimated as the total water supply capacity required to meet the water demand. The comparison of required water supply capacity calculated in the previous studies is summarized in Table S2.7. The production capacity identifed in previous studies is shown in brakets. The current production capacity of 2,572 L/s and the actual supply volume of 2,289 L/s (Table S2.2), are a little lower than the supply volume set in the F/S 2008, and a little higher than both JICA studies.

Table S2.7 Summary of Required Supply Capacity Identified in Previous Studies Unit: (L/s)

PDAM		2015	2020	2025
JICA Study 2006 (Production capacity 2005: 2,061 L/s)	Denpasar	871	1,281	1,690
	Badung	452	848	1,243
	Total	1,323	2,129	2,933
F/S 2008 (Production capacity 2015: 2,744 L/s)	Denpasar	498	507	512
	Badung	409	415	659
	Total	669	922	1,171
JICA Study 2009 (Production capacity 2010: 1,827 L/s)	Denpasar	584	N.A	N.A
	Badung	219	N.A	N.A
	Total	803	N.A	N.A

Intake capacities proposed by the previous studies are summarized in Table S2.8.

Table S2.8 River Intake Plan Proposed in Previous Studies

Study Name	Water Source	Intake Capacity		Target Year
		L/s	m^3/day	
JICA Study 2006	Ayung Dam	1,800	155,500	2025
	Petanu River	300	25,900	
	Penet River	300	25,900	
	Total	2,400	207,400	
F/S 2008	Petanu River	1,000	86,400	2025
	Penet River	500	43,200	
	Total	1,500	129,600	
JICA Study 2009	Petanu River	300	25,900	2015
	Penet River	300	25,900	
	Total	600	51,800	

S2.4 Situation and Trend of Water Supply Projects in Southern Bali

The following three (3) water supply projects are listed in the official documents of the Indonesian government. The biggest issue in the water supply projects is the difficulty in developing appropriate surface water resources because of limited water intake volume.

1) Klungkung Regency (Tukad Undaa) Water Supply, Bali
The document, "Public-Private Partnerships Infrastructure Projects in Indonesia 2010-2014" issued by the Ministry of National Development Planning/National Development Planning Agency (BAPPENAS), identifiers the following project as one of the priority projects.

Project outline: Raw water would be taken at Tukad Unda in Klungkung Regency, and treated at the Water Treatment Plant (WTP) with a capacity of 1,000ℓ/s. Bulk water supply from the WTP would be transmitted to Badung (at 700 L/s) and to Denpasar (at 300ℓ/s) along 40 km of treated water transmission pipeline.

2) Southern Bali Water Supply Project
This project is listed in the Blue Book, "Project and Technical Assistance Proposals 2006-2009" issued by the Ministry of National Development Planning/National Development Planning Agency (BAPPENAS), under the heading of the "Project Assistance".

3) Bali Southern Water Treatment Facility
This project was introduced to foreign participants as one of the 16 PPP projects in 2011 at the Indonesia International Infrastructure Conference and Exhibition 2011 (April 12-14, 2011). The Project would supply bulk water to Denapsar, Badung etc, after treatment of surface water taken from Tukad Unda at a rate of 1,500 L/s and taken from Penet river at a rate of 300 L/s.

S2.5 Reclaimed Water Utilization Plan in Southern Bali and Its Benefits

The reports on efficient use of the effluent of the Suwung WWTP prepared by the Bali Provincial Government and Cipta Karya of PU are summarized below.

1) Pre-Feasibility Report prepared by Bali Provincial Government on Suwung WWTP Effluent Utilization as Raw Water for Reclaimed Water Supply (October, 2008)

Tap water (drinking water) of 100 L/s (8,640 m^3/day) is required in the surrounding area of the WWTP. The breakdown is as follows.

- Benoa Harbor: 15 L/s (1,300 m^3/day)
- Water demand estimte for the resort development plan (BTID: Turtle Island Development) in 2010: 75 L/s (6,480 m^3/day)
- Residents of Serangan Island: 10 L/s (860 m^3/day)

This water supply system produces reclaimed water at 100 L/s at the reclaimed water treatment facility to be established at the WWTP.The reclaimed water would be sent via 400-200 mm transmission pipes to the reservoir.).

The reclaimed water treatment facility consists of a) aeration tank, b) pre-chlorination, c) bio-filter (rotating disk contact tank), d) VAF (Valve&Filter), e) activated carbon treatment tank, f) ultrafiltration (UF) membrane, and g) post-chlorine treatment.

The total project cost is 65,500 million rupiahs. The total construction cost is 62 billion rupiahs, and the breakdown is 42 billion rupiahs for the water treatment facility, and 20 billion rupiahs for the transmission

and distribution piping. In addition, 3,500 million rupiahs are estimated for design and administration costs. O&M cost covers the costs of electricity, chemicals, personnel, administrative expenses, and redemption. Unit production cost is estimated at Rp.2,300/m^3.

The reclaimed water treatement facility would take 11 months to build, with facility design to start in January 2009 and operation to start in December.

2) Pre-feasibility Study Report by Cipta Karya of PU on Waste Water Re-use from Suwung WWTP, Denpasar, Bali (2009)

This study examines the technical and financial aspects, as well as environmental and social considerations for the re-use of the effluent from the Suwung WWTP, Denpasar.

The WWTP effluent reuse plan is shown in Figure S2.5. The plan to use reclaimed water is proposed by combining the following two systems.

① After the WWTP effluent (20 L/s, 1,700 m^3/day) is treated at the reclaimed treatment facility, the reclaimed water is stored temporarily at the reservoir (500 m^3), then transmitted to the PDAM reservoir to supply to Benoa harbor and Serangan island..

② Reclaimed water is transmitted to the three reservoirs (500 m^3) through the transmission pipe (Diameter: 150mm, HDPE pipe, Pipe Length: 2,500-3,600m) after chlorination (80 L/s, approximately 6,900 m^3/day) of the WWTP effluent and storage at the main reservoir (1,500 m^3). The reclaimed water is supplied from the four reservoirs including the main reservoir to the demand point of the city area by water trucks, and used as watering and hydrant water (Non consumption use).

The following processes would be used to produce the reclaimed water:
i) oil separation, ii) coagulation tank, iii) flocculation basin, iv) settling basin, v) filtration basin,
vi) sterilization pond, vii) sludge treatment facility

A briefing session would be held for the stakeholders in 2011, and the pilot project and construction of the facility would start in 2012. It is proposed that PDAM would be the operator of the facility.

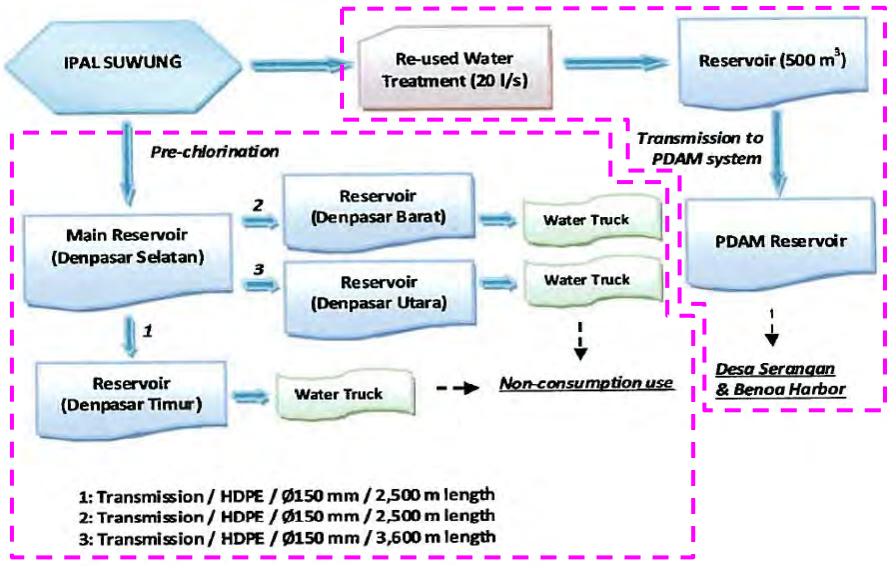

Figure S2.5 Proposed Reuse of Denpasar WWTP Effluent by Public Works

S3. Legislations Relevant to the Project

3.1 Laws & Regulations on Development of Water Supply

Laws on water resources, regulations on development of drinking water supply systems, regulations on the development of water supply, regulations on water supply services by PDAM, and laws & regulations on water supply development and financial recovery of PDAMs were collected and compiled as shown in Tables 3.1.1 and 3.1.2 in the main report. The key points to consider are high lighted below.

1) Law No.7/2004 on Water Supply

- Water refers to all water found on, above, or below land surface, including surface water, water in soil, rain water, sea water on the ground.
- A water business license can be given to individuals or business entities by the central government or regional government in line with their authority.
- Development of drinking water supply systems shall become the responsibility of the government and regional government. State owned corporations and/or regionally owned corporations shall become the operator of the drinking water supply system and cooperatives, private business entities, and the public can play a role in the implementation of the drinking water supply system.

2) Governmental Regulation No.16/2005 on Development of Drinking Water Supply Systems

- Authority and responsibility for the development of drinking water supply systems
  - Drinking water supply system development is organized by BUMN (state-owned) or BUMD (regionally owned and administered) specially established for this purpose. In the event that BUMN or BUMD is not able to enhance the quality and quantity of drinking water supply, cooperatives, private business entities and/or communities can become involved , if approved by the board of supervisors / commissioners.
  - In the event that BUMN or BUMD is not able to provide the drinking water supply service needed by the communities, the central government or regional government can establish a partly or wholly privatized drinking water supply service company.

- Participation of cooperatives, private business entities and communities
  - Cooperatives and/or private business entities can participate in organizing drinking water supply system development in regions, areas or zones, not covered by the service of BUMN / BUMD. The involvement of cooperatives and/or private business entities is acceptable on the basis of fair competition through tender.

3) Regulations on Development of Water Supply

Ministry of Public Works (MPW) regulation No.18/PRT/M/2007 “Guideline on the Implementation of the Development of Drinking Water Supply Systems (SPAM). This document is a guideline identifying requirements from the planning stage to evaluation after construction and implementation.

MPW regulation No.18/PRT/M/2010 “The Cooperation Guidelines for the Development of Water Supply System”. This document identifies detailed procedures for procurement (tender) in the event that the development of a SPAM is conducted through PPP. A feasibility study shall be prepared either by the government and/or the proponent. The feasibility study shall also review risk allocation and shall be used as the tender document for the PPP.

MPW regulation No.12/PRT/M/2010 “Guideline on Implementation of the Development of Water Supply System under the Cooperation between Government and Business Entity. Responsibility & Obligations of the Contracting Agency”. This document covers planning, preparation, and transactions of the project

and management of contracts, establishment of tender committees, determination of successful bidders and establishment of the evaluation team.

The office of the Governor would be the Contracting Agency if the service area of the Water Supply System spans across regencies/cities in the province.

4) Legal Aspects regarding Supply of Reclaimed Wastewater through PDAM

Pursuant to Government Regulation No. 16/2005, water supply services shall be delivered by a relevant regionally-owned enterprise. Under this regulation, drinking water is defined as "drinking water for households, which shall meet health requirements and be drinkable with or without any treatment process".

It is the intent of G.R. No. 16/2005 that the government (including municipal governments) provide drinking water for the community. This regulation, however, does not restrict the government from providing additional services, such as providing clean water for purposes other than for drinking. To address the question whether PDAM is allowed to purchase water and sell it for purposes other than for drinking, one can refer to the power granted to the PDAM based on its statutory/ corporate documents.

Article 2 para (c) in Denpasar City's Regional Regulation No. 3/2009 states that one of the functions of PDAM Denpasar is to provide services to the community, particularly in relation to the fulfillment of the needs of the community for 'drinking' water which is healthy and meets the relevant standards. Article 5 para (b) states that the functions of PDAM Denpasar include providing services, generating revenues from the sale of 'water' to cover all the costs incurred in operating the 'drinking water supply system'.

In Article 2 para (c), the notion 'particularly for the needs of drinking water' implies that there are other services which can be provided by PDAM. In Article 5 para (b), the term as provided in this paragraph refers to just 'water'. This may be interpreted that in addition to its main function of providing drinking water for the community, PDAM Denpasar is allowed to sell clean water (other than drinking water).

According to Article 4 para (d) of the Badung Regency's Regional Regulation No. 6/2005, one of the functions of PDAM Badung is to provide services to the community for the fulfillment of the needs for 'clean water'.

Pursuant to the above analysis, it is understood that both PDAM Denpasar and PDAM Badung are allowed to purchase and sell clean water for purposes other than for drinking.

3.2 Legislative System of PPP Infrastructure Investment in Indonesia

The present statuory framework for PPP infrastructure projects consists of the following:

- Legal framework of license and cooperation agreement (shown as ① in Figure S3.1)
- Institutional structure to accelerate PPP infrastructure investment, (KKPPI, P3CU) (shown as ② in Figure S3.1)
- Risk management framework by the government guarantee and government support (shown as ③ in Figure S3.1)

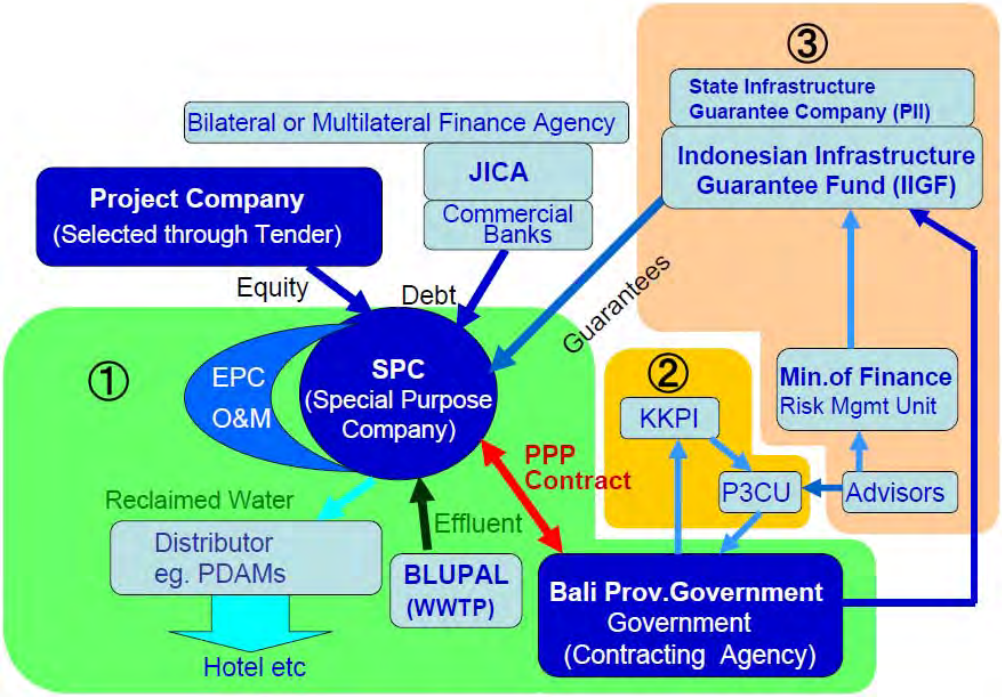

Figure S3.1 Legal Framework for PPP Infrastructure Investment

The current PPP regulatory framework is identified in Presidential Regulation No. 67/2005 as amended by No. 13/2010 and No. 56/2011. The authority to enter into a PPP is governed under Law No. 7/2004 and shall be based on the guideline stated in the Ministry of Public Works Regulation No. 12/2010.

1) Requirement of Procurement of the Project Company
Pursuant to Article 18 of Presidential Regulation 67/2005, the project company shall be procured through open tender.

2) PPP Contract (Cooperation Agreement)
The successful bidder in the tender and the Contracting Agency shall sign a Cooperation Agreement in accordance with Presidential Regulation No. 67/2005. The important items to be included in the Cooperation Agreement are as follows:

- Performance bond
- Tariff and adjustment mechanism
- Rights and obligation, including risk allocation
- Minimum service standard
- Share transfer
- Usage and ownership of the infrastructure asset
- Transfer of the asset

3) Project Company (SPC)
The project company (SPC) shall be formed as an Indonesian legal entity. If a foreign entity is awarded the contract, this foreign company is obliged to form an Indonesian legal entity in accordance with the prevailing laws and regulations.

4) Financial Close
The project company is obliged to obtain a financial close. The financial closing shall be reached at the latest of 12 months after the signing of the Cooperation Agreement.

5) Unsolicited Proposal

Presidential Regulation No. 56/2011 introduced the term “Foreign Legal Entity” to allow foreign companies to participate as the Initiator of Unsolicited Project.

The regulations on PPP provide the opportunity for a business entity to propose and initiate a PPP project. The proponent must provide certain documentation, and the proposal would have to meet the eligibility criteria as stated in this Regulation.

An unsolicited proposal would have to meet the following eligibility criteria:

- The project has not been included in related sector master plan.
- Technically integrated with related sector master plan.
- Financially and economically feasible
- Does not need any government financial support

An unsolicited proposal to be submitted by the Initiator to the Contracting Agency shall include the following documents: (1) feasibility study; (2) modality concept; (3) financing scheme including the source of such financing; and (4) bidding plan which shall include the time frame and evaluation criteria. The status of "Initiator" can only be granted after the full set of documents has been accepted by the Contracting Agency.

The Contracting Agency shall review the unsolicited proposal. If the proposal meets the eligibility criteria, the Contracting Agency can accept the project and the project can go to tender. The Initiator shall be compensated by the Contracting Agency, in the form of:

- Additional points
  In the event that the Initiator intends to tender for the project, the Initiator can be given additional points, to a maximum of 10% of the total score. This method, however, is only applicable if the weighing system (instead of lowest tariff system) is used for evaluation.

- Right to match
  If the evaluation method is using lowest tariff system, the Initiator can be given the right to match, i.e. the right of the Initiator to match the best price/ lowest tariff proposed by the other bidder.

- Purchase of the proposed project
  If the Initiator does not intend to participate in the tender, the Initiator can sell the project to the Contracting Agency.

6) Governmental support and guarantee

Government support can be fiscal or non-fiscal support/ contribution provided by the Contracting Agency and/or Minister of Finance. Government is allowed to give support to the project in the form of licensing, land acquisition, partial construction and other form of support in accordance with the relevant sector laws and regulations.

The Government of Indonesia has established the Indonesia Infrastructure Guarantee Fund (IIGF) through the formation of PT Penjaminan Infrastruktur Indonesia (PT PII) to promote investment in the infrastructure sector.

To obtain a guarantee from IIGF, a proposal shall be submitted in accordance with IIGF’s guideline (Infrastructure Guarantee Provision Guideline of March 2011) by the Contracting Agency, and not by the Initiator or the Project Company. Figure S3.2 shows the typical covered risks.

TYPICAL COVERED RISKS	
Delay or failure in obtaining licenses, permits, and approvals	
Financial close delay/failure	**Breach of contract**
Change in law/regulation	**Integration with network**
Competing facility	**Demand**
Revenue	**Tariff**
Expropriation	**Sub-sovereign or Parastatal**
Currency inconvertibility & non-transfer	**Force majeure affecting the CA**
Interface	

Figure S3.2 IIGF – Currently Available Guarantee Structure

The IIGF guarantee fee shall be borne by the project company. IIGF's involvement shall start in the preparation of the project. However, such involvement is limited to consultation for the preparation of the project.

7) Laws related to implementation of PPP projects

The relevant laws are shown in Tables 3.2.1 and 3.2.9 in the main report.

S4. Project Scope

S4.1 Reclaimed Water Demand Projection in Southern Bali

To understand the uses and demand of reclaimed water in Southern Bali, the following studies are carried out:

1) Demand survey on reclaimed water use
2) Estimation of the reclaimed water demand potential

S4.1.1 Demand Survey on Reclaimed Water Use

(1) Objective and Survey Target

An interview survey was executed to understand the reclaimed water demand in a power plant, a harbor facility, large hotels, golf courses, and shopping malls and other facilities in the survey area. Figure S4.1 shows the location of the target area and facilities interviewed in the survey.

The survey looked at the demand for three levels of reclaimed water quality shown below.

Level 1: Reclaimed water that can be used as potable and cooking water directly and indirectly.

Level 2: This is not suitable as potable and cooking water. Reclaimed water can be used for other uses such as showering, filling pools and ponds, hand washing, toilet flushing, watering gardens, and others.

Level 3: Reclaimed water can be used for watering gardens and other landscaping applications such as filling ponds. Water quality is not suitable for other uses.

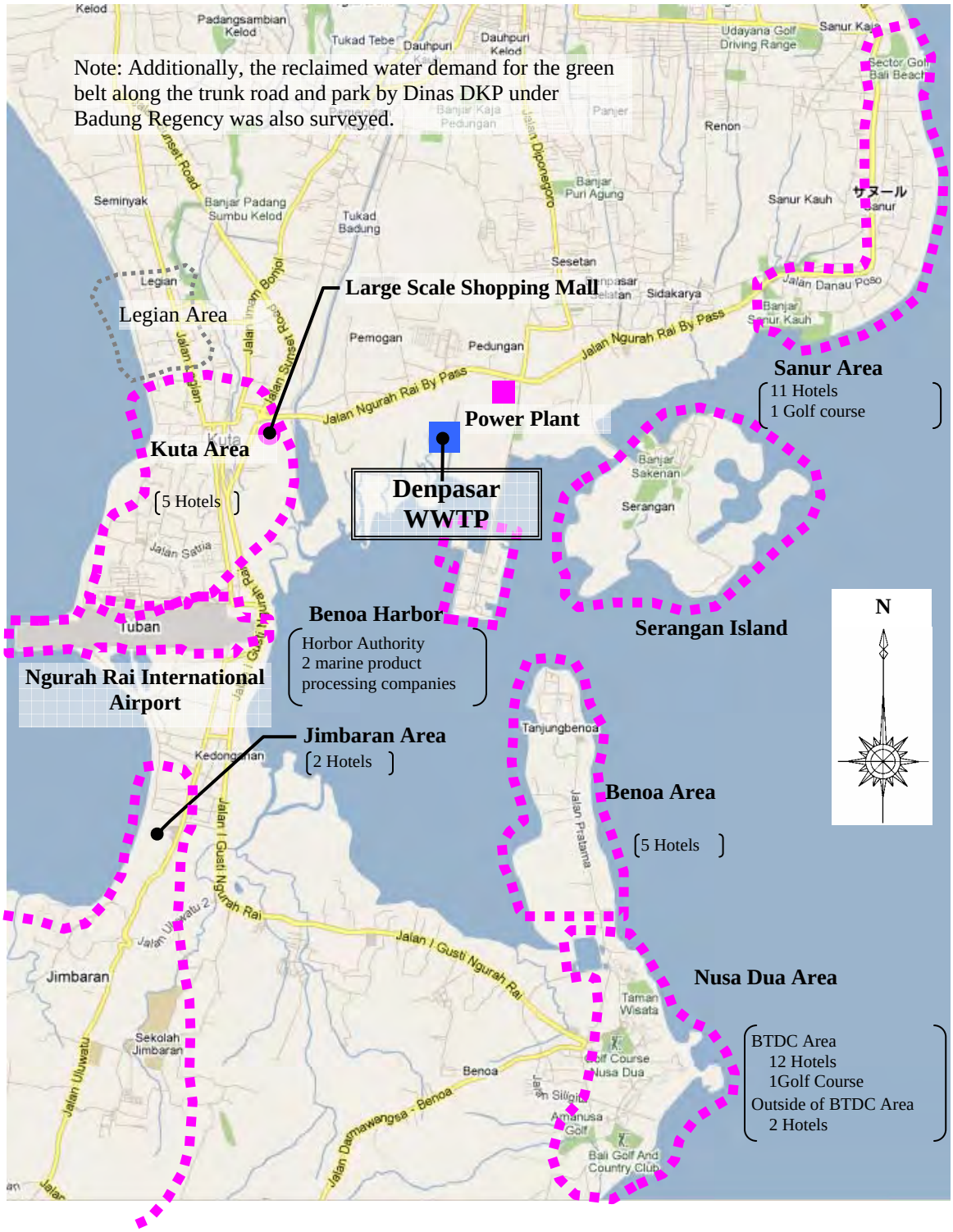

Figure S4.1 Location of the Target Area and Facilities Surveyed

(2) Results of the Survey

There is little demand for level 1 reclaimed water. People do not want to use wastewater for drinking and cooking even though it is treated. Therefore, in reporting the results of the survey the focus is mainly on the demand for level 2 and 3 reclaimed water.

1) Level 2 reclaimed water demand

- Many interviewees see little demand for level 2 reclaimed water if they have to install a separate piping system. They expect that finding the budget for installing a separate system just for flushing toilets would be difficult.
- In the survey area, there is no example of an existing indoor dual water supply piping system .
- Hotel facilities experience shortage of water for different uses. Therefore, they may use the reclaimed water to off set some of these shortages.
- The new building programs, such as the hotel and conference hall in Nusa Dua and the surrounding area, would increase the water demand. More water sources must be developed if the planned increase in water supply is to be realized. This could lead to the need to use reclaimed water. The gradual depletion and salination of groundwater in Nusa Dua and the surrounding area is rendering the continual reliance on this water source problematic in the future.
- Groundwater is the main source of water supply for the airport and the harbor facilities. Reclaimed water could be a potential supplemental source, since the long term supply of groundwater is limited. However, at the time of the survey, we are not able to acertain the demand of reclaimed water because the water supply plan for future developments has yet to be determined. There is little demand for level 2 reclaimed water at the power plant, golf courses, and large shopping malls.
- Seragen Island cannot be a target for the reclaimed water business because its future development is uncertain,

4) Level 3 reclaimed water demand

- The golf courses and large hotels use treated wastewater from their own wastewater treatment facilities, and rain water or water from the nearby river in case of emergencies. There is no serious issue with the water supply. There is some demand for irrigation water but the amount is small.
- BTDC supplies reclaimed water for irrigation in the Nusa Dua area.

(3) Cultural Acceptance of Reclaimed Water

1) Level 1: Possible to use for drinking
Even if the reclaimed water is of a quality good enough for ingestion, all interviewees are reluctant to use it for drinking and cooking.

2) Level 2: Possible to use for all purposes except drinking and cooking
This level of reclaimed water is safe for direct bodily contact and presents no problem even if ingested accidentally. Many interviewees who are managers of water utility still find it difficult to acept the use of reclaimed water for purposes other than toilet flushing. Some interviewees claim that they would accept its safe use if the quality can be shown to meet the relevant standards.

These sentiments reflect the conventional perception that reclaimed water is only good enough for toilet flushing, and the lack of confidence in or knowledge of the advances in treatment technologies to bring the water quality to a sufficiently safe level for bodily contact.

3) Level 3: Irrigation water suitable for landscaping and gardening purposes
Since all the interviewees are already familiar with irrigation using reclaimed water from BTDC and the treated water from their own wastewater treatment facilities, they understand the uses of level 3 reclaimed water.

S4.1.2 Estimation of Potential Demand of the Reclaimed Water

(1) Estimation Method

The potential demand for reclaimed water was calculated by working through the following 5 steps.
1) Identify the potential customer base
2) Determine the unit water consumption in resort hotels
3) Set permissible end uses for the different levels of water quality
4) Estimate water demand in resort hotels for each end use
5) The potential demand for reclaimed water is based on the comparison of two scenarios for reuse.

(2) Customer Base

The Nusa Dua and Benoa areas where the resort hotels are located and the Sawangan area where more hotels are going to be constructed are selected as the potential customer base for reclaimed water.

(3) Unit water consumption in hotels

The following data sets were used to calculate the unit water consumption in hotels.
1) Present water consumption based on the interview survey and
2) Present water consumption based on the water supply record
3) Comparison with water use survey in resort hotels in Okinawa prefecture in Japan, as a point of reference.

1) Unit water consumption in hotels based on the interview survey

Water consumption per room was calculated by deducting the amount of irrigation water (gardening water in hotels) from the 2010 total water consumption collected in the interview survey and dividing this by the number of guest rooms. As shown in Table S4.1, for 70-90% occupancy, the overall average unit water consumption is 2.2-2.9 m^3/day, the value for the Nusa Dua and Benoa areas is 1.9-2.5 m^3/day.

Table S4.1 Water Consumption per Guest Room Based on the Water Use Record (m^3/day)

Area	Hotel	G	Room No.	Water Used per Room (m3/day)				
				Assumed Room Occupacy Rate				
				100%	90%	80%	70%	60%
Nusa Dua	Amanusa Resort *)	5	35	**2.89**	**3.16**	**3.61**	**4.04**	4.81
	Bali Tropic Resort	4	150	1.45	1.61	**1.81**	**2.07**	**2.41**
	Inna Putri Bali *)	5	392	1.35	1.50	**1.69**	**1.93**	**2.26**
	Nusa Dua Beach Hotel *)	5	381	1.23	1.37	**1.54**	**1.76**	**2.05**
	Swiss Grand Bali *)	4	63	**1.94**	**2.14**	**2.44**	**2.77**	3.21
	The St. Regis Bali Resort *)	5	123	**1.89**	**2.10**	**2.38**	**2.71**	3.15
	The Westin Resort Nusa Dua *)	5	334	**1.78**	**1.97**	**2.22**	**2.54**	2.97
Benoa	Melia Benoa Bali	5	128	1.26	1.40	**1.58**	**1.79**	**2.09**
	Average in the above area			1.72	1.91	**2.16**	**2.45**	**2.87**
Sanur	Inna Grand Bali Beach Hotel	5	523	**4.37**	**4.86**	**5.47**	**6.25**	7.29
	Mercure Resort Sanur	4	189	1.36	1.51	**1.70**	**1.95**	**2.27**
	Puri Santrian Hotel	4	182	1.88	2.09	**2.35**	**2.70**	**3.15**
	Sanur Beach Hotel	5	428	1.70	1.89	**2.13**	**2.43**	**2.83**
	Segara Village	4	120	**3.61**	**4.01**	**4.51**	**5.15**	6.01
Jimbaran	Bali Intercontinental	5	425	**2.01**	**2.23**	**2.52**	**2.87**	3.36
	Four Seasons Resort Jimbaran	5	147	**3.07**	**3.42**	**3.82**	**4.38**	5.13
Kuta	Bali Bintang	5	401	**3.06**	**3.40**	**3.82**	**4.37**	5.09
	Bali Dynasty Resort	4	312	**2.06**	**2.29**	**2.58**	**2.95**	3.44
	Discovery Kartika Plaza Hotel	5	318	1.67	1.86	**2.09**	**2.39**	**2.79**
	Hard Rock Hotel Bali	4	418	0.72	0.80	0.90	1.02	**1.20**
	Kuta Paradiso Hotel	5	250	1.05	1.16	**1.31**	**1.50**	**1.75**
Average			5,319	**2.02**	**2.24**	**2.53**	**2.89**	3.37
Maximum				**4.37**	**4.86**	5.47	6.25	7.29
Minimum				0.72	0.80	0.90	1.02	1.20

*) BTDC : Bali Tourism Development Corporation

2) Unit water consumption based on the water supply record

The water consumption per guest room calculated from the amount of water which PT.TB supplies is shown in the following table. The amount of water used per room is 1.6-2.1 m^3/day at the occupancy rate of 70-90%. The amount of the water used per room in the Nusa Dua area is in the range of 1.9-2.5 m^3/day and would be representative of the current unit water consumption in hotels, since some hotels are also using water sources other than PDAM water.

Table S4.2 Amount of Water used per Room based on Water Supply Record to Hotels in the Nusa Dua Area (m^3/day)

Hotel	Room No.	**Supplied Volume**		**Water Supplied Per Room (m^3/day)**				
				Assumed Room Occupancy				
		(m^3/year)	(m^3/day)	100%	90%	80%	70%	60%
1	400	132,693	364	0.91	1.01	1.14	1.30	1.52
2	381	180,358	494	1.30	1.44	1.62	1.85	2.16
3	334	214,114	587	1.76	1.95	2.20	2.51	2.93
4	276	277,420	760	**2.75**	**3.06**	3.44	3.93	4.59
5	500	113,400	311	0.62	0.69	0.78	0.89	1.04
6	750	523,047	1,433	1.91	2.12	2.39	2.73	3.18
7	384	173,514	475	1.24	1.37	1.55	1.77	2.06
8	537	284,189	779	1.45	1.61	1.81	2.07	2.42
Total	3,562	1,898,735	5,203	**1.46**	**1.62**	**1.83**	**2.09**	**2.43**

Notes) Water supply amount was obtained from PT.TB.

3)present unit water consumption per room per day

Based on the previous estimation methods the unit water consumption in Southern Bali is set at 2.5 m^3/room/day (with a room occupancy rate of 80%).

4) Comparison with water use in resort hotels in Okinawa prefecture in Japan

According to the water use record in resort hotels in Okinawa in Japan, the amount of water used per guest room is 2.0-2.3 m^3/day. The unit water consumption estimated above is very close to this range.

(4) Reclaimed Water Use Scenarios

The following two scenarios are used to estimate the demand for reclaimed:

Case 1: Water is used for flushing toilets, filling ponds, gardening and other non contact uses (conventional type reclaimed water use)
Case 2: Water is also used for bathing, showering, and swimming pools but not for drinking or cooking (referred to as New Clean Water)

(5) Water Consumption in Hotels by Type of Use

The data on water consumption by type of use at resort hotels could not be obtained in this survey. Therefore, data from a 4-year water planning study on resort hotels carried out by the Ministry of Health and Welfare of Japan in 1983 is used as a reference. Water consumption by type of use is shown in Figure S4.2.

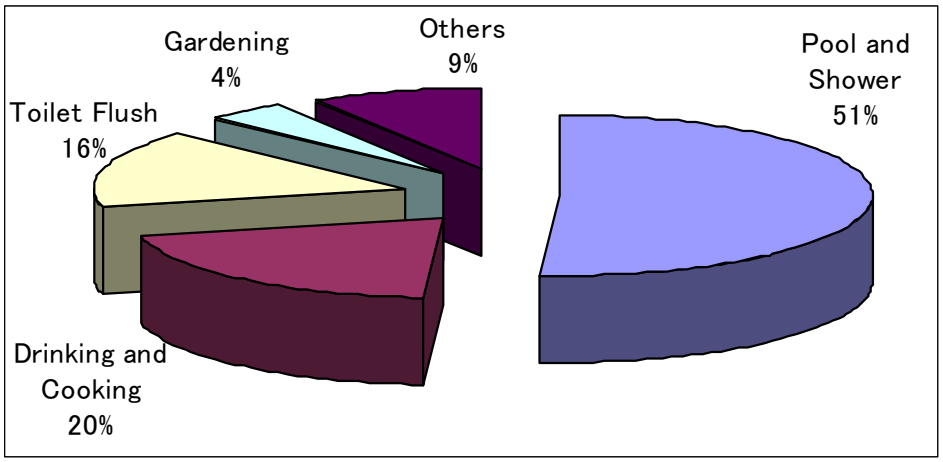

Figure S4.2 Water Use Ratio by Type of Use in Resort Hotels in Okinawa

Based on data from the Okinawa resort hotels survey, the amount of water used for flushing toilets is about 20% of the total consumption. The amount used for drinking and cooking is also about 20% of the total. These ratios shall be used when calculating the design flow of the reclaimed water for both usage scenarios.

(6) Estimation of the Reclaimed Water Demand

The assumptions used to calculate the reclaimed water demand to 2021 for the two cases is shown below.

1) Unit water consumption per room: 2.8 m^3/day, including future demand of 0.3 m^3/day.
2) Occupancy rate: 85%
3) Ratio of supplementing reclaimed water quantity with PDAM water: 0.2 for case 1, and 0.8 for case 2
4) Mixing ratio of the reclaimed water: 100% for case 1, and 50% for case 2

The calculation result of the reclaimed water demand potential for two cases is as follows.

Case 1: 3,700 m^3/day
Case 2: 7,400 m^3/day

The calculation process and the result are shown in the following table.

Table S4.3 Estimation of the Reclaimed Water Demand Potential

Item	Unit	Asumed Ratio		Nusa Dua	Benoa	Sawangan	Future Plan	Hotel Total
Room Number	No.			4,050	2,100	700	1,000	7,850
Room Number Used	No.	a	0.85	3,443	1,785	595	850	6,673
Total Water Demand	m^3/day			9,639	4,998	1,666	2,380	18,683
Case 1 for Toilet Flushing	m^3/day	b	0.20	1,928	1,000	333	476	**3,737**
Non-Drinking Water	m^3/day	c	0.80	7,711	3,998	1,333	1,904	14,946
Expected Reclaimed Water to be used	m^3/day	d	0.50	3,856	1,999	666	952	7,473

* About 670 rooms among 1000 rooms in future plan are alread under construction.

Here, “a” shows the occupancy rate. “b” and “c” show the ratio which can be used as the reclaimed water in the case 1 and 2. “d” shows the mixing ratio of PDAM water and the reclaimed water.

S4.2 Study of Alternatives for a Reclaimed Water Supply System

Two alternatives are considered for reclaimed water use.

- Case 1: Reclaimed water use centering on conventional toilet flush water
- Case 2: Reclaimed water use except for drinking and cooking purpose

The water service schemes for each case are shown in Figures S4.3 and S4.4.

In Case 1, main reclaimed water uses are for toilet flushing and car washing. Reclaimed water is already supplied by BTDC for gardening in the hotels in BTDC area. Therefore, the unmet reclaimed water demand for landscaping and gardening at the hotels is expected to be low. In addition, the conventional reclaimed water supply system needs parallel systems to supply PDAM water and reclaimed water separately.

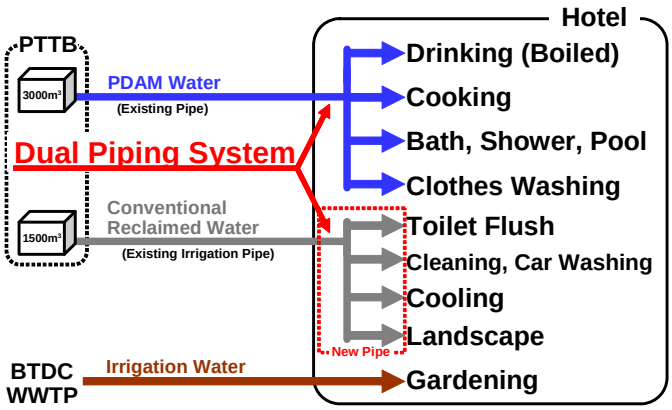

Figure S4.3 Conventional Reclaimed Water Supply System (Dual Service Pipe System)

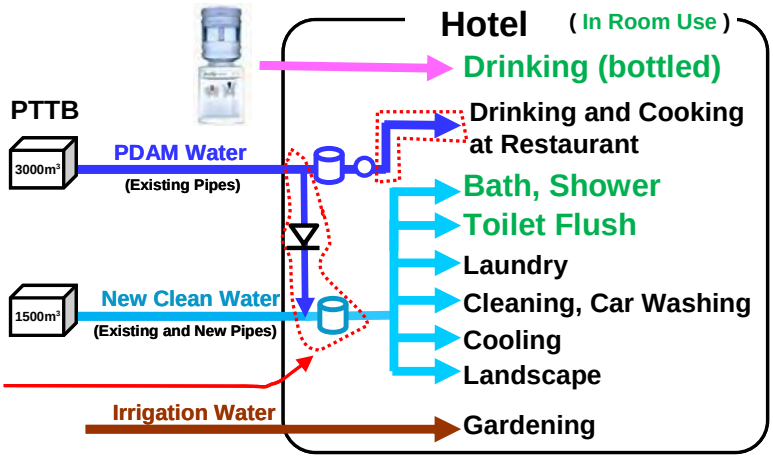

Figure S4.4 New Clean Water Supply System

Consulting Bali government's wish to use the reclaimed water, the Case 2 is prepared to supply the reclaimed water mixed with PDAM water by use of existing service pipe system in the hotels. The PDMA water and bottled water for drinking and cooking is supplied by another system as shown in Figure above.

S4.3 Reclaimed Water Treatment Process

S4.3.1 Raw Water (Secondary Effluent)

The designed capacity of the Denpasar Wastewater Treatment Plant (Suwung WWTP) is 51,000 m^3/day. The second phase of sewer line is currently under construction, and according to the information received from the WWTP, the flow rate is approximately 25,000 m^3/day as of May 2011. However, the data from the ultrasonic flowmeter installed in July 2011, showed a much lower influent flow rate of 4,865 to 9,491 m^3/day (average 7,000 m^3/day) in August. The targeted effluent BOD after the completion of the third phase of the sewage line is 30 mg/l. Both BOD (7～49 mg/l) and COD (20～170 mg/l) show big fluctuations in value. This could be caused by instability in the treatment process. Some of the reasons include: 1) the difference in influent quantity and quality during dry and rainy seasons; 2) since the plant is currently under construction, the flow rate is unstable; 3) operating conditions for the aerator may be unstable.

The monthly data from the WWTP was compared to the data obtained from the test operation of the pilot reclamation plant. Values of SS and BOD in the treated effluent (raw water for reclaimed water) varied from 2 to 3 times and COD varied from 1.2 to 1.5 times the average value. The data show that fluctuation is not only seasonal (wet and dry weather) but also daily. The degree of color and UV 254, which is not measured monthly at the WWTP exceeded normal standards. High values in color and UV 254 compared with the secondary treated wastewaters in developed countries may indicate some difficulties in the reclaimed water treatment process.

S4.3.2 Target Water Quality Level

In Indonesia, quality standards for reclaimed water have not been established. It is necessary to establish the water quality standards for use of reclaimed water, including some guidelines for the treatment process, may be with a technical assistance by the Ministry of Land, Infrastructure, Transport and Tourism of Japanese government. These standards are required for setting up the design water quality for the reclaimed water in the project. In the mean time, existing standards would be used for setting the design reclaimed water quality .

The current survey is not considering the use of reclaimed water for direct or indirect use as potable water. Therefore, it is not necessary to apply the higher water quality standard for indirect potable use (groundwater recharge to aquifers, etc.), which is equivalent to that of potable water.

Most of the tourists in Bali come from developed countries, including Europe and the U.S. They are likely to complain about color, turbidity, odor and presence of insects, such as members of the genus Chironomus. Therefore, it is conceivable that a relatively high level of water quality is required. It would be desirable to use the stricter effluent standards for recreational water established by the Ministry of Land, Infrastructure, Transport and Tourism used by the Shibaura Water Reclamation Center for reclaimed water, for this project.

Table S4.4 Reclaimed Water Quality Targets of The Tokyo Metropolitan Government Bureau of Sewerage

	The target values for recreational water established by the Ministry of Land, Infrastructure, Transport and Tourism
E.Coli	Undetected
Turbidity	1 or less
pH	5.8-8.6
Appearance	Not unpleasant
Color	3 or less
Odor	Not unpleasant
Residual Chlorine	Free residual chlorine 0.1 mg/L or Combined residual chlorine more than 0.4 mg/L
Facility Standard	Same or higher quality facility as coagulation, sedimentation and sand filtration facility

S4.3.3 Treatment Process

This survey does not consider groundwater recharge or indirect potable water. The treatment process would have to have low initial and running costs (especially electric power). The effluent quality at IPAL Suwung is not necessarily high and adequate treatment would be required to produce the water quality that would meet the standards for pools and public baths in Bali province, or standards that the Tokyo Metropolitan Government Bureau of Sewerage uses for recycled water, until the appropriate standards are established. The biofilter, ozonation, coagulation/flocculation and ceramic membrane filtration used at the Shibaura Water Reclamation Center in Tokyo, are proposed as the basic treatment process.

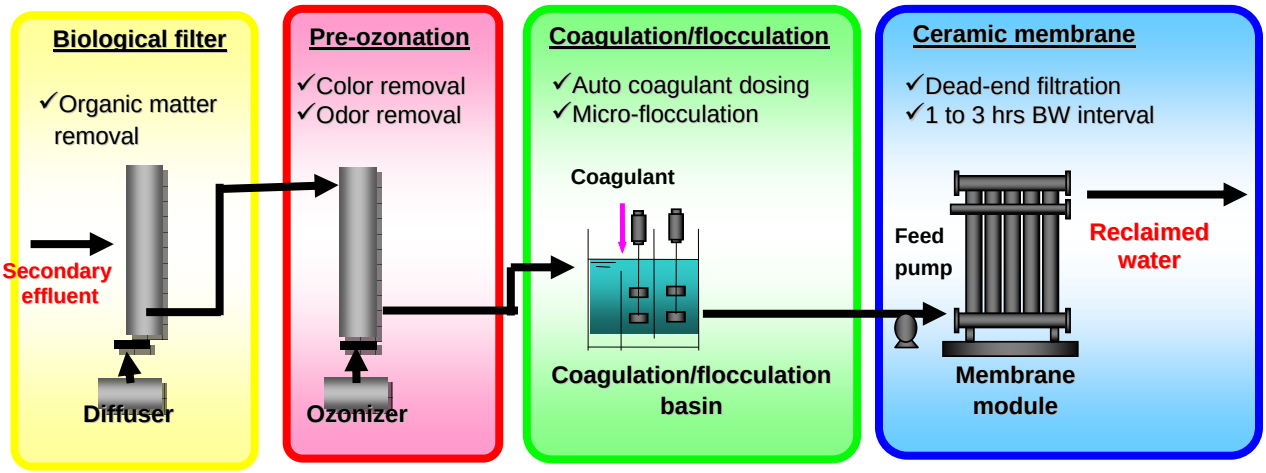

Figure S4.5 Process Flow at the Shibaura Water Reclamation Center

S4.4 Project Scope

(1) Purpose and Basic Policy of Reclaimed Water Supply

The proposed projects are planned to supply the reclaimed water to the hotels in Nusa Dua, Benoa and Sawangan. The project purposes are to provide PDAM water equivalent to reclaimed water volume to the domestic users in Southern Bali as well as solving the water shortage at the hotels.

(2) Reclaimed Water Supply Plan

The design flows of the bulk supply system from the reclamation plant to the existing distribution reservoir are set based on the reclaimed water supply plan as follows.

Table S4.5 Design Flows for the Reclaimed Water Facilities in Case 1 and Case 2

Design Flow	Case 1	Case 2	Remarks
Average Supply Flow	3,700 m^3/day	7,400 m^3/day	Water loss, about 10% of average daily flow, is assumed at distribution and service pipes
Maximum Daily Flow	4,500 m^3/day	9,000 m^3/day	For design of reclamation and transmission facilities
Average Daily Flow	4,100 m^3/day	8,200 m^3/day	For O&M of reclamation, transmission and distribution facilities
Maximum Hourly Flow	4,950 m^3/day	9,900 m^3/day	For design of distribution pipes
Maximum Supply Flow	9,000 m^3/day	18,000 m^3/day	For design of service pipe system in hotels. The flow is set at twice of the maximum daily flow.

S5. Reclaimed Water Project Plan

S5.1 Concept Design of the Facility

S5.1.1 Reclaimed Water Bulk Supply Facilities

Bulk supply facilities consist of reclaimed water treatment facility and transmission pipe. Figure S5.1 shows the location of these facilities.

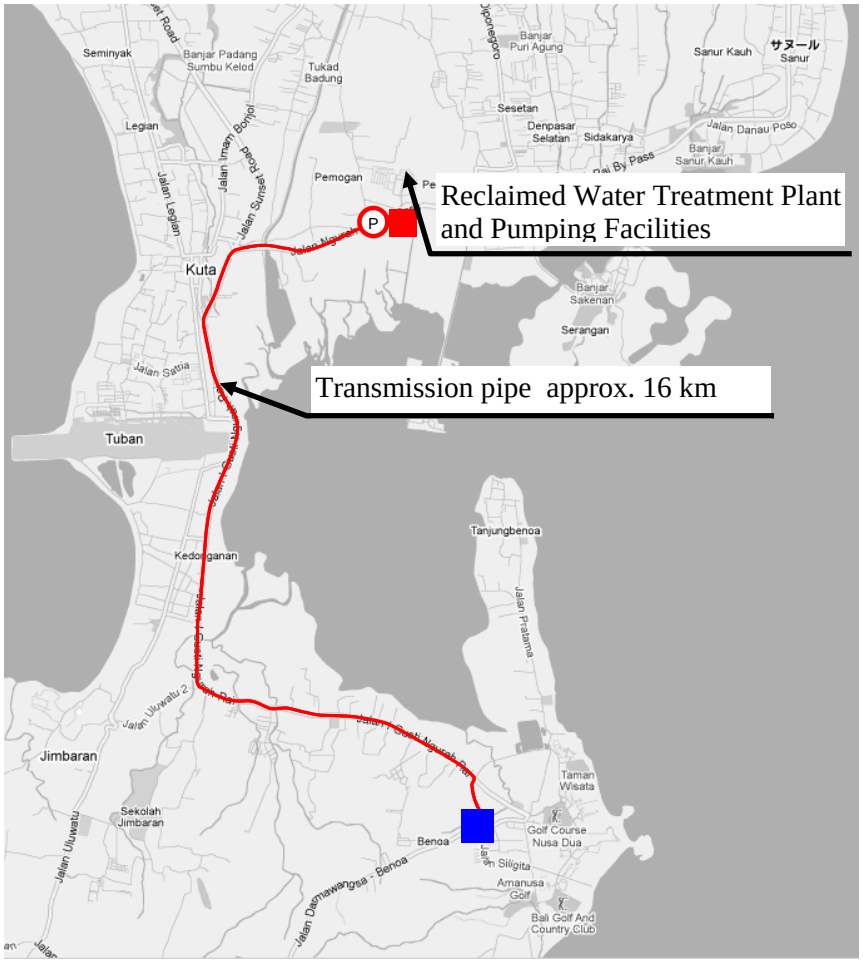

Figure S5.1 General Layout Plan of the Reclaimed Water Bulk Supply System

(1) Reclaimed water treatment facility

1) Outline

The outline of reclaimed water treatment facility is as follows.

Location: Inside the Denpasar WWTP, or in an adjoining area
Raw water: Effluent of the Denpasar WWTP
Design Capacity: Case 1, 4,500 m^3/day (= 3.125 m^3/min = 52.1 L/s)
Case 2, 9,000 m^3/day (= 6.250 m^3/min = 104.2 L/s)
Treatment Method: Biological Filtration Process → Ozone → Coagulation → Ceramic Membrane Filtration
Disinfection equipment: To be prepared in the final process
Power supply: General power line from PT. Indonesia Power
Emergency generator: For backup at the time of power failure
Civil and architectural facilities: Of earthquake-resistant construction with foundations that would withstand liquefaction and N value of 30 or higher.

2) Layout of the facility

The proposed layout of the reclaimed water treatment facility shown in Figure S5.2 takes into consideration the future development plans of Denpasar and the Denpasar WWTP, the locations of the high voltage lines, the holy spring and other constraints in the area.

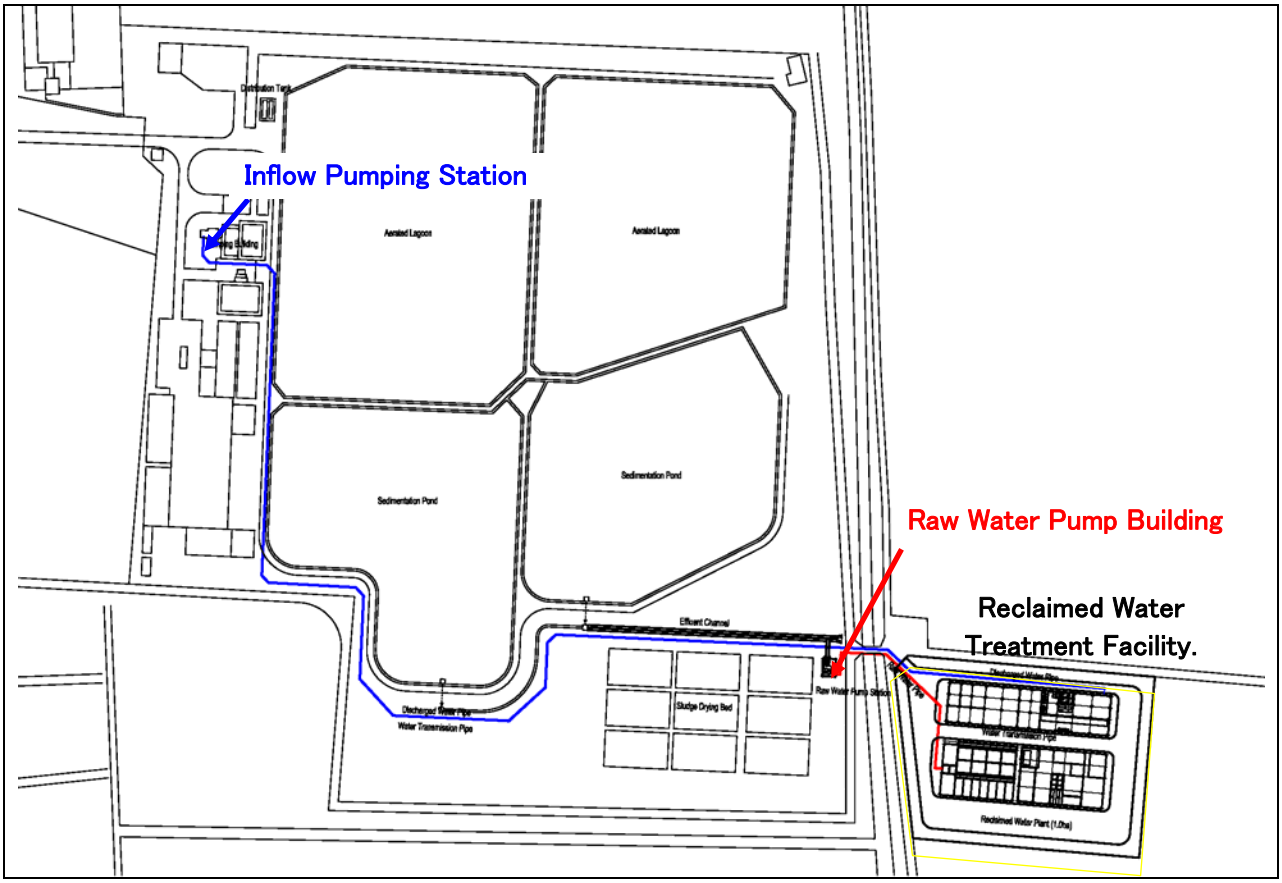

Figure S5.2 Proposed Layout of Reclaimed Water Treatment Facility

3) Outline of the facility

Outline of the facility is shown in Table S5.1.

Table S5.1 Outline of the Reclaimed Water Facility

Facility Name	Treatment Process	Equipment	Case 1	Case 2
1) Raw Water Pump Building	Raw Water Lifting	Dust Removing Screen	Two screens at each waterway. No grit chamber	
		Raw Water Pump Well (Electric Panel Room is located at the upper part of waterway)	Flow Rate: 4.1 m^3/min Quantity: 2 (1 duty/1 stand-by) Pump well: 5.2 m in length, 3.0m in width, and 2.5 m water depth	Flow Rate: 4.1 m^3/min Quantity: 3 (2 duty/1 stand-by) Pump well: 5.2 m in length, 3.0m in width, and 2.5 m water depth
2) Biological Filtration Process Building	Biological Filtration	Raw Water Tank	Capacity:18 m^3 (3.3 m in length × 2.7 m in width × 2.0 m in water depth) Number of tank: 2	
		Biological Filtration Transmission Pump Room	Pump Flow Rate: 4.1 m^3/min Quantity:2 (1 duty/1 stand-by)	Pump Flow Rate: 4.1 m^3/min Quantity:3 (2 duty/1 stand-by)
			Pump room: 6.2 m in length, 9.2 m in width	
		Biological Filtration Tank	Dimension: Approximately 6.1 m in length × 6.1 m in width × 4.0 m depth Quantity: 8 Space height: 6.90 m	Dimension: Approximately 6.1 m in length × 6.1 m in width × 4.0 m depth Quantity: 8 Space height: 6.90 m
	Common and Others	Warehouse	Approximately 55 m^2 (9.5 m × 6.0 m)	
		Workshop	Build in the ozonation building	Approximately 140 m^2 (9.5 m × 14.6 m)
		Parking Lot	Indoor parking lot for three vehicles	
3) Ozonation Building	Ozonation Coagulation/ Flocculation	Filtered Water Tank	170 m^3 (8.2 m in length × 6.3 m in width x 3.3 m in water depth) Quantity: 1	300 m^3 (15.0 m in length × 6.3 m in width x 3.3 m in water depth) Quantity: 1
		Ozone Reactor and Backwash Pump Room	Ozone reactor pump Flow Rate: 3.4 m^3/min Quantity: 2 (1 duty/1 stand-by) Backwash pump: Flow Rate: 16.8 m^3/min Quantity: 2 (1 duty/1 stand-by)	Ozone reactor pump Flow Rate: 3.4 m^3/min Quantity: 3 (2 duty/1 stand-by) Backwash pump Flow Rate: 16.8 m^3/min Quantity: 3 (2 duty/1 stand-by)
			Pump room: Approximately 100 m^2	
		Ozone Contactor Tank	Dimension: Approximately 2.9 m in length × 1.3 m in width × 5.0 m depth Quantity: 2 (2 tanks × 1 trains)	Dimension: Approximately 2.9 m in length × 1.3 m in width × 5.0 m depth Quantity: 4 (2 tanks × 2 trains)
		Ozone Treatment Unit	Quantity: 1	Quantity: 2 (1 unit × 2 trains)
		Coagulation/Flocculation Tank	Dimension: Approximately 5.5 m in length, 2.0 m in width, 1.7 m depth Number of Row: 1	Dimension: Approximately 5.5 m in length, 2.0 m in width, 1.7 m depth Number of Row: 2
	Chlorination (Treated Water Transmission Process)	Microfiltered Water Tank	60 m^3 (8.1 m in length × 3.8 m in width × 2.0 m in depth) Quantity: 1	
		Transmission Pump Room	Refer to transmission facility	
		Sodium Hypochlorite	Capacity: 10 m^3, Quantity:2	

Facility Name	Treatment Process	Equipment	Case 1	Case 2
		Storage Tank		
	Common and Others	Monitoring Room	Approximately 70 m^2 (10.4 m × 6.8 m)	
		Workshop	Approximately 90 m^2 (7 m × 13 m)	Build in the Biological Filtration Process Building
		Laboratory and Preparation Room	Laboratory: Approximately 70 m^2 (13.7 m × 5.2 m) Preparation Room: Approximately 30m^2 (5.5 m × 5.2 m)	
		Staff Room	Approximately 120 m^2 (13.2 m × 9.0 m) for 10 persons	
4) Membrane Filtration Building	Membrane Filtration	Filtration Room	Microfiltration (ceramic filter) unit: 1 set Tanks for the chemicals for filter washing and dosing pump: 2 sets Membrane filter pump, Flow Rate: 3.4 m^3/min Quantity: 2 (1 duty/1 stand-by) Drainage pump, Flow Rate: 2.0 m^3/min Quantity: 2 (1 duty/1 stand-by)	Microfiltration (ceramic filter) unit: 2 sets Tanks for the chemicals for filter washing and dosing pump: 2 sets Membrane filter pump, Flow Rate: 3.4 m^3/min Quantity: 3 (2 duty/1 stand-by) Drainage pump, Flow Rate: 2.0 m^3/min Quantity: 2 (1 duty/1 stand-by)
		Drainage Tank	400 m^3 (21.8 m in length × 9.3 m in width × 2.0 m in depth) Quantity: 1	550 m^3 (29.8 m in length × 9.3 m in width × 2.0 m in depth) Quantity: 1
		Ozonation Equipment Room	Approximately 85 m^2 (17.0 m × 5.2 m)	Approximately 170 m^2 (17.0 m × 10.0 m)
		Blower Room	Blower, Air Volume: 22.2 m^3/min Quantity:2 (1 duty/1 stand-by) Backwash Blower, Air Volume: 37.2 m^3/min Quantity: 2 (1 duty/1 stand-by) Blower Room: Approximately 110m^2 (16.0 m in length × 7.0m in width)	Blower, Air Volume: 22.2 m^3/min Quantity: 3 (2 duty/1 stand-by) Backwash Blower, Air Volume: 37.2 m^3/min Quantity: 3 (2 duty/1 stand-by) Blower Room: Approximately 110m^2 (16.0 m in length × 7.0m in width)
	Common and Others	PLN Room	Approximately 50 m^2 (10.0 m×5.0 m)	
		Substation	Approximately 50 m^2 (10.0 m×5.0 m)	
		Generator Room	Approximately 60 m^2 (10.0m×6.0 m)	
		Electrical Panel Room	Approximately 250 m^2 (17.0 m×15.0 m)	
5) Others	Common and Others	Guard Post, Gate, Fence	common	
		Raw Water Pipe	Diameter: 300 mm Length: 100 m	Diameter: 400 mm Length: 100 m
		Drainage Pipe	Diameter: 200 mm Length: 335 m	Diameter: 300 mm Length: 335 m

(2) Transmission Facility

Since the existing UPA reservoir for using reclaimed water distribution tank is located higher than the reclamation plant, transmission pumps are required.

Two pumps (1 duty/1 stand-by) and 3 pumps (2 duty/1 on stand-by) are designed for Case 1 and Case 2 respectively. Each pump has discharging capacity of 3.4 m^3/min. They would be installed at the pump room (8.8 m long and 7.8 m wide) in the ozonation building.

The transmission pipeline is a pressured line from the treatment facility to the existing reservoir used for irrigation water in the past. Locally available high density polyethylene pipe would be used because of its shock resistance, low price, low inner friction coefficient, lightweight and has other good attributes. The pipe diameter of 300m (for Case 1) and 400 mm (for Case 2) is optimal for the designed flow and was selected as a result of cost comparison (construction cost and O&M cost) for 20 years based on the design. In addition, an electromagnetic flowmeter and water level meter would be installed at the branch connecting point for the reservoir and in the reservoir.

An open cut method is generally applied for laying work of transmission pipes, but the following methods would be selected considering easiness of construction, price, site conditions as follows:

- River and drainage canal crossings: water pipe bridge
- Traffic congestion areas: night time construction
- Crossing power distribution cable at the airport: pipe-jacking method

S5.1.2 Distribution and Service Facility of the Reclaimed Water

(1) Distribution Facility

Distribution facility composed of distribution tank and distribution pipe. Reclaimed water would be stored in a reservoir and distributed to the hotels in the Nusa Dua, Benoa, and Sawangan areas.

The reservoir owned by PDAM Badung with a capacity of 1,500 m^3 previously used for irrigation water would be repaired for using reclaimed water distribution.

Design distribution flow to each area is shown below.

Table S5.2 Design Flow of Reclaimed Water to Each Area (Case2)

Area	Design Distribution Flow (m^3/day)	Design Service Flow (m^3/day)*	Remarks
Nusa Dua	4,240	3,800	For Case 1, the figure are half.
Benoa	2,200	2,000	-ditto-
Sawangan **	1,760	1,600	-ditto-
Total	8,200	7,400	-ditto-

Note) * : These figures are set from the potential demand shown in Table S4.3.
** : These figures future demand of hotels in Sawangan area.

There are already existing pipes to the Nusa Dua area previously used for irrigation water. These would be repaired and new ones would be installed to distribute the reclaimed water to the Benoa and Sawangan areas. The lengthes of the new distribution pipes are as follows.

Benoa Area: Total 6,500 m
(Case 1: φ200 mm: 5,800 m、φ100 mm: 700 m)
(Case 2: φ300 mm: 5,800 m、φ150 mm: 700 m)

Sawangan Area: Total 5,200 m
(Case 1: φ200 mm: 4,000 m、φ100 mm: 1,200 m)
(Case 2: φ300 mm: 4,000 m、φ150 mm: 1,200 m)

(2) Water Service Facility

The existing service pipe system should be improved to provide the reclaimed water. For Case 1, additional service pipes should be installed to each guest room for the supply of reclaimed water. For Case 2, because the existing service pipes for each guest room can be used for the mixed water of PDAM water and the reclaimed water just before supplying for the new clean water uses, except for drinking and cooking. A separate piping system should be installed for bringing water for drinking and cooking, to the restaurants and kitchens. Examples of service pipe system improvement for each case are shown in Figure S5.3 and S5.4, respectively.

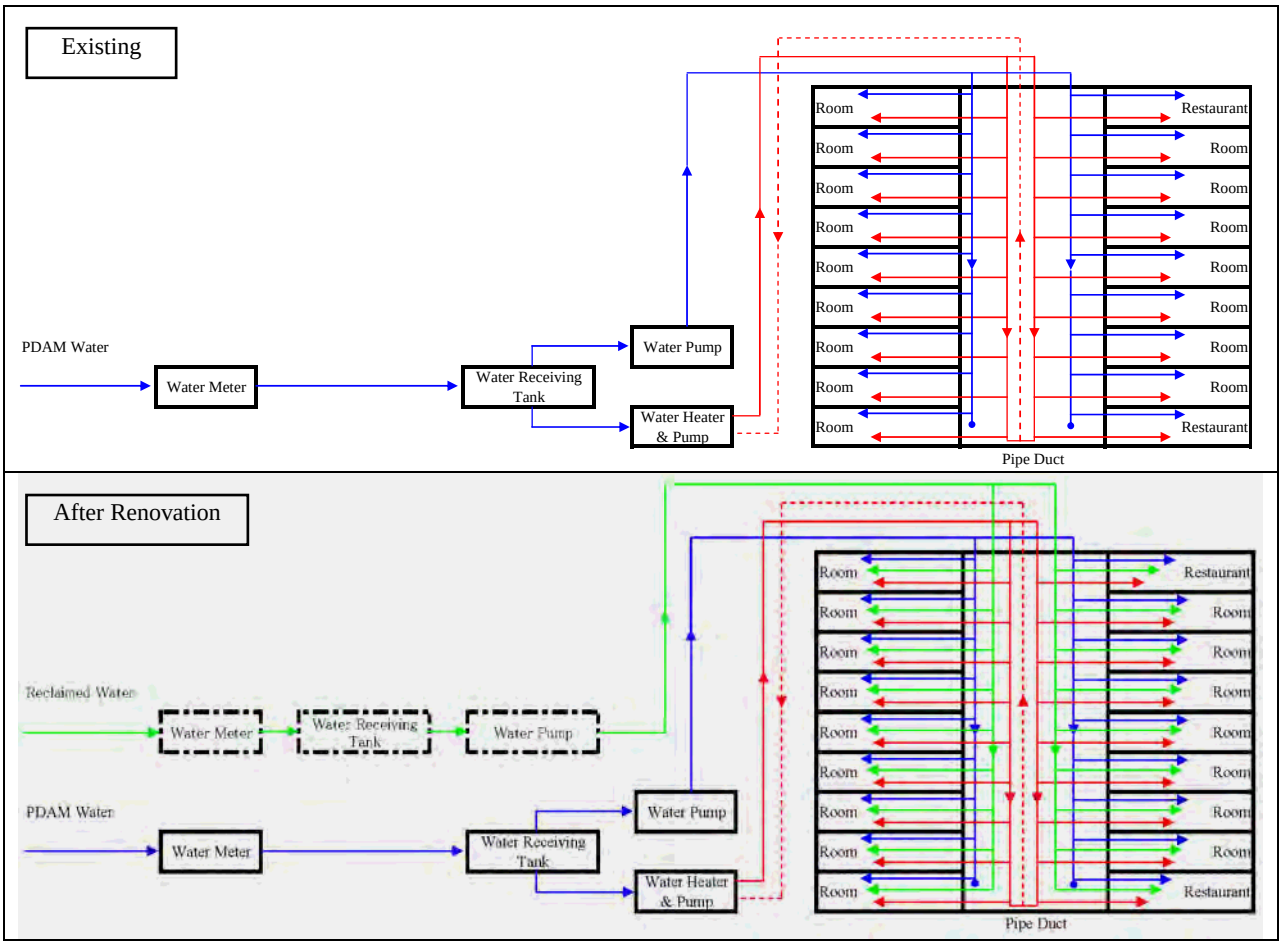

Figure S5.3 Service Pipe Improvement Plan for Case 1, Dual Service Pipe System

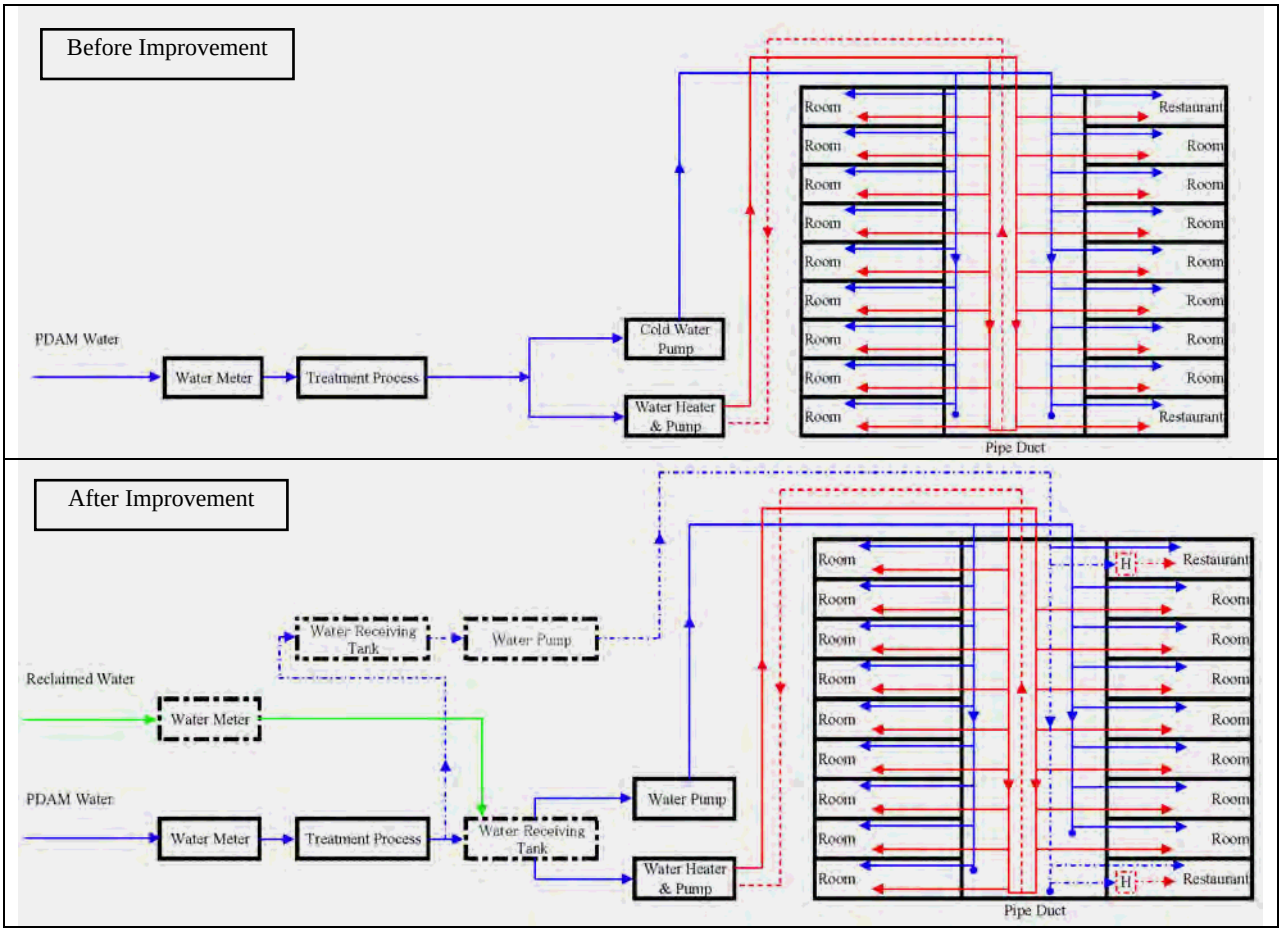

Figure S5.4 Service Pipe Improvement Plan for Case 2, assumed Dual Service Pipe System

S5.2 Project Implementation Plan

S5.2.1 Project Implementation Organization

A 25-year BOT contract is recommended for this Project. The contract would give the private partner adequate time to earn the profit and recover the investment and transfer the know-how and technical skills to the public partner when the latter takes over the assets and operations. This BOT scheme would establish the desirable partnership between the public and private sectors which could reduce the cost of operating or maintaining the facilities as a result of economies of scale, application of innovative technologies, and more flexible procurement practices.

Under the PPP framework, the Bali Provincial government would be the Contracting Agency under the supervision of MoPU and Bappenas. The SPC would be the counterpart to the Contracting Agency. Water purchase agreements would be concluded with the PDAMs. Government support and guarantee would be provided according to the PPP law.

Pursuant to Ministry of Public Works Regulation 12/2010, the Bali Provincial government becomes the Contracting Agency under supervision of the Governor and the successful bidder would establish the SPC which would enter into a Cooperation Agreement with the Contracting Agency. If a foreign entity is awarded the contract, the foreign company is obliged to form an Indonesian business entity in accordance with the prevailing laws and regulations. Pursuant to Presidential regulation No. 77/2007, amended by No. 111/2007, the maximum equity participation by foreign business entities in a special purpose company (SPC) shall be 95 %.

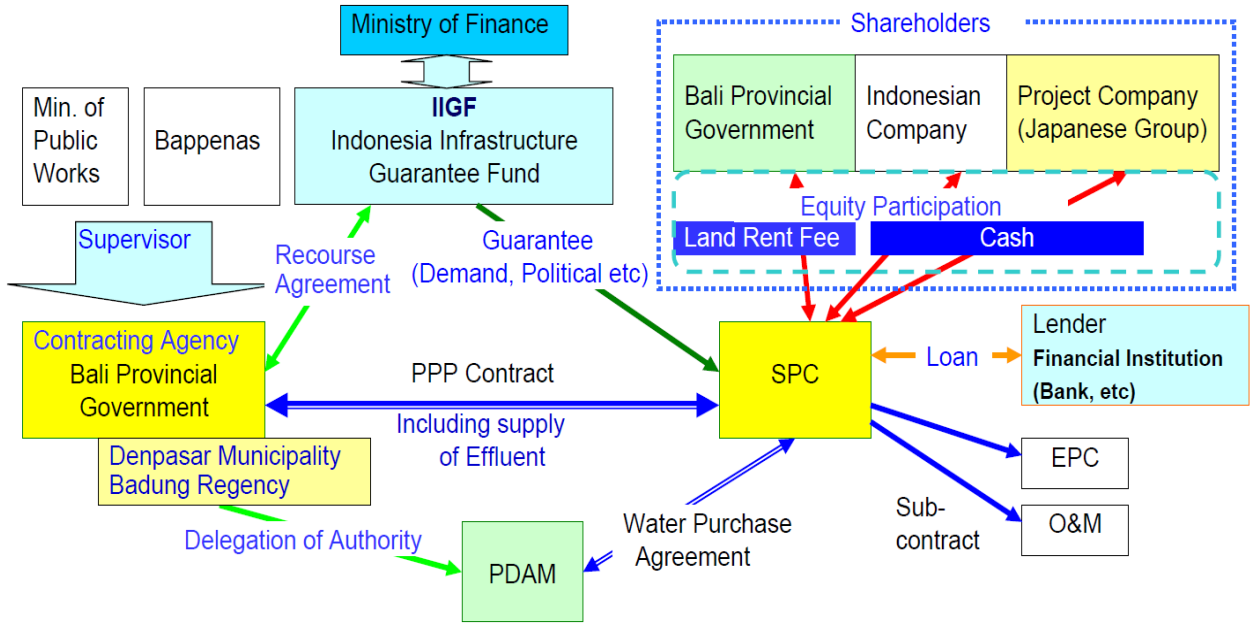

Figure S5.5 Proposal of the Cooperation Agreement Structure in BOT Form

S5.2.2 Roles & Responsibilities for the Public and Private Partners

The SPC in this wastewater reclamation project would receive the effluent from the Denpasar Waste Water Treatment plant (WWTP), process the effluent and transmit the reclaimed water to the delivery point to PDAMs as illustrated below. The use of existing PDAM facilities and construction of some new pipes would bring the water to the hotels. The hotels would deal with the improvement of service piping systems.

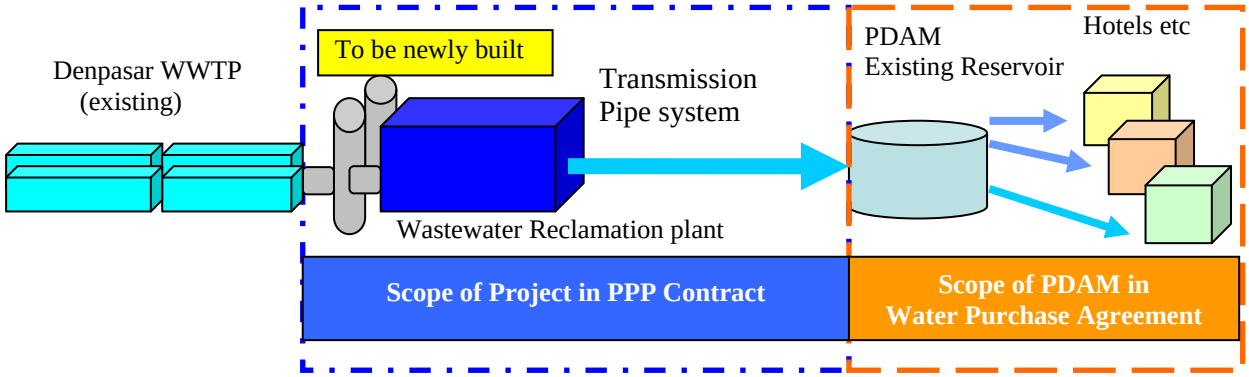

Figure S5.6 Demarcation of Roles and Responsibilities, for PDAM Badung Case

The roles and responsibilities of the Contracting Agency and the SPC are as follows:

Table S5.3 Roles & Responsibilities for the Contracting Agency and SPC

	Contracting Agency	SPC to be established by Project Company
Object	To produce clean water from the effluent by means of wastewater reclamation process and to supply the clean water to the commercial industries in Southern Bali through PDAMs in order to cope with the water shortage forecasted for the near future and to reduce impacts on the environment.	

Duties & Respon-Sibility	To provide the effluent at the quality and quantity in accordance with the agreement	To implement the development of reclaimed wastewater (clean water) on BOT basis by investing the required capital and technologies
	To endorse the water purchase agreement by and between PDAMs and SPC, including take or pay agreement, punctual payment	To arrange and/or procure necessary finance and to repay this under sole responsibility.
	To arrange required government support and guarantee under the PPP framework according to the prevailing laws & regulations.	To bear and pay the guarantee fee which will be imposed by PII against their Guarantee to the BOT contract.
Investment	No specific investment.	All equipment & materials in the scope of the BOT contract shall be procured, installed, commissioned and O&M of the complete facilities to be invested except for the land.
Others	O&M of the Denpasar WWTP at own cost and responsibility	To monitor & measure the quality of the effluent for confirmation, if necessary

S5.2.3 Procurement Package

As shown above, the private sector partner would invest in the reclaimed water treatment and the transmission facilities. Therefore given the scale of the facilities, it is proposed that there would be only one procurement package.

S5.2.4 Process of Procurement

If the technical and commercial feasibility of this wastewater reclaiming project is confirmed by this study, it is understood that this project would be an unsolicited project since other conditions stated in Chapter 3 are already satisfied.

S5.2.5 Tender Procedure to Select Project Company

All Indonesian PPP projects are subject to competitive procurement. The following is a process that typically include prequalification. The procedure would follow Ministry of Public Work Regulation No. 12/PRT/M/2010 “the Cooperation Guidelines for the Development of Water Supply System”.

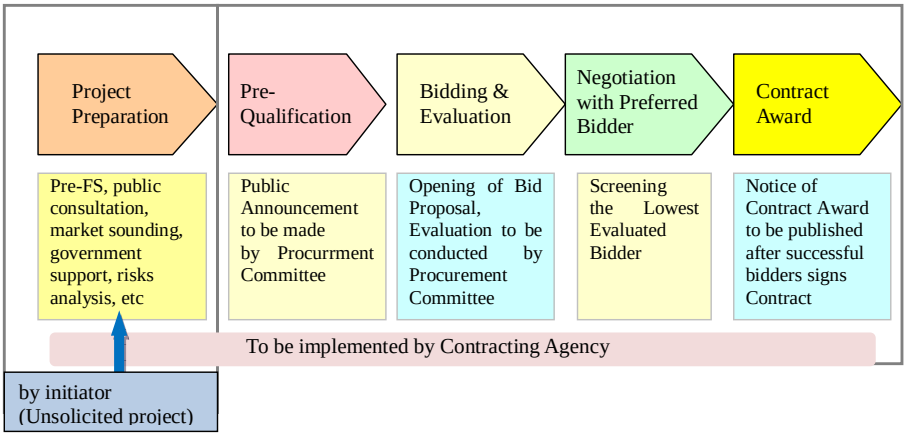

Figure S5.7 Procurement Process of BOT Contract

S5.2.6 Project Implementation Schedule

The project implementation schedule would take into consideration the time required for coordination, financial arrangements and public outreach. A draft implementation schedule is shown in Table S5.4.

Table S5.4 Draft Implementation Schedule of The Project

Description	2012				2013				2014				2015				2016			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Preliminary Stage																				
Bidding Process by Indonesian Government (Bali Province)																				
・Tender Preparation, Tender Documents, Bid Evaluation Method/Criteria																				
・Tender Process (Prequalification, Bidding, Evaluation)																				
Preparation for Establishment of SPC																				
Procurement of Finance & Governmental Suppot/Guarantee																				
PPP Contract Preparation/Concluding & Its Effectuation																				
Socialization Activities to Stakeholders on use of Reclaimed Water																				
Acquisition of Permission / Approval																				
EIA Approval (Environmental Permission)																				
Reclaimed Water Bulk Sales Agreement with PDAM																				
Finance Closing																				
Recourse Agreement & Guarantee Agreement with IIGF																				
Concluding of SPC Shareholder Agreement & License Approval from **BKPM**																				
Hand Over Land to SPC																				
Construction Works																				
Detailed Design																				
Tendering for Selection of EPC Contractor																				
Construction Work of Reclamation Plant																				
Construction Work of Reclamed Water Tansmission Facilities																				
Manufacturing of Equipment (Pumps & Mechanical/Electrical Equipment)																				
Installation of Equipment (Pumps & Mechanical/Electrical Equipment)																				
Improvement Work of Existing Reservoir, Distribution Mains and Pipes (by PDAM)																				
Installation of New Distribution Pipes (by PDAM)																				
Connection Work of Distribution Mains and Pipes (by PDAM)																				
Improvement Work of Service Pipes and Related Facility (by End Users)																				
Reclaimed Water Supply Service																				

S5.3 Management and Operation & Maintenance

S5.3.1 Basic Structure

Figure S.5.7 shows the basic organizational structure for operating the reclaimed water bulk supply system. The SPC has 3 major functions..

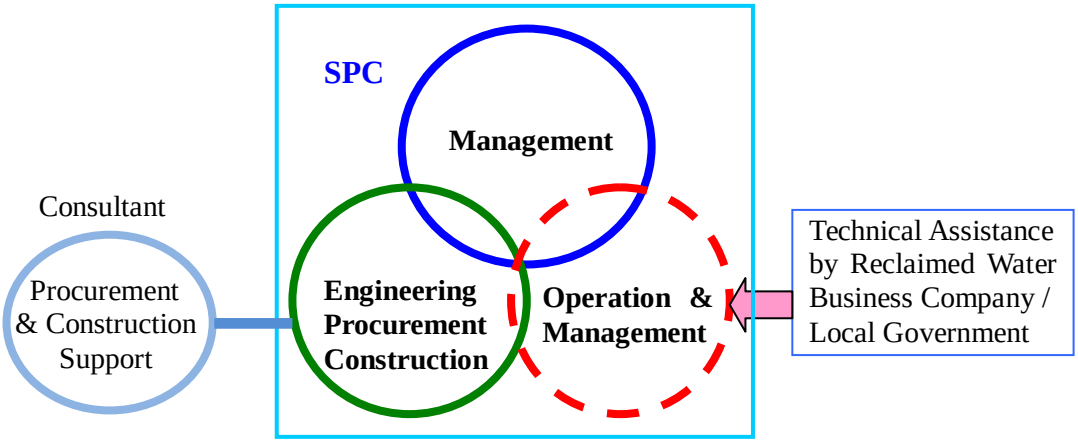

Figure S5.8 Functions of SPC

S5.3.2 Organization and Staffing

The SPC is organized as follows for the management and O&M functions. The EPC function would be outsourced.

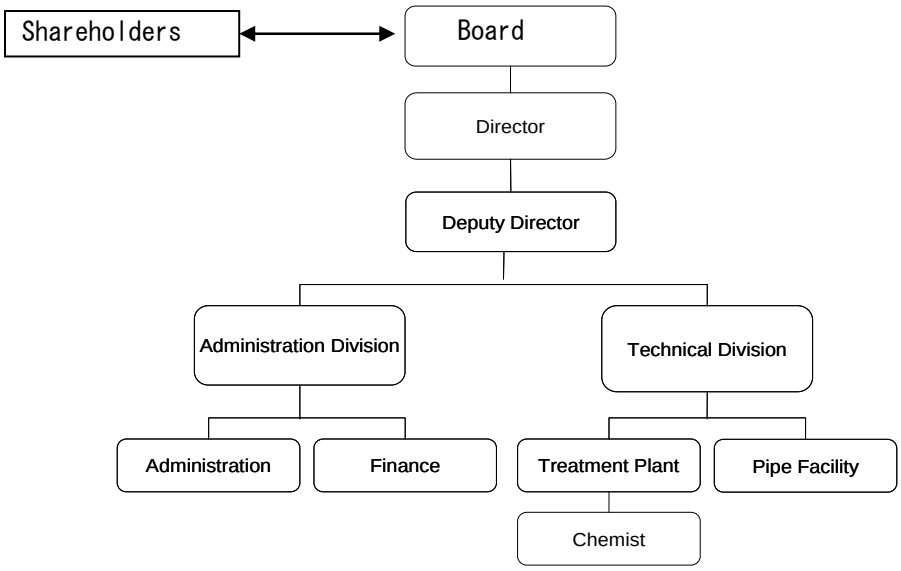

Figure S5.9 Organization of SPC

About 22 to 25 staff would be required (management: 3, Administration Division: 8, Technical Division: 11 to 14) for Case 1 or Case2, and smaller number of staff is for Case 1.

S5.4 Project Cost

S5.4.1 Cost Components and Cost Estimation

(1) Cost Components

The four main cost components are construction, engineering services, tax charges, and operation and maintenance (O&M). These are further categorized as shown below.

Table S5.5 Components of the Project Cost

Main Item	Detail Item
【1】Construction	(A) Site preparation
	(B) Reclamation plant construction
	(C) Transmission pipe installation
	(D) Distribution reservoir reconstruction
	(E) Distribution pipe installation
	(F) Service pipe facilities renovation in hotels
【2】Engineering Services	(A) Detailed design, construction supervision, additional surveys, etc.
	(B) Capacity building
	(C) Publication and education-related
【3】Tax Charges	(A) Value-added tax (VAT)
	(B) Import tax
	(C) Surface water use tax
【4】Operation and Maintenance (O&M)	(A) Personnel
	(B) Electricity
	(C) Chemicals
	(D) Fuel
	(E) Water quality tests
	(F) Repairs and replacement
	(G) Office expenses

(2) Parameters for Cost Estimation

The unit prices for the cost estimation were decided by taking into consideration the cost information available in Bali as much as possible. The detail list of the unit prices for construction is shown in Table 8.b.4 of Appendix 8. Both the construction and O&M costs are divided into the two cases in this project. The parameters for cost estimation are as follows.

・Service life of the reclaimed water treatment facilities: BOT 25 years (2013 - 2038) and operation period is 23 years
・Currency conversion : 1 IDR = 0.00909 JPY (as of August 2011)
・Price escalation (Local currency) : 5.3 %[1] for operation period, and 6.8%[2] for construction period
(Foreign currency) : 1.8%[3] for construction period

The cost for renovation and reconstruction is not applicable because the service life of the facilities are longer than or equal to the operation period of the project (about 20 years).

[1] the average figure projected in “Country Forecast October 2011”, The Economist Intelligence Unit Limited., London. UK.
[2] the average price escalation for the last five years (2006 ~ 2010) calculated from “Situation base data for foreign countries” on the web page of Japan Foreign Ministry.
[3] the results of a survey for accommodating JICA Loan in 2010

S5.4.2 Project Cost

(1) Construction Costs

The construction costs are calculated for all the facilities required for the project, from the reclamation plant to the renovation of service pipe facilities in each hotel. As the responsibilities of constructing and renovating these facilities are divided between SPC, PDAM Badung and the hotels, the construction costs are calculated separately for these three parties.

Table S5.6 Responsible Organization of the Each Construction Component

Items	SPC	PDAM	Hotels
(A) Site Preparation	○		
(B) Reclamation Plant Construction	○		
(C) Transmission Pipe Installation	○		
(D) Distribution Reservoir Reconstruction		○	
(E) Distribution Pipe Rehabilitation and Installation		○	
(F) Renovating the Service Pipe Facilities in Each Hotel			○

Table S5.7 Construction Cost of Case 1

(1) Construction Cost by Each Facility

Item	IDR (×1,000)			JPY (×1,000)
	LC	FC	Total	Total
【A Site Preparation】				
Site Preparation	5,968,887	0	5,968,887	54,257
【B Reclamation Plant Facility】				
Structure Construction				
Raw Water Pump Building	976,400	0	976,400	8,875
Biological Treatment Building	5,455,191	0	5,455,191	49,588
Ozonation Building	7,942,297	0	7,942,297	72,195
Membrane Filtration Building	12,454,956	0	12,454,956	113,216
Site Work	3,598,539	0	3,598,539	32,711
Vehicles	2,070,000	0	2,070,000	18,816
Connection Charge for Electricity	631,250	0	631,250	5,738
Sub Total (1)	33,128,632	0	33,128,632	301,139
Mechanical and Electrical Facility				
Mechanical Equipment	28,027,620	24,004,951	52,032,571	472,976
Electrical Equipment	35,613,810	0	35,613,810	323,730
Sub Total (2)	63,641,430	24,004,951	87,646,381	796,706
Total	96,770,062	24,004,951	120,775,013	1,097,845
【C Water Transmission Pipe】				
Water Transmission Pipe	44,144,600	0	44,144,600	401,274
【D Distribution Reservoir】				
Distribution Reservoir	3,449,933	0	3,449,933	31,360
【E Distribution Pipe】				
Distribution Pipe for Nusa Dua	3,342,380	0	3,342,380	30,382
Distribution Pipe for Benoa	10,285,000	0	10,285,000	93,491
Distribution Pipe for Sawangan	8,465,200	0	8,465,200	76,949
Total	22,092,580	0	22,092,580	200,822
【F Renovation of Service Pipe Facilities in the Hotel 】				
Renovation Cost	29,230,000	0	29,230,000	265,701
Total	29,230,000	0	29,230,000	265,701

(2) Construction Cost by Responsible Agency

Item	IDR (×1,000)			JPY (×1,000)
	LC	FC	Total	Total
SPC Total Construction Cost	146,883,549	24,004,951	170,888,500	1,553,376
PDAM Total Construction Cost	25,542,513	0	25,542,513	232,181
Hotel Total Renovation Cost	29,230,000	0	29,230,000	265,701
Grand Total Construction Cost	201,656,062	24,004,951	225,661,013	2,051,259

Table S5.8 Construction Cost of Case 2

(1) Construction Cost by Each Facility

Item	IDR (×1,000)			JPY (×1,000)
	LC	FC	Total	Total
【A Site Preparation】				
Site Preparation	6,507,139	0	6,507,139	59,150
【B Reclamation Plant Facility】				
Structure Construction				
Raw Water Pump Building	1,224,468	0	1,224,468	11,130
Biological Treatment Building	9,387,773	0	9,387,773	85,335
Ozonation Building	8,823,814	0	8,823,814	80,208
Membrane Filtration Building	14,261,371	0	14,261,371	129,636
Site Work	4,357,294	0	4,357,294	39,608
Vehicles	2,070,000	0	2,070,000	18,816
Connection Charge for Electricity	631,250	0	631,250	5,738
Sub Total (1)	40,755,971	0	40,755,971	370,472
Mechanical and Electrical Facility				
Mechanical Equipment	33,402,949	34,308,417	67,711,366	615,496
Electrical Equipment	35,613,810	0	35,613,810	323,730
Sub Total (2)	69,016,759	34,308,417	103,325,176	939,226
Total	109,772,730	34,308,417	144,081,147	1,309,698
【C Water Transmission Pipe】				
Water Transmission Pipe	56,218,200	0	56,218,200	511,023
【D Distribution Reservoir】				
Distribution Reservoir	3,449,933	0	3,449,933	31,360
【E Distribution Pipe】				
Distribution Pipe for Nusa Dua	3,342,380	0	3,342,380	30,382
Distribution Pipe for Benoa	13,326,700	0	13,326,700	121,140
Distribution Pipe for Sawangan	10,757,200	0	10,757,200	97,783
Total	27,426,280	0	27,426,280	249,305
【F Renovation of Service Pipe Facilities in the Hotel 】				
Renovation Cost	19,750,000	0	19,750,000	179,528
Total	19,750,000	0	19,750,000	179,528

(2) Construction Cost by Responsible Agency

Item	IDR (×1,000)			JPY (×1,000)
	LC	FC	Total	Total
SPC Total Construction Cost	172,498,069	34,308,417	206,806,486	1,879,871
PDAM Total Construction Cost	30,876,213	0	30,876,213	280,665
Hotel Total Renovation Cost	19,750,000	0	19,750,000	179,528
Grand Total Construction Cost	223,124,281	34,308,417	257,432,698	2,340,063

(2) Engineering Services

1) Detailed Design, Construction Supervision and Additional Surveys

These costs cover the following items.

・Detailed design
・Construction supervision
・Project management during construction
・EIA
・Additional ground and geological surveys
・Survey of the existing distribution reservoir and distribution pipes (originally used for irrigation)

The detailed design and construction supervision costs are calculated based on the estimated required man-months (MM) for foreign and local engineers shown below, including office expenses, etc.

・Foreign Engineer : 86 MM
・Local Engineer : 275 MM

2) Capacity Building and Public Outreach

The capacity building and promotional activities are conducted at the pilot reclamation plant in Denpasar WWTP. The associated costs are excluded from the total project cost because the major portion of these activities would be finished before the confirmation of the reclaimed water demand at the target hotels.

(3) Tax Charges

The following tax charges are estimated as part of the project cost.

1) Value-added Tax (VAT)

VAT is estimated at 10% of the local currency portion of the project cost.

2) Import Tax

The import tax depends on the items to be imported. there is a possibility that the reclaimed water project will be exempted from import tax if import duty exemption as stipulated in the Ministry of Finance Regulation No. 101/PMK.04/2007 is applicable to this Project. The project costs in this survey are exempt from import tax as a prerequisite for the calculations.

3) Surface Water Use Tax

According to Regulation of Bali Province No.3/2004 on the tax on groundwater and surface water uses, business entity shall pay surface water use tax if they use this resource. At this time, surface water use tax is not included in the project cost estimate. The application of this surface water use tax is a key issue that the SPC should clarify during the contract negotiation with the Bali Provincial Government and PDAM.

(4) Others

The physical contingency is set at 10 % of the sum of construction and engineering services costs. The price escalation contingency is set at 6.8% for the local currency and 1.8% for the foreign currency.

(5) Project Cost for SPC

Project cost for SPC is shown in the figure below.

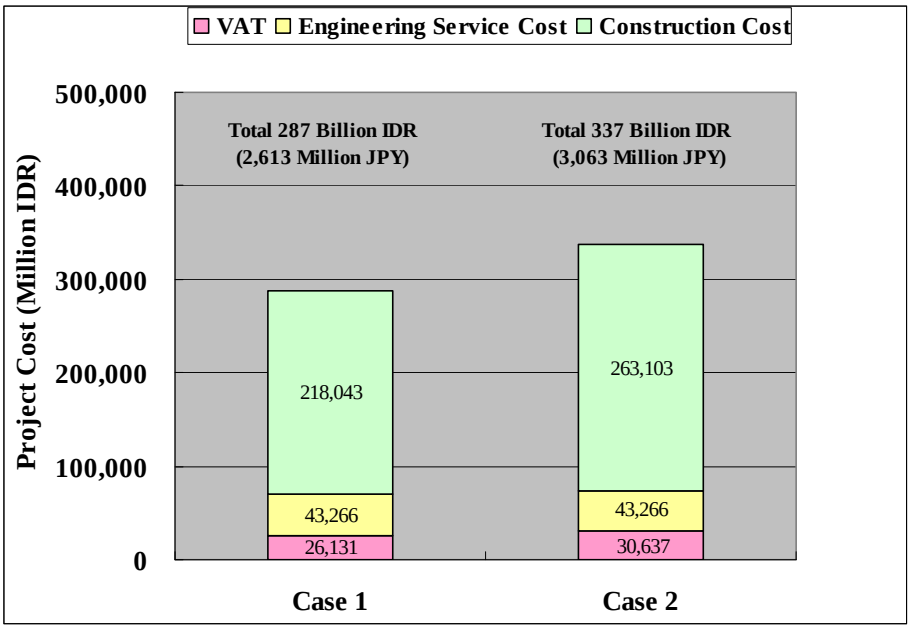

Figure S5.10 Project Cost for SPC

S5.4.3 Operation and Maintenance Costs

All the annual operation and maintenance costs related to the SPC are estimated. The annual operation and maintenance costs include personnel, electricity, chemicals, fuel, water quality testing, repairs and replacements, office expenses, etc.

Operation and Maintenance Costs for each case at 2016 price are shown in Figure S5.11.

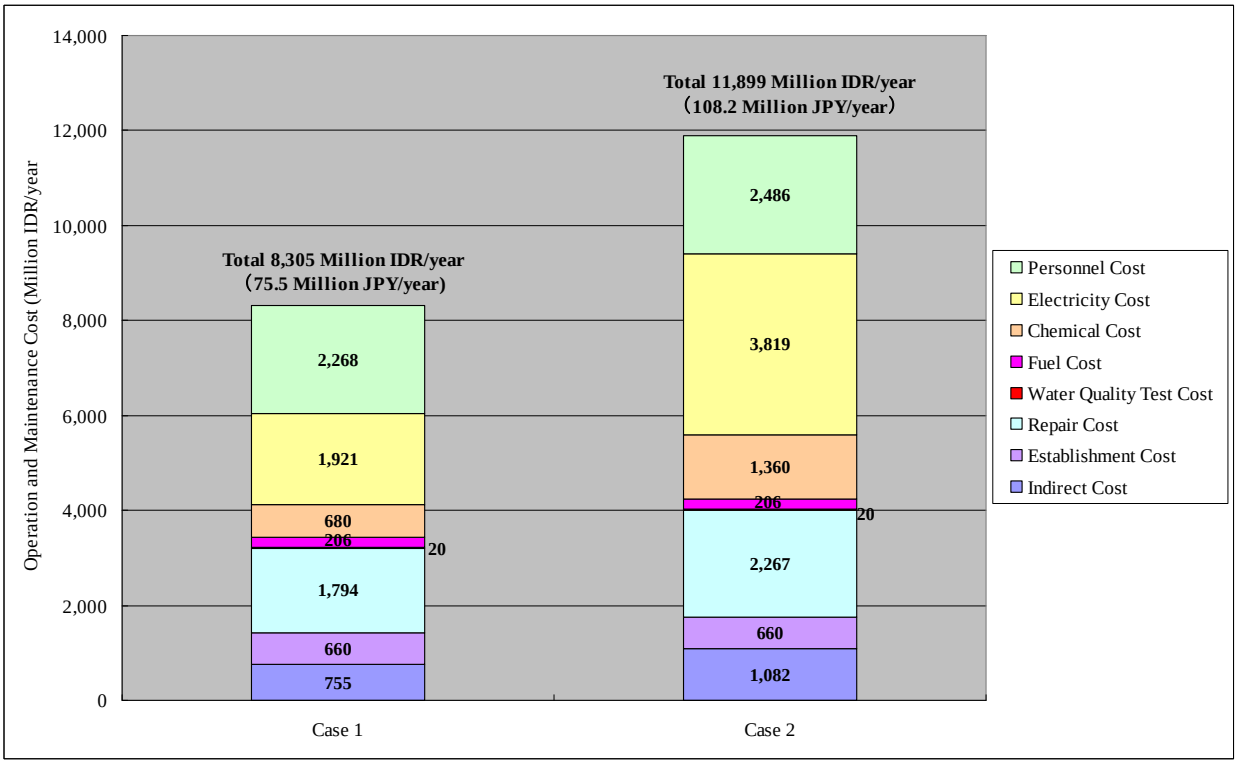

Figure S5.11 Annual Operation and Maintenance Costs for Each Case (in 2016)

S5.5 Project Financing Plan and Projection of Project Revenue

S5.5.1 Project Financing Plan

(1) Equity & Debt

The Project Company who will be awarded through the open tender shall establish SPC (Special Purpose Company) for execution of this Wastewater Reclaiming project and the total Project Cost shall be funded by Equity (capital) and Debt (loan from financing institutions). Proportion of equity and debt shall be 30% vs. 70% based on advice from banks in Indonesia and examples in other PPP infrastructure projects. Total amount of the Project Cost to be financed by banks shall be seventy percent (70%) of the total sum of the Project Cost by SPC and the interest during the construction period and loan grace period.

Table S5.9 Total Cost and Equity/Debt (Case 1 : 4,500 m^3/day, Case 2 : 9,000 m^3/day)

		Amount (IDR1,000)		Ratio (percent)		
		Case 1	Case 2	Composition		Ratio
【1-1】	**Construction cost**					
(A)	**Site Preparation**	**5,968,887**	**6,507,139**	2.0%	1.8%	109%
(B)	**Reclamation Plant Facility**	**120,775,013**	**144,081,148**	39.8%	40.5%	119%
	Architectural and Civil works	30,427,382	38,054,721			
	Vehicle and Connection charge	2,701,250	2,701,250			
	Mechanical and Electrical work	87,646,381	103,325,177			
(C)	**Water Transmission pipe**	**44,144,600**	**56,218,200**	14.6%	15.8%	127%
	Construction Cost	**170,888,500**	**206,806,487**	**56.3%**	**58.2%**	**121%**
【1-2】	**Price Contingency**	**27,332,018**	**32,377,910**	9.0%	9.1%	119%
【1-3】	**Physical Contingency**	**19,822,052**	**23,918,440**	6.5%	6.7%	121%
	Sub-total (1)	**218,042,571**	**263,102,836**	**71.9%**	**74.0%**	**121.7%**
【2-1】	**Engineering Service cost**					
	Engineering Service fee	**36,558,326**	**36,558,326**	**12.1%**	**10.3%**	**100%**
【2-2】	**Price Contingency**	**2,774,578**	**2,774,578**	0.9%	0.8%	100%
【2-3】	**Physical Contingency**	**3,933,290**	**3,933,290**	1.3%	1.1%	100%
	Sub-total (2)	**43,266,195**	**43,266,195**	**14.3%**	**12.2%**	**100%**
【3】	**Tax Charge**					
(A)	**VAT**	**26,130,877**	**30,636,903**			
(B)	**Import Tax**	**0**	**0**			
	Sub-total (3)	**26,130,877**	**30,636,903**	**8.6%**	**8.6%**	**117%**
	Total (1)+(2)+(3)					
	Total	**287,439,642**	**337,005,934**	**94.8%**	**94.8%**	**117%**
【4】	**Interest (to be financed)**					
(A)	**during construction**	**3,323,020**	**3,792,399**			
(B)	**during loan grace period**	**12,575,484**	**14,744,010**			
	Sub-total (4)	**15,898,504**	**18,536,409**	**5.2%**	**5.2%**	**117%**

	Total (1)+(2)+(3)+(4)					
	Total	**303,338,146**	**355,542,343**	**100%**	**100%**	**117%**

Funding		Case 1 (4,500 m^3/day)	Case 2 (9,000 m^3/day)
	Equity	**IDR 91,001,444,000**	**IDR 106,662,703,000**
	Debt	**IDR 212,336,702,000**	**IDR 248,879,640,000**

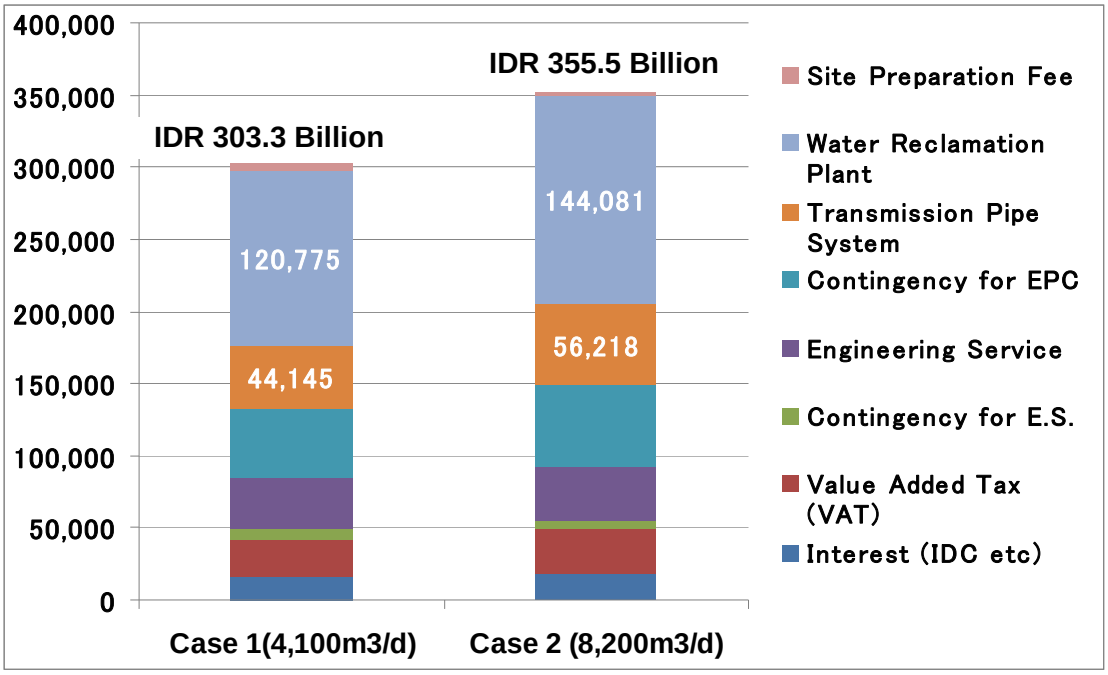

Figure S5.12 Total Project Cost Breakdown and Comparison of Case 1 & 2

(2) Equity Participants in the SPC and Amount of Equity

It is proposed that equity participants in the SPC shall be determined considering the following:

- Pursuant to the prevailing laws, an Indonesian company shall participate in the SPC, holding more than 5% of the capital of the SPC.
- The project company who would be awarded the project in open tender shall be a major shareholder, holding more than 51% of the capital of the SPC.
- Bali Provincial Government may participate as the leasor of land for the wastewater reclaiming facilities. Rental fee of the land shall be assessed based on the market value according to the prevailing law and regulations.

Configuration of the equity participants in the SPC under the above assumptions are shown in the following Figure.

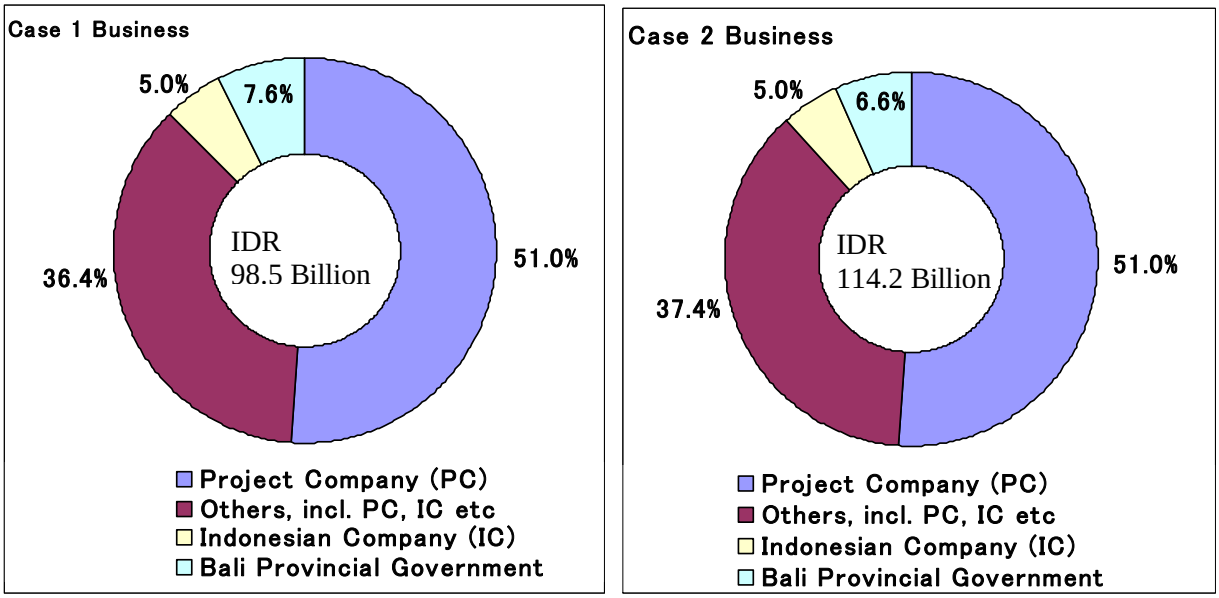

Figure S5.13 Configuration plan of SPC Shareholders

(3) Loan from Financial Institution

The project would be funded mainly through debt financing with 70% of the total project cost from Bilateral such as JICA PSIF Loan or finance from Multilateral Agency. Loan conditions compared to Indonesian commercial banks are shown in the table below.

Table S5.10 Loan Conditions of Indonesian Commercial Banks and Bilateral/Multilateral Agency

		Indonesian commercial banks	Finance from Bilateral or Multilateral Agency (JICA PSIF Loan etc)
1)	Project	Private Sector Investment	Private Sector Investment
2)	Procedures for loan application	By Private company's request Short and simple procedures	By Private company's request Short and simple procedures
3)	Loan conditions		
	Interest rate	10% - 12% p.a.	2.5% p.a.(by assumption)
	Repayment period	max. 10 years (no grace period)	max. 25 years including 5 years' grace period
	Currency of loan	IDR	Foreign Currency (Yen etc)

S5.5.2 Projection of Project Revenue & Cost and Cash Flow

(1) Revenue from the Project

Revenue from the Project is calculated by multiplying sales volume, unit sale price and duration, and then, through the survey, each parameter has been set as follows:

1) Annual Bulk Sales Volume of the Reclaimed Water
Based on the reclaimed water supply plans for Case 1 and Case 2, and the assumptions that the produced reclaimed water is received fully under the purchase contract and government off-take guarantee, the annual bulk sales volume of the reclaimed water are set fixed during BOT period as follows;

Table S5.11 Annual Bulk Sales Volume of the Reclaimed Water

			Case 1 Business	Case 2 Business
1)	Reclaimed Water Production (maximum)		4,500 m^3/day	9,000 m^3/day
2)	Reclaimed Water Distribution (average)		4,100 m^3/day	8,200 m^3/day
3)	Annual Operating Days		365days	365days
3)	Annual Production Volume (Sales Volume)		1,496,500 m^3	2,993,000 m^3
3)	BOT period	First year (2016)	1,496,500 m^3	2,993,000 m^3
3)	BOT period	Last year (2038)	1,496,500 m^3	2,993,000 m^3

2) Proposed Unit Bulk Sales Price

Based on the following requirements, bulk sales unit price of the Reclaimed Water will be defined.

- lower than the tariff price of clean water to Hotels and higher than the tariff price of irrigation water to Hotels.
- Since the Reclaimed Water will be sold through PDAM to end users (Hotels), not directly, reasonable margin and expenses of PDAM shall be considered for setting the bulk price to PDAM. In this Survey, bulk sales price will be calculated under the assumed that thirty percent (30 %) of sales price to end users can cover PDAM's margin and expenses.
- Bulk sales unit price shall be affordable to recover the investment cost and O&M fees.
- Bulk sales unit price can be subject to price adjustment by change of consumer price indexes etc. (O&M fees, as well, are also subject to price adjustment by inflation rate.)

i) lower than the tariff price of clean water to Hotels

Bulk sales price of the Reclaimed water should be set in-between the tariff price of clean water to Hotels and tariff price of irrigation water to Hotels in view of the Reclaimed water quality and application. The tariff prices during year of 2009 to 2012, and the tariff price forecast after 2013 are shown in below Figure. However, it is view of the end users and does not consider the cross-subsidy condition for PDAM.

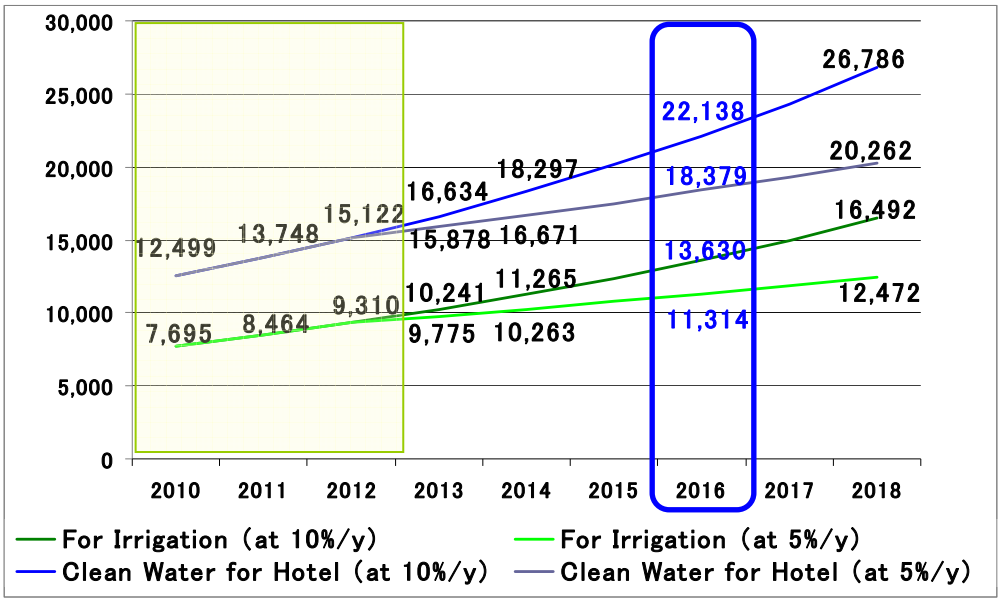

Figure S5.14 Tariff Rates (Hotel) Change and Prediction of PDAM Badung Unit: IDR/m^3

Table S5.12 Tariff Rates to Hotel of PDAM Badung (Actual and Prediction) Unit: IDR/m^3

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Irrigation Water	7,695	8,464	9,310	10,241	11,265	12,391	**13,630**	14,993	16,492
	7,695	8,464	9,310	9,775	10,263	10,776	**11,314**	11,879	12,472
Clean Water	12,499	13,748	15,122	16,634	18,297	20,126	**22,138**	24,351	26,786
	12,499	13,748	15,122	15,878	16,671	17,504	**18,379**	19,298	20,262

Note: Upper Column of Irrigation water and Clean water is based on 10% annual increase and the Lower Column is based on 5% annual increase.

ii)Price Adjustment Formula according to Inflation Rate

Bulk sales price shall be subject to price escalation according to inflation rates of the materials, electricity prices etc which constitute the production cost. Figure 5.15 shows price adjustment formula and the corresponding parameters. This price adjustment formula has been applied to BOT contract signed in August, 2011 between PDAM Bekasi and private business entity (PT Moya Indonesia).

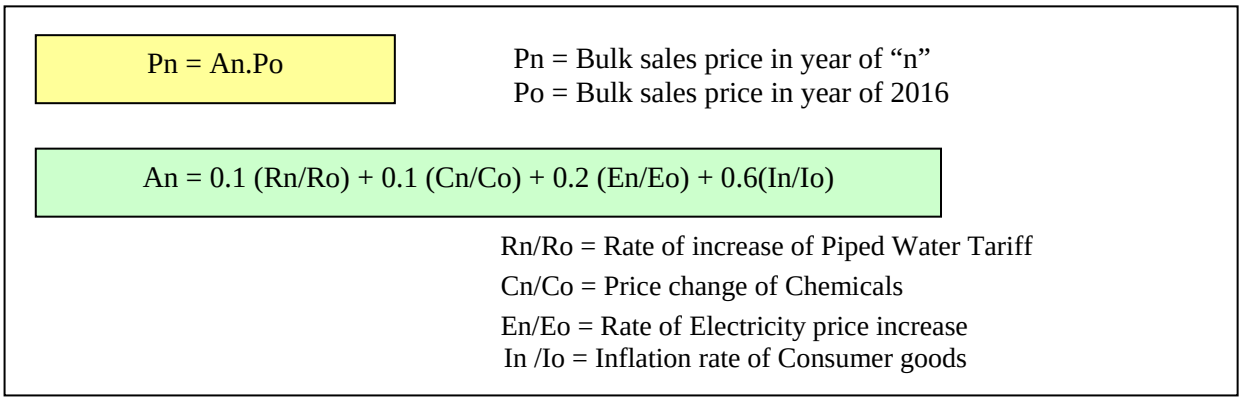

Figure S5.15 Price Adjustment Formula of the Tariff Rate

Furthermore, it is proposed to solve the exchange risk issue by adding exchange fluctuation rate factor to the above price adjustment formula as shown below; Sharing of the exchange risk between Public and Private can be determined by setting the value of parameter B.

Pn = An x Po x (1 + B x Excgange Fluctuation Rate)
(eg.) If exchange risk is equally shared between Public and Private, parameter B will be 50%.

3)Revenue (Operation) Period

In case of 25 years BOT Contract, revenue (operation) period will be as follows;

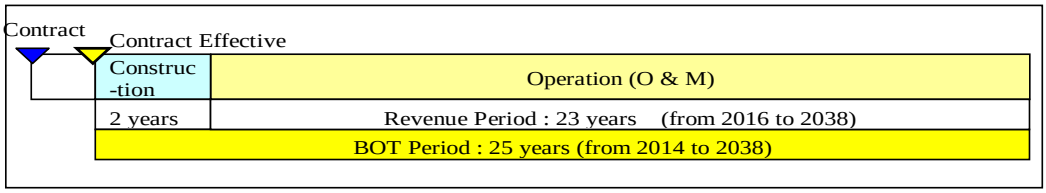

Figure S5.16 BOT Period and Project Revenue Perio

(2) Expenses

Main expenditure items and the assumed conditions for cash flow projection are as follows;

1) Repayment of Principal and Interest of the Debt
Based on the assumption that seventy percent (70%) of the Total Project cost to be financed by Bilateral or Multilateral Agency, such as JICA PSIF Loan, repayment of the principal and interest shall be projected in the Expenditure plan.

2) Land rent fee
Land rent fee is excluded from the expenditure items based on the assumption that Bali Provincial government will participate in SPC as a shareholder in the form of assets.

3) Effluent from the Waste Water Treatment Plant of BLUPAL (IPAL Suwung)
Effluent from the WWTP is assumed to be supplied to SPC at free of charge and surface water use tax is considered not applicable, judging from the present situation that the effluent are discharged to sea via river.

4)O&M costs
The cost are estimated factoring in price escalation based on CPI (consumer price index) at 5.3% during 25 years. Repair and replacement costs required are also included.

Following Figures show the O&M costs required during BOT period for each case.

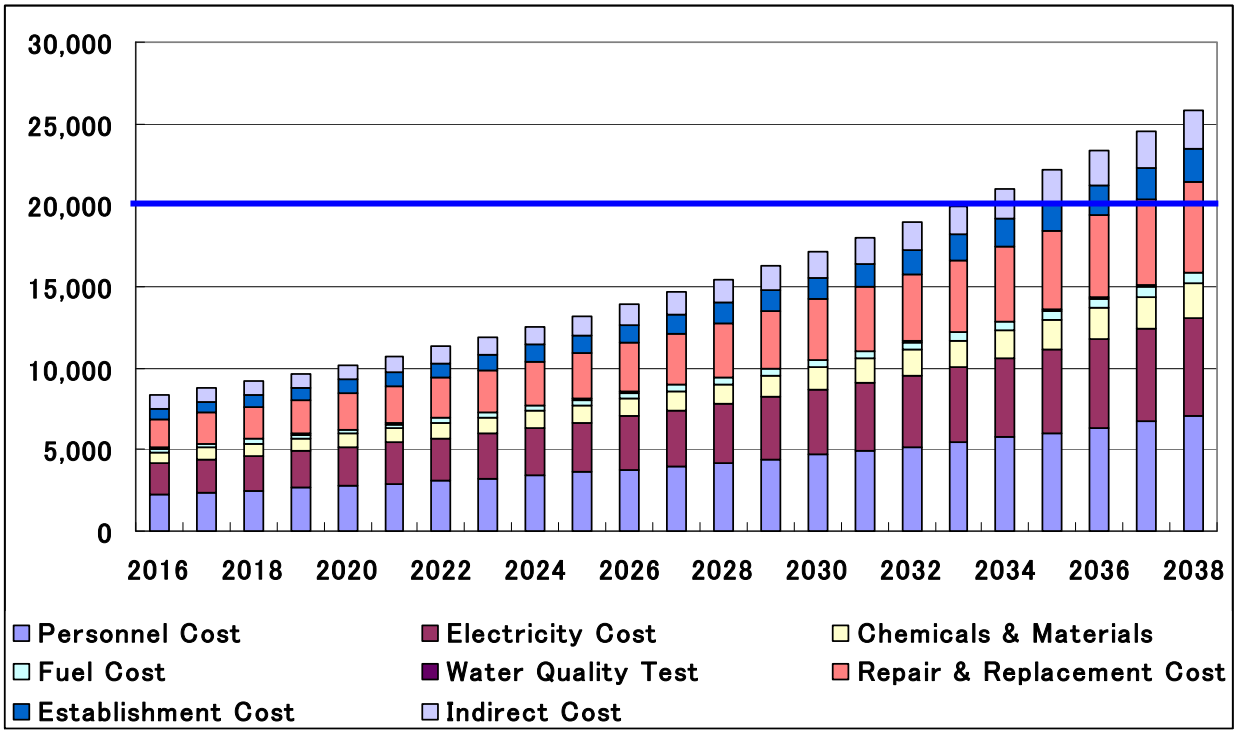

Figure S5.17 Payment Schedule of O&M Cost for Case 1 (4,500 m^3/day), Unit: Million IDR

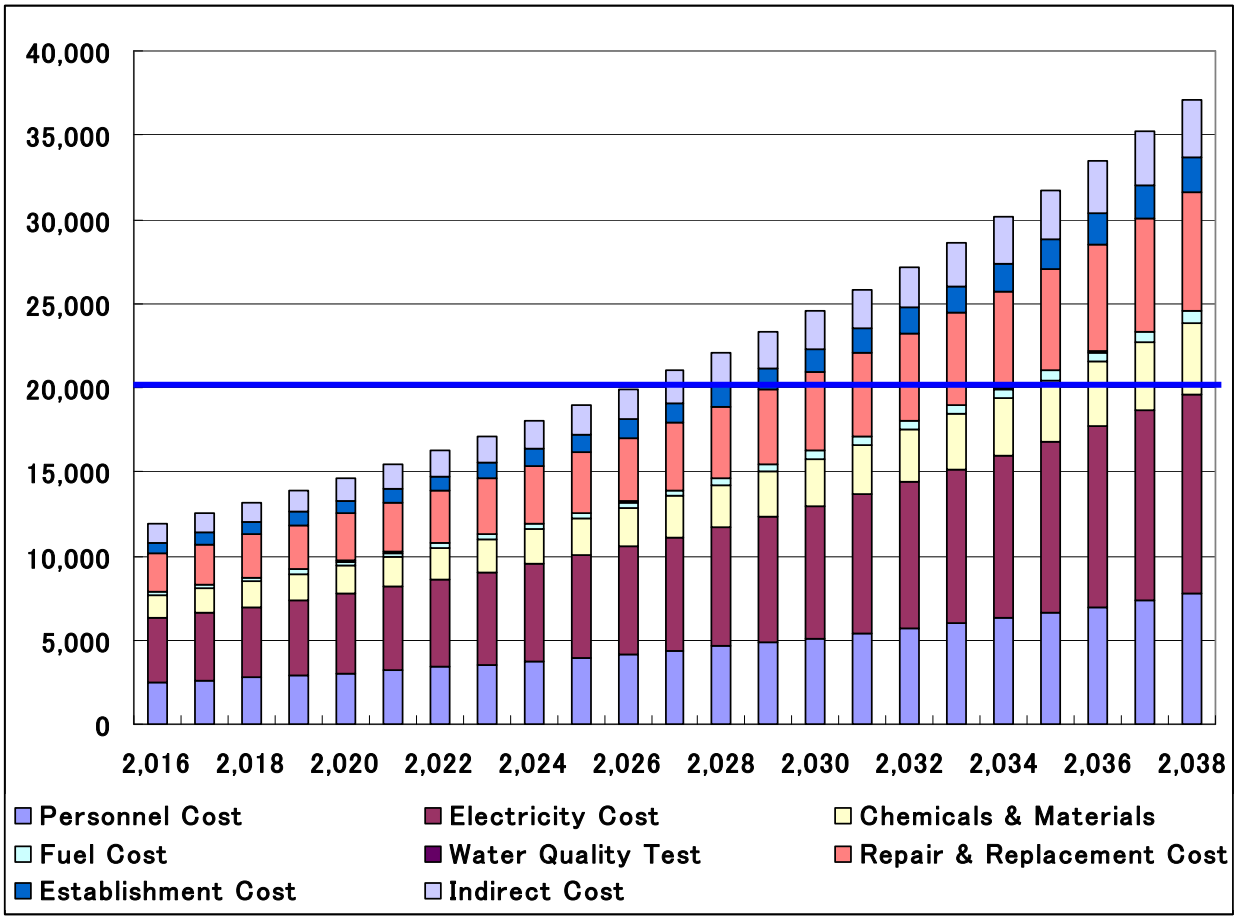

Figure S5.18 Payment Schedule of O&M Cost for Case 2 (9,000 m^3/day), Unit: Million IDR

(3) Cash Flow Projection

Results of revenue & expenditure projection of Case 1 and Case 2 business are shown below; under an assumption that the business revenue of both cases are calculated based on bulk sales price of IDR 12,000/ m^3 (2016 year price).

1) Case 1 Business (4,500 m^3/day, Revenue Base: 4,100 m^3/day)

Since the amount of the expenditure far exceed the business revenue, Case 1 business would suffer the loss throughout BOT period (25 years). In the next section, financial analysis of the Project is explained in detail. Case 1 Business based on bulk sales price of IDR 12,000/ m^3 would not be financially feasible.

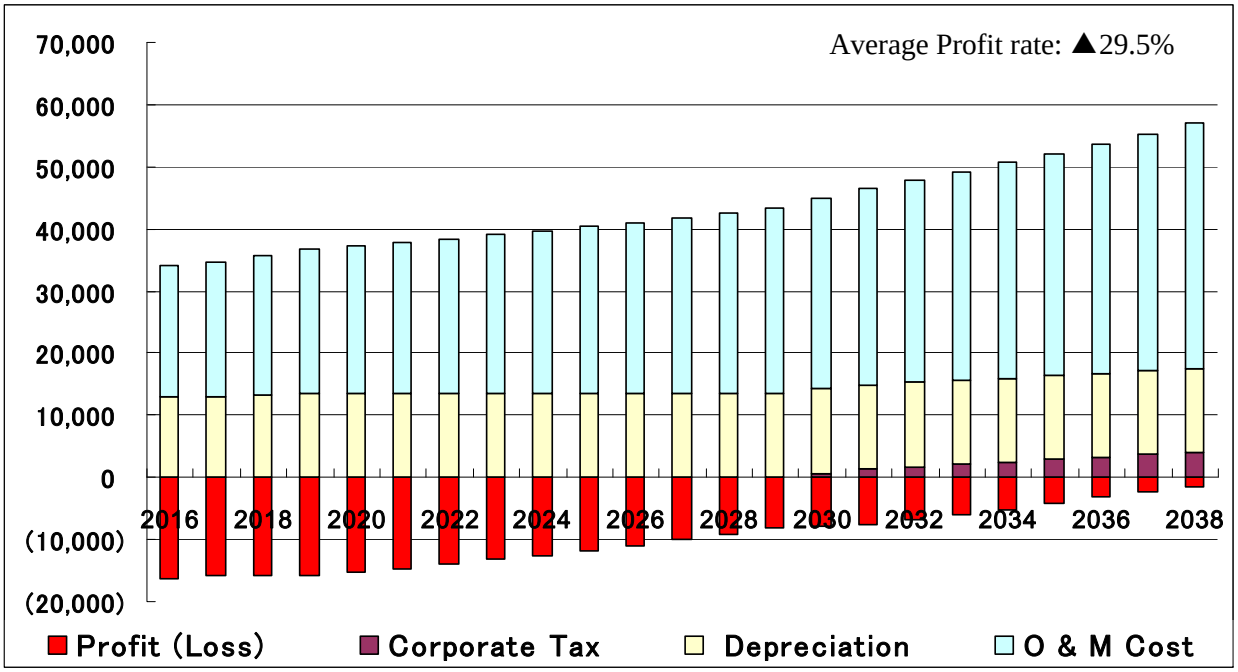

Figure S5.19 Revenue & Expenditure Projection for Case 1 Business (4,500 m^3/day), Unit: Million IDR

2) Case 2 Business (9,000 m^3/day, Revenue Base: 8,200 m^3/day)

Case 2 Business would suffer loss for the first seven years, but the average profit rate throughout BOT period (25 years) is 10.6%. The Case 2 Business based on bulk sales price of IDR 12,000/ m^3 would be financially feasible covering the expenditure.

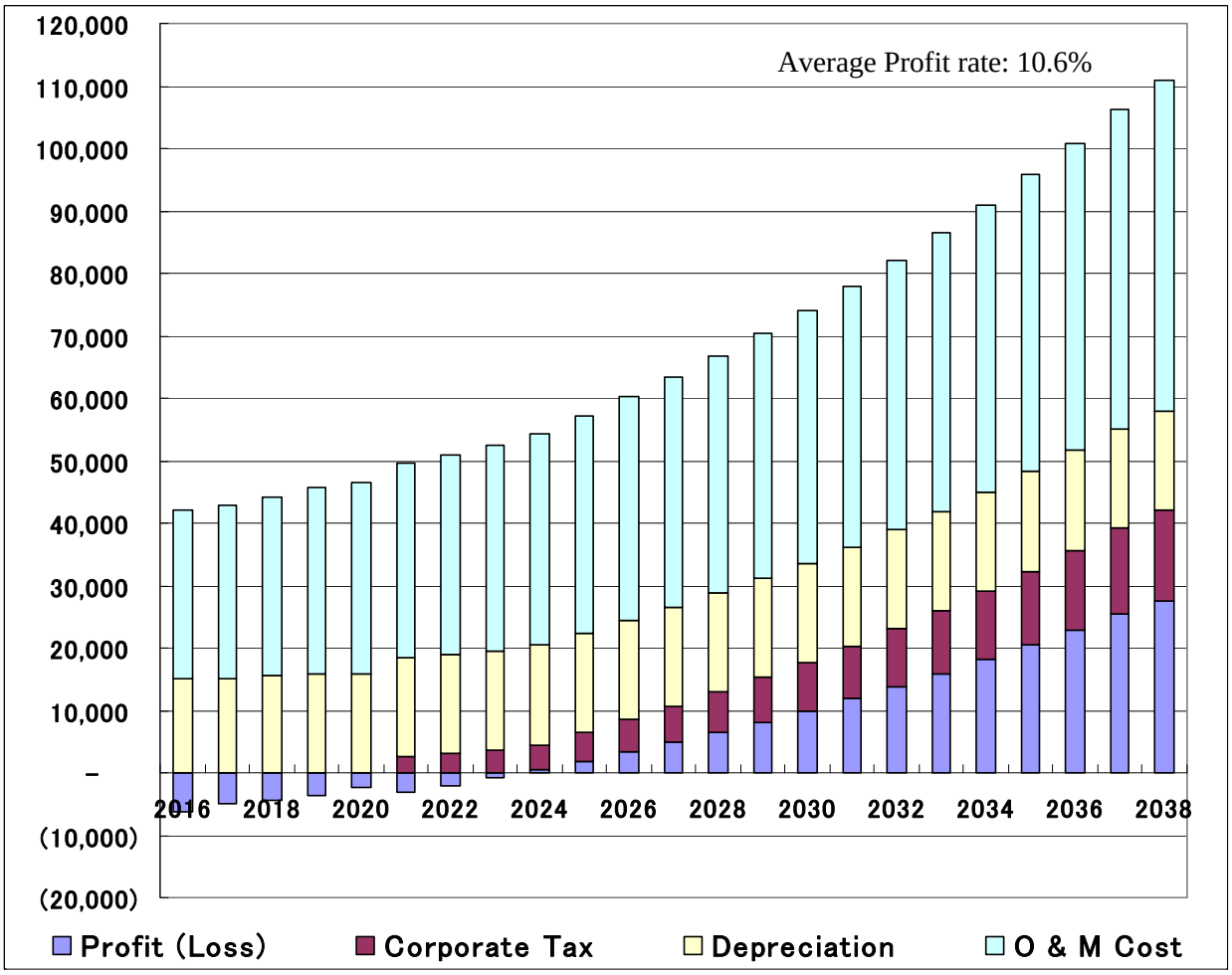

Figure S5.20 Revenue & Expenditure Projection for Case 2 Business (9,000 m^3/day,), Unit: Million IDR

S6. Project Evaluation

S6.1 Financial Analysis and Evaluation

S6.1.1 Financial Analysis

(1) Method of financial analysis

For verification of the feasibility of this wastewater reclaiming rroject, project profitability and stability shall be analyzed in view of investors (shareholders) and also in view of financing institute. In order to judge of profitability by investors, indicator of Equity IRR (Equity Internal Rate of Return) shall be applied to verify eligibility of business investment. And, from bankers' view point, indicator of Debt Service Cover Ratio (DSCR) shall be applied in order to evaluate if the cash flow has margin to repay the debt (principal and interest).

(2) Steps of financial analysis

Firstly, bulk sales price of the Reclaimed water, which is base of the revenue, shall be studied, and then, revenue and expenditure items and the contents shall be studied in order to make cash flow calculation.

1) Setting of Bulk Sales Price of Reclaimed Water (in year of 2016)

Based on the study on "Tariff Rates Change and Prediction of PDAM Badung to star Hotels", the bulk sales price to PDAM is assumed to be 70% of the tariff rates, the bulk sales price shall be between IDR 9,000/m^3 and IDR 12,000/m^3. Accordingly, the financial analysis will be conducted by calculating Equity IRR and DSCR based on the bulk sales price of the reclaimed water to be set less than IDR 12,000/m^3.

Table S6.1 Expected Range of the Bulk Sales Price of Reclaimed Water (Price in year of 2016)

	Annual Rate of Tariff Increase		**Bulk Sales Price = 70% of the Tariff Price**
	at 5%	at 10%	
Maximum Price (Clean Water)	IDR 18,379/m^3	IDR 22,138/m^3	
Price of Reclaimed Water	**IDR 12,000 to IDR 18,000**		**IDR 8,400 to IDR 12,600/ m^3**
Minimum Price (Irrigation Water)	IDR 11,314/m^3	IDR 13,630/m^3	

Note: Annual rates of increase after year of 2013 are predicted based on fact that tariff rates have been increased by 10% per year.

2) Assumption for Cash Flow Calculation

Based on result of the study in section 5, cash flow projection shall be prepared.

- Total project cost for Case 1 and Case 2 is as shown in Table 5.9
- Funding of total project is 30% by Equity of SPC, 70% by Debt of SPC
- Loan conditions of the debt is summarized in the conditions shown in Table 5.12, in case of bilateral agency.
- Currency of the repayment of the debt is the foreign Currency (Yen in case of JICA PSIF Loan). Since forecast or estimate of future exchange rates or exchange risks are extremely difficult, the exchange rate at each repayment time shall be regarded as the same as the present exchange rate (IDR 1 = 0.00909 Yen).
- The sales volume and revenue is assumed as shown in Table 5.13 and Figure 5.16.
- For the bulk sales price adjustment due to inflation rate, the inflation rate of 5.3% per year shall be applied to O&M fees.
- Expenditure items and the details are based on the assumption described in section 5.5.2.
- Pursuant to the present laws/regulations, the corporate income tax rate is 25% and the tax during the first 5 years shall be exempted.

3) Basic Conditions for Financial Analysis

Equity Internal Rate of Return (Equity IRR) is an indicator to evaluate profitability of capital investments for SPC shareholders. E-IRR is the rate at which the invested capitals equal to the net profits after all expenses and debt repayment. By using Capital Asset Pricing Model (CAPM) as evaluation criteria of the Equity IRR, the anticipated profitability rate is calculated as follows;

Anticipated Profitability Rate (Cost of Equity) is estimated about 15%.
Cost of Equity (Ke) = 7.2% + (0.97 x 8.0%) = 14.96% (approx. 15%)

・Risk free rate (interest rate of risk-free assets)
Interest rate (7.2% p.a.) of 20-year Indonesian Government Bond (IDR) is to be adopted.

・Beta (regression of stock market returns versus the return of the market)
Based on comparable companies in Singapore, China and Malaysia, the re-levered beta is 0.97.

・Market Risk Premium (MRP, difference between the return expected in market and rate of IDR)
Jakarta composite stock price index (15.2%) – IDR (7.2%) = 8.0%

(3) Evaluation criteria

1) Equity Internal Rate of Return (Equity IRR)
Equity IRR should be more than 15% as one of the evaluation criteria of the financial feasibility for the investors. This criteria is considered reasonable comparing with the long term interest rates of the loans (12 to 14% p.a.) in Indonesia.

2) DSCR(Debt Service Cover Ratio)
This indicator is to judge whether the cash flow amount after corporate tax can repay the principals and interests of the debt. In any case, the value of the DSCR should be higher than one (1). By considering the reasonable allowance, DSCR value should be more than 1.2 as the evaluation criteria of financial feasibility.

6.1.2 Financial Analysis Results

(1) Results for Case 1

Equity IRR and DSCR are respectively calculated based on the bulk sales prices at IDR 12,000/m^3. But it turns out computationally prohibitive due to the low profitability.

In order to seek necessary conditions to make Case 1 business feasible based on the bulk sales price of IDR 12,000/ m^3, required amount of governmental fiscal support, such as Viability Gap Fund (VGF) against the total project cost are calculated. As shown in the table below, about 54% of the project cost should be covered by the VGF.

Table S6.2 Financial Analysis Results for Case 1 with Governmental Financial Support

Sales Price	IDR 12000/m3			
VGF	54%	50%	43%	40%
E-IRR	15.31	13.73	11.35	10.45
DSCR(min)	1.42	1.33	1.20	1.15
DSCR(ave)	2.60	2.41	2.16	2.06

(2) Results for Case 2

Equity IRR and DSCR are respectively calculated based on the bulk sales prices at IDR 12,000/m^3, the Equity IRR is calculated as 15% and DSCR is 1.39. The results verify the financial feasibility of Case 2 business.

6.1.3 Financial Evaluation

(1) Case 1

In case of Case 1 business, the demand (production) volume is a half of Case 2 business, but the total project cost is merely approximately 15% smaller than Case 2. Accordingly, the production cost is resulted in higher and the financial analysis concludes that government fiscal support is required to make the project financially feasible.

Reasonability of VGF provision to Case 1 business may be judged through a further study and evaluation of the various social benefits below:

- Effluent from Denpasar WWTP is currently discharged into sea via river. The organic and inorganic components contained in the effluent would be environmental burden to sea and sea shores. But, through the advanced process of the water reclamation plant and also by establishing water recycle, such environmental burden could be largely reduced. It is considered very important to reduce the environmental burden to sea and sea shores, the tourism resources in Nusa Dua area of Bali Island.
- Meanwhile, underground water is used due to supply shortage of the piped water. Continuous use of underground water would be in future a cause of land subsidence and contamination of the underground water mixed with salt. It is significantly important that replacement of underground water by the reclaimed water could reduce use of the underground water.
- Beginning of the reclaimed water use even if its application is limited to toilet flushing could be quite beneficial as social test, education and socialization activity towards establishing water recycle system.

(2) Case 2

The analysis results verify the financial feasibility of Case 2, based on the bulk sales prices at IDR 12,000/m^3.

Sensitivity Analysis is done under the following conditions under the bulk sales prices at IDR 12,000/m^3.

1) Construction Cost Increase (Cost Overrun): 5% or10% increase
2) O&M costs increase: 2%, 4% or 6% increase
3) Exchange Rate Fluctuation: annual 1%,2% or 3% increase

The results show that the Equity IRR decrease 1.5% when the construction cost increase 10%, but under other conditions the Equity IRR decrease are within 0.5. The DSCR show more than 1.2 under the conditions above. Consequently the financial soundness are verified under the conditions above.

S6.2 Economic Analysis and Evaluation

S6.2.1 Economic Analysis

In order to assess the economic viability of the project, the alternative cost approach is adopted to calculate EIRR. The results are summarized in the table below:

Table S6.3 Economic Analysis Results

Item	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
1. Benefits	The following alternative costs, with the provision of reclaimed water at 4,100 m^3/day, are estimated as the economic benefits. - cost of pumps and power supply to obtain the same amount of water. - purchase cost of bottled drinking water. - contribution to tourism industries. Benefit: IDR 1,013,400 million	The alternative costs, with the provision of reclaimed water at 8,200 m^3/day, are estimated as the economic benefits. Benefit: IDR 1,254,144 million
2. Costs	The following items are estimated as an economic cost to require a supply at 4,100	The items are estimated as an economic cost to require a supply at 8,200 m^3/day.

	m^3/day. - overall construction cost from reclamation plant to service pipes in hotels. - costs required to install water distribution networks and to connect house connections when the same amount of PDAM water is supplied to domestic users. - O&M costs Cost: IDR 448,752 million	 Cost: IDR 568,580 million
3. Analysis Results	EIRR: 12.91% Net Benefit: IDR 564,648	EIRR: 13.65% Net Benefit: IDR 685,564

S6.2.2 Economic Evaluation

The calculated EIRR is 12.91% and 13.65% for Case 1 and Case 2, respectively. The EIRR indicates that the reclaimed water project could be economically valuable.

S6.3 Operation and Effect Indicators

The operation and effect indicators for evaluation of this proposed project are chosen according to the document "Reference Operation and Effect Indicators (2nd Edition)",which defines operation and effect indicators as follows:

Operation Indicators: Indicators to quantitatively measure the utilization and maintenance states of the facilities

Effect Indicators: Indicators to clarify the project objectives and expected effects and quantitatively measure achievements

Both operational and effect indicators can be divided into basic indicators and supplementary indicators. Basic indicators are the indicators which are generally necessary or easy to collect data. Supplementary indicators are those required specifically for a project due to its characteristics and components and those which are necessary but difficult to collect data.

Section 15 (Water Supply Operation and Effect Indicators (Draft)) of this reference book are specifically referred to in the selection of operation and effect indicators and sorting of basic and supplementary indicators.

Tables S6.4 and S6.5 show the selected operation and effect indicators (draft) of the reclaimed water bulk supply project and their calculation methods and target values (draft).

Table S6.4 Operation Indicators of the Proposed Reclaimed Water Bulk Supply System (Draft)

Category	Indicator Name	Calculation Method	Target Value	Purpose	Note
Project Implementation Area					
Basic Indicator	Amount of the Reclaimed Water Supplied (m^3/day)	Based on daily average flow the records for water supply (transmission) ＜on a yearly basis＞	41,00 m^3/day (Case 1) 82,00 m^3/day (Case 2)	To understand the basic operational state of the reclaimed water bulk supply project	This is also used to calculate a basic effect indicator
	Facility Capacity Utilization Rate (%)	Facility Capacity Utilization Rate of facilities (at the average supply amount) ＜on a yearly basis＞	100 %		To be applied to the reclamation and transmission facilities
Supplementary Indicator	Intake Amount of the Secondary Effluent (m^3/day)	Based on the records of daily average intake flow ＜on a yearly basis＞	Amount of the Reclaimed Water Supplied (m^3/day) plus water loss in the reclamation process	To evaluate the state of raw water securement	
	Water Quality	According to the water quality standards for sewage effluent ＜on a yearly basis, a monthly basis, seasonal basis, etc.＞	The limit values set in the water quality standards on sewage effluent.	To evaluate the adequacy of raw water quality and impacts on the water reclamation treatment process	
		According to corresponding water quality standards related to the planned uses of the reclaimed water ＜on a yearly basis, a monthly basis, seasonal basis, etc.＞	The limit values set in the water quality standards related to the planned uses of the reclaimed water for Case 1 and Case 2, respectively.	To evaluate the O&M state of the reclamation facilities	

Table S6.5 Effect Indicators of the Proposed Reclaimed Water Bulk Supply System (Draft)

Category	Indicator Name	Calculation Method	Target Value	Purpose	Note
Project Implementation Area (Currently PT.TB Service Area)					
Basic Indicators	Ratio of the Actual Amount of Reclaimed Water Supplied to the Planned Amount	Actual amount of the reclaimed water supplied ÷ the planned amount of reclaimed water supply（%） ＜on a yearly basis＞	100%	To understand the level of realizing the plan	
Supplementary Indicator	Hypothetical Domestic Served Population（persons）	Based on the assumption that the amount of PDAM water, equivalent to the amount of the reclaimed water supplied to the hotels, will be available for domestic customers. Dividing the amount of the reclaimed water supply by the per capita water consumption of the project implementation area	About 18,400 persons equivalent (=3,700/0.201) for Case 1. About 36,800 persons equivalent (=7,400 / 0.201) for Case 2.	To understand the state of producing general effects of the reclamation project	Present per capita water consumption in PT.TB area is about 201 lpcd.
	Percentage of Hypothetical Increase in the Coverage of Water Supply	（ Hypothetical Domestic Served Population）÷ (Population in the Project Implementation Area）×100	About 18% (= 18,400 / 102,727 x 100) for Case 1. About 36% (= 36,800 / 102,727 x 100) for Case 2.	Same as above	Total Population in PT.TB area in 2010 is 102,727
Administration Area（Southern Supply Area of PDAM Badung）					
Supplementary Indicator	Hypothetical Domestic Served Population (persons）	Base on the assumption that the amount of PDAM water, equivalent to the amount of the reclaimed water supplied to the hotels, will be available for domestic customers. Dividing the amount of the reclaimed water supply by the per capita water consumption of the project implementation	About 25,350 persons equivalent (= 3,700 / 0.146) for Case 1. About 50,700 persons equivalent (=7,400 / 0.146) for Case 2.	Same as above	Present per capita water consumption in PT.TB area is about 146 lpcd.
	Percentage of Hypothetical Increase in the Coverage of Water Supply	（ Hypothetical domestic serviced population ）÷（population within the administration area）×100	About 7% (= 25,350 / 384,153 x 100) for Case 1. About 14% (=50,700 / 384,153 x 100)	Same as above	Total Population in southern service area of PDAM Badung in 2010 is 384,153.

S6.4 Risks and Countermeasures for the Implementation and Supervision of the Project

Risks to the Project were identified to study the risk sharing among the public and private entities under the PPP framework as well as the countermeasures for each identified risk. Details are examined in Section 15.2 of the Main Report.

The following table summarizes the main risks and their countermeasures, and the sharing of these risks. In the table, entity mainly responsible for each risk is marked with ◎ and entity partly responsible is marked with ○.

Table S6.6 Main Risks, Countermeasures and Risk Sharing of the Project

Category	Risk	Countermeasures	Risk Sharing		
			GM	SPC	PD AM
(1) Land Acquisition Risk	Land Acquisition Risk	• Timely and proper procedures in application to acquire the land. • The reduced project revenue due to the delay in starting the project is compensated with government guarantee (PT PII).	◎		
(2) Design & Construction Risk	Technology Risk	• To adopt tried-and-true technologies having past operational records.		◎	
	Construction Completion Risk	• EPC contractor should have sufficient experience of constructing reclamation plants and installing transmission pipes. • The construction contract should be a type which puts comprehensive responsibilities on the EPC contractor.		◎	
		• PDAM Badung takes responsibility for the rehabilitation of the existing distribution reservoir and network and the installation of new distribution pipes.			◎
	Related Infrastructure and Utility Risk	• Additional electric power transmission line should be installed by the local power company (Indonesian Power). • Piped water needs to be supplied by PDAM Badung.	◎		
(3) Environmental Risk	Environmental Risk	• The reclaimed water demand and the capability of meeting the target water quality of the reclaimed water continuously in the long term should be confirmed before the signing of the PPP contract so that the EIA process and the acquisition of environmental license can be done smoothly.	○	◎	
		• Compliance of the local water quality standards.	○	◎	
		• To establish the water quality standards for the reclaimede water use	◎		
(4) Off-take Risk	Off-take Risk	• Off-take Risk should be clarified in the contract. • Loss should be compensated financially or in other forms based on government guarantee.	◎		
(5) O&M Risk	Raw Water Securement Risk	• The contract should clarify that the secondary effluent is of sufficient quantity and quality to ensure continuous and	◎		

Category	Risk	Countermeasures	Risk Sharing		
			GM	SPC	PD AM
		stable suply to the SPC for the contracted period.			
	Insufficient Capability Risk	• O&M company established with foreign sponsor's fund should include skilled staff from local water or sewerage utilities with experience in wastewater reclamation.		◎	○
(6) Inappropriate Water Use Risk	Inappropriate Water Use and Accidental Ingestion Risk (For Case 2)	• Intended usages of the tap water mixed with the reclaimed water should be clearly indicated using notification boards and illustrations. • To provide additional free water bottles and/or install water dispensers (including those with hot water supply function).		◎	◎
		• To keep the concentration of residual chlorine at a suitable levelin the reclaimed water receiving tanks to be installed at the hotels.			◎
		• To establish a comprehensive water quality monitoring system from sewage treatment plant to the reclaimed water treatment facilities.		◎	○
(7) Financial Risk	Currency Exchange Risk	• Forecasting (frequency and magnitude of fluctuations and) is difficult. Pre-agreement on how to share this risk should be considered.	◎	◎	◎
	Inflation	• Bulk sale price should be subject to price adjustment by reflecting change of electricity tariff, consumer prices and wages.	◎	◎	◎
(8) Accident & Disaster Risk	Force Majeure Risk	• To secure reinsurance from a credible international damage insurance company with a good track record.		◎	○
(9) Law & Regulation Change Risk	legal & Permit Approval Change Risk and others	• The loss due to political risk should be compensated in accordance with the government guarantee (PT PII).	○		

S6.5 Environmental and Social Considerations

(1) Tasks to Assess Environmental and Social Impacts

Environmental and social aspects of this reclaimed water supply project were considered based on Indonesian environmental laws and regulations. JICA's latest guidelines for environmental and social considerations (April 2010) were also referred to ensure the soundness and effectiveness of remedial measures to address environmental and social concerns.

As already explained, two alternative reclaimed water supply systems (Case 1: Conventional Reclaimed Water Supply System and Case 2: New Clean Water Supply System) have been set for comparison in the preparatory survey. Case 1 is for conventional reclaimed water uses such as toilet flushing. Case 2 is for new reclaimed water uses involving direct skin contact. As for the considerations of environmental and social aspects, these two cases are compared in 14.4.2 of Main Report and 10.b (1) of Appendix 10. As a result, Case 1 is evaluated to be preferable in regard to environmental and social aspects. However, during the second survey period in Indonesia, Case 1 is evaluated to be less feasible than Case 2 as a PPP

project because of its difficulties in installing the dual pipe systems in target hotels and its necessity of subsidy from local government. Therefore, this section of executive summary, Chapter 14 of Main Report and its relevant appendixes (Appendixes 9 to 11) explain the results of Initial Environmental Examination (IEE) and other relevant tasks for Case 2 that requires more cautious of environmental and social considerations. In addition, the project evaluation in Chapter 15 of Main Report includes the comparison of the risks related to environmental and social considerations between Case 1 and Case 2.

Prior to the implementation of this survey, the proposed reclaimed water supply project was classified as Category B in JICA's project categorization for deciding the level of required environmental and social considerations. This classification remains unchanged because no major irreversible negative impacts, such as large scale involuntary settlement or loss of endangered or rare species would be caused by the project. The project has several potential negative impacts of medium significance, mainly on the social conditions, such as degradation of traffic flow during the installation of transmission and distribution pipes.

The tasks undertaken to assess environmental and social impacts are listed in Table S6.7.

Table S6.7 Tasks of Environmental and Social Considerations

Task ID	Task Description
Task 1	Describing the project components and the environmental and social aspects of the project with site maps.
Task 2	Environmental screening for the categorization of the project in terms of environmental and social considerations.
Task 3	Confirmation of the existing laws and regulations related to the environmental and social considerations required in Indonesia and Bali Province for PPP projects.
Task 4	Confirmation of the existing procedures of environment appraisal including Environmental Impact Assessment for PPP projects in Indonesia.
Task 5	Strategic Environmental Assessment (SEA) and alternative analyses to avoid negative impacts of the reclaimed water supply project.
Task 6	Environmental scoping for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA).
Task 7	Evaluation of potential negative impacts and considerations on mitigation measures.
Task 8	Consideration of environmental monitoring for reclaimed water quality, traffic flow, etc.
Task 9	Discussions between the Indonesian and Japanese sides and stakeholder meeting for public consultation.
Task 10	Preparation of a draft TOR for the EIA required for the project implementation.
Task 11	Reconfirmation of the environmental and social considerations using JICA's Environmental Checklist.

The results of these tasks are explained in Chapter 14 of the main report. Appendix 9 (Detailed Project Activity Plan) and Appendix 10 (Environmental Effect Study Report) are prepared as requested in the minutes of meeting signed between the Indonesian government and JICA on December 1, 2010. Appendix 10 includes the detailed the results of the Initial Environmental Examination (IEE) conducted in this preparatory survey. Appendix 11 (A Draft TOR for the EIA) is prepared based on the results of the IEE.

(2) Process of Required EIA

According to Ministry of Environment Regulation No. 11/2006, any projects including the installation of water transmission pipe equal to or longer than 10 km are required to conduct EIA. Since the water transmission pipeline to be installed in this PPP project is more than 10 km, this PPP project needs to conduct EIA in order to obtain the environmental license. Figure S6.1 shows the Indonesian EIA (AMDAL in Indonesian language) procedure which the reclaimed water supply project has to follow after Appraiser Committee of EIA officially announces the necessity of EIA. The Appraiser Committee of EIA will be led by the Environmental Board of the Bali Provincial Government (BALH) in the case of this project and will consist of representatives from government agencies, academics, associations and local leaders.

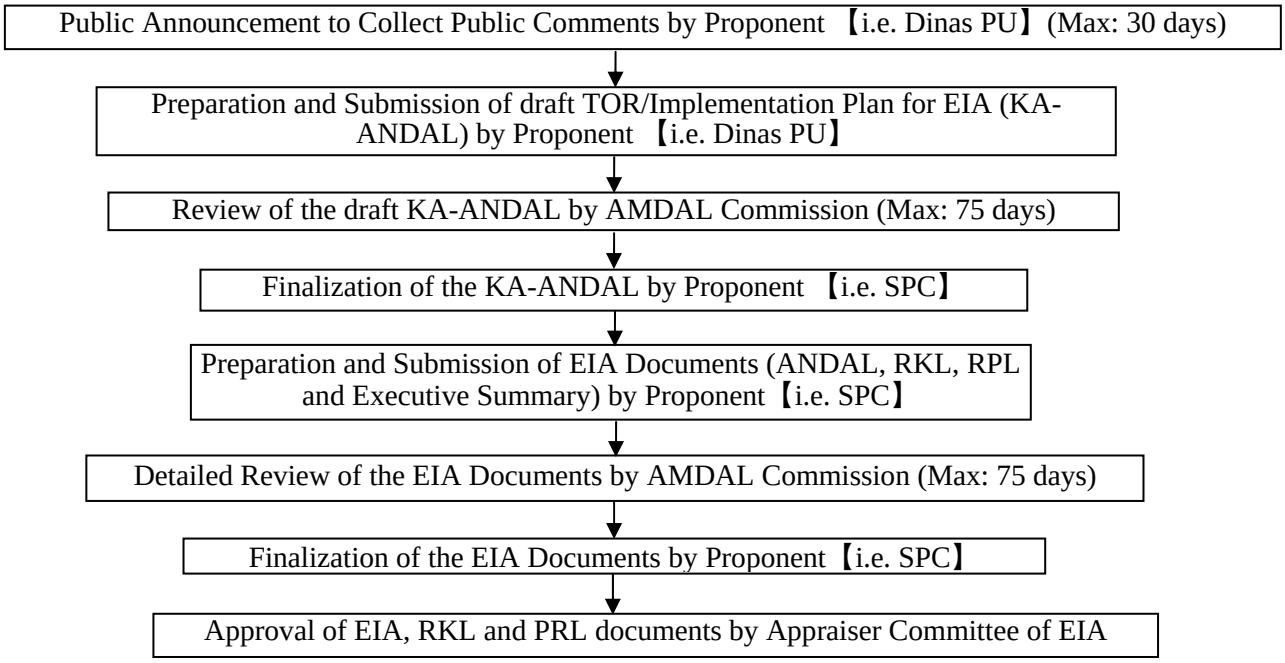

Figure S6.1 Procedure of EIA (AMDAL) in Indonesia

According to the Indonesian general guidelines on PPP projects issued by BPPENAS in June, 2010, it is understood that Proponent of a PPP project in the EIA procedure changes from Responsible Government Entity to Private Enterprise at the signing of the PPP Contract. Therefore, in case of this reclaimed water supply project, DIANS PU/Bali Provincial Government has to prepare the draft KA-ANDAL (TOR/Implementation Plan of the EIA) in Indonesian based on the draft TOR of the EIA prepared in English in this preparatory survey (see Appendix 11) and submit it to BALH before the signing of the PPP contract. After the PPP contract is signed, the SPC has to finalize the KA-ANDAL, implement the EIA study and prepare the required EIA documents in order to receive environmental license before the starting the construction.

(3) Results of the Initial Environmental Examination (IEE)

The IEE conducted in the preparatory survey focused on the identified moderately significant negative impacts. Section 14.4 of Chapter 14 in the main report describes 1) the strategic environmental and social considerations at the early stage of the project planning; 2) the five alternative analyses conducted for environmental and social considerations; 3) the results of a comprehensive environmental scoping; 4) the evaluation of moderately significant potential negative impacts and their mitigation measures; 5) required environmental monitoring; and 6) the results of workshops with relevant government agencies and a stakeholder meeting.

During the pre-construction stage, this project may face some difficulties with land acquisition for the proposed water reclamation plant (one hectare over segmented mangrove habitats which used to be fish ponds) and cultural acceptance of the planned uses (showering, bathing, filling swimming pools, etc.) of the reclaimed water at the targeted hotels. This project also has positive impacts on the search for alternative water resources in Southern Bali, the growth of eco-friendly and local job opportunities.

During the construction stage, only the installation of the transmission and distribution pipes would have moderately significant negative impacts on the traffic flow. Some potential minor negative impacts may include air pollution, noise and vibration from construction machines and trucks, physiographical, hydrological, biological and social impacts of land clearing and embankment at the water reclamation

plant site, and inflow of construction workers to Southern Bali. The project also has positive impacts on the income and job opportunities for local people during the construction stage.

During the operation stage, the tourists staying in the hotels may complain due to their perceptions on the use of reclaimed water and have concerns related to health and aesthetics. The project may cause minor negative impacts including the air pollution, noise and vibration from the installed equipment such as a generator, impacts of the backwash water from the water reclamation plant on the treatment process of the Suwung WWTP and the increase of burden to the target hotels in terms of facility maintenance costs and water charges. This project also has positive impacts in the reduction of ground water extraction at the hotels and river water extraction by future water supply projects in Bali, the quantity and quality of the effluent from the WWTP, the growth of eco-friendly and local job opportunities.

In the IEE, required environmental monitoring was considered after the evaluation of the moderately significant negative impacts and the proposal of their mitigation measures. A tentative water quality monitoring plan was prepared for the water quality control of the reclaimed water. This tentative water quality monitoring plan should be revised in the EIA based on the agreement between BLUPAL, SPC and PDAM Badung regarding the sharing of responsibilities in water quality control. This agreement should be stated in the PPP contract.

The survey team and counterparts from relevant government agencies held several workshops during the survey to discuss the direction and process of the survey. DINAS PU of the Bali Provincial Government and BLUPAL also held a stakeholder meeting on September 27, 2011 in Denpasar with the help of the survey team to explain the project to various stakeholders and collect their comments. The survey team summarized the suggestions, questions, etc. collected in these workshops and stakeholder meeting together with the responses in Tables 10.f.4 and 10.f.5 of Appendix 10). An interview with the Bali Tourism Board, which was absent at the stakeholder meeting, was conducted on October 7, 2011 to add to the perspectives from the hotels. The Bali Tourism Board made some positive reactions on the use of the reclaimed water in the hotels (see Table 10.f.6 of Appendix 10).

(4) Confirmation using JICA's Environmental Checklist and Preparation of a Draft TOR for the EIA

In Chapter 14 of the main report, the environmental and social considerations reviewed for this project were double-checked against JICA's Environmental Checklist. Any outstanding tasks identified would be covered in the EIA process. The environmental consultants to be hired by the Indonesian side (DINAS PU/Bali Provincial Government) and the SPC for the implementation of the EIA would carry out the following tasks. A draft TOR for the EIA shown in Appendix 11 explains these tasks.

1) public announcement about the project,
2) preparation of a draft KA-ANDAL,
3) completion of the KA-ANDAL,
4) data collection and field surveys,
5) review of existing reports, evaluation of impacts and planning of environmental management and monitoring,
6) socialization
7) preparation of the draft EIA documents,
8) completion of the EIA documents, and
9) acquisition of environmental license for the project.

S6.6 Evaluation of Proposed Projects

The results of comparing the two cases with technical and economic views are shown in the following table.

Table S6.8 Comparison and Evaluation of the Two Cases

Criteria	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
1. Technical Aspects		
1) Simplicity of Construction and Installation	The renovation of service pipes in the hotels is more difficult than the work for Case 2, because new service pipes have to be installed in each guest room to supply the reclaimed water for flushing toilets. The hotel may be required to close the hotel service operation temporarily by the renovation work.	Although the installation of new service pipes to each guest room is not required, an independent service pipe system should be established to supply drinking/cooking for restaurant, bars and necessary places. The new drinking water service pipe system is easier to install because locations where modifications are required will be relatively limited.
2) Ease of O&M	Know-how accumulated in the O&M of the conventional reclaimed water supply system can be used for the O&M for Case 1 Project. Thus appropriate O&M in this case can be easily achieved.	This case is required to provide more safe reclaimed water than that of Case 1, the O&M is difficult and requires accumulation of more sophisticated technical know-how.
3) Water Quality Management	Know-how accumulated in the water quality control and monitoring the produced reclaimed water can be used for the O&M for Case 1 Project. An appropriate water quality management in this case can be easier than that of Case 2 Project.	Establishment of water quality management and monitoring system and their exact execution are essential to secure safety of the reclaimed water. Preventive measures against accidental ingestion or wrong usage are also required as well as emergency measures.
4) Reclaimed water quality standards	Indonesian reclaimed water quality standards for this case can be developed, refer to Japanese reclaimed water quality standards for different use purposes.	To create the reclaimed water quality standards suitable for bathing and showering requires detailed scientific studies and discussions among stakeholders, because no actual practices for such reclaimed water use purposes. The early creation of the standards is difficult.
5) Risks related to Accidental Ingestion	Risks related to accidental ingestion of the reclaimed water can be avoided by preparing and executing protection measures of cross-connections between the service pipes for reclaimed water and PDAM water.	Preparation and exact execution of preventive measures against accidental ingestion and wrong use of the reclaimed water are pre-requisites for the implementation of the Case 2 Project. But the accidental ingestion and wrong use could not be completely avoided.
2. Economic Aspects		
2.1 Financial Analysis		
1) Evaluation criteria	Financial parameter of Equity IRR >15%, and Minimum DSCR (Debt Service Coverage Ratio) >1.2 are applied to minimum requirements for showing financial feasibility.	Financial parameter of Equity IRR >15%, and Minimum DSCR (Debt Service Coverage Ratio) >1.2 are applied to minimum requirements for showing financial feasibility.
2) Analysis Results	To satisfy the above financial evaluation criteria, one of the following results should be accepted: - Reclaimed water bulk supply price of 19,300 IRD /m^3 (at 2016 price) - About 54% of total construction cost is covered by a public financial assistance (VGF), in case of the price	To satisfy the above financial evaluation criteria, the reclaimed water bulk supply price of 12,000 IRD /m^3 (at 2016 price) is accepted.

Criteria	Case 1: Conventional Reclaimed Water Supply System	Case 2: New Clean Water Supply System
	of 12,000 IRD /m^3 (at 2016 price)	
3) Sensitive Analysis	No sensitive analysis done because the above financial analysis results.	Sensitive analysis has done the following conditions: cost overrun on construction cost of 5% and 10% increase, O&M cost increase of 2%,4%,6%, and exchange rate increase of 1%, 2%, and 3% per year. The results show that the impact except the cost over run of 10% increase are small. The resulted financial indicators are as follows: - Decreases in Equity-IRR are within 0.5% except the case of 10% cost overrun, showing Equity-IRR decrease of 1.5%. - DSCR is maintained more than 1.2.
4) Evaluation	- The price of reclaimed water without public financial assistance is much higher than the affordable price discussed in Chapter 11. - Application of public financial assistance is the matter of Indonesian governments based on evaluation of public benefits generated by the Project.	The reclaimed price of IDR 12,000/m^3 is within 70% of the price range between the PDAM water tariff to hotels and irrigation water tariff with assumption of 10% annual increase. When the price and the sales are guaranteed, the Case 2 Project is financially feasible.
2.2 Economic Analysis		
1) Benefits	The following alternative costs, with the provision of reclaimed water at 4,100 m^3/day, are estimated as the economic benefits. - cost of pumps and power supply to obtain the same amount of water. - purchase cost of bottled drinking water. - contribution to tourism industries. Benefit: IDR 1,013,400 million	The alternative costs, with the provision of reclaimed water at 8,200 m^3/day, are estimated as the economic benefits. Benefit: IDR 1,254,144 million
2) Costs	The following items are estimated as an economic cost to require a supply at 4,100 m^3/day. - overall construction cost from reclamation plant to service pipes in hotels. - costs required to install water distribution networks and to connect house connections when the same amount of PDAM water is supplied to domestic users. - O&M costs Cost: IDR 448,752 million	The items are estimated as an economic cost to require a supply at 8,200 m^3/day. Cost: IDR 568,580 million
3) Analysis Results	EIRR: 12.91% Net Benefit: IDR 564,648	EIRR: 13.65% Net Benefit: IDR 685,564
4) Evaluation	The economic analysis results show the Project has high economic values.	The economic analysis results show the Project has high economic values.

S7 Conclusion and Recommendation

S7.1 Conclusion

It is concluded that the proposed two projects have different difficulties each to implement because of following issues:

In Case 1 Project, the proposed project is not feasible financially due to the reclaimed water demand as low as 3,700 m^3/day with the customers' affordable reclaimed water price range. It is demonstrated that the project could be financially viable when it is covered about more than 54% of total construction cost by a public financial assistance (VGF).

In Case 2 Project, in which the reclaimed water is extended to use bathing and showering purposes, the project shows the financially feasible with the customers' affordable reclaimed water price range. But this project cannot be implemented technically due to following reasons: this extended use purposes have not been practiced so far in Japan and other countries, then the reclaimed water quality standards cannot be established easily, severe water quality monitoring and control are required in the operation of reclaimed water treatment and supply facilities to provide safe reclaimed water, the safety in use of reclaimed water cannot be secured completely, and risks related to accidental ingestion and wrong use cannot be avoided completely.

S7.2 Recommendations

To realize the Case 1 Project as an Indonesian PPP Infrastructure Project, it is necessary to increase the reclaimed water demand and/or to receive any public financial assistance.

First, it is recommended the following three points to increase the demand for Case 1 Project.

- To formulate promotion programs and execute continuous promotion activities on reclaimed water use through deepening the understanding of the stakeholders
- To establish reclaimed water quality standards suitable for the intended uses
- To prepare law and regulations for promoting the introduction of dual pipe system in target hotels, i.e. installation of pipes for providing the reclaimed water

1) To formulate promotion programs and execute continuous promotion activities on reclaimed water use through deepening the understanding of the stakeholders.

Increase in the reclaimed water demand is a most important issue. It is required various promotion activities to obtain the understanding and the support of the stakeholders: the needs of using the reclaimed water in the Southern Bali such as an imbalance between the water demand and water supply; reveal of groundwater problems of depletion and reduction in pollution loads to the seashore; to promote the reclaimed water use for creating a consensus to use the reclaimed water as much as possible. It is highly recommended to prepare promotion programs and to execute continuous promotion activities.

We hope that the pilot reclaimed water treatment plant constructed at the Denpasar WWTP by Metawater Co., Ltd., has played a very important role to provide an opportunity to deepen the understandings on the reclaimed water to be produced by the proposed project.

The groundwater is used in the airport, the power generation plant, the seaport, and hotels in southern Bali. But problems in groundwater such as groundwater depletion and salination are revealed in the Southern Bali. To protect the groundwater problems and to preserve the groundwater as an important water resources for future, it is highly recommended to establish any regulating regal measures in groundwater use in the southern Bali.

2) To establish reclaimed water quality standards suitable for use purposes

At present any reclaimed water quality standards are not established in Indonesia. It is recommended to establish reclaimed water standards suitable for various use purposes as soon as possible. In order to establish the Indonesian reclaimed water quality standards, the tentative standards set in the Preparatory survey: the Japanese reclaimed water quality standards and the reclaimed water quality standards used by the Tokyo metropolitan government, would be useful.

3) To introduce legislation toward promoting installation of additional service pipe system in targeted buildings for providing the reclaimed water

Reclaimed water users (hotels in the Survey) should install a new reclaimed water service pipe system by their own budgets. It is recommended to introduce legislation toward promoting installation of additional service pipe system in the targeted buildings for providing the reclaimed water as well as establishing a special fund to assist building owners.

Finally, regarding the public financial support (VGF), a possibility to apply VGF to the proposed Case 1 Project seems very low because the final users are not domestic users but hotels of tourism industries, based on the comments of Indonesian central government. The Case 1 Project will provide benefits to the domestic users as well as the direct benefits to the hotels and tourism industries, i.e., the same volume of water to the reclaimed water could be used by the domestic users, and the Case 1Project is expected to contribute the pollutants reduction to the seashore near the Denpasar WWTP. Considering these public economic benefits, the possibility of applying the public financial support should be further discussed as well as promotion of increase in reclaimed water demand.