

各国における上下水道事業

Water and sewerage works in each country

PPP Council for Overseas
Water Infrastructure

Sewerage Infrastructure in Cambodia

By

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14 February, 2011

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Background



✦ *South-East of Asia- North connected by the Loas, the East to the Vietnam, the South-by the Golf Sea of Thai and the West- by the Thailand.*

✦ *Land Area 181.035 sq Kms .*

✦ *Population : 13,388,910 (Population Cencus 2008)*

✦ *The main religion is Buddhism.*

✦ *Capitalcity : Phnom Penh*

✦ *Total Number of Provinces and Municipality: 24*

✦ *Total Number of Districts: 185*

✦ *Total Number of Comunes: 1621*

✦ *Total Number of Villages: 14,073*

✦ *Urban Population: 2,614,440 (19.5%)*

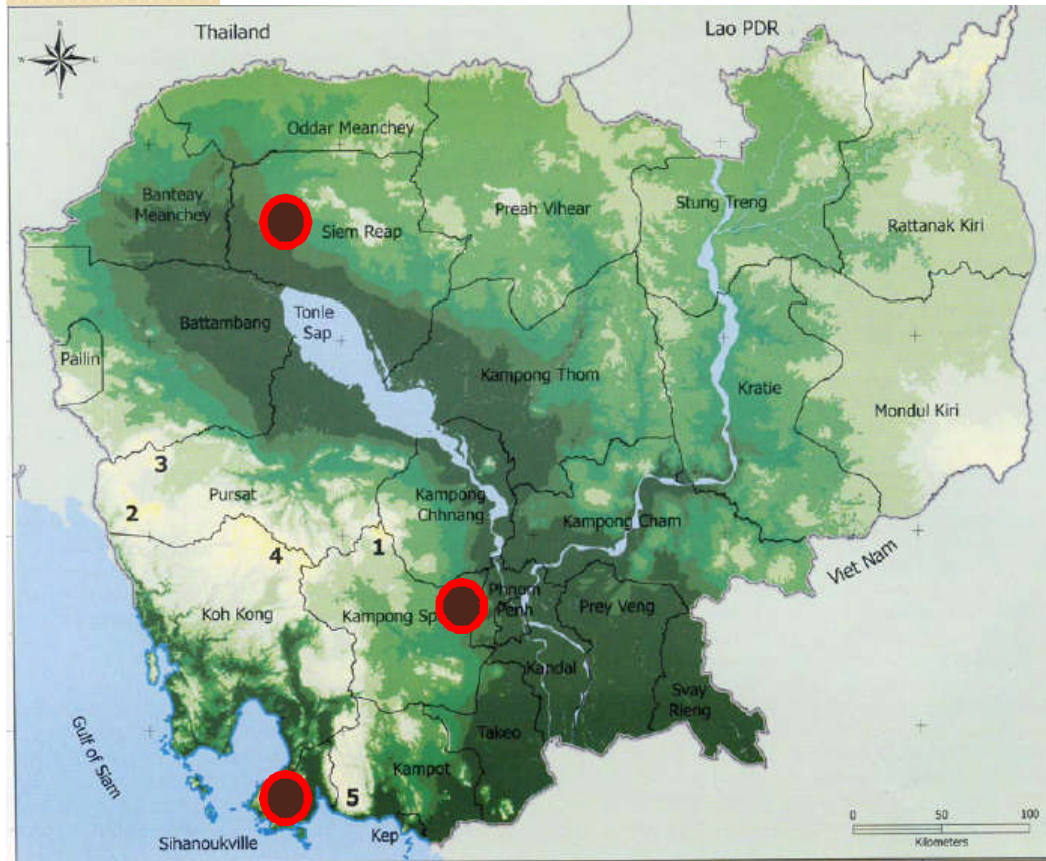
✦ *Annual Growth Rate: 1.54%*

✦ *Average Size of Household: 4.7*

Water Boundary



Pipeline Project



- **Kampot Wastewater Treatment System:** MPWT was conducting the FS and projecting to finish at the end of 2011.
- **Environmental Master Plan:** MOE was conducting the study (Water Supply, Wastewater, Solid Waste & Air Quality) to cover Siem Reap, Phnom Penh & Sihanoukville Towns in 2010.
- **Water and Sanitation Sector Financing Strategy for Cambodia:** WB was conducting the study & projecting to finalize in 2010.
- **Coastal Sustainable Development:** MLMUPC and related institution to develop the Coastal Master Plan Development Study including the water and sewerage infrastructure in 2010.
- **Phnom Penh Sewage Treatment Plant:** MOE & MPWT were conducting the FS and going to finish in 2011.
- **Towns Development Project:** ADB is going to conduct the FS in 2011 and the loan is projecting in 2013.

Law and Regulation

Water quality standard in public water areas for bio-diversity conservation in Cambodia

No.	Parameters	Unit	Standard value
River			
1	pH		6.5-8.5
2	BOD ₅	mg/l	1-10
3	Suspended Solid	mg/l	25-100
4	Dissolved Oxygen	mg/l	2-7.5
5	Coliform	MPN/100ml	<5000
Lakes and Reservoirs			
1	pH		6.5-8.5
2	COD	mg/l	1-8
3	Suspended Solid	mg/l	1-15
4	Dissolved Oxygen	mg/l	2-7.5
5	Coliform	MPN/100ml	<1000
6	Total Nitrogen	mg/l	0.1-0.6
7	Total Phosphorus	mg/l	0.005-0.05
Coastal water			
1	pH		7-8.3
2	COD	mg/l	2-8
3	Dissolved Oxygen	mg/l	2-7.5
4	Coliform	MPN/100ml	<1000
5	Oil content	mg/l	0
6	Total Nitrogen	mg/l	0.2-1
7	Total Phosphorus	mg/l	0.02-0.09

Source: Annex 4, Sub-Decree on Water Pollution Control, 1999

Design Data for Wastewater Treatment Plant

➤ **Influent**

- Total BOD load: 1,838 kg/d
- Ambient Temperature : 24° C

➤ **Waste Stabilization Pond System**

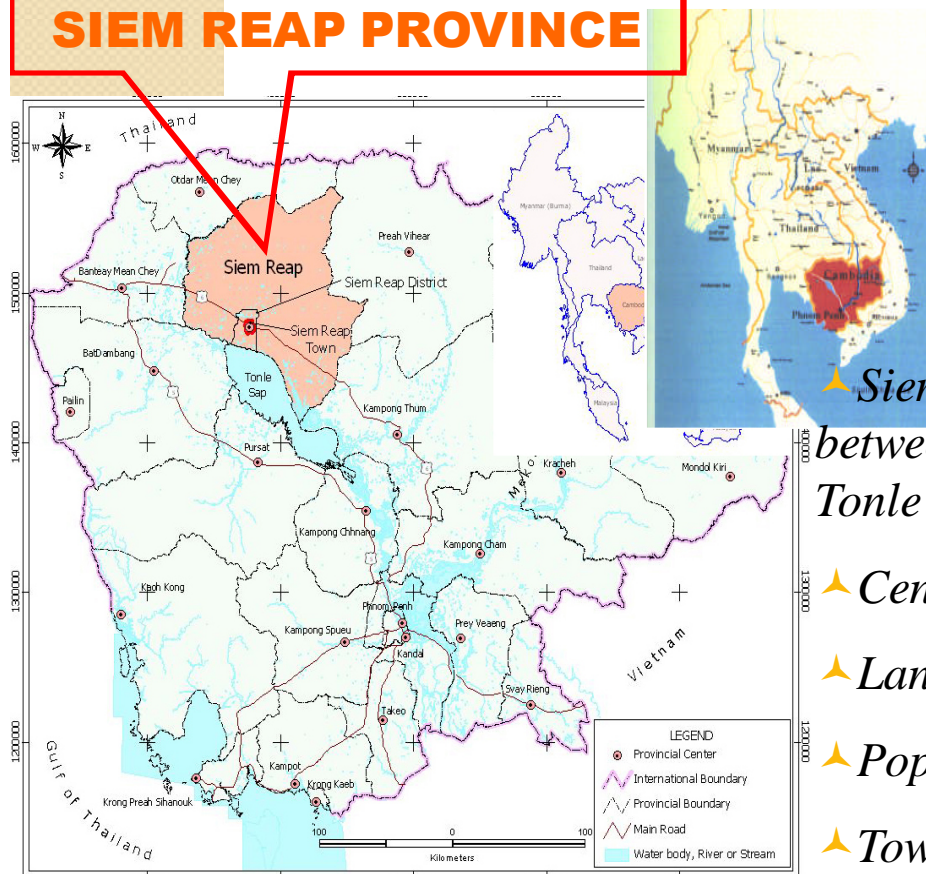
- Anaerobic Ponds, Sludge Disposal
- Facultative Ponds
- Maturation Ponds
- BOD Removal Rate: 95%
- Coliform Removal Rate : 99%

➤ **Effluent**

- BOD load : 368 kg/d; 0.07 mg/l

Siem Reap Sewerage System & Improvement of Siem Reap River

SIEM REAP PROVINCE



▶ *Siem Reap lies within the large, flat plain lying between the Kulen mountains to the North-east and Tonle Sap to the South.*

▶ *Centre Economy of Tourism.*

▶ *Land Area :12,150 sq.Kms*

▶ *Population : 782 809 persons (Municipal Siem Reap)*

▶ *Town City : Siem Reap-Angkor*

▶ *Total Number of District: 12*

▶ *Total Number of Comunes: 100*

▶ *Total Number of Villages: 875*

Siem Reap Sewerage System & Improvement of Siem Reap River

Storm Drainage

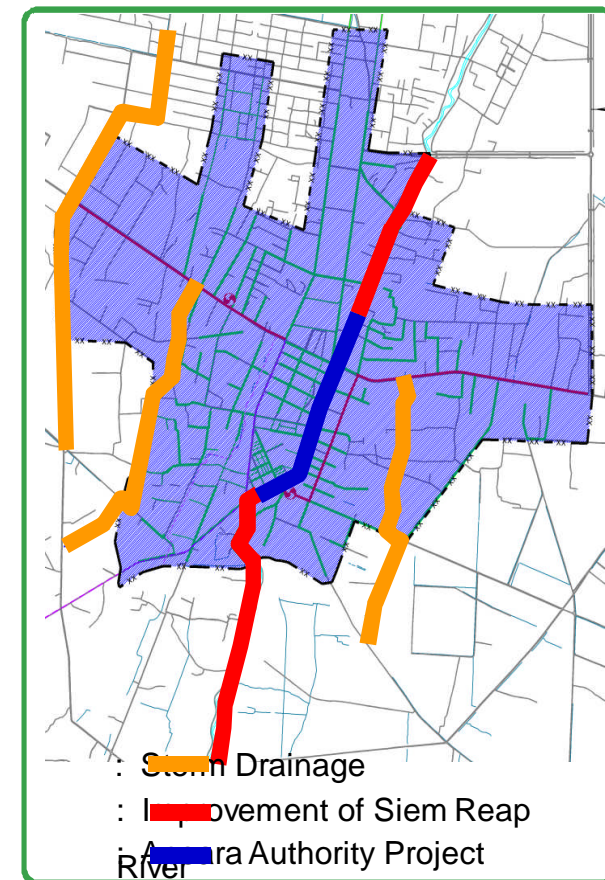
- Length is increased by about $L \doteq 2.0\text{km}$, Route of storm drainage is changed.

F/S	This Project
<u>Total : L=6.07km</u>	<u>Total : L= 8.2km</u>
- West 1 : L=2.45km	- West 1 : L=3.3km
- West 2 : L=2.24km	- West 2 : L=2.6km
- East : L=1.38km	- East : L=2.3km

Improvement of Siem Reap River

- In combinations with under construction by Apsara Authorities

F/S	This Project
<u>Total : L=4.0km</u>	<u>Total : L=4.0km</u>
Dragon Bridge ~ Crocodile Farm : L=4.0km	New Bridge at former Tourism Department ~ Dragon Bridge : L=1.6km Dragon Roundabout ~ New Ring Road Bridge : L=2.4km
Replacement of floodgate : 1EA	Same as left



Waste Stabilization Pond System



- សំណង់សំគាល់ (Legend)**
- 1 ផ្លូវចូល (Gate House)
 - 2 បឹងស្តុកទឹក (Construction Pond)
 - 3 បឹងស្តុកទឹក (Construction Pond)
 - 4 បឹងស្តុកទឹក (Construction Pond)
 - 5 បឹងស្តុកទឹក (Construction Pond)
 - 6 បឹងស្តុកទឹក (Construction Pond)
 - 7 បឹងស្តុកទឹក (Construction Pond)
 - 8 បឹងស្តុកទឹក (Construction Pond)
 - 9 បឹងស្តុកទឹក (Construction Pond)
 - AP1 បឹងស្តុកទឹក (Construction Pond)
 - AP2 បឹងស្តុកទឹក (Construction Pond)
 - SD3 បឹងស្តុកទឹក (Construction Pond)
 - HP1 បឹងស្តុកទឹក (Construction Pond)

Problem and Constraint

- The present situation of sewerage and drainage is alarming and requires urgent intervention to address the issues;
- A further deterioration is expected through rapid town development
- At present, there is no sewerage and drainage sector master plan for the towns or country,
- Not adequate human resources, empowerment and financial resources for O&M and management of the sewer system;

Necessary Countermeasure

- Establishment of legislation and laws for wastewater management institutions for the empowerment/enforcement, Capacity building and resources mobilization.
- Master plan for Sewerage and Drainage system of each urban area and towns throughout the country is urgently required;
- Encouragement of Private Sector Participation.



Thank You





The Second Meeting of “PPP Council for Overseas Water Infrastructure”

PROMOTING PPP IN WATER INFRASTRUCTURE, SOLID WASTE, AND WASTE WATER MANAGEMENT IN INDONESIA



Presented by:

Budi Yuwono
Director General of Human Settlements,
Ministry of Public Works, Republic of Indonesia

Tokyo, February 14, 2011

I. Water Supply

1. Water Supply Problems

- ▶ Level of services of drinking water in Indonesia in average (in urban and rural areas) is only 47.7%.
- ▶ The total population in Indonesia is 237 million people, and about 54% of the total population are living in urban areas. The need for drinking water is high.
- ▶ The limited bulk water provision which is caused by inappropriate water sources management and the impact of global climate change. Environmental degradation and pollution of bulk water sources are also serious problems which make water treatment needs a huge investments.



2. MDGs Target and Budget needed

- ▶ The target MDGs is to increase the level of service to 68.8%.
- ▶ The total budget needed to increase the level of services of drinking water is approximately US\$ 4.6 billion.
- ▶ The Government budget to achieve that target is only about US\$ 1.18 billion. Therefore, there is as much as US\$ 3.42 billion budget needed from other sources besides the government budget.



3. Strategic Plan 2010–2014 for Water Infrastructure

- ▶ The target for developing the IKK/district level water system from year 2010 to year 2014 is 820 locations/districts.
- ▶ The target for developing rural water supply system from year 2010 to year 2014 is 4,650 villages.



4. Water Infrastructure Potential Projects for PPP

- ▶ Umbulan water supply project in East Java with the capacity of 4.000 It/second and the estimated investment is US\$ 0.2 billion.
- ▶ Jatiluhur water supply project in West Java with the capacity of 5.000 It/second and the estimated investment is US\$ 0.19 billion.
- ▶ Bandar Lampung water supply project in Sumatera with the capacity of 500 It/second and the estimated investment is US\$ 36.6 million.



5. Supporting for PPP Projects

- ▶ Presidential Regulation number 13 year 2010 as revision of Presidential Regulation number 67 year 2005 regarding Partnership of Government and Private Sector.
- ▶ Establishment the Supporting Agency for Drinking Water Development System (which is called BPPSPAM) to facilitate PPP in water infrastructure



II.Solid Waste Management

1. Problems of Solid Waste

- ▶ Rapid increase of a waste generated, particularly in domestic waste. Currently, the increase rate of the waste generated from domestic waste is about 2–4% per year.
- ▶ Inefficiency in solid waste management, limited capacity of budget, and low level of services.
- ▶ Methane gas are releasing to the air uncontrolled that makes air pollution.



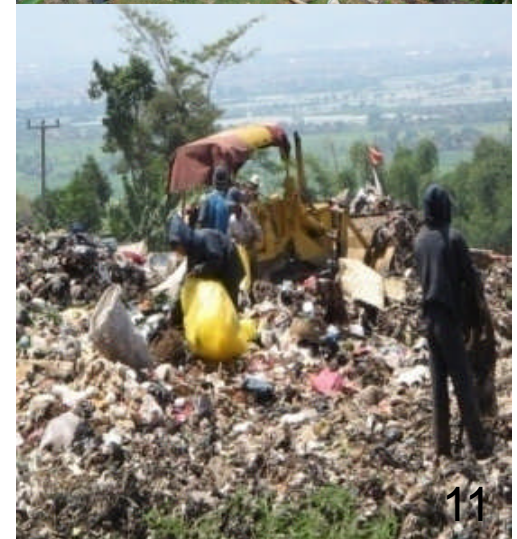
2. Strategic Plan for Solid Waste Management

- ▶ Regional disposal site (TPA Regional) like implemented in Mamminasata Metropolitan Area (Makassar, Sungguminasa, Maros and Takalar) and in Sarbagita Metropolitan Area (Denpasar, Badung, Gianyar and Tabanan). The target for developing regional disposal sites in Indonesia from year 2010 to year 2014 is 11 locations.



3. Supporting for PPP Solid Waste Management Projects

- ▶ Law number 18 year 2008 regarding Solid Waste Management which recommends local governments to close open dumping disposal site as of the date of enactment of this law. In the future, the final disposal sites must be operated by sanitary landfill system.
- ▶ Minister of Public Works Regulation number 21 year 2006 regarding Policy and Strategy for Solid Waste Management which recommends the increase of level of service and quality of solid waste management, and promoting private sector partnership.



4. Solid Waste Potential Projects for PPP

- ▶ Namo Bintang disposal site in Medan city. The total area of the disposal site is 17 ha. The estimated investment (LFG Flaring system) is US\$ 7.19 million.
- ▶ Jatibarang disposal site in Semarang City. The total area of the disposal site is 44.5 ha. The estimated investment (LFG Flaring system) is US\$ 6.21 million.



III. Wastewater Management

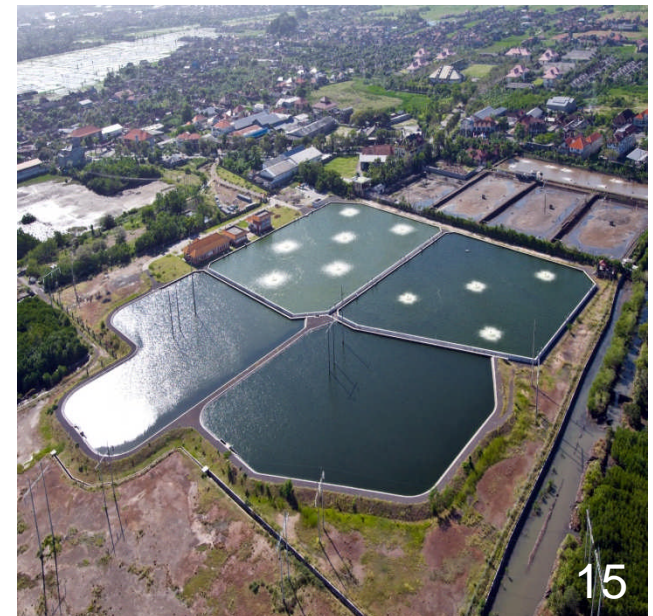
1. Strategic Plan

- ▶ Developing the off-site systems such as implemented in Denpasar city through the Denpasar Sewerage Development Project (DSDP) with support of Japan assistance. The target for developing this kind of infrastructure from year 2010 to year 2014 is 11 cities. Besides this system, we also plan up to year 2014 to develop the on-site system of wastewater for 210 locations.



2. Potential Wastewater Management Projects for PPP

- ▶ Water recycling of Suwung wastewater treatment plant in Bali. The beneficiary is to supply water for watering city park of Denpasar Bali. The estimated project cost is US\$ 1.63 million.
- ▶ Water recycling of Bojongsoang wastewater treatment plant in Bandung West Java. The beneficiary is to supply water for non-domestic use (agriculture, fisheries and industrial). The estimated project cost is US\$ 1.23 million.



Thank You



Attachment

PPP in Water Infrastructure, Solid Waste and Waste Water Management In Indonesia

Tokyo, February 14, 2011

BUDI YUWONO

Director General of Human Settlements
Ministry of Public Works
Republic of Indonesia

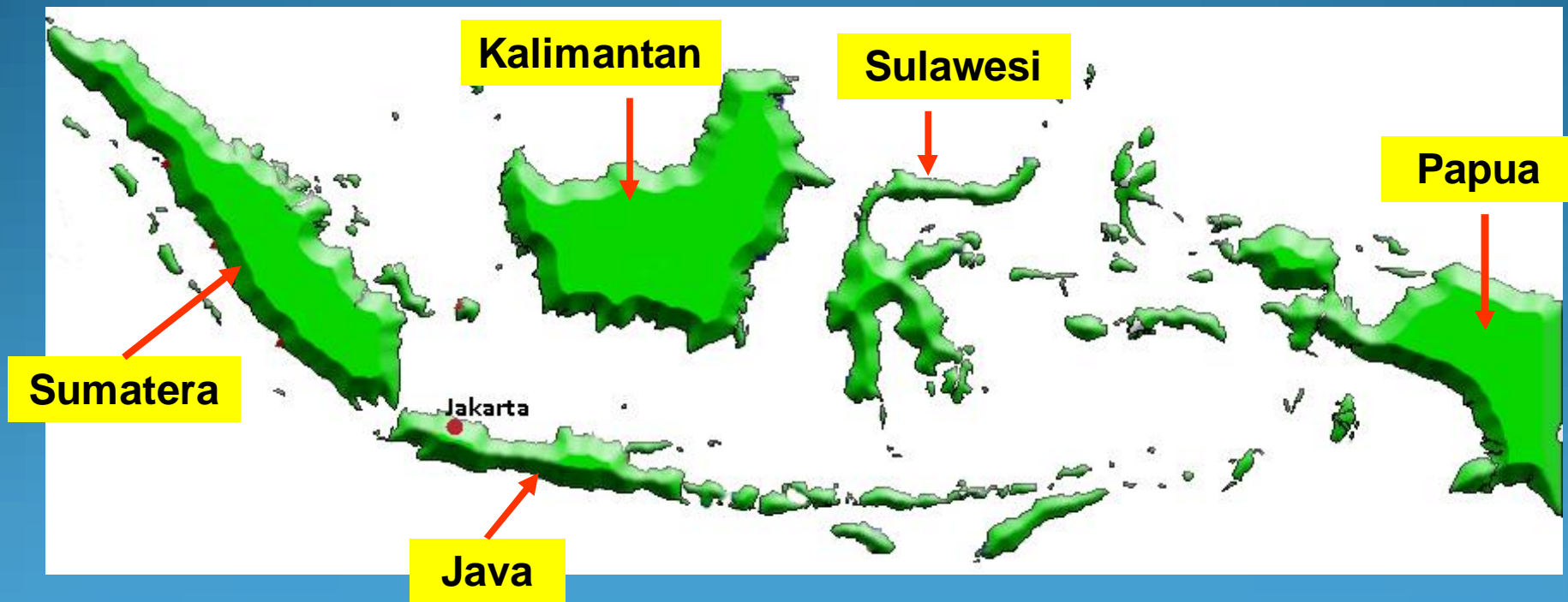
The Second Meeting of PPP Council for
Overseas Water Infrastructure



DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
MINISTRY OF PUBLIC WORKS

General Information

- Population in Indonesia : 237 million inhabitants (2010)
- Area : 5,180,053 km²
- Number of Provinces : 33
- Number of cities/districts : 497
- Number of Metropolitan/big/medium cities: 10/13/56





I. WATER SUPPLY



STRATEGIC ISSUES OF WATER SUPPLY

- The quantity of raw water in urban area becomes more scarce
- Pipe drinking water services is still low (In the Year 2010, National average = 47.7%).
- Non revenue water is still high (national average = 33%)



NATIONAL DEVELOPMENT POLICY FOR WATER SUPPLY SYSTEM

WATER SUPPLY (Public Works Minister Regulation No. 20/2006)

- Improving the quality and increasing coverage of service
- Developing alternative sources of funding and financing mechanism
- Institutional strengthening and legislation
- Increasing security and quality of raw water
- Increasing community participation



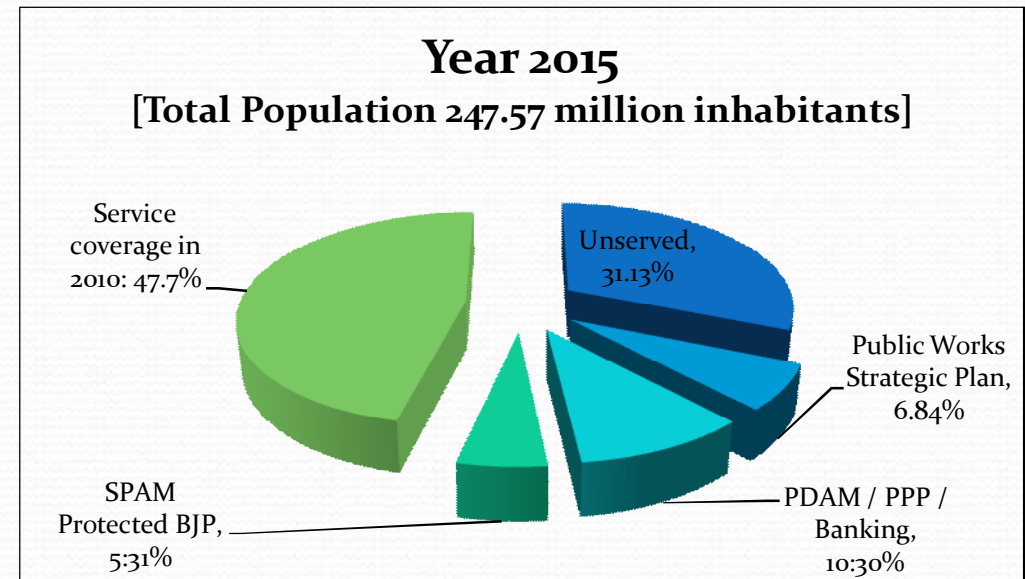
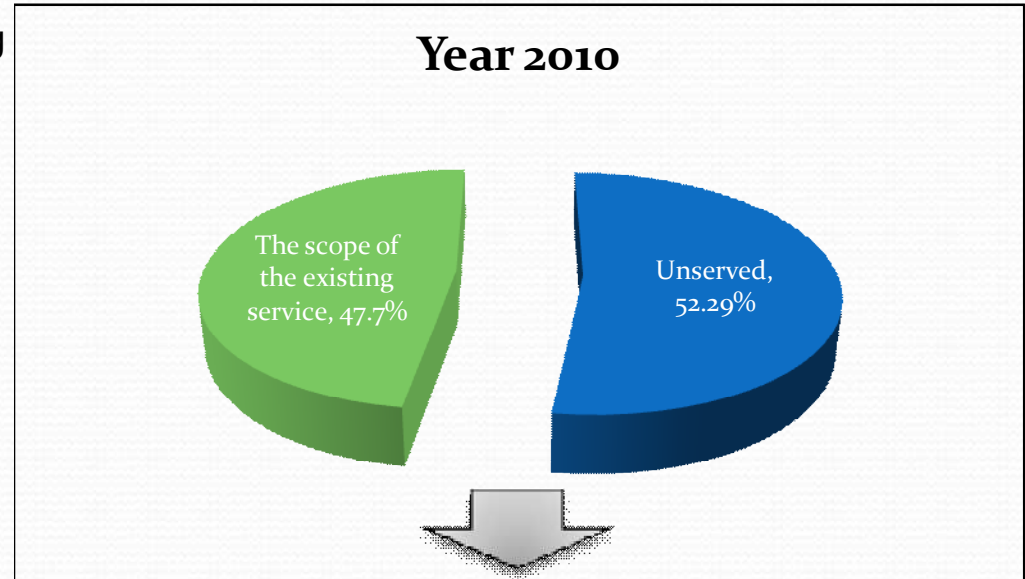
NATIONAL STRATEGIC PLANNING ON WATER SUPPLY SYSTEM DEVELOPMENT 2010 - 2014

- **Increasing production capacity in urban, sub urban (820 IKK), strategic areas (fish harbor, remote areas, boundaries areas, remote islands) and rural areas (4,650 villages) until year 2014 by : 14,120 lt/s.**
- **Facilitating Public Private Partnership (PPP) Project for 23 locations**
- **Implementation reuse water supply in 8 locations**
- **Facilitating water supply for urban low income community in 577 locations**
- **Facilitating 107 Local Water enterprises (PDAMs) in accessing loan to local banks for expanding services**

Strategy for Achieving Target of Water Supply Development

Use all the potential sources of funding and financing patterns are available as follows:

- Contribution of Public Works Strategic Plan is to improve access to water for 16,942,200 inhabitants (6.84%).
- The potential contribution of Local Water Enterprises/ PPP / Banking Loans / budgets to increase access to Water Supply for 25,397,390 inhabitants (10.30%)
- Encouraging the development of independent water supply system for the 13,153,165 inhabitants (5.31%) which can be fulfilled by the Water Supply System not protected through the piping network



Budget Requirement for MDGs Achievement

Source of Fund	US \$ Million			%
	Urban	Rural	Total	
Government	1.05	0.81	1.86	40
Non Government (Loan, PPP, etc)	2.25	0.54	2.79	60
Total	3.31	1.35	4.66	100



INVESTMENT OPPORTUNITIES ON WATER SUPPLY PROJECTS

JATIGEDE WATER SUPPLY

- PPP MODALITY : BOT
- CAPACITY PLANNING : 6,000 Ips
- ESTIMATED PROJECT COST: US\$ 357.6 Million
- ESTIMATED IRR : 20.0 %
- BENEFICIARY : Provision for 2,4 million inhabitants or 480,000 connections
- PROJECT LOCATION : West Java Province

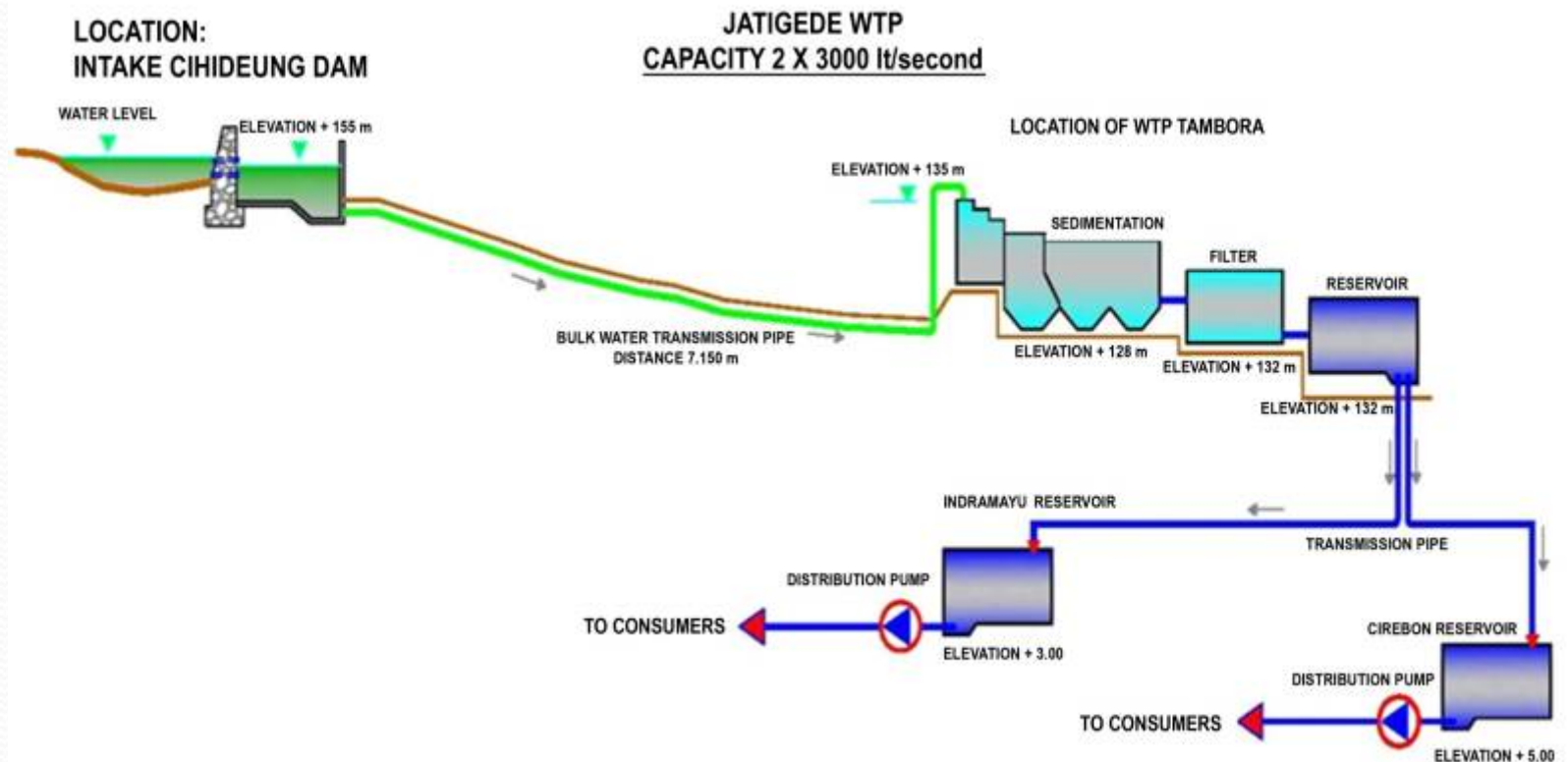


- Sumedang Regency
- Majalengka Regency
- Indramayu Regency
- Cirebon Regency
- Cirebon Municipalit

JATIGEDE WATER SUPPLY

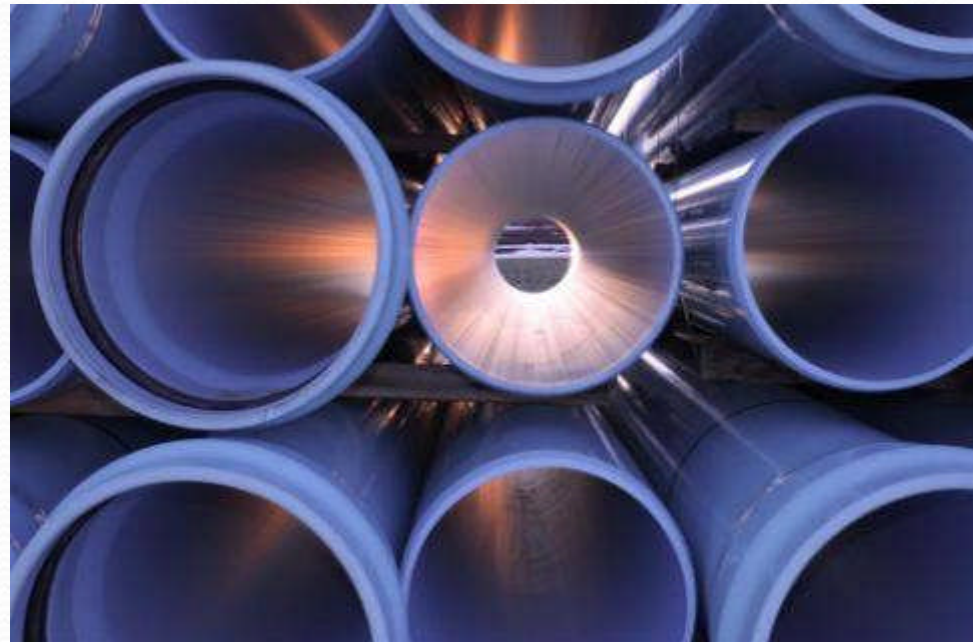
PROJECT SCOPE :

- Development of Water Treatment Plant (WTP) 2 x 3.000 lps
- Procurement of transmission pipe ND 1,600 mm length 7,150 m
- Development Reservoir 2 x 7000 m³



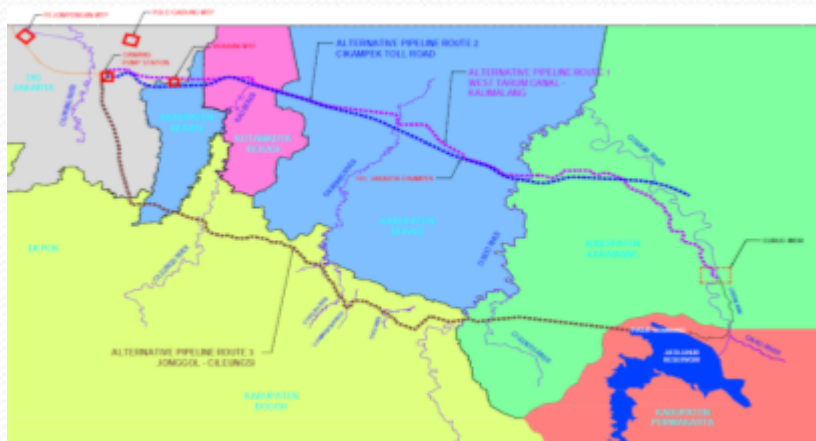
ESTIMATED TIME OF IMPLEMENTATION:

- Project Preparation : 2011
- Tender Process : 2012
- Construction : 2012-2014
- Operation : 2014



JAKARTA, BEKASI, KARAWANG WATER SUPPLY (JATILUHUR)

- PPP MODALITY : BOT
- CAPACITY PLANNING : 5000 Ips
- ESTIMATED PROJECT COST : US\$ 189.3 million
- ESTIMATED IRR : 17.30 %
- BENEFICIARY : Provision for 2 million inhabitants or 400,000 connections
- PROJECT LOCATION : Jakarta



- Bekasi Municipality
- Bekasi Regency
- Karawang Regency

**JAKARTA, BEKASI, KARAWANG
WATER SUPPLY (JATILUHUR)**

PROJECT SCOPE :

- Development of intake 5,000 lps
- Development of Water Treatment Plant (WTP) 5,000 lps
- Procurement of transmission pipe ND 1,800 mm length 58 km



JAKARTA, BEKASI, KARAWANG
WATER SUPPLY (JATILUHUR)

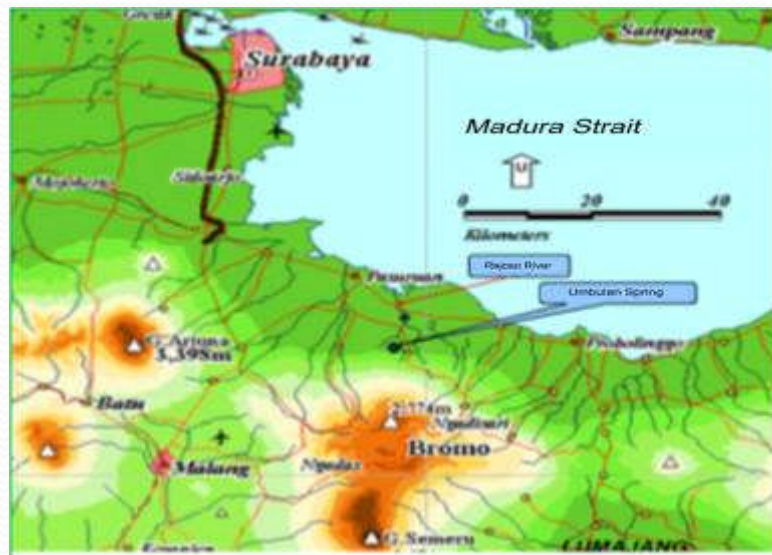
ESTIMATED TIME OF IMPLEMENTATION:

- Project Preparation : 2011
- Tender Process : 2012
- Construction : 2013-2014
- Operation : 2014



UMBULAN WATER SUPPLY

- PPP MODALITY : BOT
- CAPACITY PLANNING : 4,000 Ips
- ESTIMATED PROJECT COST : US\$ 204.2 Million
- ESTIMATED IRR : 14.54 %
- BENEFICIARY : Provision for 1.6 million inhabitants or 320,000 connections
- PROJECT LOCATION : East Java Province

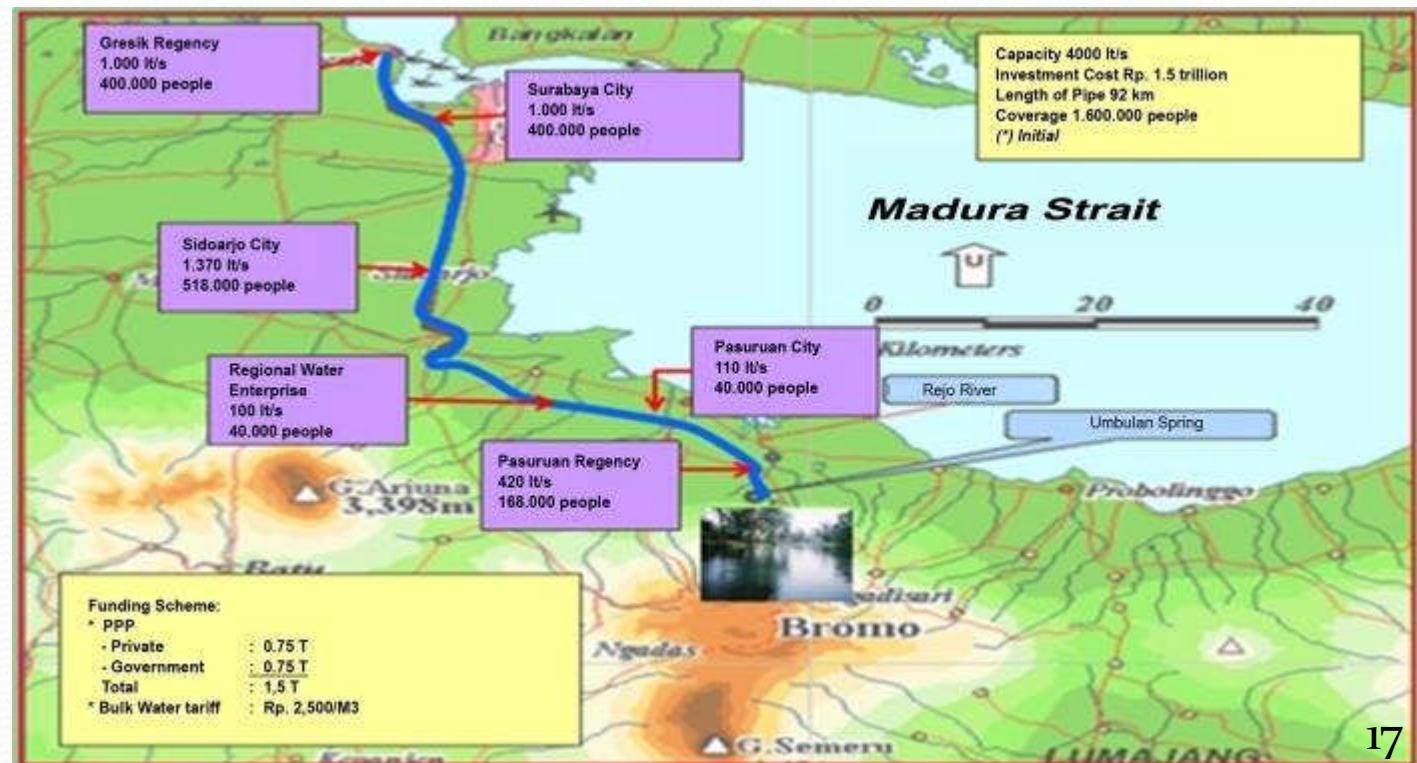


- Pasuruan Regency
- Pasuruan Municipality
- Sidoarjo Regency
- Surabaya Municipality
- Gresik Regency

UMBULAN WATER SUPPLY

PROJECT SCOPE :

- Development of intake 4.000 lps
- Provision and pipe transmission of raw water ND 1000-1800 mm length 92 km
- Development of 2 pumping station 4.000 lps.



ESTIMATED TIME OF IMPLEMENTATION:

- Project Preparation : 2011
- Tender Process : 2012
- Construction : 2013-2014
- Operation : 2014



KARIAN-SERPONG WATER CONVEYANCE

- PPP MODALITY : BOT
- CAPACITY PLANNING : 10,000 Ips
- ESTIMATED PROJECT COST : US\$ 690 Million
- ESTIMATED IRR : 16 %
- BENEFICIARY : Provision for 4 million inhabitants or 800,000 connections
- PROJECT LOCATION : Banten Province



- Karian
- Serpong

PROJECT SCOPE :

- Development of Water Treatment Plant (WTP)
10,000lps
- Procurement of transmission pipe length 90 km



ESTIMATED TIME OF IMPLEMENTATION:

- Project Preparation : 2011
- Tender Process : 2012
- Construction : 2013-2014
- Operation : 2015



BANDAR LAMPUNG WATER SUPPLY

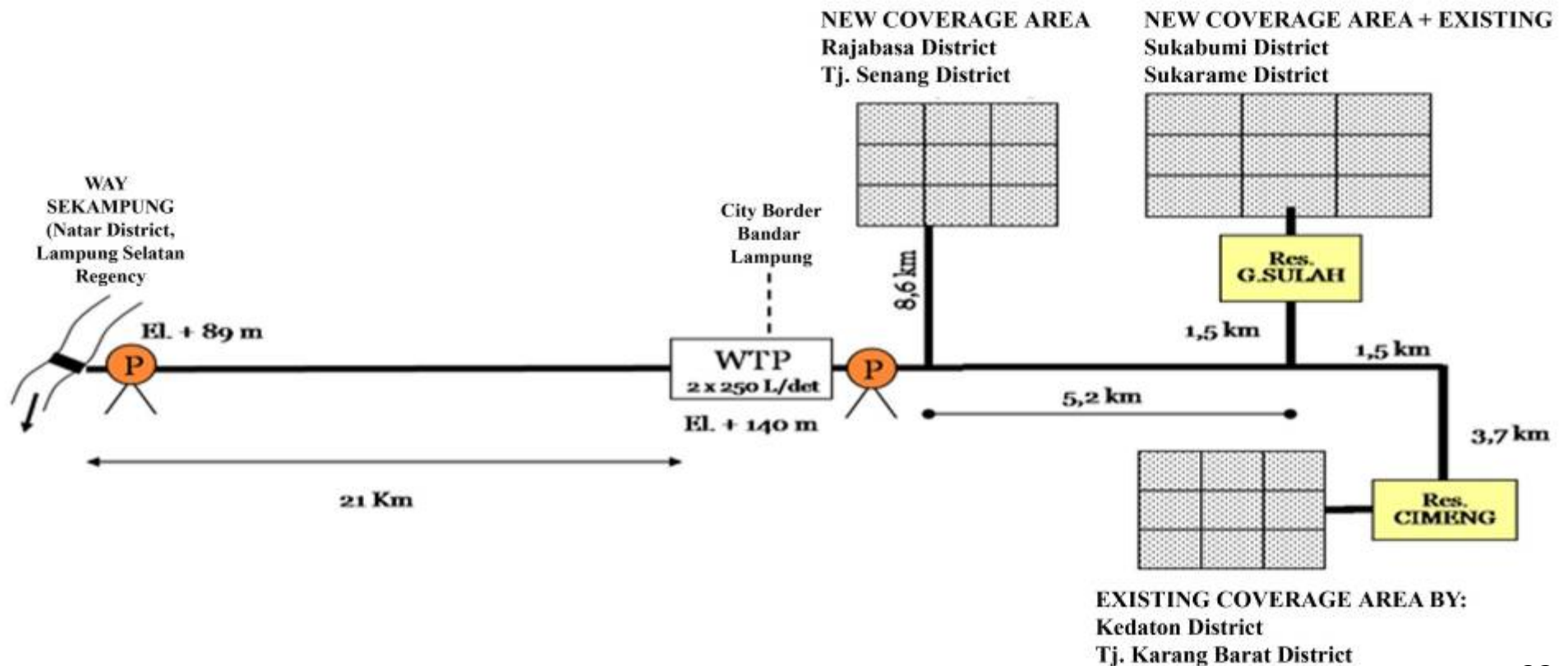
- PPP Modality : BOT/Concession
- Estimated Project Cost : Rp 366,7 Billion (equivalent with 40,74 Million US \$)
- Project Location : Bandar Lampung City

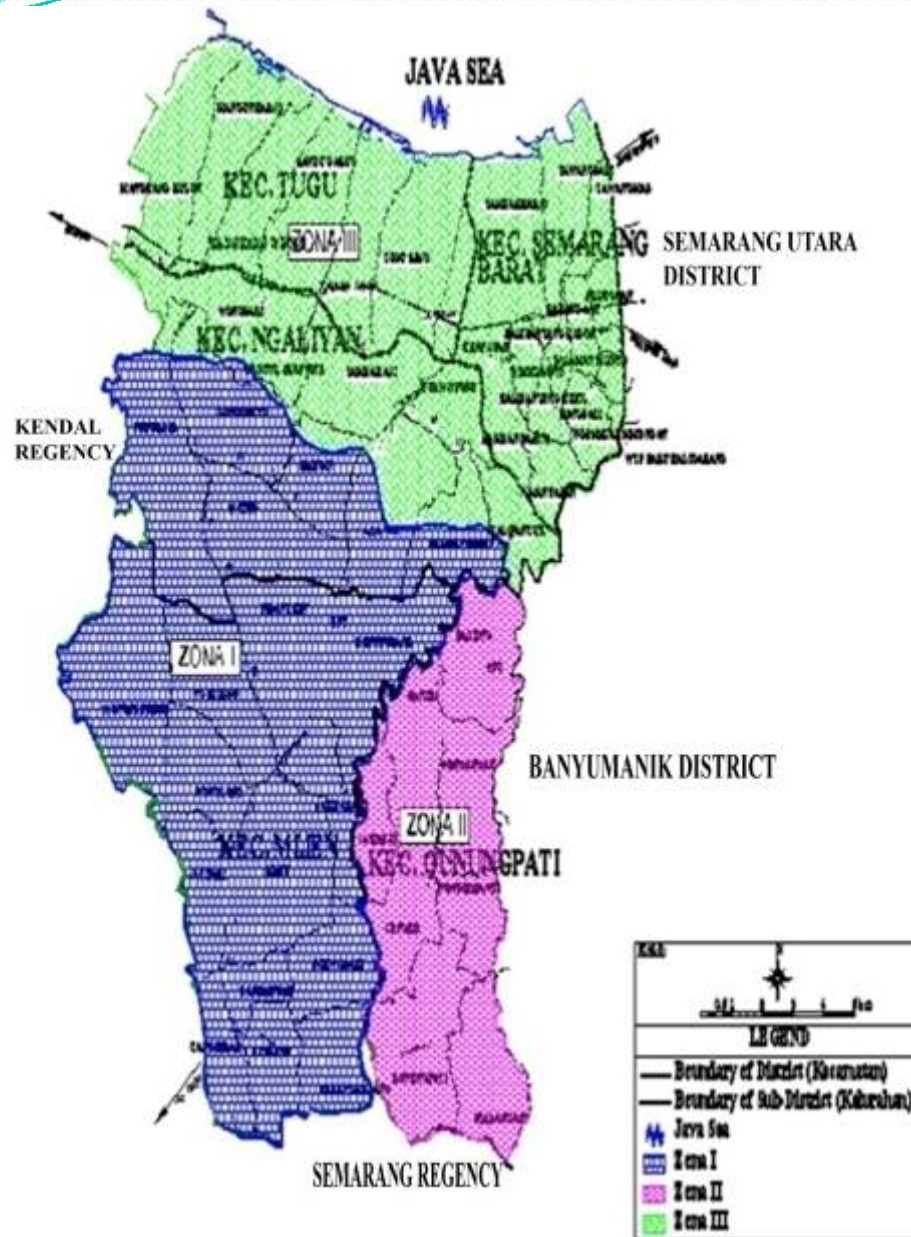
Scope of Project:

- Development of Intake and WTP 2 x 250 L/sec
- Development of Distribution network and house connections



- Existing Tariff : Rp 3,600/m³
- average tariff rate projection in 2013 : Rp 5,100/m³
- Tariff will be feasible if there is support for raw water :
 - Projected tariff (concession) : Rp 50370/m³ – Rp 5,100/m³
 - Projected tariff (BOT) : Rp 5,670/m³ > Rp 5,100/m³ (PDAM efficiency needs to be done)





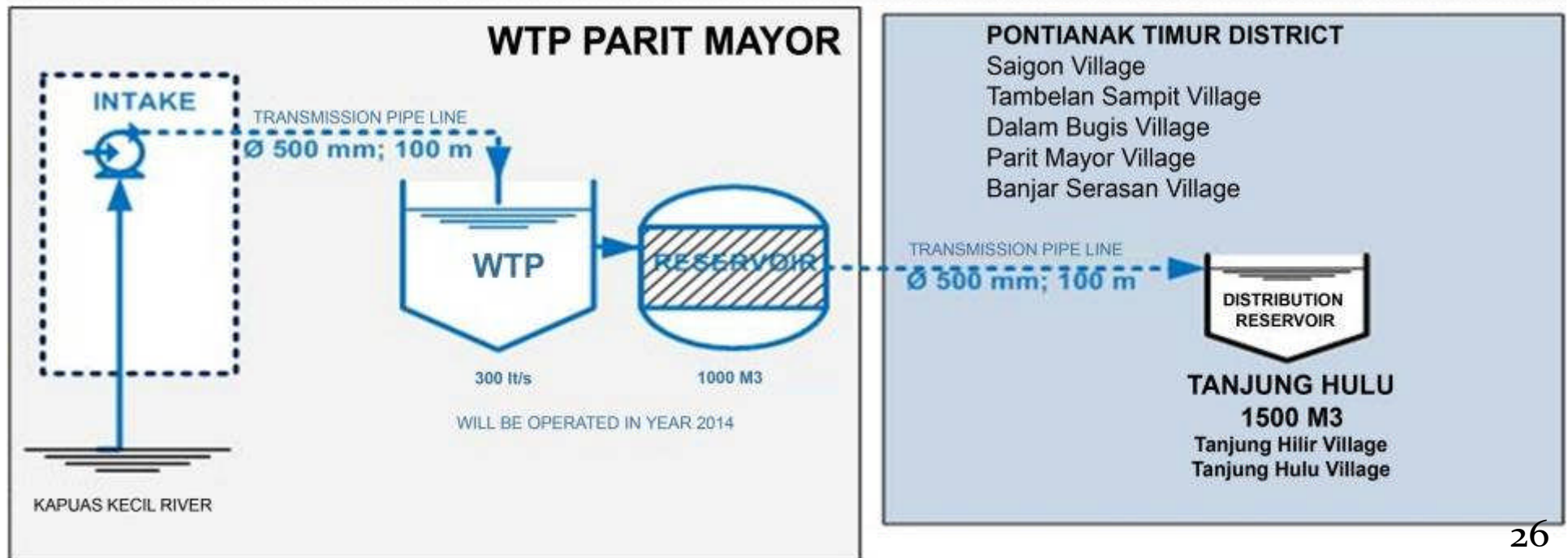
PROJECT SCOPE :

- Development of Intake 1.050 L/sec
- Transmission pipe of raw water
- WTP 2 x 500 L/sec
- Distribution pipe system
- Reservoir
- Distribution and service unit

Average tariff (2008) :
Rp. 2.427/ m³

EASTERN PONTIANAK CITY WATER SUPPLY

- PPP Modality : BOT
- Estimated Project Cost
 - Conventional WTP : 6,37 Million US \$
 - Reverse Osmose : 14,17 Million US \$
- Project Location : Eastern Pontianak City



- Average tariff (2010) : Rp. 3.044/m³
 - Bulk water tariff with RO system (2014) : Rp. 3.959/m³
 - Bulk water tariff with conventional system : Rp. 2.322/m³
- Source: Kapuas Kecil River

PROJECT SCOPE :

- WTP 300 L/sec
- Reservoir 4000 m³

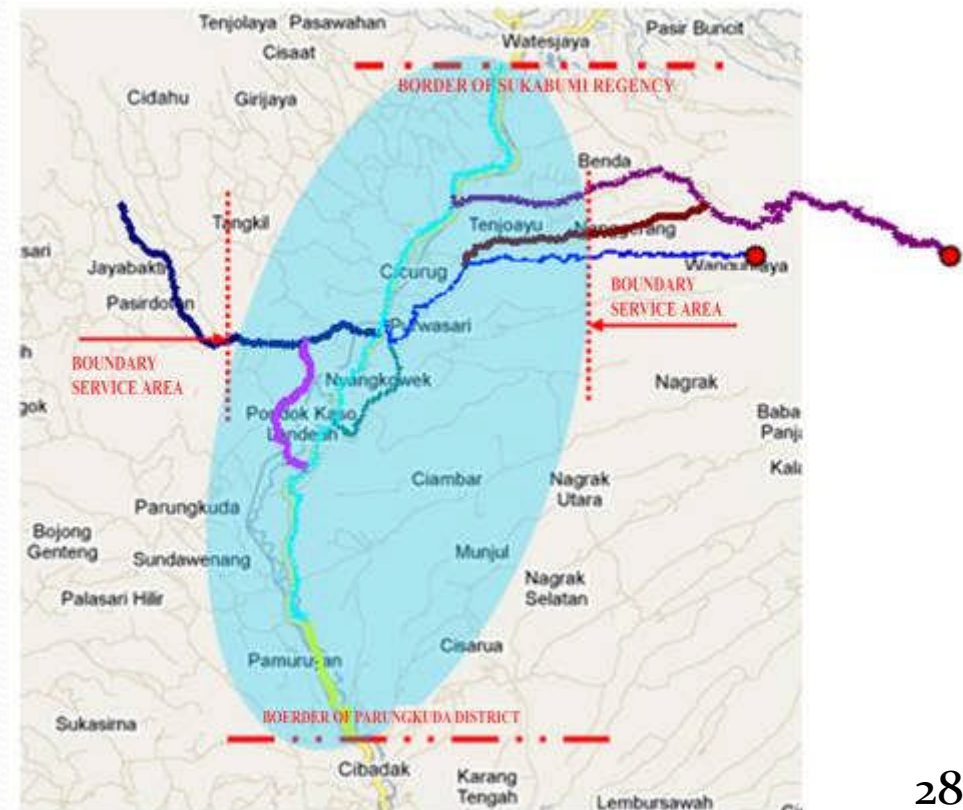


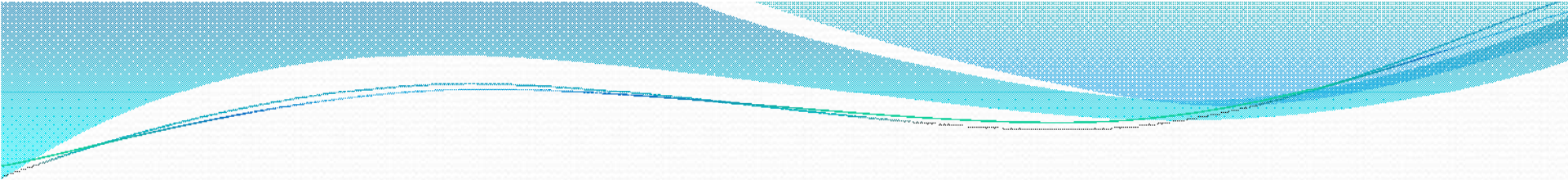
SUKABUMI WATER SUPPLY

- PPP Modality : BOT/ concession
- Estimated Project Cost : 17.78 Million US \$
- Project Location : Cidahu, Cicurug, Parungkuda

PROJECT SCOPE :

- Broncapturing 195 L/det + 150 L/det
- Transmission pipe
- Distribution and service unit





II. SOLID WASTE MANAGEMENT



STRATEGIC ISSUES OF SOLID WASTE MANAGEMENT IN INDONESIA

- Solid waste collection service coverage is still low (60-75)%
- 90% of Solid waste disposal method still using open dumping, the rest has been upgraded to sanitary landfill
- Methane gas released directly into air due to lack of gas treatment facilities



NATIONAL DEVELOPMENT POLICY FOR SOLID WASTE MANAGEMENT

SOLID WASTE MANAGEMENT (Public Works Minister Regulation No.21/2006)

- Increase services coverage
- Improve quality of waste management
- Increase the active role of the community and private sector
- Improve of institution capacity
- Increase alternative funding source



NATIONAL STRATEGIC PLANNING ON SOLID WASTE MANAGEMENT 2010 - 2014

- **Development of sanitary landfill sites in 210 cities**
- **Development of 3R facilities in 250 locations**
- **Supporting of landfill gas handling in 15 locations**

THE EXISTING OF SOLID WASTE LANDFILL PROJECTS

A. Technology: **Landfill Gas Flaring** (Final Disposal Site-TPA)

1. TPA SumurBatu, Bekasi City
2. TPA Batulayang, Pontianak City
3. TPA Sukowinatan, Palembang City
4. TPA Tamangapa, Makasar City
5. TPA Piyungan, Jogjakarta City

B. Technology : **Gas, Landfill & Anaerobic Digestion**

1. TPA Bantargebang, DKI Jakarta
2. TPA Suwung, Bali

C. Technology : **Aerobic Composting**

1. Gianyar waste recovery project, Kabupaten Gianyar, Bali



Project Planning :

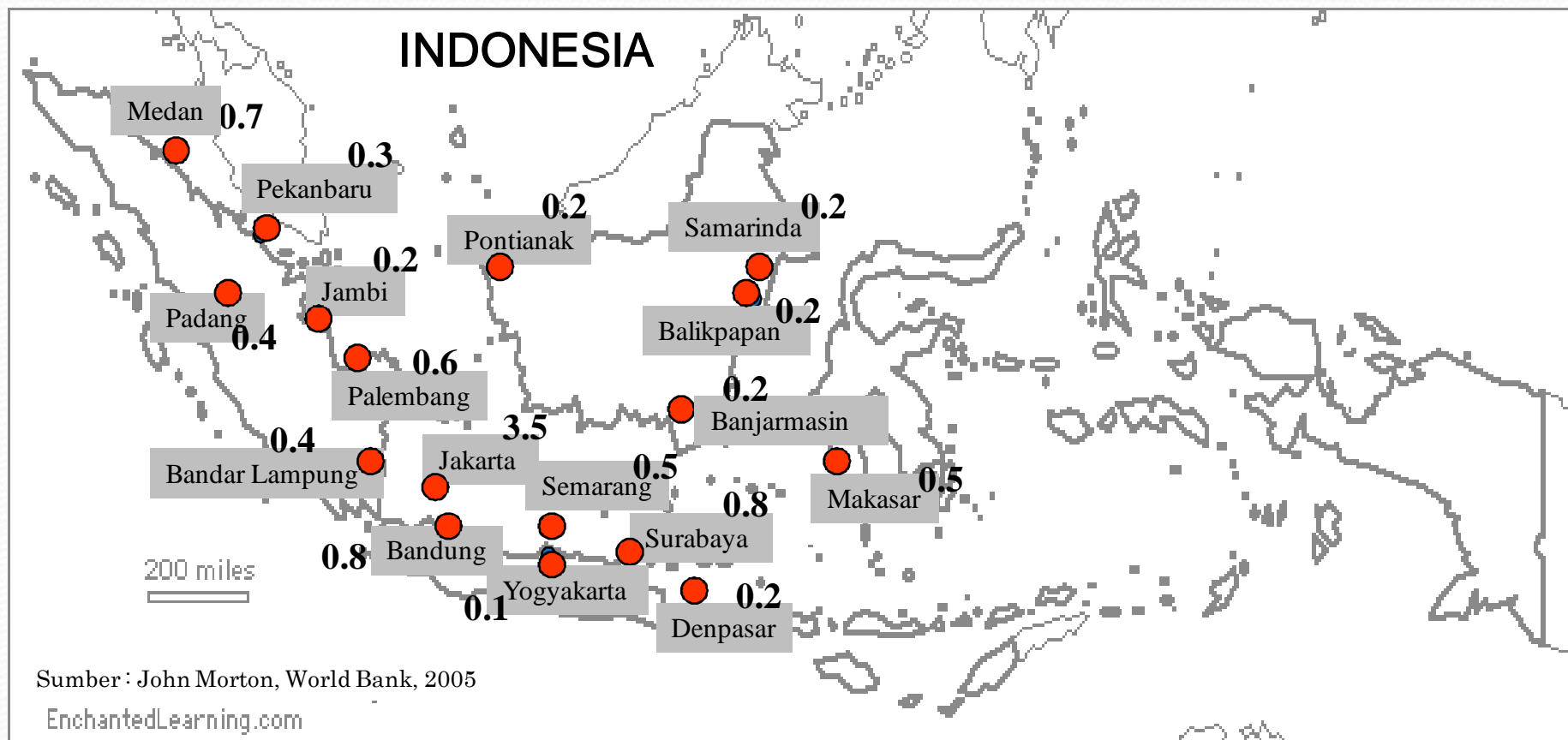
Landfill quality improvement and CDM projects development : cooperation between the Ministry of Public Works, Local Government and the World Bank, KfW (Germany)



INVESTMENT OPPORTUNITIES ON SOLID WASTE MANAGEMENT PROJECTS

PROSPECTS FOR SOLID WASTE MANAGEMENT

- Estimated waste generation in Indonesia's major cities : 10 million ton/year
- Methane gas produces about 404 million m³/year or 6.07 million ton CO₂/year equivalent



LIST OF POTENTIAL CITIES

No	City	Population (inhabitants)	Waste (ton/day)	Incoming Waste to Landfill (ton/day)	Potential Reduction tCO ₂ e (2010 – 2020)	Estimation	
						Investment 2010 – 2020 (US\$)	Revenue 2010 – 2020 (US\$)
SUMATERA							
1	Bandar Lampung	822,880	514	334	742,399	3.05 million	7.42 million
2	Medan	2,102,205	1,577	788	1,750,626	7.19 million	17.51 million
3	Pekanbaru	867.753	434	295	655.213	2.69 million	6.55 million
JAVA							
4	Depok	1,536,282	1,152	691	1,535,292	6.31 million	15.35 million
5	Semarang	1,511,236	1,133	680	1,510,262	6.21 million	15.10 million
6	Surakarta	522,935	327	261	580,665	2.39 million	5.81 million
7	Malang	816,637	408	265	589,413	2.42 million	5.89 million

Note : Assumption 1 tCO₂e = 10 US\$

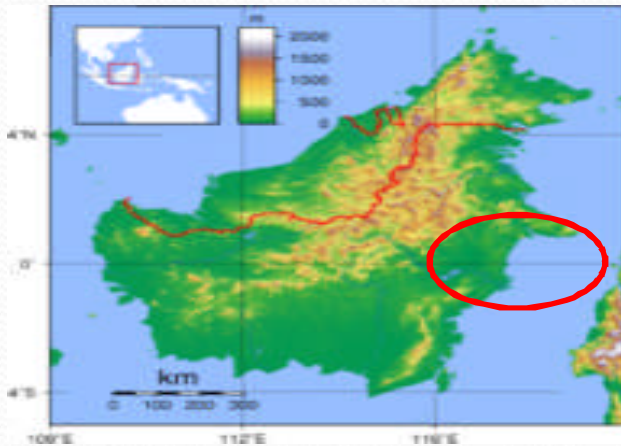
LIST OF POTENTIAL CITIES (2)

No	City	Population (inhabitants)	Waste (ton/day)	Incoming Waste to Landfill (ton/day)	Potential Reduction tCO ₂ e (2010 – 2020)	Estimation	
						Investment 2010 – 2020 (US\$)	Revenue 2010 – 2020 (US\$)
WEST NUSA TENGGARA ISLAND							
8	Mataram	504,000	315	252	321,786	2.30 million	3.22 million
KALIMANTAN ISLAND							
9	Balikpapan	512,128	320	256	568,665	2.34 million	5.69 million
10	Banjarmasin	627,245	392	255	565,898	2.33 million	5.66 million
11	Palembang	1,417,047	1,063	531	1,180,112	4.85 million	11.80 million
12	Samarinda	602,117	376	245	543,228	2.23 million	5.43 million

Note : Assumption 1 tCO₂e = 10 US\$

BALIKPAPAN CITY - KALIMANTAN

- Balikpapan located at East Kalimantan Province



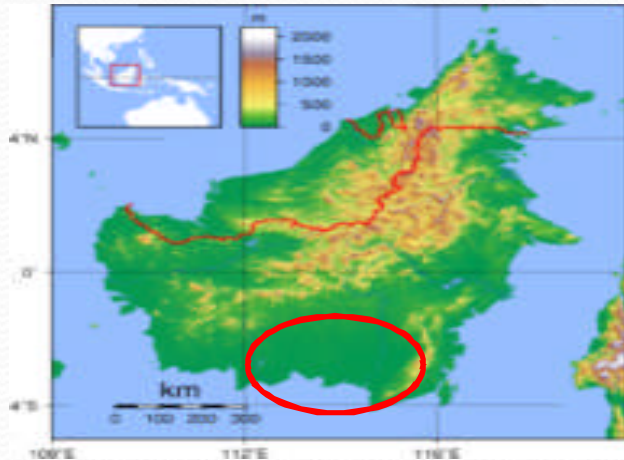
- Area : 503.30 km²
- Population : 512,128 people
- Solid Waste Management Agency : Cleansing Department of Balikpapan City
- Estimate of solid waste production : 320 ton/day
- Incoming waste to landfill : 256 ton/day

- Final Disposal Name : Manggar
- Size : 25.1 Ha
- Start operation 2002
- Method : Sanitary Landfil
- Waste Composition : 66 % organic
- Potential Reduction (2010-2020) : 568,665 ton CO₂
- Estimated Investment (LFG Flaring System) : 2.34 million US\$
- Estimated Revenue (2010-2020) : 5.69 million US\$



BANJARMASIN CITY - KALIMANTAN

➤ Area in South Kalimantan Province



- Area : 7 km²
- Population : 627,245 people
- Agency of Waste Management : Sanitation and Waste Management Agency of Banjarmasin City
- Estimate of waste : 392 ton/day
- Incoming waste to landfill : 255 ton/day

- Final Disposal Name : Basirih
- Size : 35 Ha
- Start operation 2000
- Method : Controlled Landfil
- Waste Composition : 56 % organic
- Potential Reduction (2010-2020) : 565,898 ton CO₂
- Estimated Investment (LFG Flaring system) : 2.33 million US\$
- Estimated Revenue (2010-2020) : 5.66 million US\$



BANDAR LAMPUNG CITY - SUMATRA

- Area in Lampung Province



- Area : 192 km²
- Population : 822,880 people
- Agency of Waste Management : Sanitation Agency of Bandar Lampung City
- Estimate of Waste : 514 ton/day
- Incoming waste to landfill : 334 ton/day

- Final Disposal Name : Bakung
- Size : 20 Ha
- Start operation 1996
- Method : Semi Controlled Landfill
- Waste Composition : 60 % organic
- Potential Reduction (2010-2020) : 742,399 ton CO₂
- Estimated Investment (LFG Flaring system) : 3.05 million US\$
- Estimated Avenue (2010 - 2020) : 7.42 million US\$



DEPOK CITY – WEST JAVA

- Area in West Java Province



- Area : 20.504,54 Ha
- Population : 1,536,282 people
- Agency of Waste Management : Sanitation and Environmental Agency of Depok City
- Estimate of waste : 1,152 ton/day
- Incoming waste to landfill : 691 ton/day

- Final Disposal Name : Cipayung
- Size : 10,1 Ha
- Start operation : 1988
- Method : Controlled Landfill
- Waste Composition : 79 % organic
- Potential Reduction (2010-2020) : 1,535,292 ton CO₂
- Estimated Investment (LFG Flaring system) : 6.31 million US\$
- Estimated Revenue (2010-2020) : 15.35 million US\$



PALEMBANG CITY - SUMATRA

- Area in South Sumatera Province



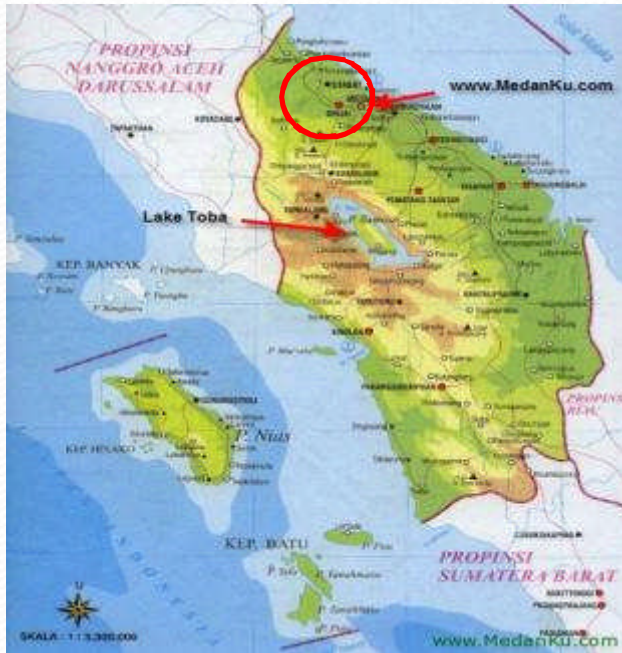
- Area : 400.61 Km²
- Population : 1,417,047 people
- Agency of Waste Management : Sanitation Agency of Palembang City
- Estimate of Waste : 1,063 ton/day
- Incoming waste to landfill : 531 ton/day

- Final Disposal Name : Karyajaya
- Size : 40 Ha
- Start operation : 1994
- Method : Sanitary Landfill
- Waste Composition : 68,12 % organic
- Potential Reduction (2010-2020) : 1.180.112 ton CO₂
- Estimated Investment (LFG Flaring system) : 4.85 million US\$
- Estimated Revenue (2010-2020) : 11.80 million US\$



MEDAN CITY - SUMATRA

- Area in North Sumatera Province



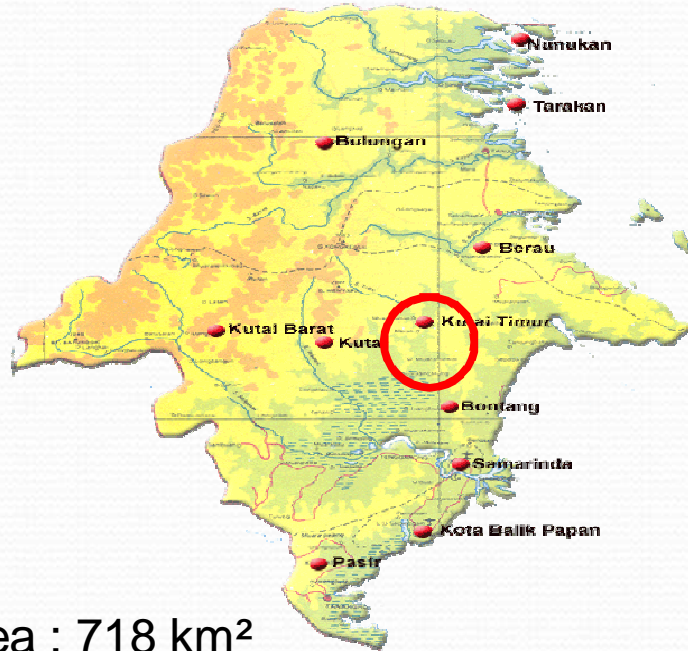
- Area : 265,10 km²
- Population : 2.102.105 people
- Agency of Waste Management : Sanitation Agency of Medan City
- Estimated of waste : 1.577 ton/day
- Incoming waste to landfill : 788 ton/day

- Final Disposal Name : Namo Bintang
- Size : ± 17,54 Ha
- Start operation : 1987
- Waste composition : 48,2 % organic
- Potential Reduction (2010-2020) : 1.750.626 tCO₂
- Estimated Investment (LFG Flaring system) : 7,19 million US\$
- Estimated Revenue (2010-2020) : 17,51 million US\$



SAMARINDA CITY - SUMATRA

- Area in East Kalimantan Province



- Area : 718 km²
- population : 602,117 people
- Agency of Waste Management : Sanitation Agency of Samarinda City
- Estimate of waste : 376 ton/day
- Incoming waste to landfill : 245 ton/day

- Final Disposal Name : Bukit Pinang
- Size : \pm 5 Ha
- Start operation : 1995
- Waste composition : 61.5 % organic
- Potential reduction (2010-2020) : 543,228 ton CO₂
- Estimated Investment (LFG Flaring system) : 2.23 million US\$
- Estimated Revenue (2010-2020) : 5.43 million US\$



SEMARANG CITY – CENTRAL JAVA

- Area in Central Java Province



- Area : 37,366.84 Ha
- Population : 1,511,236 people
- Agency of Waste Management : Sanitation and Park Agency of Semarang City
- Estimate waste : 1,133 ton/day
- Incoming waste to landfill : 680 ton/day

- Final Disposal Name : Jatibarang
- Size : 44.5 Ha
- Start operation : 1993
- Method : Sanitary Landfill
- Waste composition : 61,95 % organic
- Potential Reduction (2010-2020) : 1,510,262 ton CO₂
- Estimated Investment (LFG Flaring system) : 6.21 million US\$
- Estimated Revenue (2010-2020) : 15.10 million US



MATARAM CITY – WEST NUSA TENGGARA

- Area in West Nusa Tenggara Province



- Area : 6,130.00 Ha
- Population : 504,000 people
- Agency of Waste Management : Sanitation Agency of Mataram City
- Estimate of waste : 315 ton/day
- Incoming waste to landfill : 252 ton/day

- Final Disposal Name : Kebon Kongok
- Size : 8.6 Ha
- Start operation : 1994
- Method : Sanitary Landfill
- Waste composition : 72 % organic
- Potential Reduction (2010-2020) : 321,786 ton CO₂
- Estimated Investment (LFG Flaring system) : 2.30 million US\$
- Estimated Revenue (2010-2020) : 3.22 million US\$



SURAKARTA CITY – CENTRAL JAVA

- Area in Central Java Province



- Area : 44.03 km²
- Population : 522,936 people
- Agency of Waste Management : Sanitation and Park

Agency of Surakarta City

- Estimate waste : 327 ton/day
- Incoming waste to landfill : 261 ton/day

- Final Disposal Name : Putri Cempo
- Size : ± 17 Ha
- Start operation : 1987
- Waste composition : 65% organic
- Potenti Reduction (2010-2020) : 580,665 ton CO₂
- Estimated Investment (LFG Flaring system) : 2.39 million US\$
- Estimated Revenue (2010-2020) : 5.81 million US\$



MALANG CITY – EAST JAVA

- Area in East Java Province



- Area : 110.06 Km²
- Population : 816,637 people
- Agency of Waste Management : Sanitation Agency of Malang City
- Estimate of waste : 408 ton/day
- Incoming waste to landfill : 265 ton/day

- Final Disposal Name : Supit urang
- Area : \pm 11.9 Ha
- Start operation : 1993
- Waste composition : 88.76 % organic
- Potential Reduction (2010-2020) : 589,413 ton CO₂
- Estimated Investment (LFG Flaring system) : 2.42 million US\$
- Estimated Revenue (2010-2020) : 5.89 million US\$





III. WASTEWATER MANAGEMENT

Water Recycling of Suwung WWTP

- Beneficiary: supply water for fire hydrant and for watering city park of Denpasar
- Estimated Project Cost: Rp 14,63 Billion (or equivalent with 1.63 Million US \$)
- Estimated FIRR: 14,8%
- Project Location: South Denpasar, East Denpasar, and West Denpasar
- Project Scope:
 - Pre chlorination
 - Main reservoir: 1.500 m³
 - Transmission pipe: HDPE 8.600 m
 - District reservoir @ 500 m³



Water Recycling of Bojongsoang WWTP

- Beneficiary: supply water for non domestic demands (agriculture , fisheries and industrial) in Bandung City and surrounding area.
- Estimated Project Cost: Rp 11,01 Billion (or equivalent with 1.23 Million US \$)
- Project Location: Bandung City and surrounding area
- Project Scope:
Consist of 2 system options :
 1. Wetland (20 L/s) and Physical Chemistry (80 L/s), or
 2. Physical Chemistry (100 L/s)

