

SEMINAR INCHEM TOKYO 2017

THE DOMESTIC WASTEWATER MANAGEMENT IN INDONESIA

Current Situation And Future Development

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INTRODUCTION

Indonesian Population

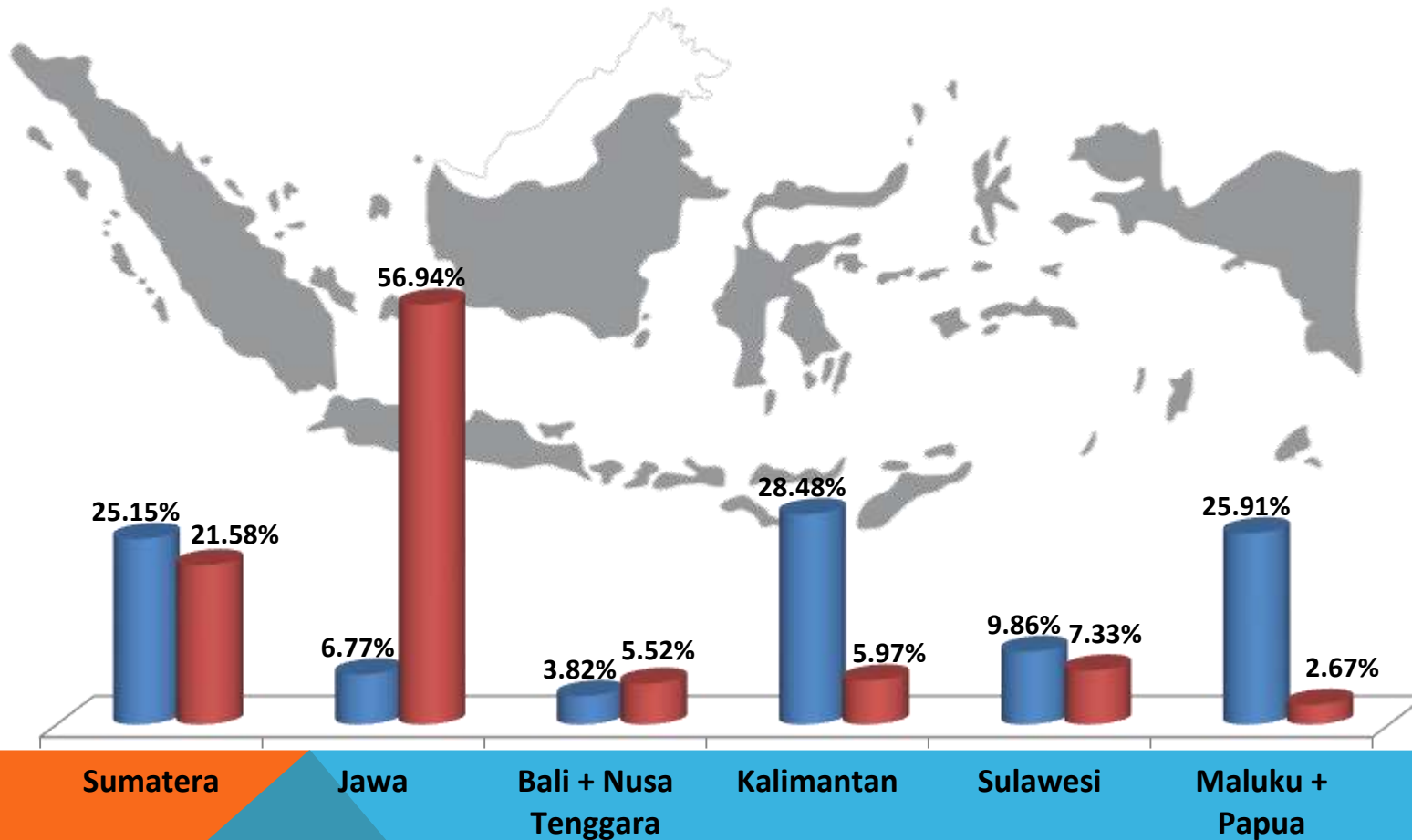
Based on data from the Minister of Home Affairs Republic of Indonesia, the number of Indonesian population is 257,912,349 people.

The growth rate of Indonesia's population is around 1.49 percent.

(Based on data of June 30, 2016)

Indonesia consists of 34 provinces. Currently, there are 416 districts in Indonesia. The number of cities in Indonesia is 98 cities. The total districts and cities in Indonesia are 514 districts and cities.

Indonesian Population



Percentage of Indonesia Population by Island

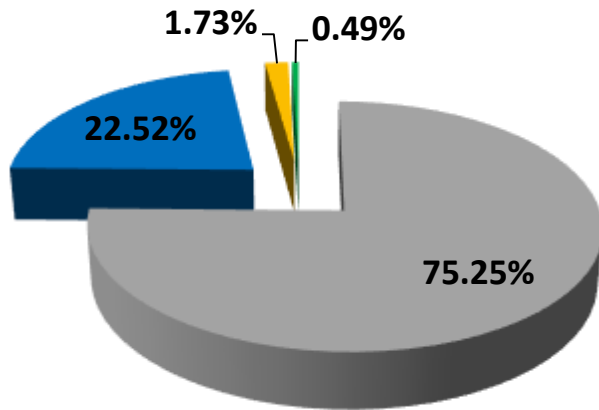
Source: BPS, 2015

■ Percentage of Area
■ Percentage of Population

Environmental Issues in Indonesia

➤ Water Pollution

Highly Polluted River

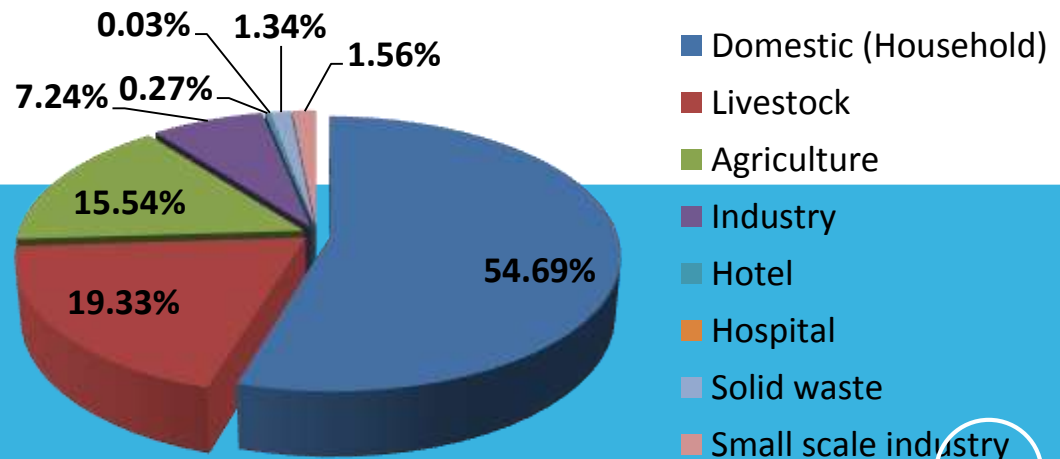


River Water Quality Monitoring In 2013
(411 Sampling Points)

Source: Ministry of the Environment and Forestry, 2015

- Heavy polluted
- Moderate polluted
- Slightly Polluted
- Meet the Standard

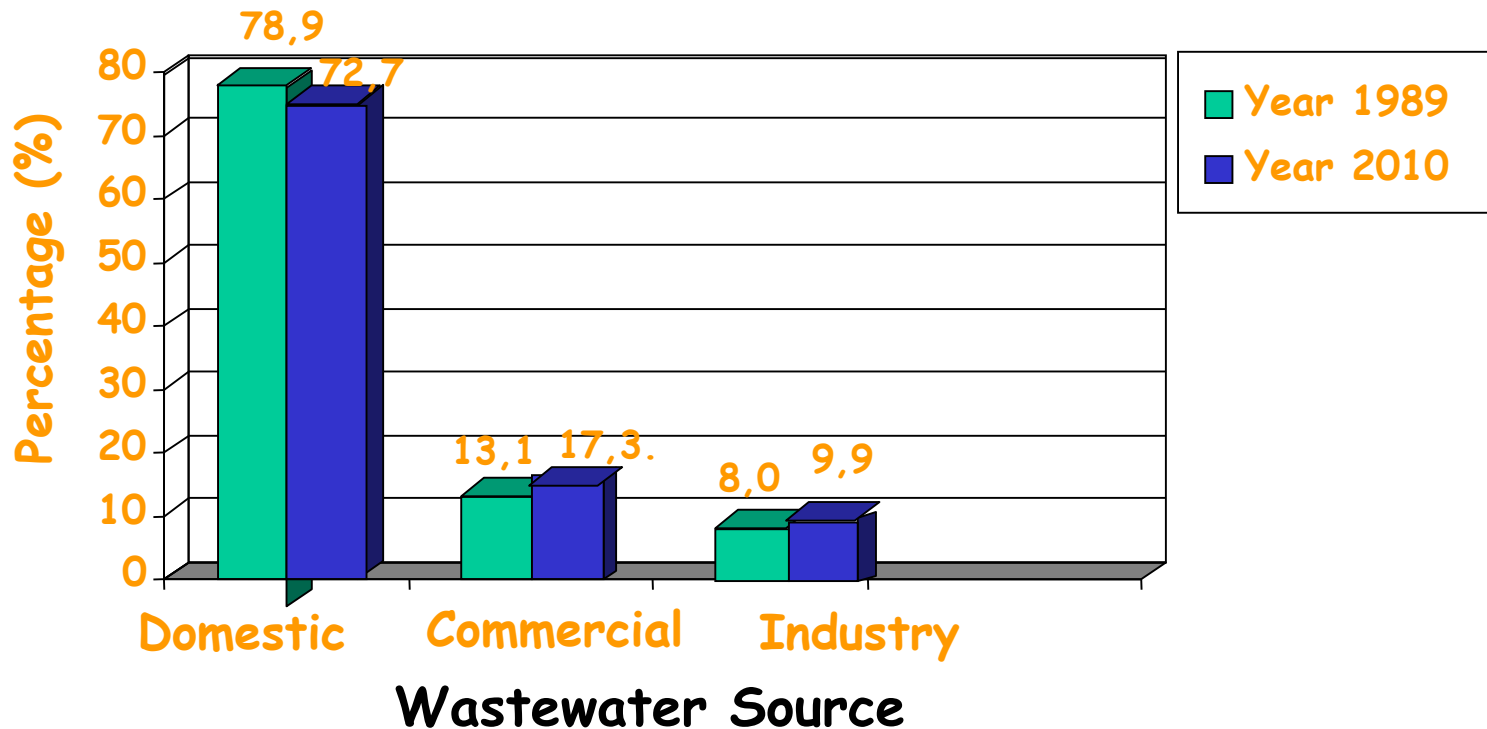
Pollution Sources in 5 River basin (Musi, Citarum, Ciliwung, Brantas, Barito)



Source: Ministry of the Environment and Forestry, 2015

WASTEWATER POTENTIAL IN DKI JAKARTA

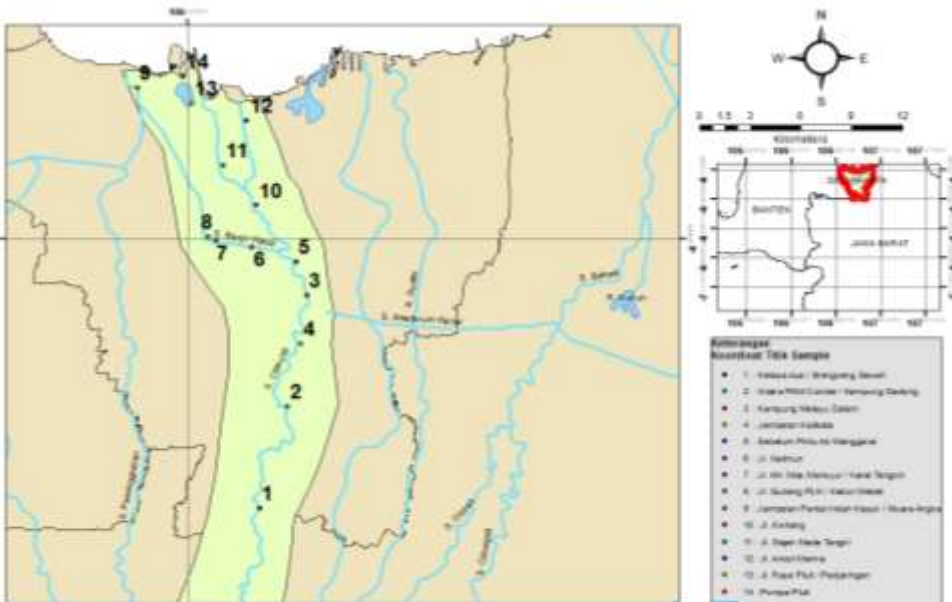
Total waste water discharged : Year 1989 : 1.316.113 m³/day
Year 2010 : 2.588.250 m³/day



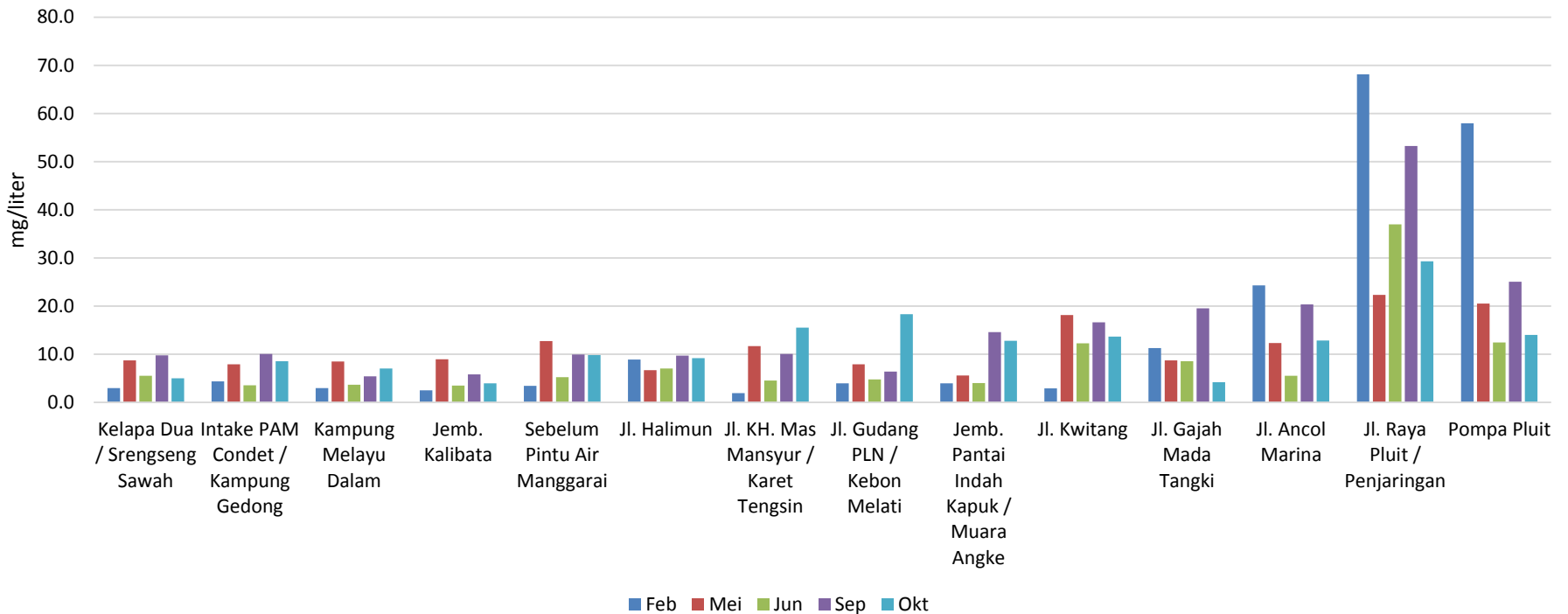
Source: Japan International Cooperation Agency (JICA) Study, 1989

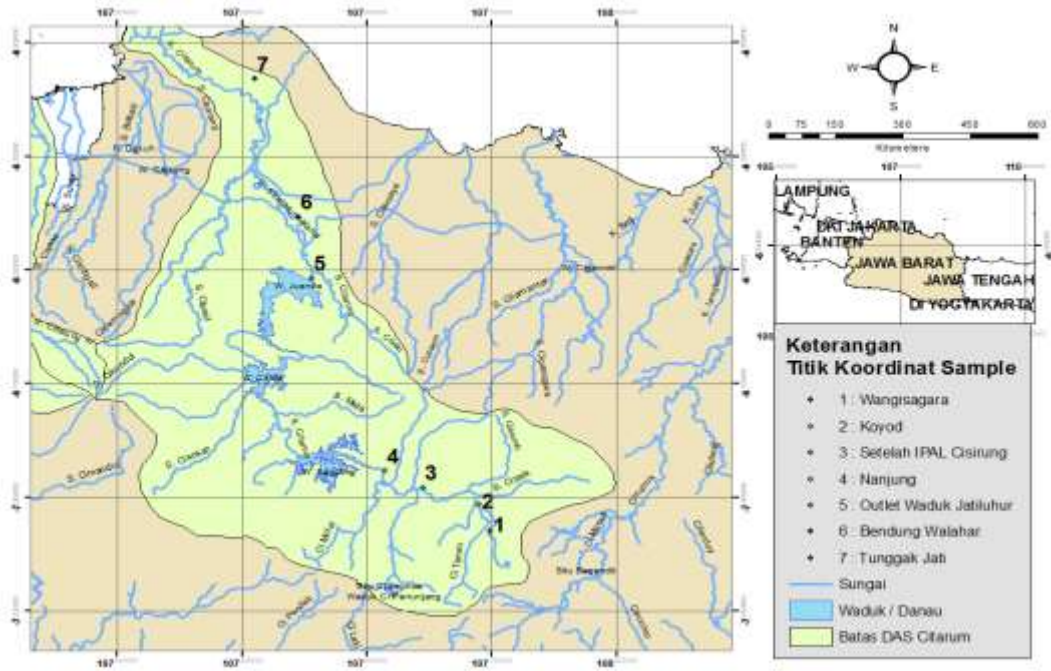
Due to the low service of wastewater treatment, especially domestic waste water, has caused severe river water pollution, especially in Java.

BOD Concentration Of Ciliwung River 2014



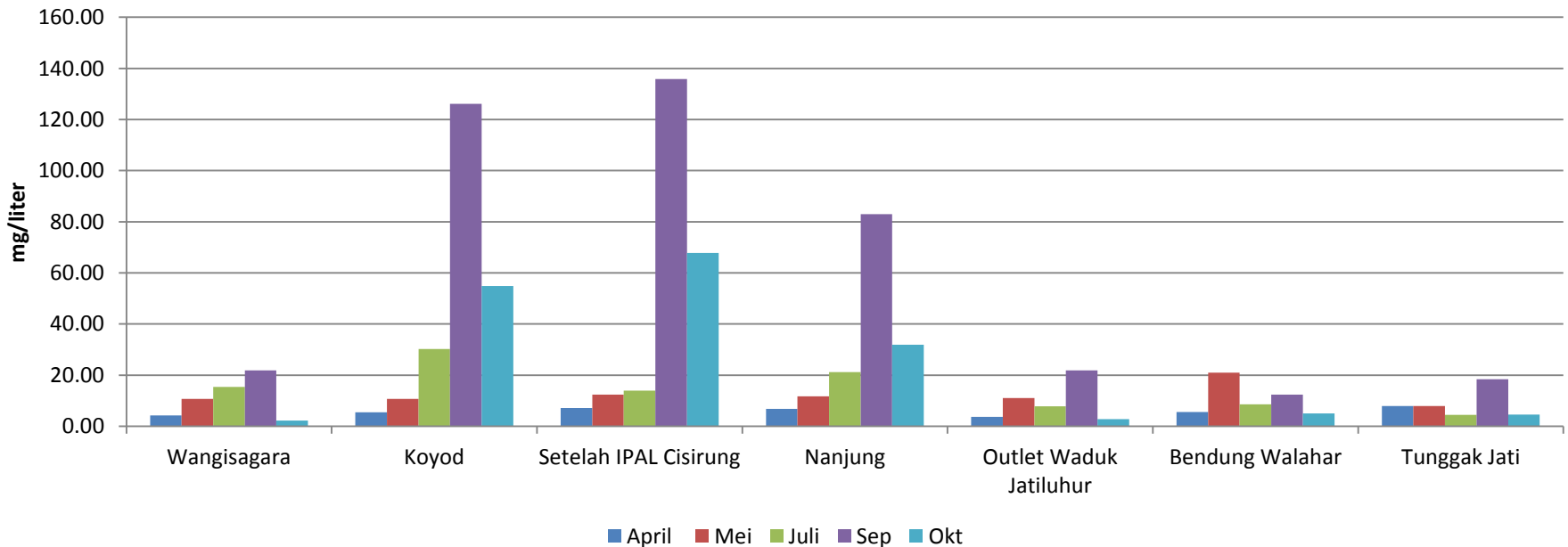
BOD Concentration of Ciliwung , 2014





BOD Concentration Of Citarum River 2014

BOD Concentration Of Citarum River 2014



National Policy On The Management Of Domestic Wastewater In Indonesia



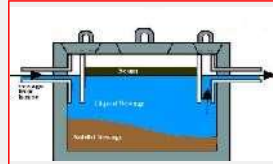
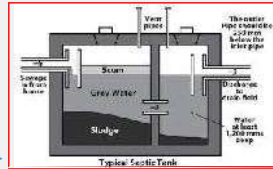
Individual, Community and Institutional-based Sanitation Approaches

Approach	Community Based	Institutional Based	
Level	Neighborhood	City Wide	Regional/National
	<p>Adequate Sanitation:</p> <ol style="list-style-type: none"> 1. Rural 2. Slum Area 	<p>Wastewater infrastructure services based on demand responsive approach</p>	<p>Wastewater infrastructures development support inter cities/region coordination to protect watershed from human waste pollution</p>
	<p>On-site Sanitation: Small Scale Community Sewerage System (SANIMAS)</p>	<ul style="list-style-type: none"> • Metropolitan & Large Cities Off-site/sewerage system • Medium & Small Cities <ul style="list-style-type: none"> - Integrated system of existing on-site and new off-site sanitation - Improved Setage Treatment Plant (IPLT) and sludge services - Shallow/small bore sewer or small scale sewerage integrated to municipal sewerage system to support revitalization program for old cities • New Town <ul style="list-style-type: none"> - Develop a small sewage system for Low Cost Housing Area - Encourage sewerage development for new town 	<p>Clean River Program (PROKASIH) or other similar program</p>

DOMESTIC WASTEWATER MANAGEMENT IN INDONESIA

Sistem
Setempat
(On-Site)

STORAGE &
Processing



individual/Communal

TRANSPORTATION



SEPTIC SLUDGE
Truck

FINAL
PROCESSING



Sludge Treatment Plant



Centralized



Settlement

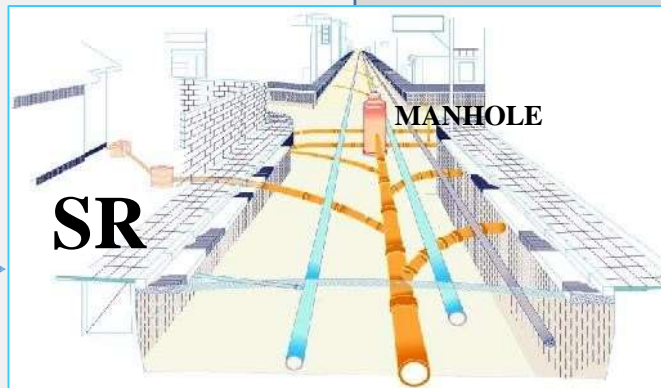


regional scale

Sludge
Treatment



Sistem
Terpusat
(Off-Site)



SR → JARINGAN PERPIPAAN AIR LIMBAH

CURRENT SITUATION

Current Situation

- For urban areas with high population densities implemented with a centralized system.
- At present the centralized wastewater management system is located in only 12 cities with low service coverage (Totally below 5 %).
- To reduce quantities of worse sanitation in urban area, Indonesia government introduced the community-based sanitation (SANIMAS) program to improve urban-poor sanitation since 2001. The pilot project of SANIMAS (community-based sanitation) program was initiated by AusAID through WSP-EAP World Bank (Water and Sanitation Program – East Asia Pacific) and was supported by the government of Indonesia.
- Until now, SANIMAS has been implemented in all (27) provinces, and more than 300 locations.

Centralized Wastewater Treatment Plant Of 12 cities in Indonesia

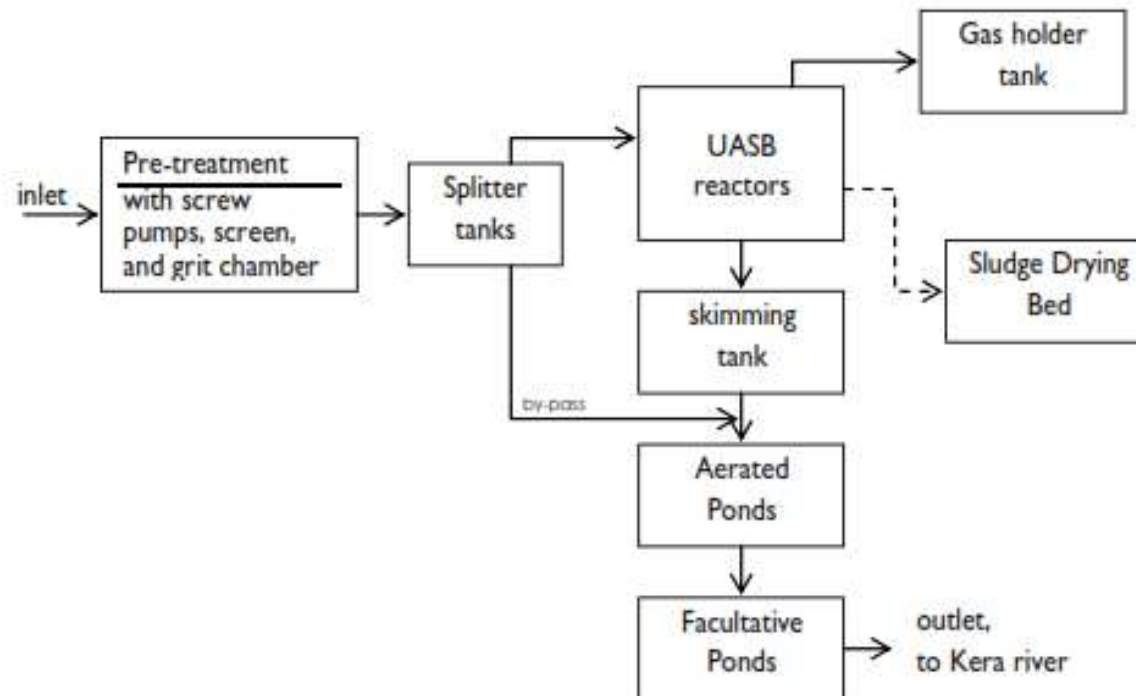
Wastewater Treatment Plant	City	System	Total Capacity (m3/day)
Pulo Brayan	Medan	UASB (Upflow Anaerobic Sludge Blanket) + Aerated Lagoon	10,000
Ajibata	Prapat	Aerated Lagoon	2,000
Setiabudi	DKI Jakarta	Aerated Lagoon	60,480
Bojongsoang	Bandung	Anaerobic, Facultative & Maturation Pond	243,000
Kesenden	Cirebon	Anaerobic, Facultative & Maturation Pond	7,033
Ade Irma	Cirebon	Anaerobic, Facultative & Maturation Pond	5,626
Gelatik	Cirebon	Anaerobic, Facultative & Maturation Pond	3,944
Rinjani	Cirebon	Anaerobic, Facultative & Maturation Pond	3,944
Sewon	Yogyakarta	Aerated Lagoon	15,500
Pucang Sawit	Surakarta	Aerob Facultative & Biofilter	9,504
Suwung	Bali	Aerated Lagoon	51,000
Margasari	Balikpapan	Extended Aeratin	800
HKSN	Banjarmasin	RBC	5,000
Pekapuran Raya	Banjar Masin	RBC	2500
Lambung Mangkurat	Banjarmasin	RBC	1,000
Basirih	Banjarmasin	RBC	2,000
Tata Banua	Banjarmasin	RBC	2,000
Sungai Andai	Banjarmasin	RBC	3,000
Sultan Adam	Banjarmasin	RBC	2,000
Margasari	Balikpapan	Extended Aeration	800
Sukasari	Tangerang	Oxidation Ditch	2,700
Batam Center	Batam	Oxidation Ditch	2,852
Boulevard	Manado		2,000

Pulo Brayan Wastewater Plant - Medan

The plant using a combination of UASB process and aerated lagoon. After two screens, a coarse one and a fine one, the wastewater flows through a grit chamber. The fine screen and the grit chamber are equipped with automatic cleaners.

In an Upflow Anaerobic Sludge Blanket (UASB) reactor the wastewater is treated anaerobically. The UASB has no return system and also no pH adjustment system as usually designed. After the UASB the wastewater flows into a facultative lagoon. The lagoon is equipped with two aerators. The aerators are operated for only 4-5 hours each day to reduce energy cost. The effluent is discharged into river Kera.

The effluent COD is in the range of 50 to 75mg/l and the BOD between 40 and 55mg/l.



The process diagram of the Pulo Brayan WWTP

PULO BRAYAN –MEDAN WASTEWATER TREATMENT PLANT



SCREW PUMPS



UASB REACTOR



AERATED LAGOON

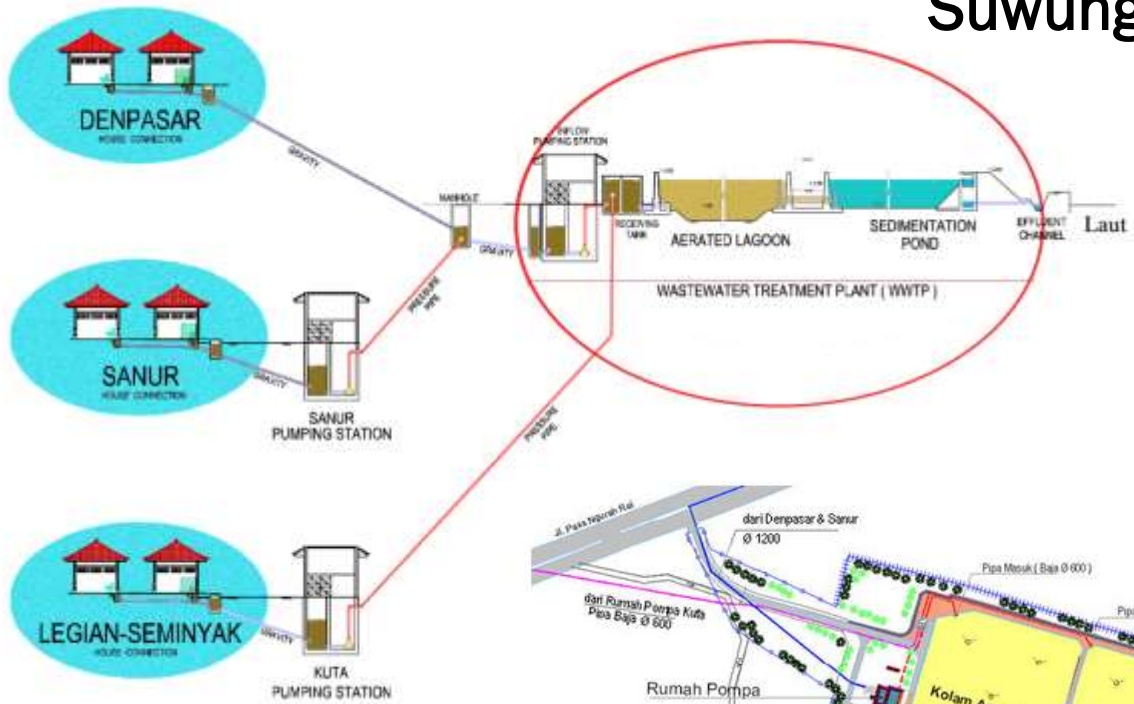


GRIT CHAMBER



EFFLUENT
BOD 40 – 55 mg/L

Suwung WWTP - Denpasar



Effluent



Lay Out IPAL/WWTP Suwung

SUWUNG WASTE WATER PLANT – CAPACITY 51,000 M3/DAY

BANJARMASIN WWTP USING RBC SYSTEM



WWTP Margasari – Balikpapan (Extended Aeration With Surface Aerator)

Capacity : 2000 m³/day



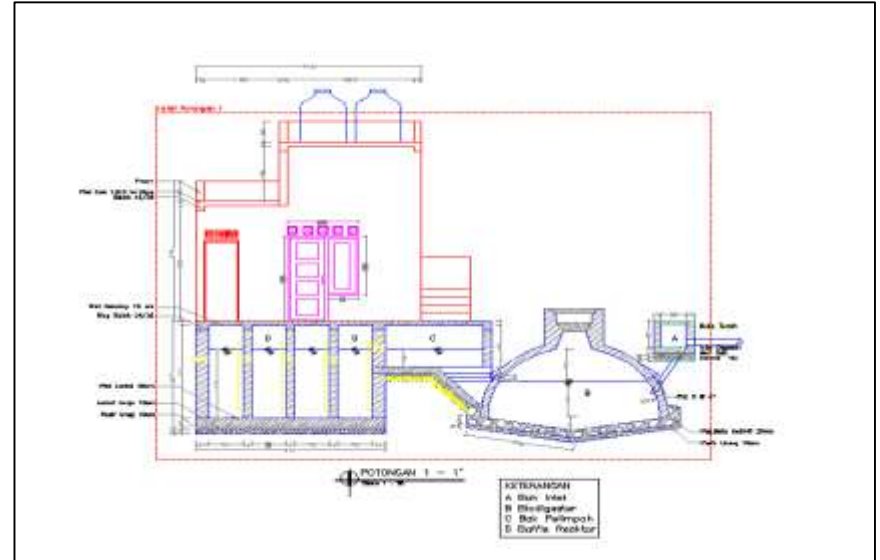
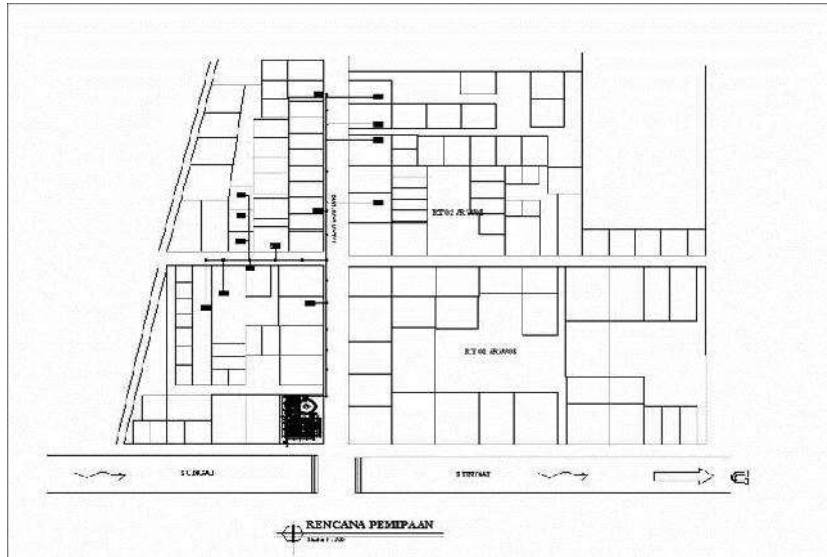
Examples :

On-site Sanitation: Small Scale Community Sewerage System (SANIMAS)

A total of approximately 1700 decentralized wastewater treatment systems (DEWATS) have been constructed until 2015.

This year, Sanimas will be built in 753 locations spread across various provinces in Indonesia.

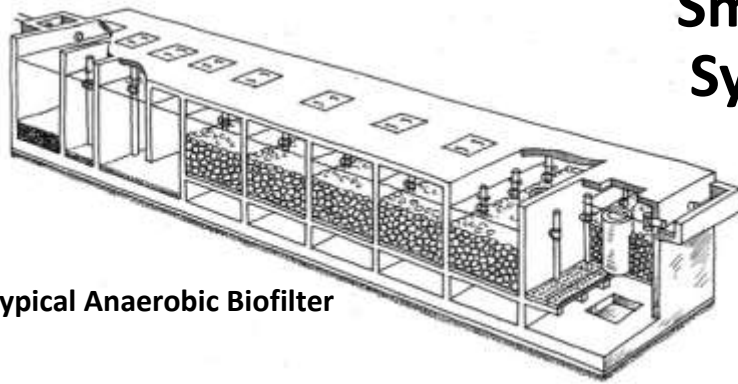
Combined System Public Toilets And Simple Piping Equipped With Biodigester



Small Scale Community Sewerage System Using Anaerobic Baffle Reactor



Small Scale Community Sewerage System Using Anaerobic Biofilter



Typical Anaerobic Biofilter



Communal WWTP (Sanimas) Ds. Ploso, Jombang City



Communal WWTP (Sanimas) Ds. Tunggorono, Jombang City



Communal WWTP (Sanimas) Ds. Tlekung, Batu City

Business units such as hotels, office buildings, shopping centers, hospitals, industries and their businesses which have not been served by the sewerage network have to treat their own domestic wastewater.

Wastewater treatment technology that is widely used by business activities:

1. Activated Sludge Process
2. Biofilter Process: Both Anaerobic-Aerobic Biofilter and Aerobic Biofilter.
3. Rotating Biological Reactor (RBC)
4. Now, have started to use Membrane Bio Reactor (MBR) technology for domestic wastewater treatment.

APPLICATION OF ACTIVATED SLUDGE TECHNOLOGY FOR DOMESTIC WASTEWATER TREATMENT IN INDONESIA

Activated sludge process is widely used because its construction is relatively simple, but its operation requires operators with relatively high skill.

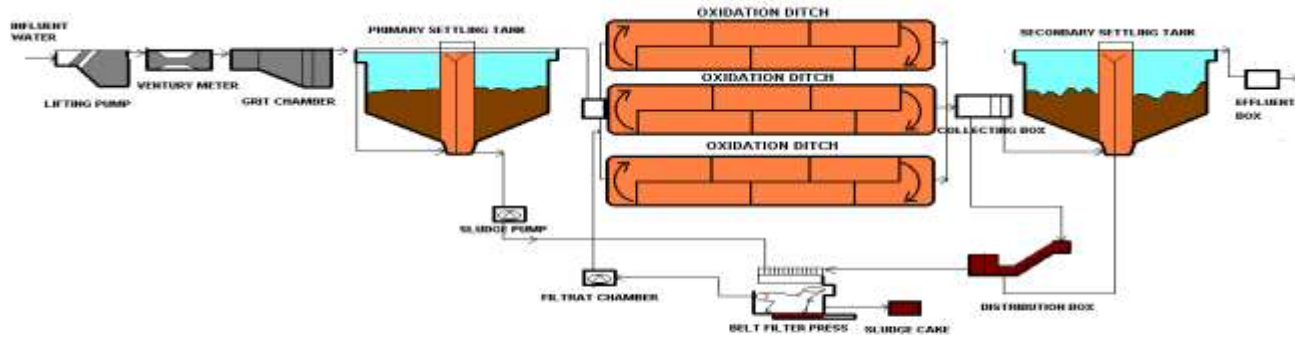
The failure of the activated sludge process in Jakarta is largely due to poor operation.



Active sludge process is widely used especially in high rise buildings and in industry.

WASTEWATER TREATMENT USING OXYDATION DITCH PROCESS

LOCATION : JABABEKA CAPACITY 18,000 M3 PER DAY



**PRIMARY
SEDIMENTATION TANK**



OXYDATION DITCH



**FINAL
SEDEMENTATION TANK**

RECYCLE SLUDGE



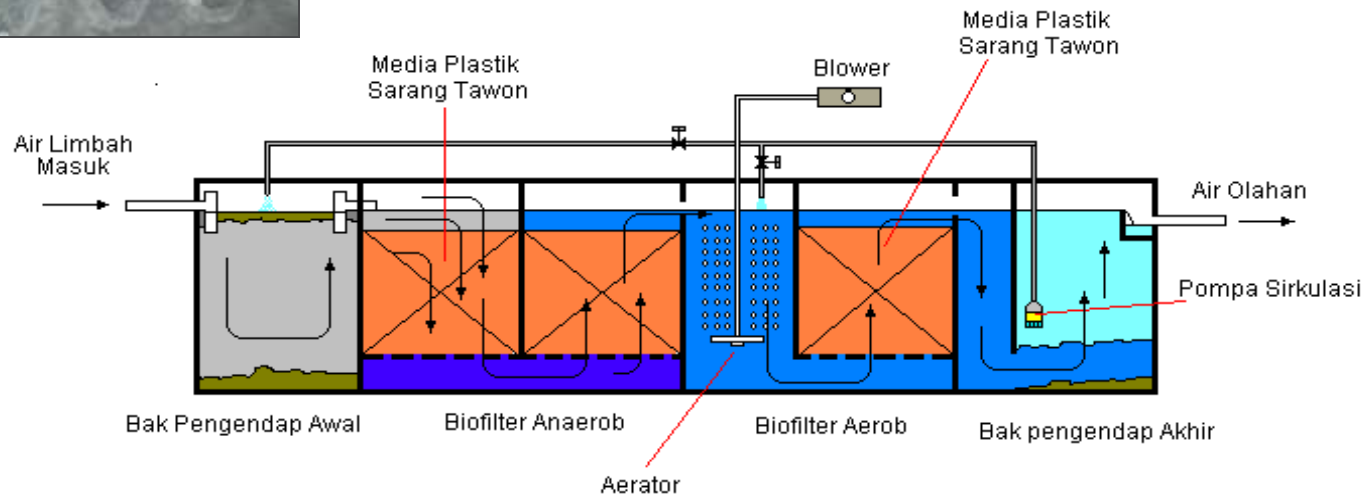
**TREATED
WATER**

APPLICATION OF ANAEROBIC-AEROBIC BIOFILTER TECHNOLOGY FOR DOMESTIC WASTE WATER TREATMENT IN INDONESIA

ANAEROBIC-AEROBIC BIOFILTER TECHNOLOGY

Biofilter as growth media of microbes

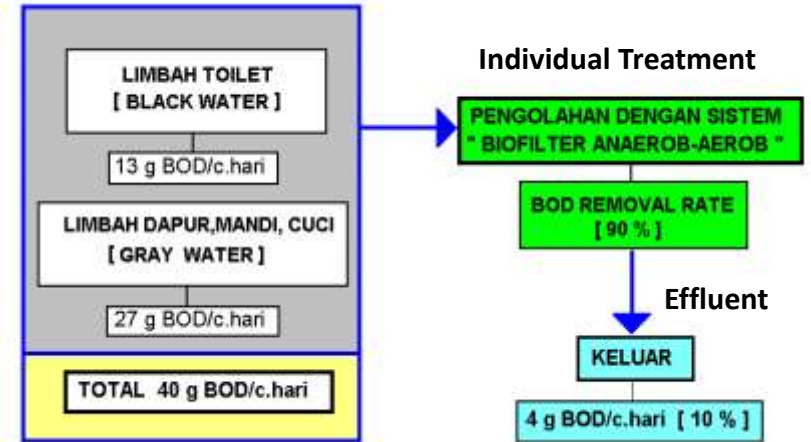
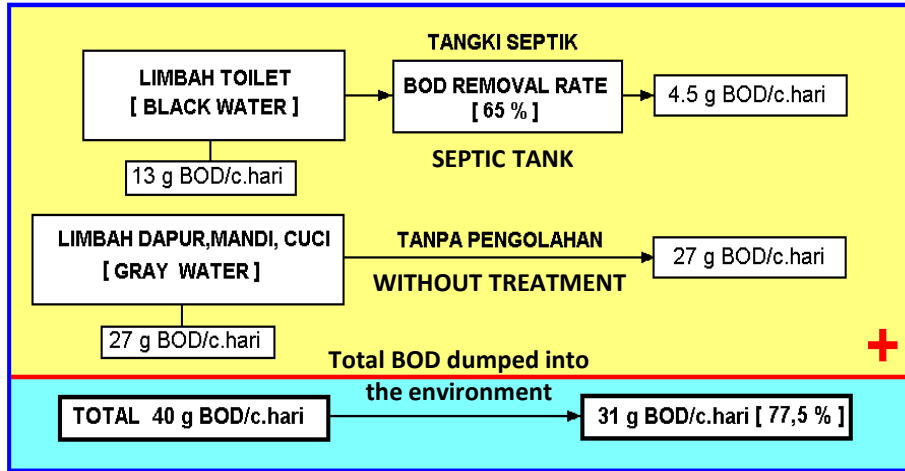
- Type : Honeycomb, cross flow
- Material : PVC sheet
- Specific contact areas : 200-225 m²/m³
- Size : 30 cm x 25 cm x 30 cm
- Hole size : 3 cm x 3 cm
- Weight : 30-35 kg/m³
- Porosity : 0,98
- Color : transparent or black



ADVANTAGES OF ANAEROBIC-AEROBIC BIOFILTER PROCESS :

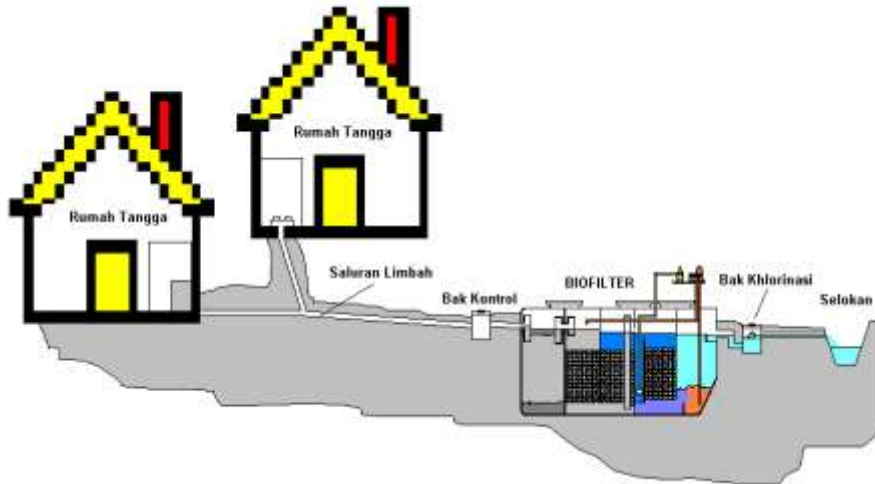
- Easy Operation and maintenance.
- Sludge produced small/slightly.
- Can be used for wastewater treatment with low concentrations or high concentrations.
- Resistant to fluctuations in the amount of waste water and fluctuations in concentrations.
- Operating costs are relatively low.

INDIVIDUAL DOMESTIC WASTEWATER TREATMENT USING ANAEROBIC-AEROBIC BIOFILTER PROCESS



Current household waste water disposal system.

Household wastewater disposal system with anaerobic-aerobic biofilter system "On Site Treatment" system developed by BPPT

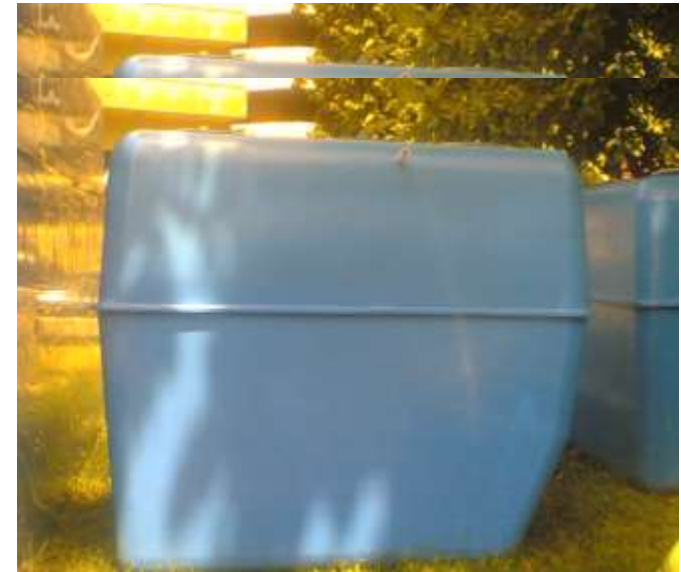
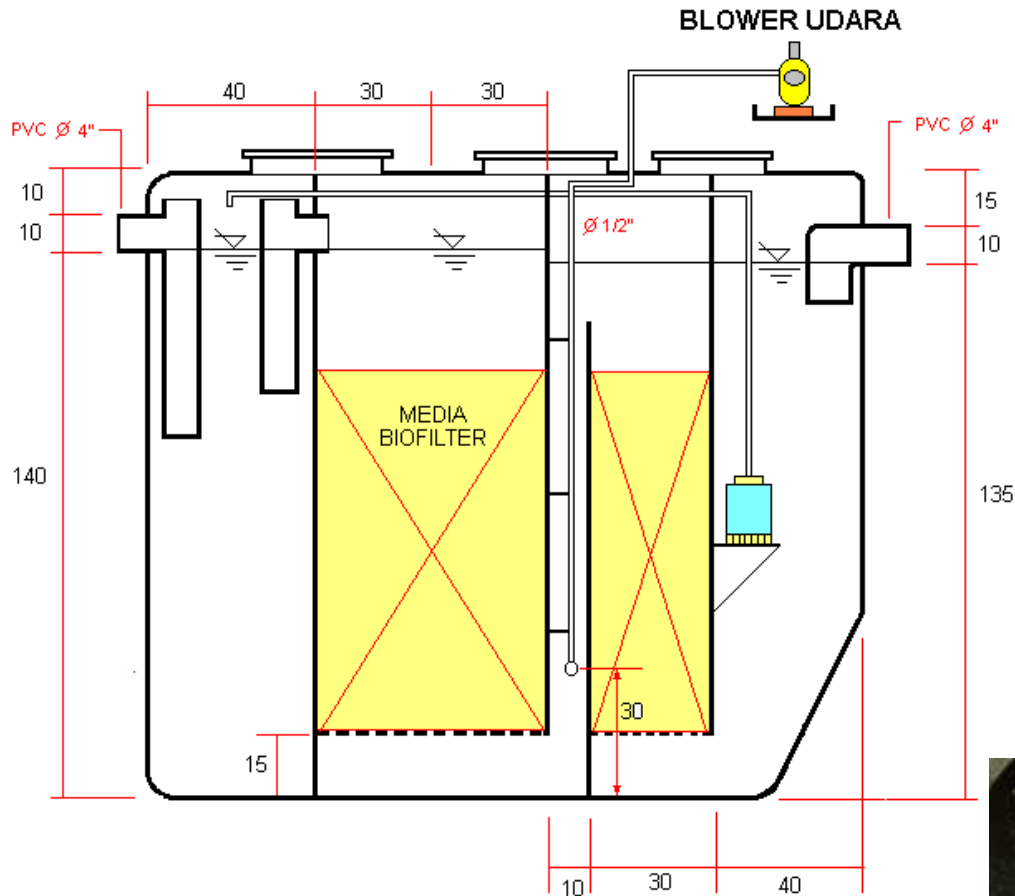


Treated Water



INDIVIDUAL DOMESTIC WASTEWATER TREATMENT UNITS

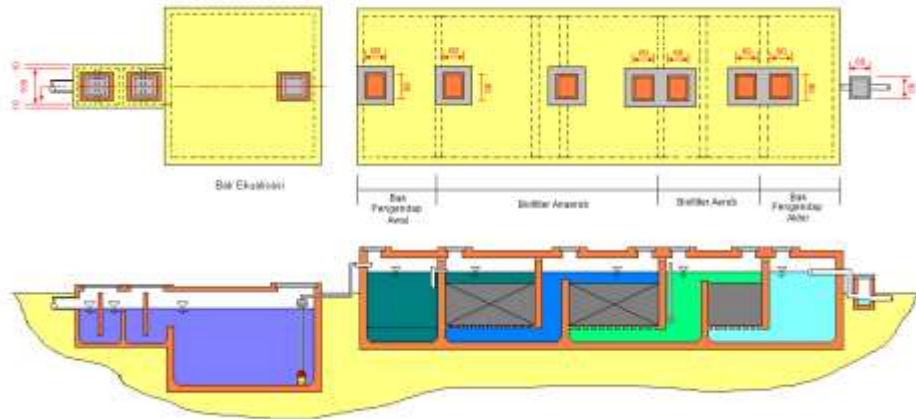
BIOFILTER UNTUK 10 ORANG



Unit : Cm

BIOFILTER FOR DOMESTIC WASTEWATER CAPACITY 8-10 PEOPLE

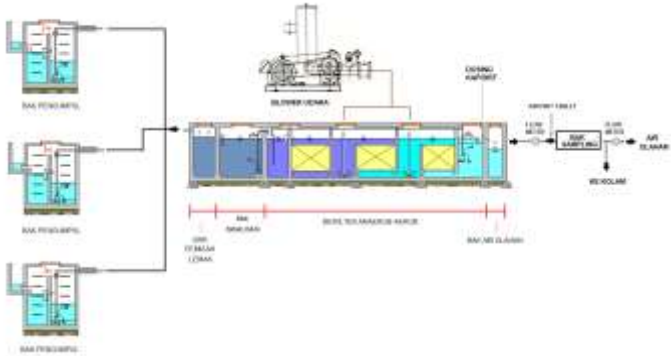
HOSPITAL WASTEWATER TREATMENT USING ANAEROBIC-AEROBIC BIOFILTER CAPACITY 150 M3 PER DAY



Application of biofilter for the treatment of domestic wastewater at PT. Bogasari Flour Mills. Capacity 300 m3 per day.



**DDOMESTIC WASTEWATER TREATMENT
USING ANAEROBIC-AEROBIC BIOFILTER
CAPACITY 100 M3 PER DAY**



Application Of Anaerobic-Aerobic Biofilter and MBR For Domestic Wastewater Treatment



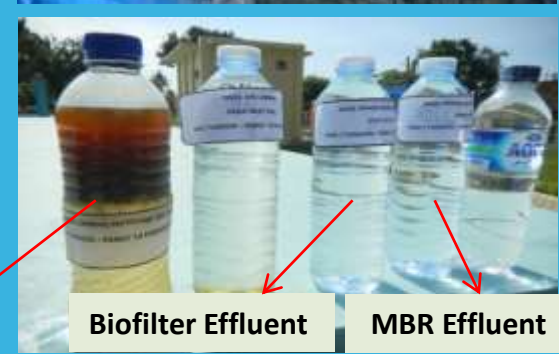
MEMBRANE BIO REACTOR (MBR)



Anaerobic-Aerobic Biofilter



Inlet Wastewater



Biofilter Effluent

MBR Effluent

Application Of RBC For The Treatment Of Domestic Wastewater From Office or Commercial Building



The problem is that ammonia concentrations often do not meet the effluent standards of domestic wastewater

FUTURE DEVELOPMENTS

With with the issuance of the new domestic wastewater effluent quality standard, which is more stringent than the previous one, appropriate domestic wastewater treatment technology is required in order for the treated water to meet the wastewater quality standards.

Effluent Domestic Wastewater Quality Standard

The Regulation of Environment And Forestry Of The Republic Of Indonesia

Number: P.68/Menlhk/Setjen/Kum.1/8/2016

Parameters	Unit	Maximum Concentration*
pH	-	6 - 9
BOD	mg/l	30
COD	mg/l	100
TSS	mg/l	30
Oil and Grease	mg/l	5
Ammonia	mg/l	10
Total Coliform	MPN/100 ml	3000

Note :

*) Apartment, lodging, dormitories, health services, restaurants, meeting halls, settlements, domestic wastewater from industry, WWTP of settlements, WWTP of urban area, ports, airports, railway stations, terminals etc.

FUTURE DEVELOPMENTS

The following are the strategies in improving domestic wastewater management in Indonesia :

- Increase the financial capacities for wastewater infrastructure developments, both on-site and off-site, and also recover treatment cost to insure services;
- Increase the societies contribution on developing housing effluent of domestic wastewater treatment system;
- Increase the work of wastewater treatment institution and separate function between regulator and operator;
- Increase the access to domestic wastewater services, both on-site and off-site, in urban and rural areas;
- Develop a regulation and apply treatments according to the enacted guidelines.

Key Issues and Recommendations

Issue	Recommendations to Address Issues
Less than 5 percent of urban wastewater is currently treated	<ol style="list-style-type: none"><li data-bbox="624 265 1785 536">1. Conduct citywide sanitation planning through City Sanitation Strategy, focusing on the development of centralized systems in highly urbanized areas while ensuring that low income communities and eradication of open defecation are prioritized.<li data-bbox="624 551 1785 822">2. Continue Decentralized Wastewater Treatment Systems (DEWATS) program in locations where centralized systems are not viable, but with consideration of comparative costs, required effluent quality and O&M constraints.<li data-bbox="624 836 1785 936">3. Focus future DEWATS approach on provision of decentralized systems with sewerage networks.<li data-bbox="624 951 1785 1165">4. Expand coverage of centralized sewerage more rapidly through a staged approach initially using combined sewerage and interceptors before transitioning to separate systems.<li data-bbox="624 1179 1785 1279">5. Design treatment facilities and set effluent standards to take account of influent and receiving water quality.

Issue	Recommendations to Address Issues
Huge investment is needed to implement current local government sanitation investment plans and for long term.	<ol style="list-style-type: none"><li data-bbox="662 267 1835 429">1. Central government to develop guidelines for local government management of wastewater services focusing on service delivery to customers.<li data-bbox="662 429 1835 592">2. One Service Provider to have overall responsibility for wastewater infrastructure including centralized sewerage, DEWATS and septage management.<li data-bbox="662 592 1835 755">3. Regulatory arrangements to be developed for wastewater services, including tariff structures whereby consumer fees cover operating costs.<li data-bbox="662 755 1835 918">4. Professionalize the sector by developing additional training and licensing programs for specific skills areas.<li data-bbox="662 918 1835 1080">5. Private sector to be encouraged to take on the role of Service Provider for all or part of a wastewater system.

CONCLUSIONS

- The number of centralized wastewater treatment plants in Indonesia is still very small.
- Domestic wastewater is the largest source of river water pollutions.
- By increasing both off site and on site systems, the degradation of raw water quality can be reduced.
- Appropriate domestic wastewater treatment technology is required in order for the treated water to meet the new wastewater quality standards.
- Community Participation is also very important to be concerned about.

THANK YOU

OTSUKARESAMADESHITA