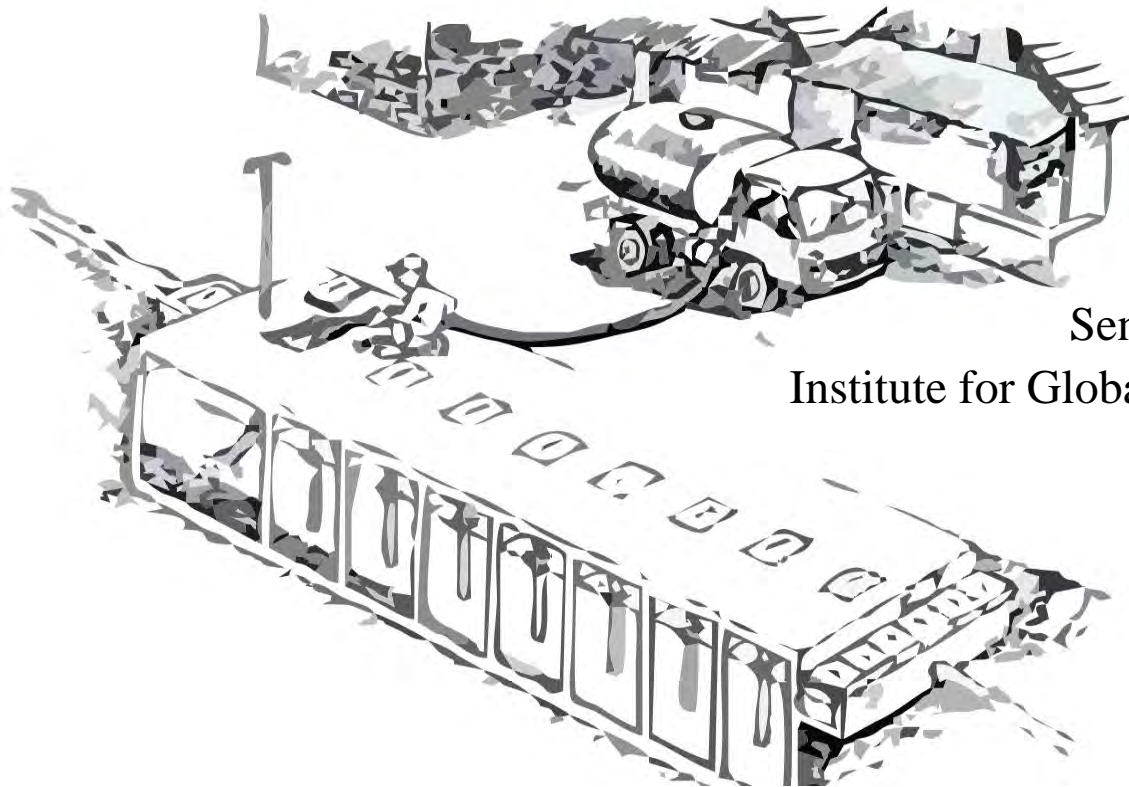


Decentralised Wastewater and Septage Management in Asia – Challenges and Opportunities



Pham Ngoc Bao, Ph.D

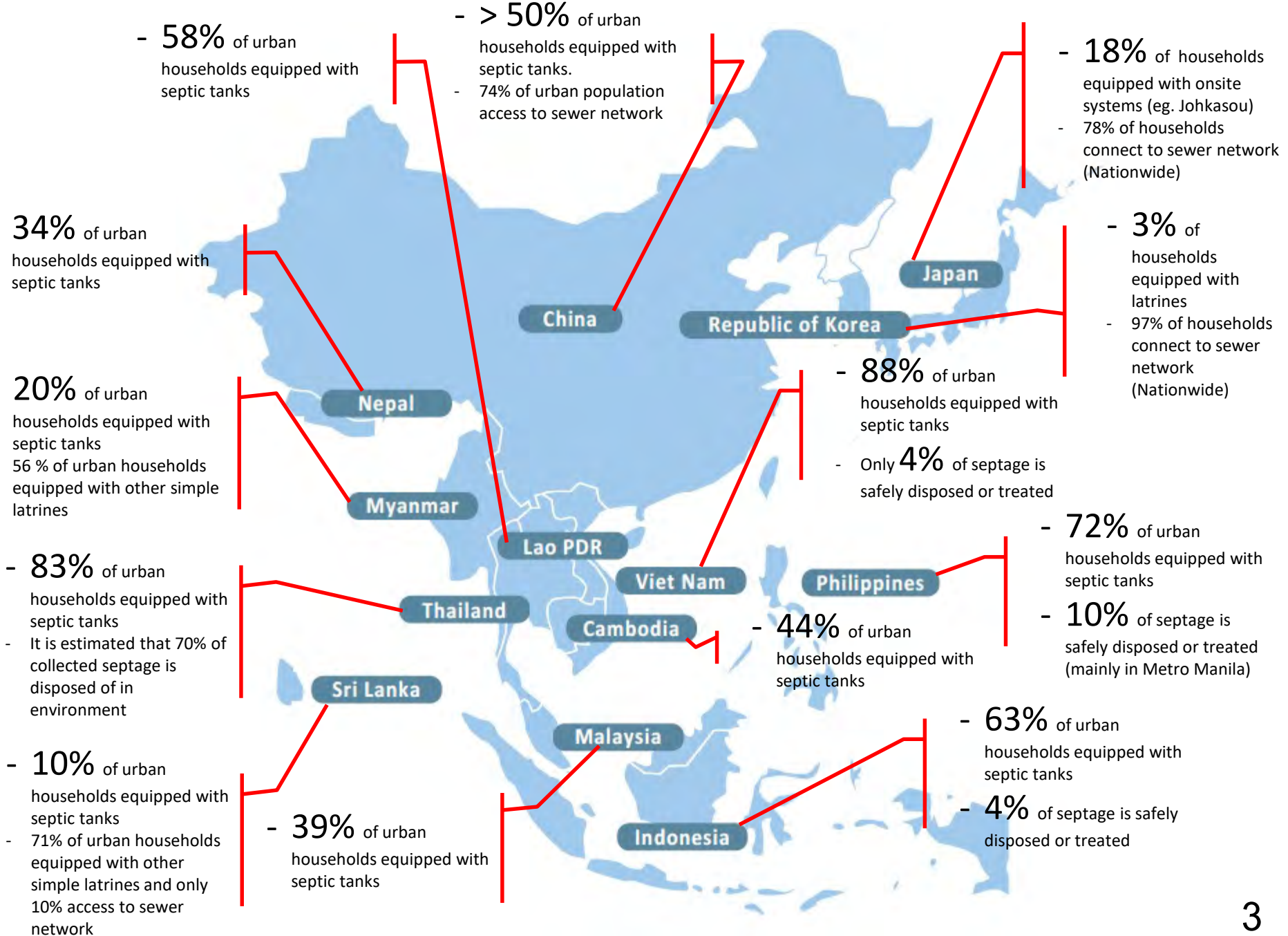
Senior Water and Sanitation Specialist

Institute for Global Environmental Strategies (IGES)

Email: ngoc-bao@iges.or.jp

Background

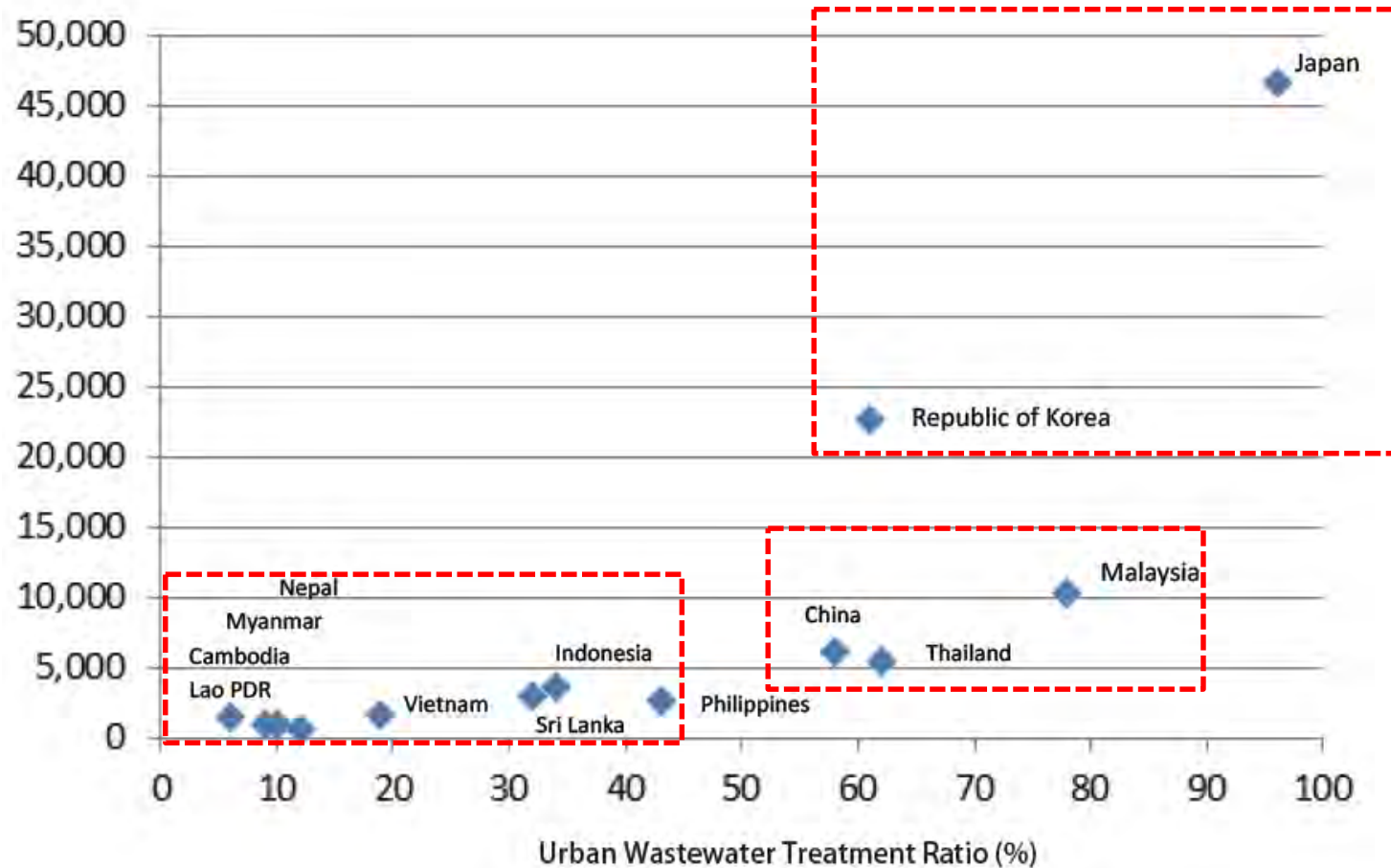
- The Asia-Pacific region, **with over 4.6 billion people by 2016**, is the home of nearly **60% of the world population**.
- Rapid population growth, urbanization, industrialization and changes in consumption patterns, including shifting diets toward highly water-intensive foods such as meats, which have led to **a significant increase in water demand, and placed a huge burden on water infrastructures in the region**.
- It is estimated that from **80% to 90% of generated wastewater**, especially in developing countries within the region, **is discharged directly into water bodies without any treatment or only partially treated by simple on-site sanitation systems** such as septic tanks, causing substantial levels of contamination in ground and surface water sources, as well as coastal ecosystems, and placing a huge economic impact.



(Source: WHO and UNICEF, 2017; and database from WEPA website)

Relationship between urban wastewater treatment ratio and GDP per capita

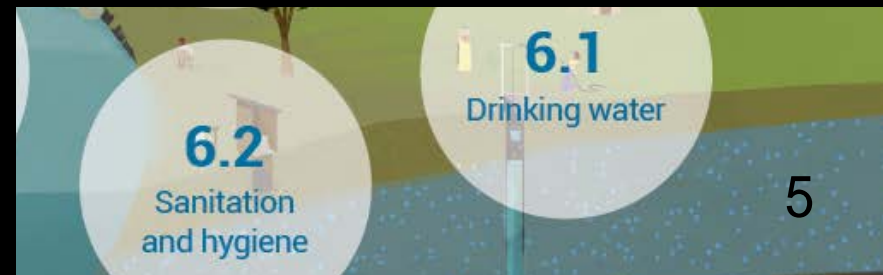
GDP per Capita in 2012
(in US\$)

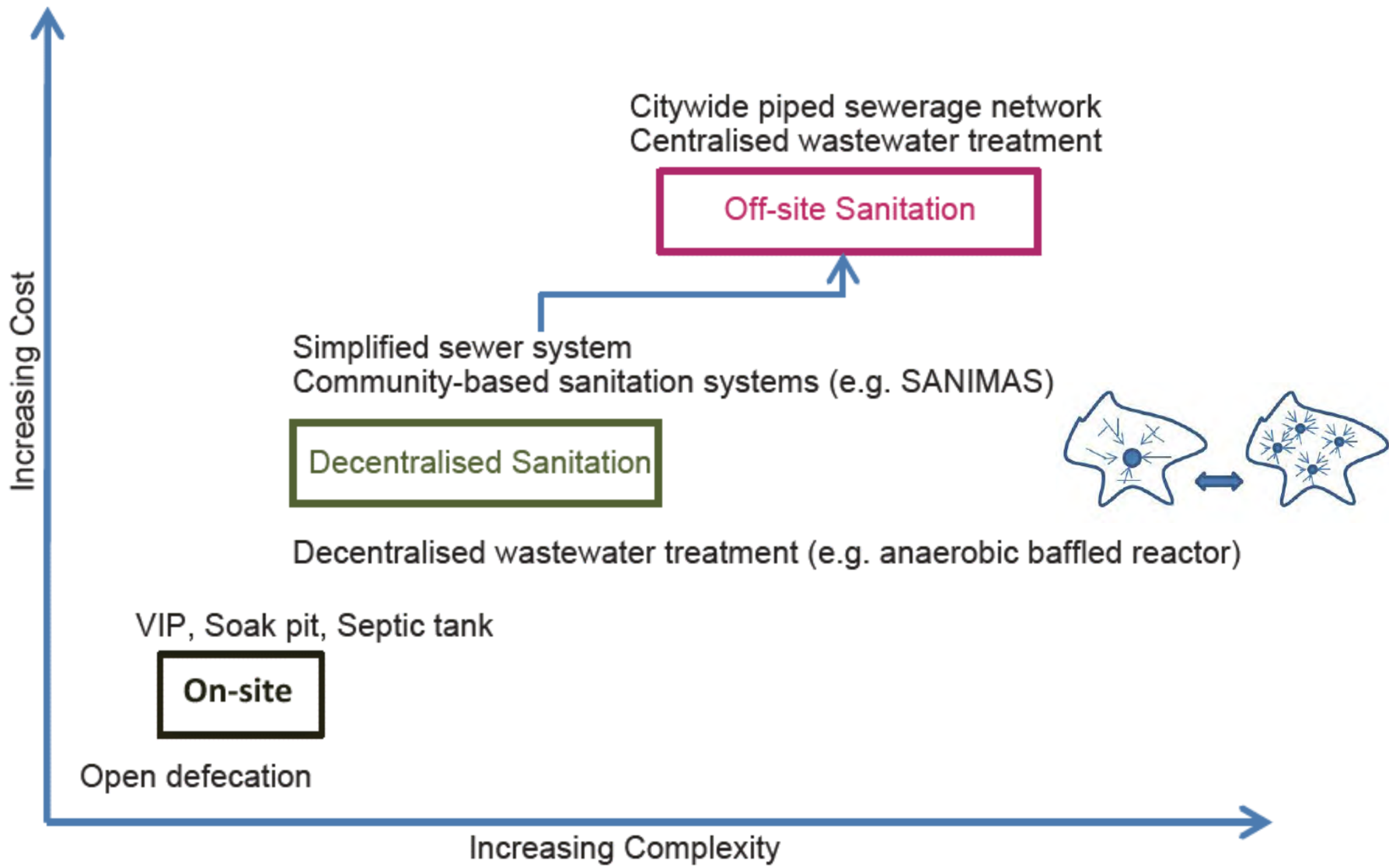


SDG 6



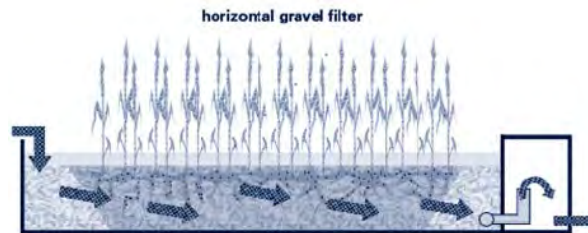
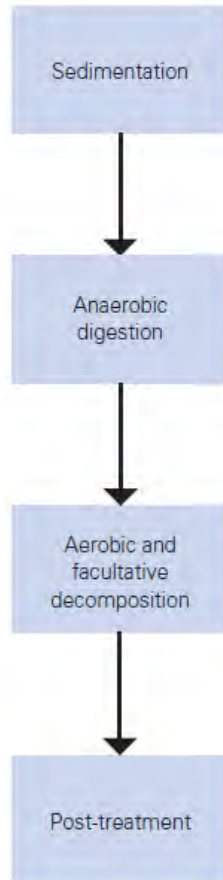
From MDGs to SDGs – Addressing unfinished business





Decentralised sanitation fills the gap between on-site and centralised sanitation options

Typical DEWATS combine the following technical treatment steps



Example of SANIMAS system in Indonesia

Common Challenges in Addressing Poor Sanitation in WEPA Countries

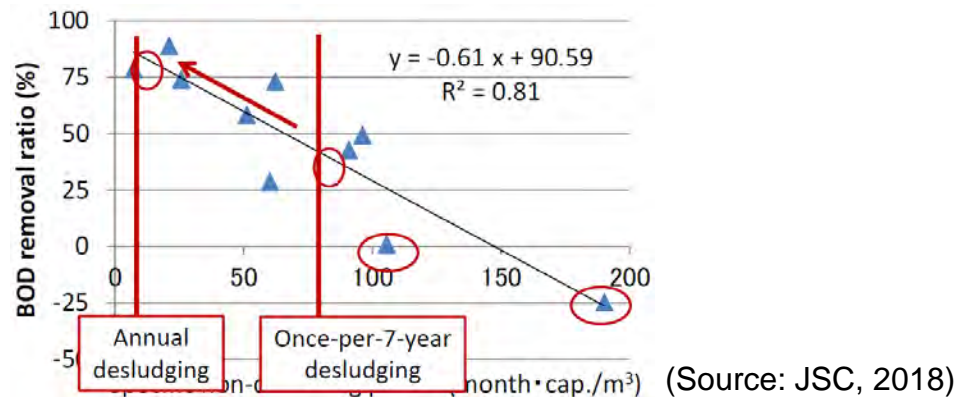
- Predominance of septic tanks with its **poor performance/maintainance** as effective onsite wastewater treatment system, but **considered as diffuse sources of pollution in many urban areas.**
- **Lack of proper septage management**, including ineffective emptying, collection & transport, treatment and disposal system.



Fig. 1. Discharge of collected septage at “dumping points” in Bandung; and effluent from septage treatment plant in Denpasar, Indonesia
(Source: Author)

Common Challenges in Addressing Poor Sanitation in WEPA Countries

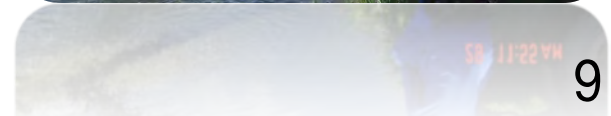
- More stringent effluent standard is being applied in many urban areas, including residential and commercial buildings
- Poor maintenance (desludging) for onsite and decentralised treatment systems (DEWATS)



- No clear definition on DEWATS? Lack of knowledge on suitable DEWATS options for different local contexts?
- Which effluent standard should be applied? Should we use the same effluent standard for centralised wastewater treatment plants? No detailed guidelines, and standard method (& certification system) for treatment performance evaluation for DEWATS technologies

New Effluent Standards for Domestic Wastewater Discharge in Indonesia

No	Parameters	Unit	Value	
			Old Regulation*	New Regulation*
1	pH	-	6-9	6-9
2	Biological Oxygen Demand (BOD)	mg/L	100	30
3	COD	mg/L	-	100
4	Total Suspended Solid	mg/L	100	30
5	Oil and Grease	mg/L	10	5
6	Ammonia	mg/L	-	10
7	Total Coliform	total/100 mL	-	3,000
8	Discharge	L/orang/hari	-	100



Science seems to be clear...but **Reality & Future is NOT**

5m³ truck load of FS
dumping ~ 5,000 pe.
practicing open
defecation

Vietnam



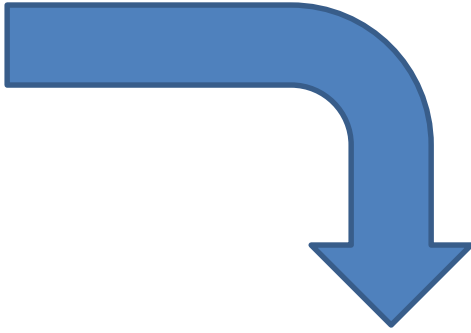
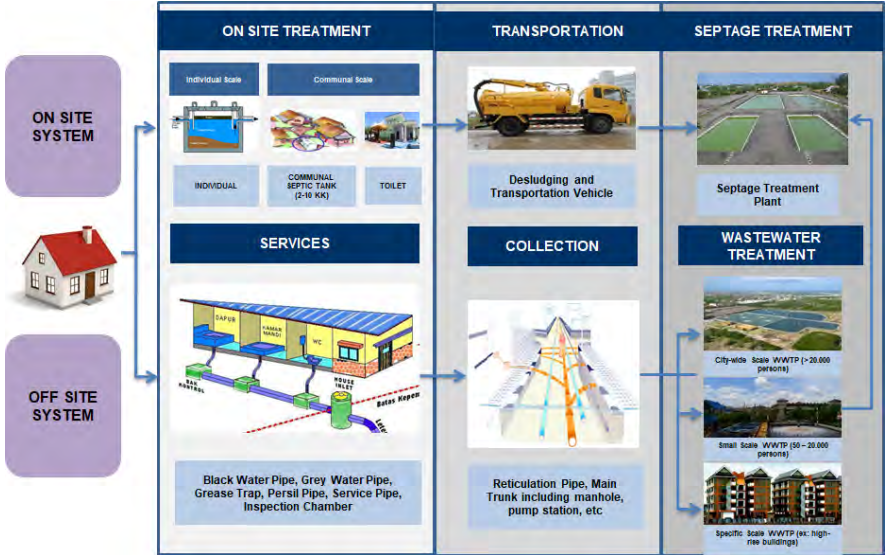
More than 150 STP have been
constructed, but only **less than 10% are
still under operational**...because of
**LACK OF APPROPRIATE
TECHNOLOGIES???.NO**

Bandung- Indonesia



Septage management **requires an integrated system level approach, considering the overall sanitation service chain** and incorporating all relevant aspects (including technological, legal and institutional framework, financial, etc.), and especially there are strong **needs for appropriate business models for septage management in the region**¹⁰

MoPWH Regulation No.4 Year 2017



Proper septage management contributes to Universal Access in Indonesia

Septage management is still relevant in Indonesia

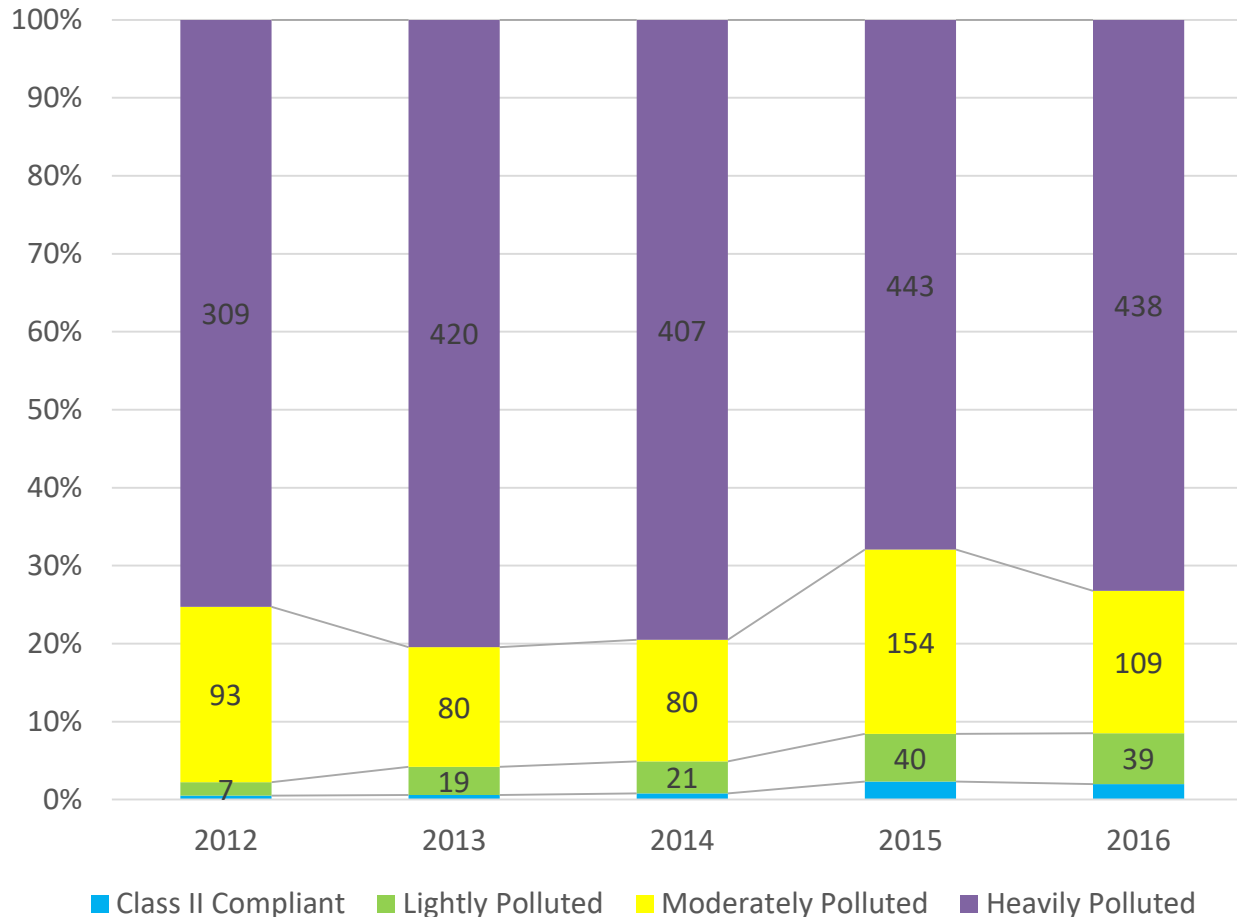
85% population still using septic tank



- Improve the quality and advantage of on-site system
- Ensure the on-site system is done correctly
- Supporting other target (100% water supply & 0% slum area):
 - Improve the quality of raw water
 - Provide basic sanitation for slum area

(Source: Asri, 2018)

Status of River Water Quality in Indonesia 2012- 2016



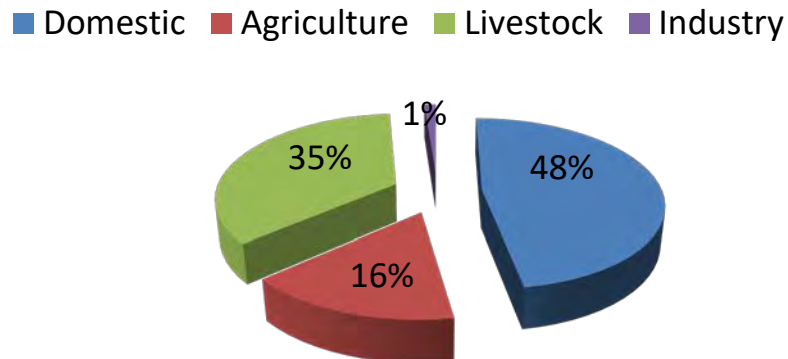
*Numbers Indicate sampling points

Status of compliance with water quality in Indonesia

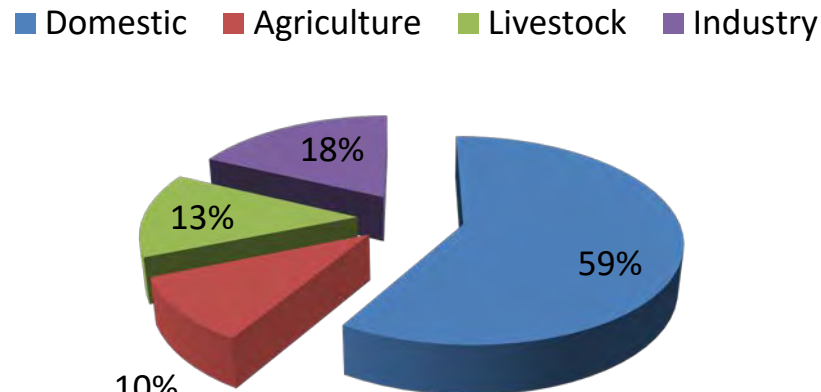


CONTRIBUTION OF POLLUTION SOURCES IN MAJOR RIVER BASINS

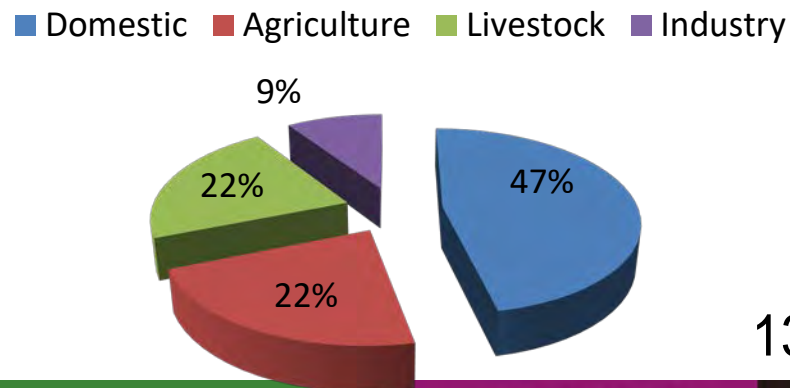
MUSI River



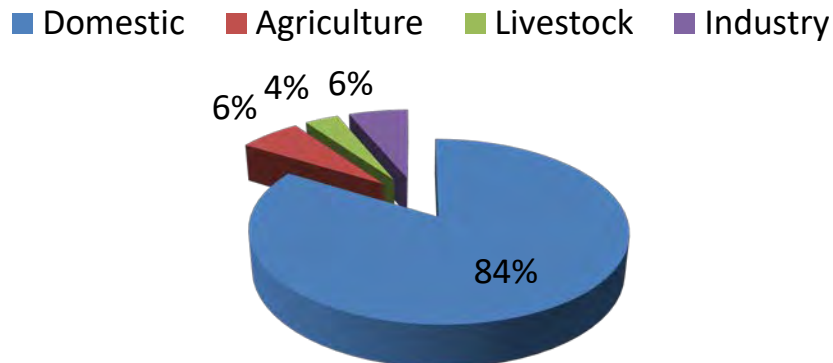
CITARUM River



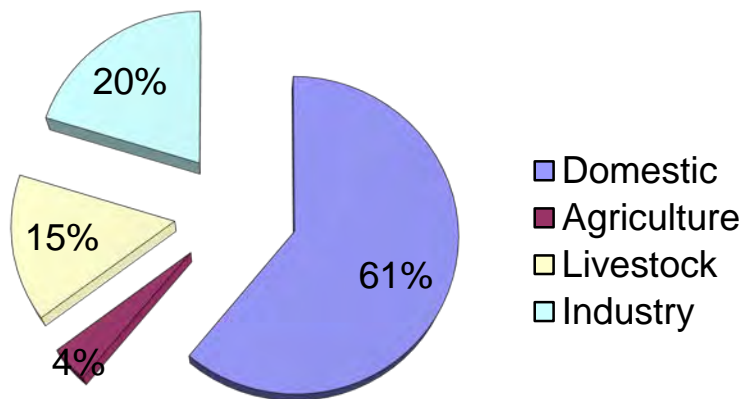
BRANTAS River



CILIWUNG River

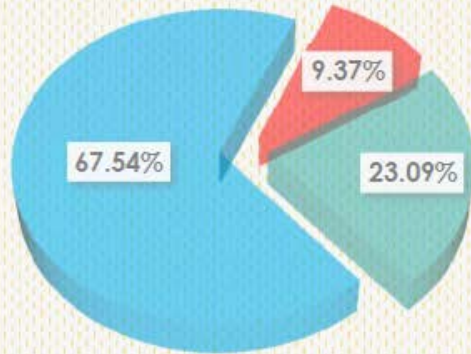


CISADANE River



Present sanitation service access and wastewater treatment in Indonesia

Sanitation Access in 2017



Source: BPS, 2017

■ Improved Access ■ Basic Access ■ No Access

Off-Site

Sanitation System City/Regional Scale

WWTP City Scale in 13 locations: Medan, Parapat, Batam, Tangerang, Jakarta, Bandung, Cirebon, Surakarta, Bantul, Banjarmasin, Balikpapan, Manado, Denpasar
 On-going WWTP Project City Scale: Jakarta, Palembang, Pekanbaru, Jambi, Makassar

2017: 1,2 M people*

RPJMN Target 9 cities: 3 achieved

On-Site

Sanitation System :

253

Septage Treatment Plant built / rehab / optimised in 2008-2017

Off-Site

Decentralised and Communal System

COMMUNITY-BASED

14929 Communal System built (2003-2017)

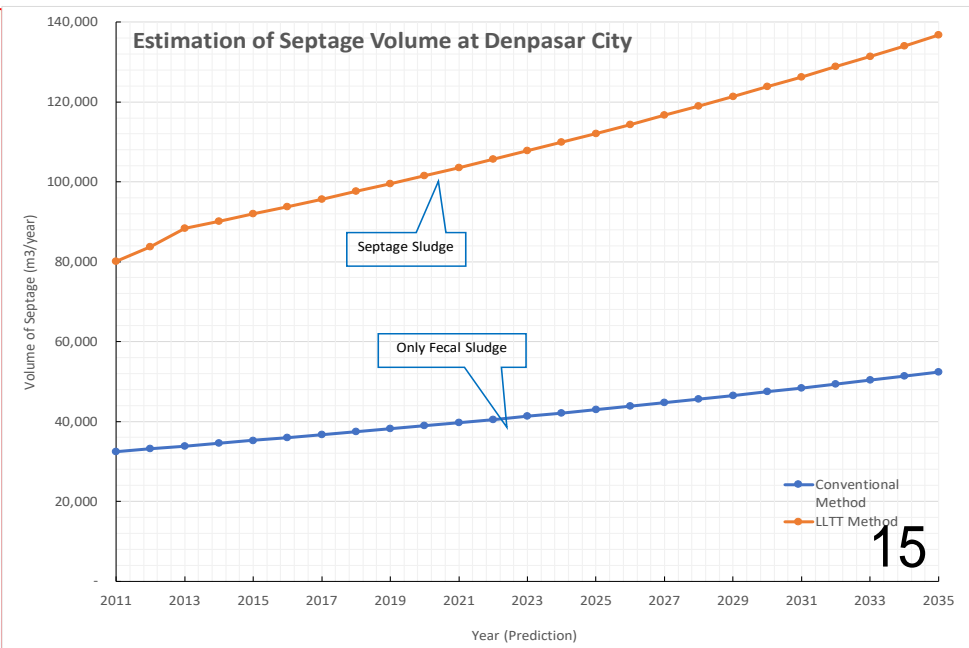
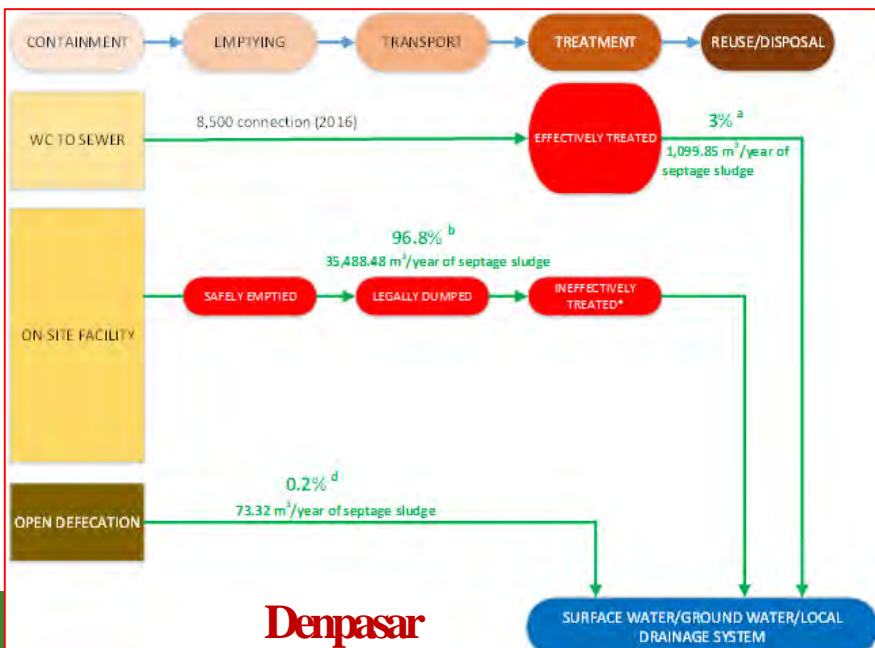
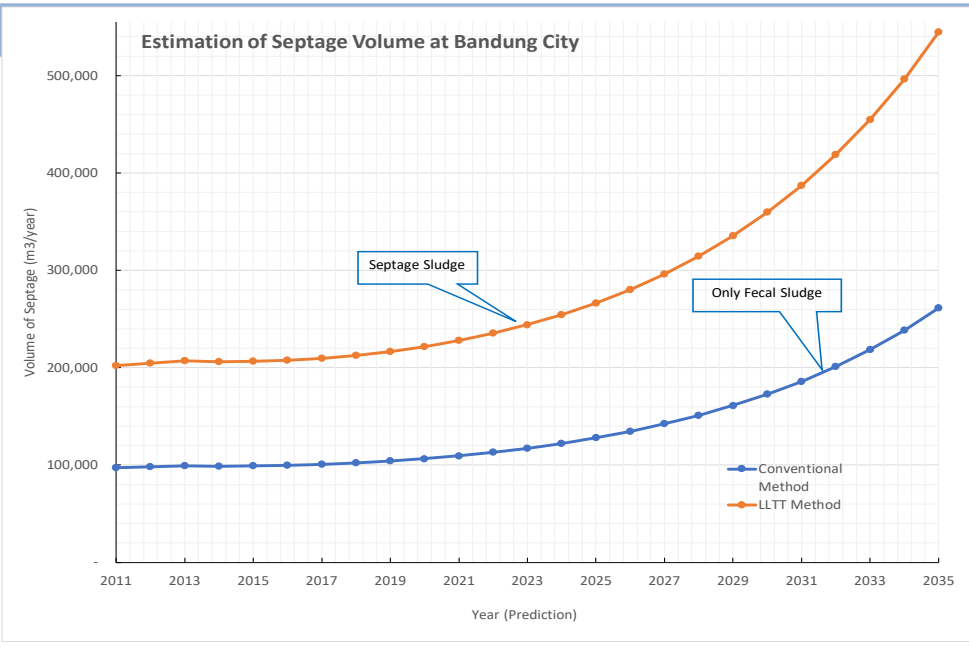
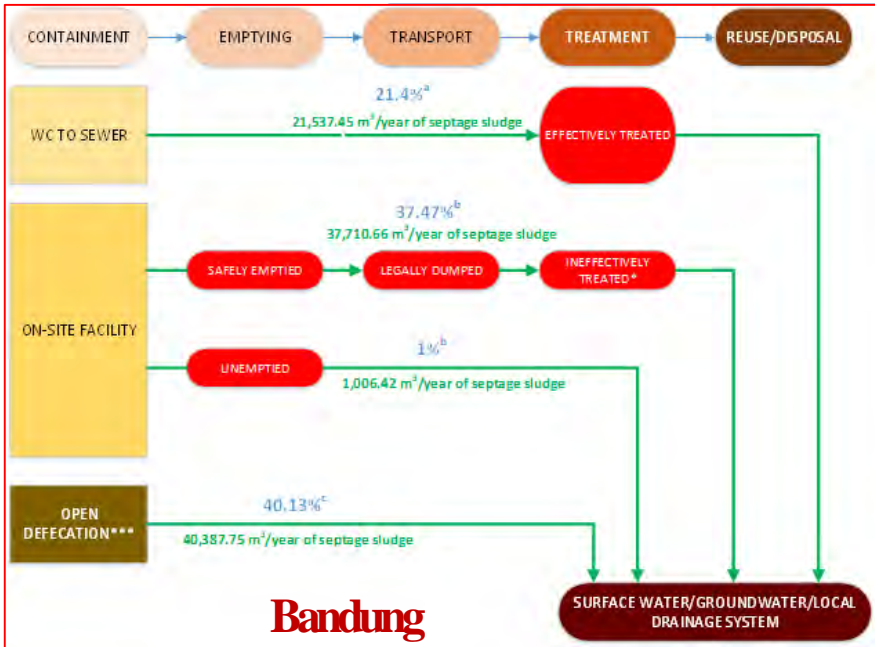
INSTITUTIONAL-BASED

237 Decentralised System built in 119 City / District (2008-2017)

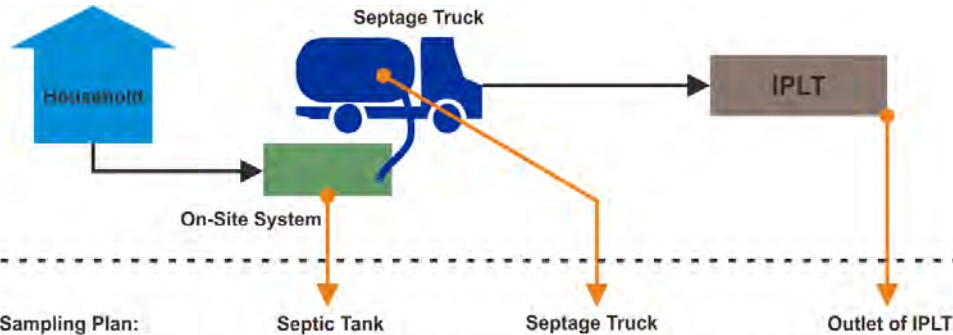
2017: 1,7 M people*

* Outcome based on design capacity built

Septage Flow Diagrams in Bandung and Denpasar



Septage Samplings and Laboratory Analysis at ITB



Sampling Plan:

Septic Tank

Septage Truck

Outlet of IPLT

Number of Sample @ Cities:

2 Samples/Location

2 Samples (Different Truck/Time)

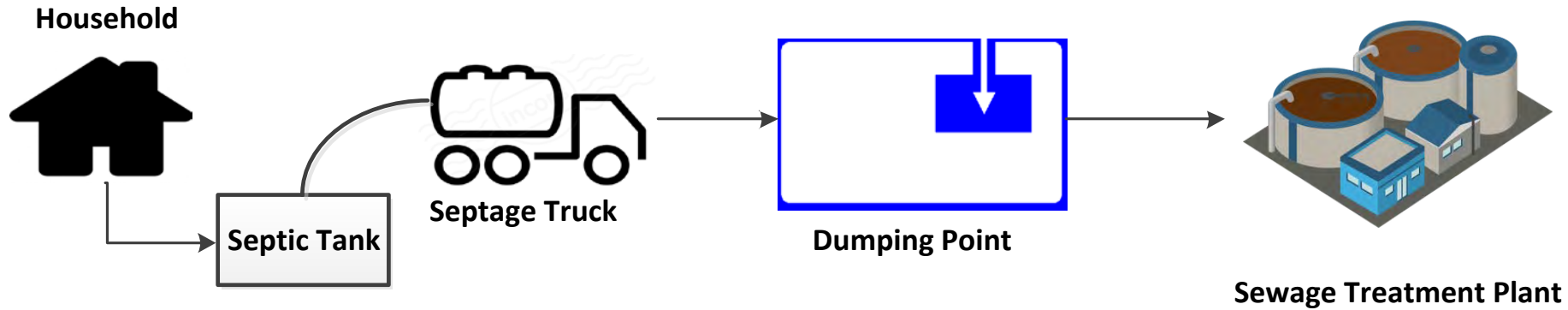
2 Samples (Different Truck/Time)

No1	Parameter	Technique
1	BOD ₅	Incubation Probe
2	COD	Titrimetric
3	Total and Free Ammonia	Ion Selective Elec
4	Total Nitrogen	Ion Selective Elec
5	Total Phosphorus	Colorimetric
6	Total Solids	Gravimetric
7	Total Suspended Solids	Gravimetric
8	Volatile Suspended Solids	Gravimetric
9	E. Coli	Enzyme Substrate
10	Heat Value	Calorimeter
11	Helminth Egg	Ballinger



Existing Septage Service Chain in Bandung

Septage Emptying, Collection and Disposal



In many cases, householders have to break their floor to access septic tank for sludge emptying

Emptying sequence desludging service section (a) Desludging process (b) Transporting septage to dumping point (c) Sludge dumping process (d) Dumping point that connected to Bojongsoang WWTTP

Existing Septage Service Chain in Bandung

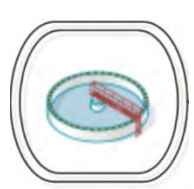
Access to Toilet



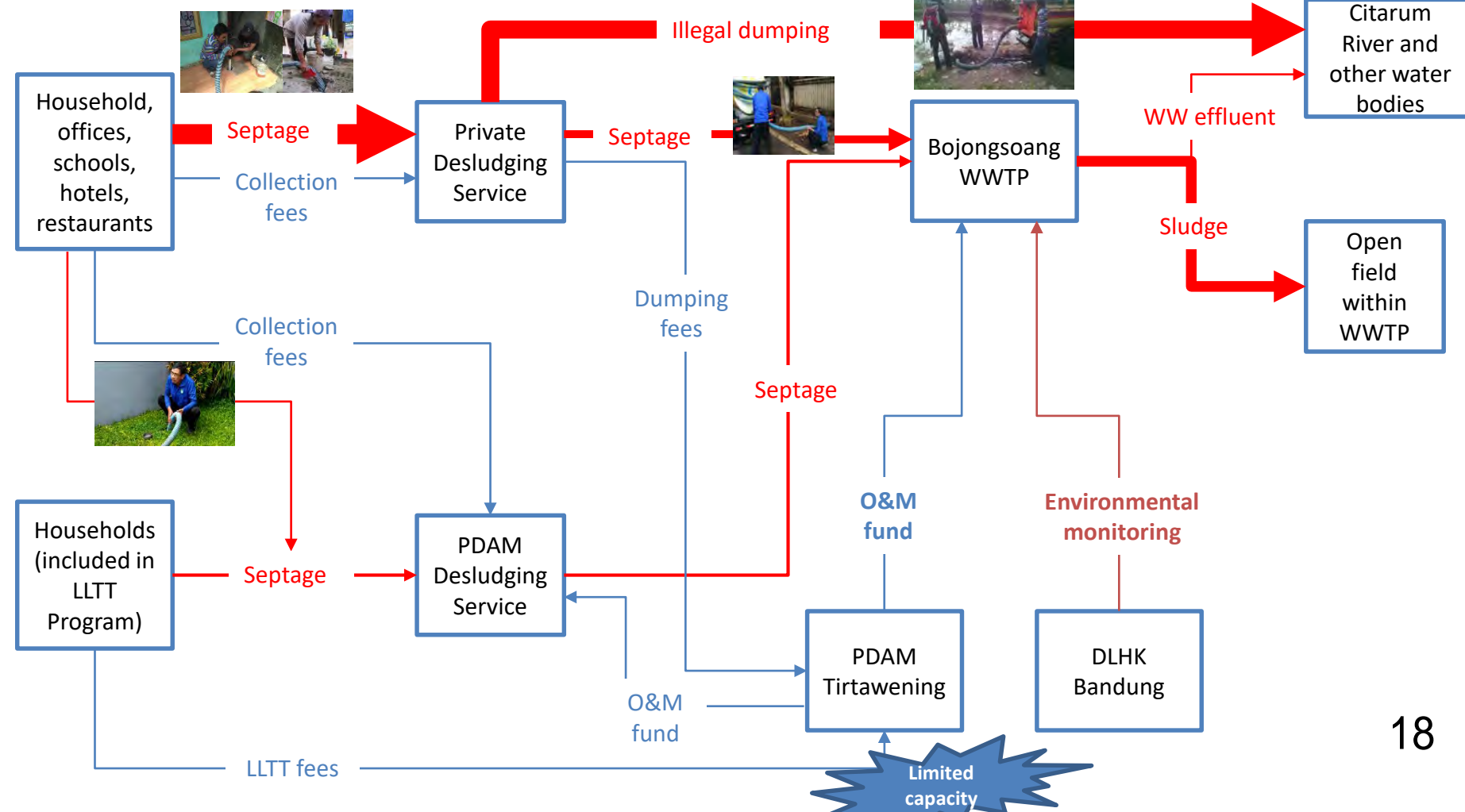
Emptying Transportation



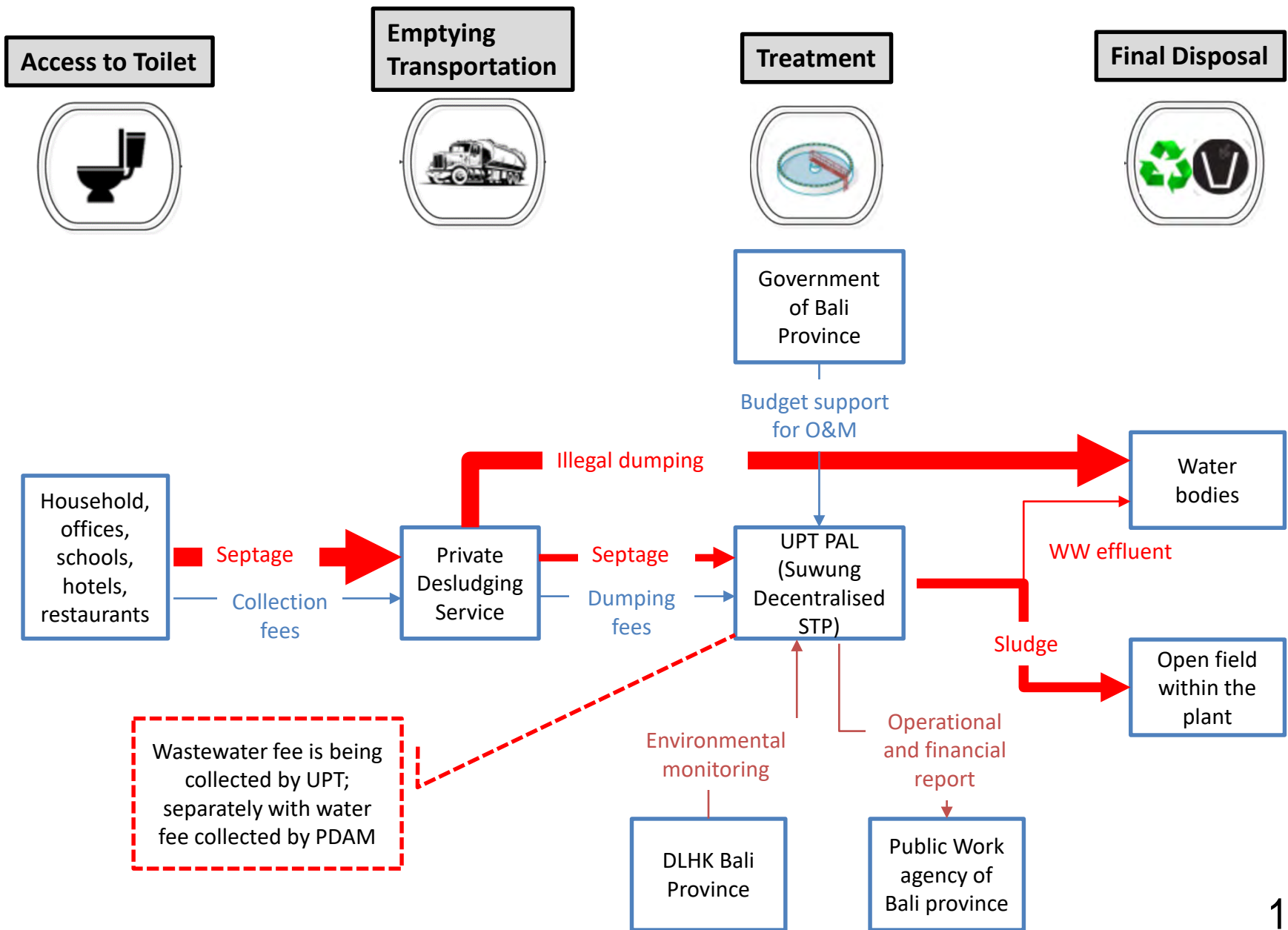
Treatment



Final Disposal



Existing Septage Service Chain in Denpasar



BUSINESS MODELS FOR SEPTAGE COLLECTION AND TREATMENT IN INDONESIA

Opportunities for Attracting Private Finance to Water and Sanitation Sector

Average willingness to pay for septage emptying and collection service in Bandung and Denpasar

Bandung

Class (IDR/desludging)		Number of respondents	Percentage (%)	Total Amount (IDR/desludging)	
lower limit	upper limit			lower limit	upper limit
	< 100,000	34	13.6	13,600	13,600
100,000	150,000	47	18.8	18,800	28,200
150,000	200,000	65	26.0	39,000	52,000
200,000	250,000	61	24.4	48,800	61,000
	> 250,000	43	17.2	43,000	43,000
Amount		250	100%	163,200	197,000

Denpasar

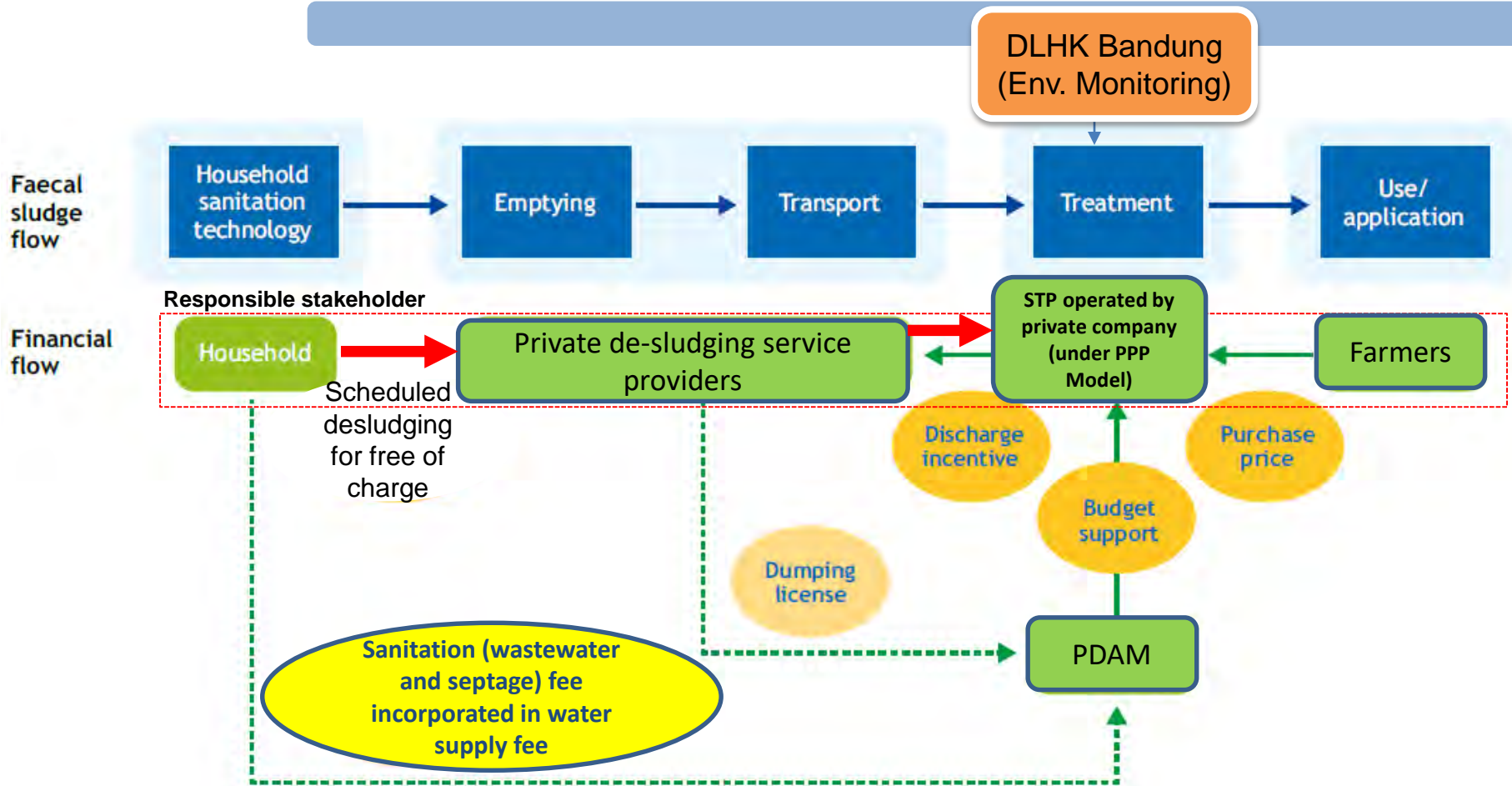
Class (IDR/desludging)		Number of respondents	Percentage (%)	Total Amount (IDR/desludging)	
lower limit	upper limit			lower limit	upper limit
	< 100,000	1	1.0	1,000	1,000
100,000	150,000	10	10.0	10,000	15,000
150,000	200,000	15	15.0	22,500	30,000
200,000	250,000	33	33.0	66,000	82,500
	> 250,000	41	41.0	102,500	102,500
Amount		100	100	202,000	231,000

Ability to pay for septage emptying and collection service in Bandung and Denpasar

Bandung				
Service	Percentage of average household expenditure/month	Expenditure (IDR/month)	ATP amount (IDR/month)	Existing Condition (IDR/month)
Septage Management	2 %	2,369,941	47,398	12,500

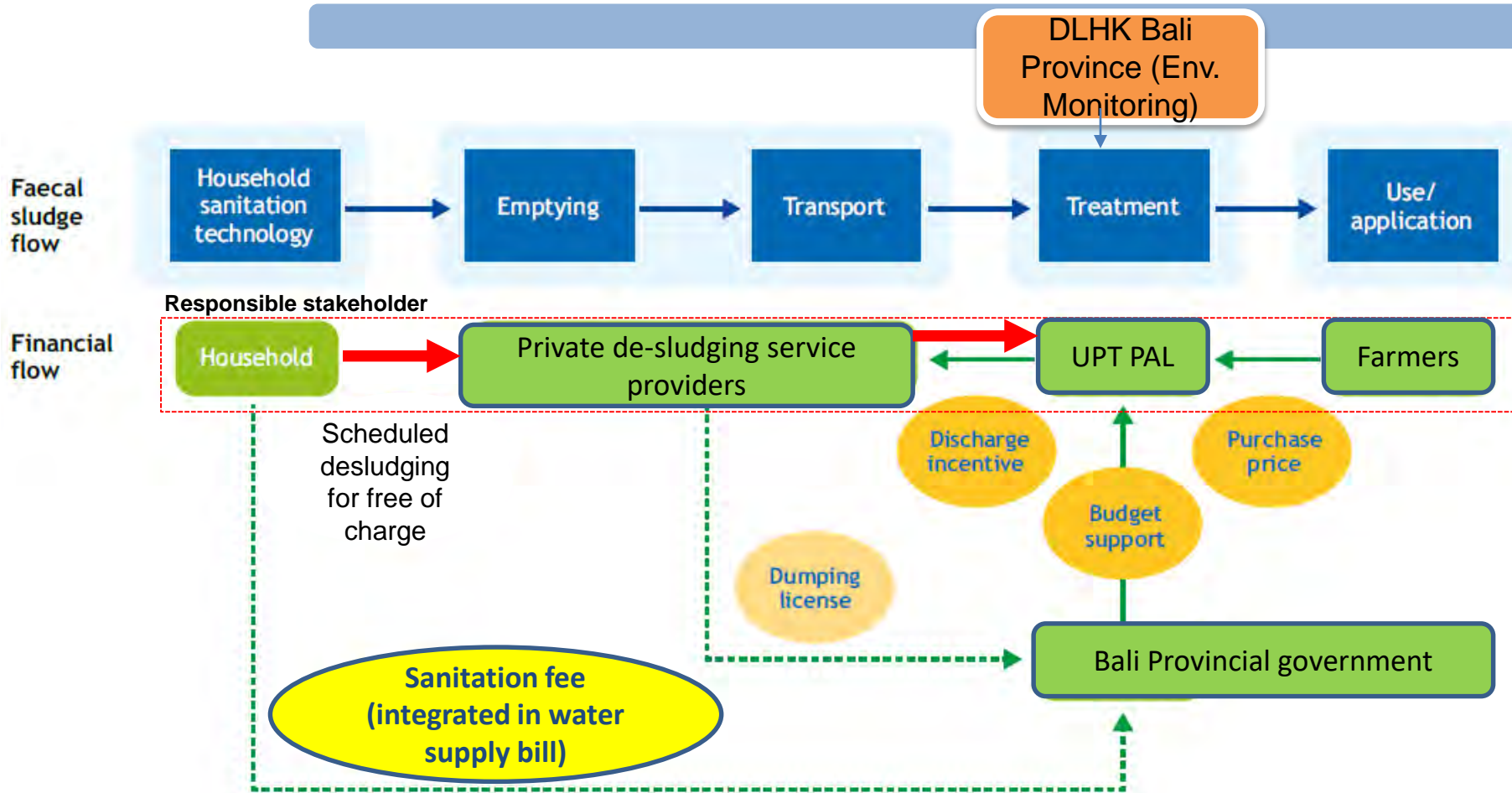
Denpasar				
Service	Percentage of average household expenditure/month	Expenditure (IDR/month)	ATP amount (IDR/month)	Existing Condition (IDR/month)
Septage Management	2 %	2,300,056	46,001	14,583

Conceptual simplified incentivised discharge model for Bandung with high consensus among relevant stakeholders



Item	Amount (IDR/year)
O&M septage management	128,232
Ability to pay	568,776
Willingness to pay	180,100
Recommended tariff for covering O&M costs	374,438

Conceptual simplified incentivised discharge model for Denpasar with high consensus among relevant stakeholders



Item	Amount (IDR/year)	
O&M septage management	299,876	
Ability to pay	552,012	24
Willingness to pay	216,500	
Recommended tariff for covering O&M costs	384,256	

THE WAY FORWARD

1. Political will and strong commitments

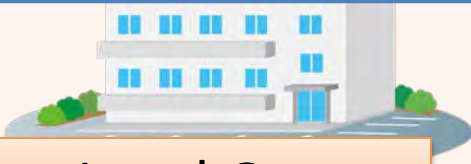


Central Gov.

2. Roles and responsibilities of each stakeholder

3. Appropriate business model and roadmap for establishing appropriate sanitation fee structure

5. Capacity for monitoring and enforcement of septage disposal



Local Gov.



Private sectors

4. Awareness raising



Residents

6. Regular desludging program with the supports of GIS-based database

7. Collaboration with research institutions and universities



“National Workshop on Business Models for Septage Collection and Treatment in The Urban Areas of Indonesia”

Organized by:

Kategori Kesehatan
Rakasa Air dan Limbah Cair
FTSL - ITB

“National Workshop on Business Models for Septage Collection and Treatment in the Urban Areas of Indonesia”

25 JAN 2019
FRIDAY - JUMAT

Waktu/Jam Acara :
07:30
Sampai selesai.

Tempat Acara :
Gedung CRCS (Center for Research and Community Services) Lantai 3, Institut Teknologi Bandung, Jalan Ganasha No. 10, Kota Bandung.

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Teknologi Bandung

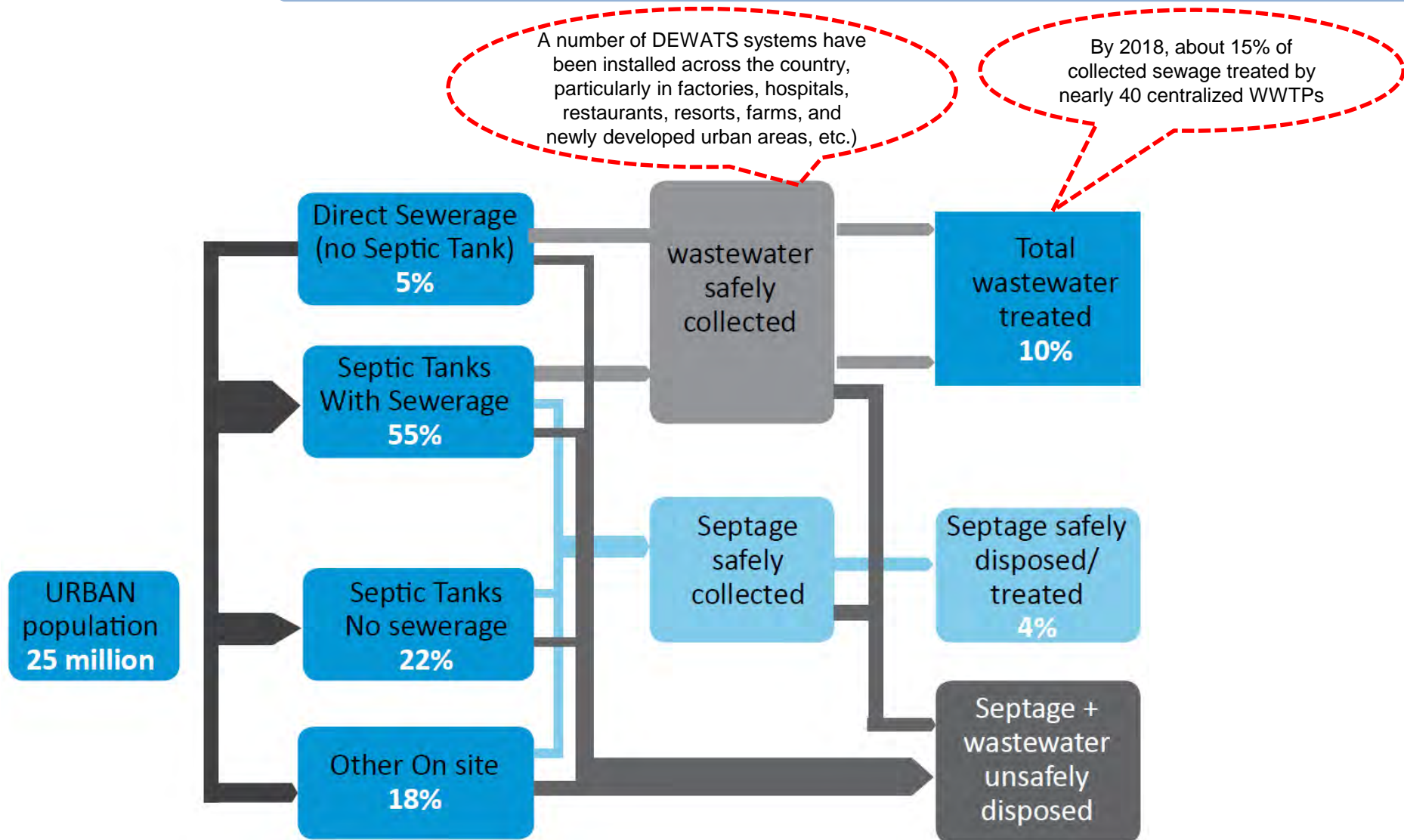
Prof. Dring Ir. Prayati Soewondo
KK-RALC Institut
Teknologi Bandung

Elis Hastuti
S.T., M.Sc.
Peneliti Balai AMPLP
Pusatling Perumahan dan
Permukiman - PUPR

Solyan Iskandar
Institutional Development Advisor
of USAID RIJWASH PLUS



Present sanitation service access and wastewater treatment in Vietnam



Source: World Bank, 2013

Current Sanitation Management (Decentralized Wastewater Treatment System by Johkasou in Yangon-1)

High Residential Buildings



Hospital (Health Care Center)



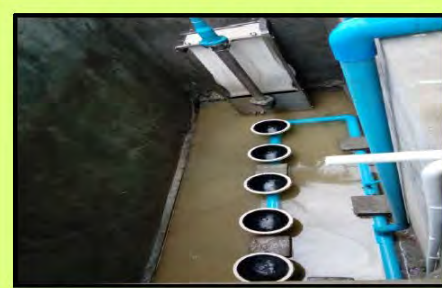
Factories (Industrial Use)



Public Recreation Center



(BORDA) Decentralization Wastewater Treatment System (7m³/day) at B.E.H.S (1) Tamwe, Yangon



Location – YCDC Officer Housing-Membrane Bio-Reactor System (30m³/day, 38m³/day)

Present sanitation service access and wastewater treatment in Malaysia

	Centralized Wastewater Treatment (Ex: Sewer system)	Middle scale or cluster type wastewater treatment (Ex: Sanimas)	Decentralized wastewater treatment (Ex: Septic tank, johkasou, pit latrine)	Without any wastewater treatment
Definition	Sewage Treatment Plants identified in the Sewerage Catchment Study to cater for a sewerage catchment area	Also known as multipoint Sewage Treatment Plants which cater for scattered development by different developers	Also known as on-site treatment systems designed to treat and dispose of effluent from single premise and/or single ownership development	Open defecation or direct discharge
Installed plant number	101	10,373	2,530,900	
Number of Population using each wastewater treatment systems*	8,132,260	20,487,766	12,935,943	-

* Calculation using Population Equivalent (Design Capacity of the system)

Reference: Malaysia Water Industry Guide 2018 (exclude Sabah & Sarawak)

Desludging Trend

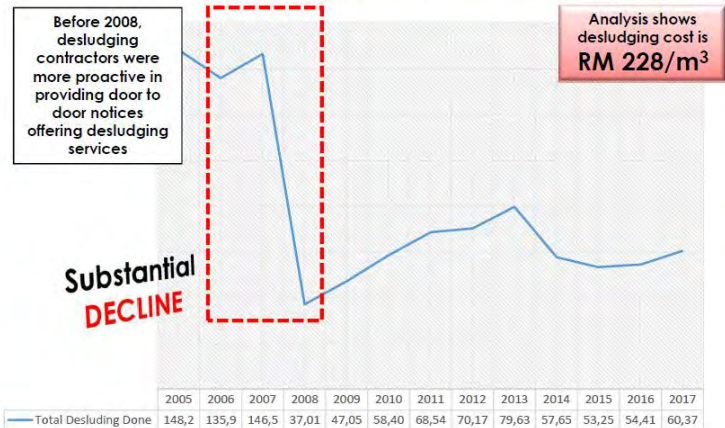
BACKGROUND

In January 2008, Water Services Industry Act 2006 become enforceable

Responsibility of desludging individual septic tank falls under the owner

Prior to WSIA mandatory scheduled desludging was in place

INDIVIDUAL SEPTIC TANK (IST) DESLUDGING TREND (2005 – 2017)




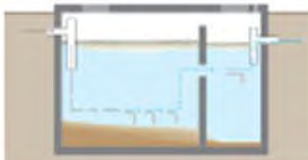

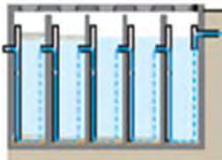

Social Issues

- Refusal From Owners
- Septic Tank Cover Sealed
- Inaccessible, etc

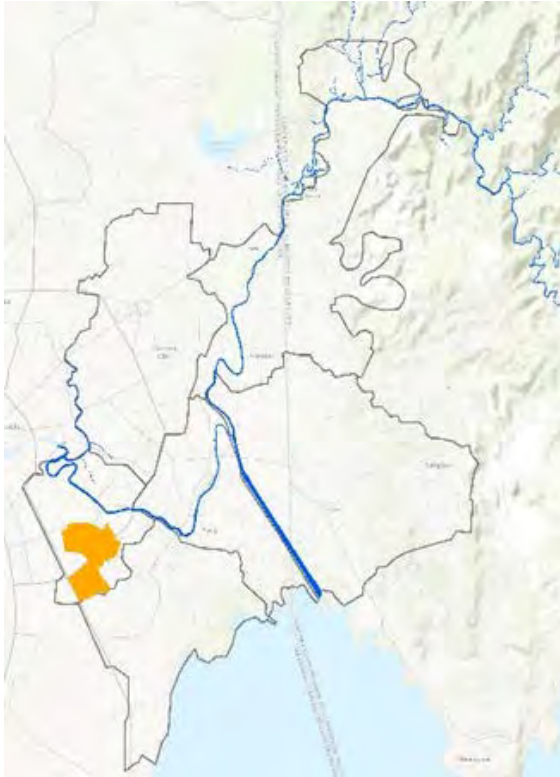
Impact

- Higher risk of being confronted with water borne diseases
- Quality of water resource will be affected, etc

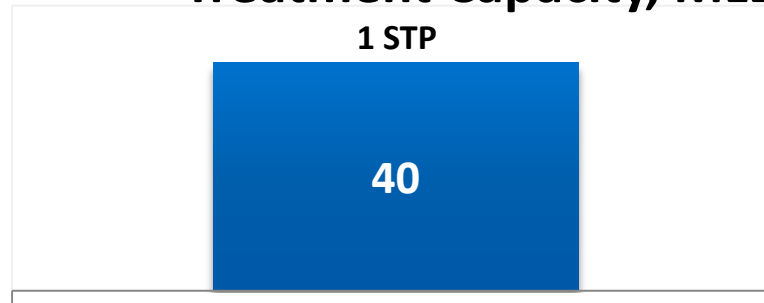
5-YEAR PLAN ON SANITATION PROGRAM IN THE PHILIPPINES

2017	2018	2019	2021	2022
User Interface	Collection and Storage	Conveyance	(Semi-) Centralised Treatment	Reuse and Disposal
				
<ul style="list-style-type: none"> • Toilet Facilities (with Super, Mid and Sub Structure) • Communal Toilet Facilities • Public Toilet Facilities 	<ul style="list-style-type: none"> • Policy on Standard Design, Construction, Maintenance of Septic Tank • Alternative Sanitation Technologies • Retrofitting of old ST (underdesign or w/ leaching chamber) 	<ul style="list-style-type: none"> • Sludge and Septage Management Program • Training on NSSMP 	<ul style="list-style-type: none"> • Decentralized Wastewater Treatment System • Small Community Sewage Treatment Facility 	<ul style="list-style-type: none"> • Policy in Safely Managed Sanitation Services • Used Biosolids and treated wastewater

Wastewater Condition in 1997



Treatment Capacity, MLD

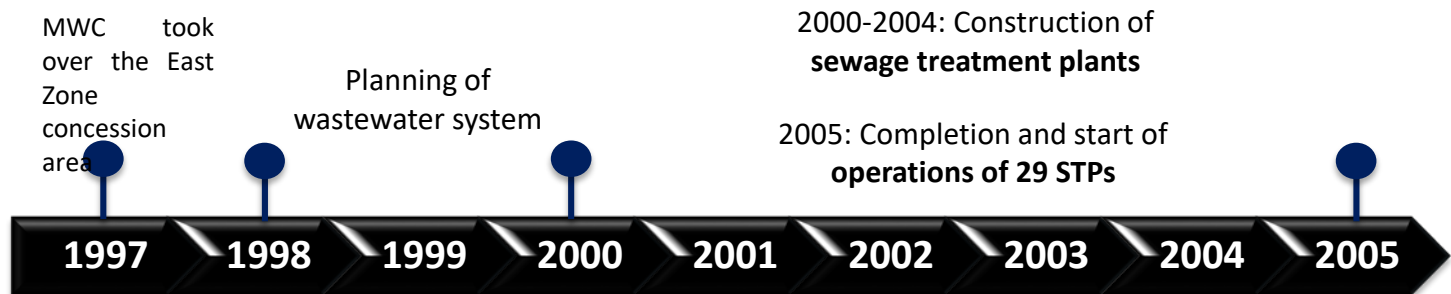


1997

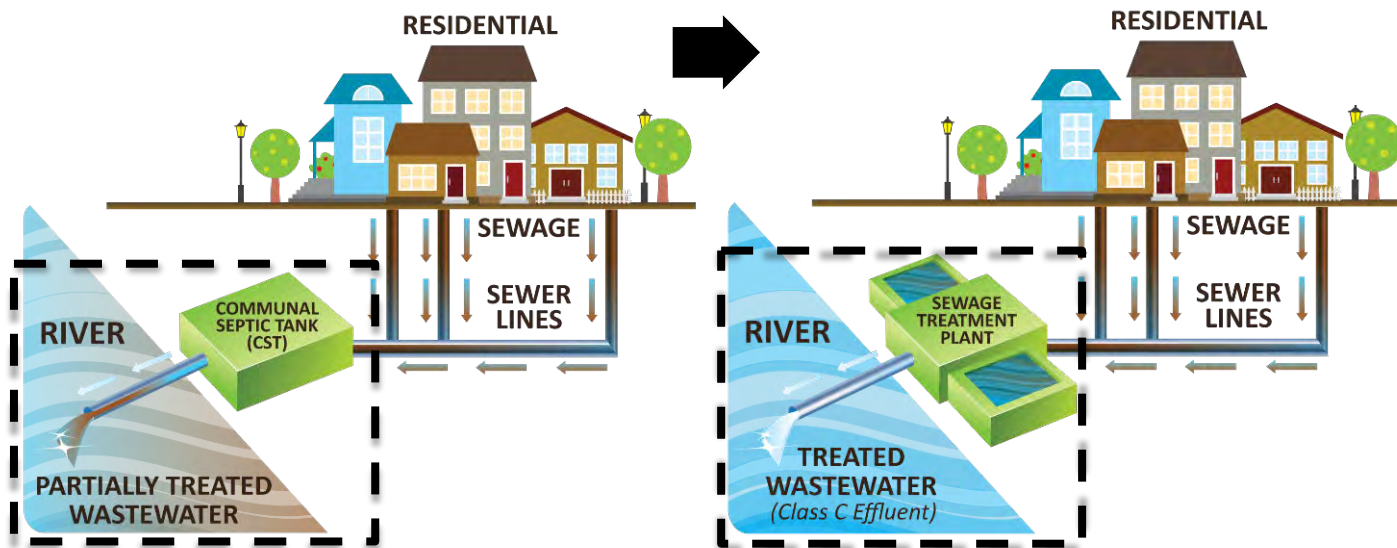
- ✓ 3% of population was connected to sewerage system
- ✓ 85% of households were using septic tanks
- ✓ 58% of pollution was contributed by domestic sources
- ✓ 1 operational sewage treatment plant

Source : *Water For All 2006 (Sector Profile, ADB)*

GOOD PRACTICES & LESSONS LEARNED FROM THE PHILIPPINES

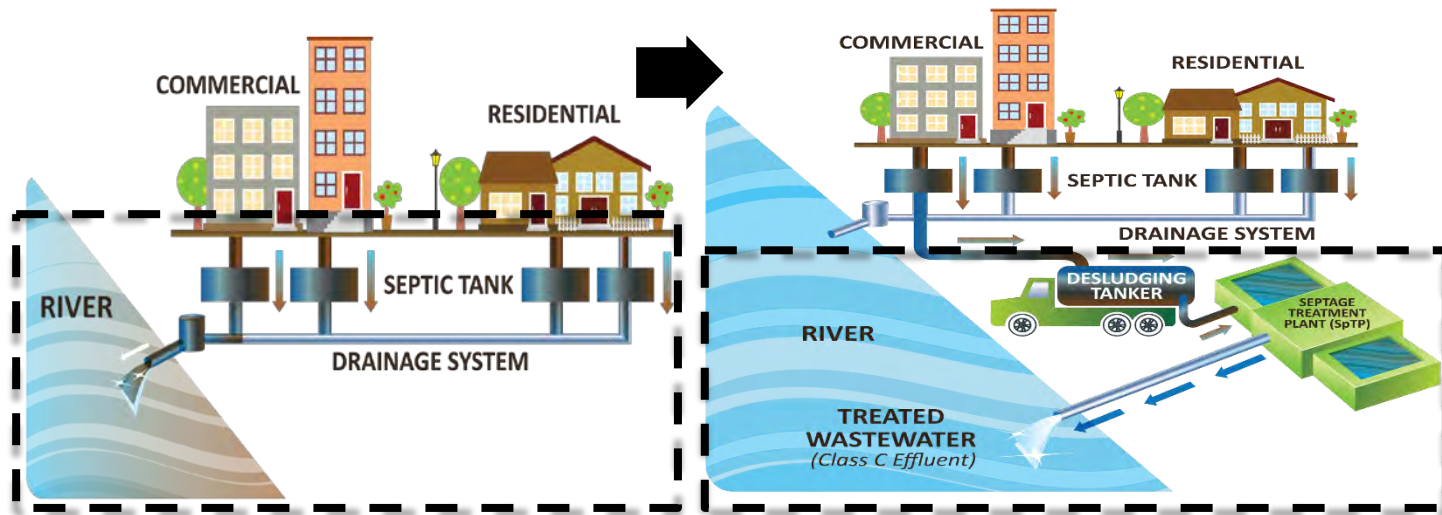


Upgrade of Communal Septic Tanks to Separate System



GOOD PRACTICES & LESSONS LEARNED FROM THE PHILIPPINES

Decentralised approach for Septage Management (as Interim Solution)



GOOD PRACTICES & LESSONS LEARNED FROM THE PHILIPPINES

North Septage Treatment Plant



South Septage Treatment Plant



35

GOOD PRACTICES & LESSONS LEARNED FROM THE PHILIPPINES

