



# Fecal Sludge Management

## A Case Study of Malaysia

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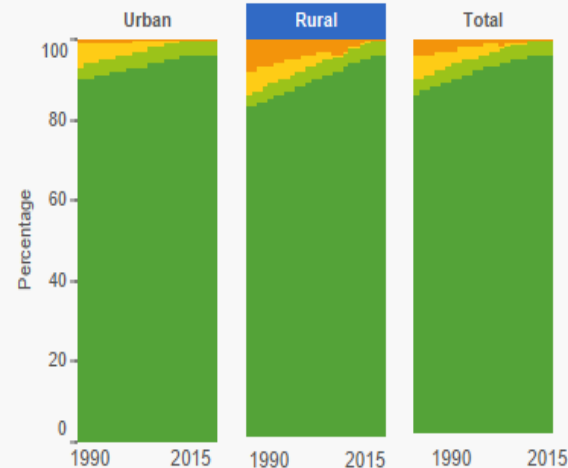


# Status of Sanitation & Environmental Health in Malaysia

14 States | 144 Local Authorities | Population: 32 Million | 189 River Basin

96%

Population with access to improved sanitation



70%

Population Connected to Wastewater Treatment Systems

90%

Increase in ratio of Clean Rivers in 2015 vs 1993

26%

Population Connected to Septic Tanks

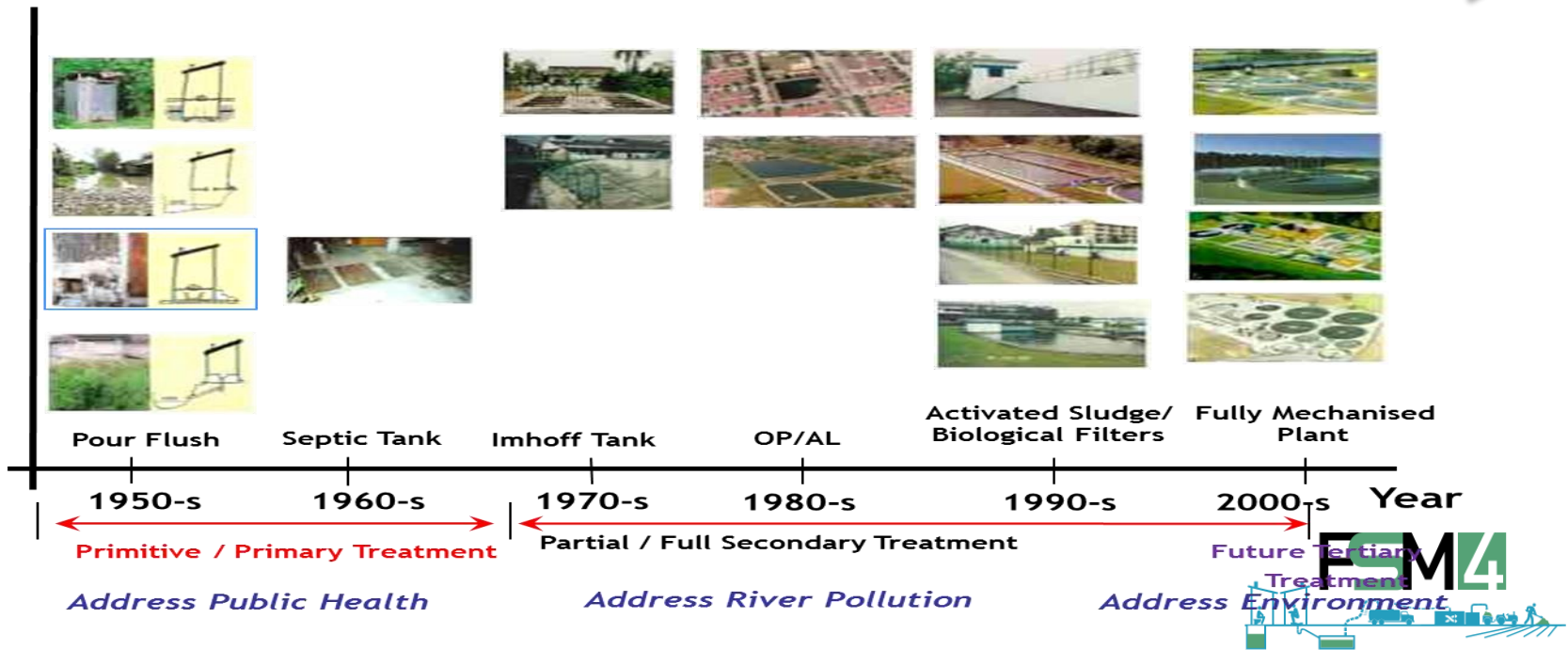
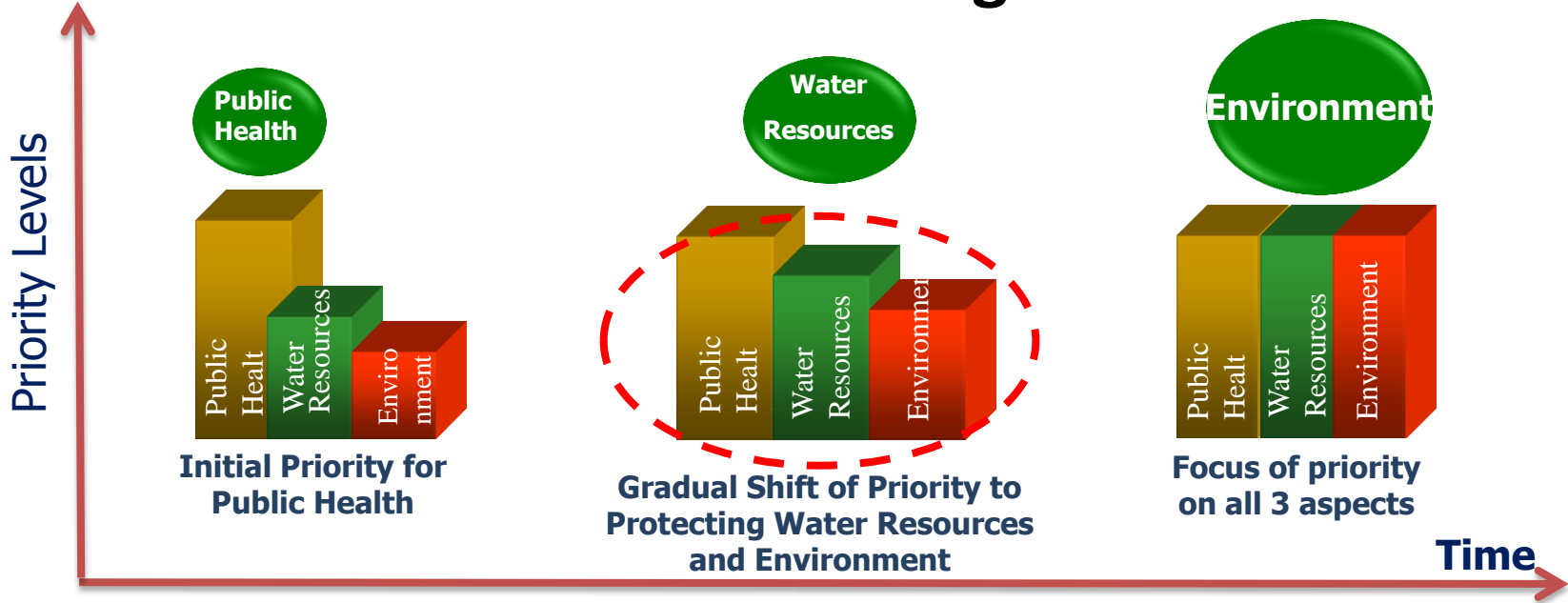
95.5%

Population served with Piped Water Services

Water Borne Disease Related to Sewage Pollution => **Negligible**

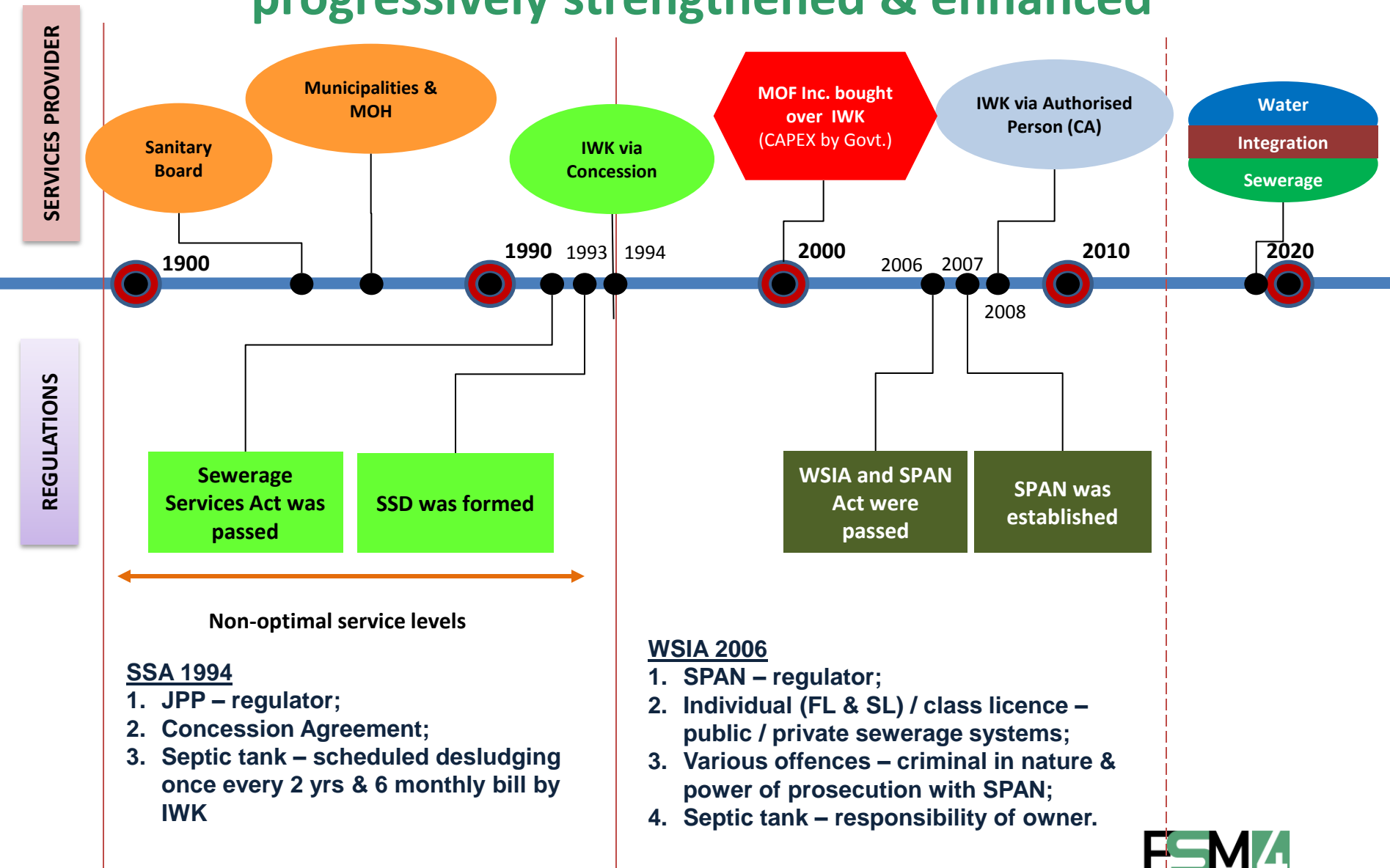


# The Needs of Sewerage Services



# Sewerage Management in Malaysia

## progressively strengthened & enhanced



# IWK's Key Obligations

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- a) Manage, operate, maintain the existing and new public sewerage systems;
  - b) Upgrade and refurbish the existing public sewerage systems;
  - c) Plan, design, construct and commission new public sewerage systems;
  - d) Receive, collect, treat and dispose of sewage and sewage sludge
  - e) Empty, transport, treat and dispose of sewage sludge from septic tanks
  - f) To collect and retain sewerage charges from customers
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**Note :**

*Item (b) and (c) are not carried out since Water Services Industry Act (WSIA) 2006 was enforced.*

*The role is being undertaken by the Government.*

**Spirit of the WSIA 2006 :**

- OPERATOR TO BE ASSET LIGHT
- OPERATOR FOCUS ON DELIVERY OF SERVICE TO CUSTOMERS



# Governance Structure of Sewerage Services in Malaysia



Ministry of Energy, Green Technology and Water

Undertakes Refurbishment or Upgrading Projects Funded by Government



Ministry of Finance

Owns Indah Water through the Minister of Finance Incorporated



Ministry of Natural Resources & Environment



Suruhanjaya Perkhidmatan Air Negara

National Water Services Commission

Policy & Control of National Sewerage Agenda by Government

Regulates Sewerage Services



- 1. Provision of Sewerage Services in 87 Local Authority Areas
- 2. Sewerage Services Billing & Collection

Regulates Effluent Discharge



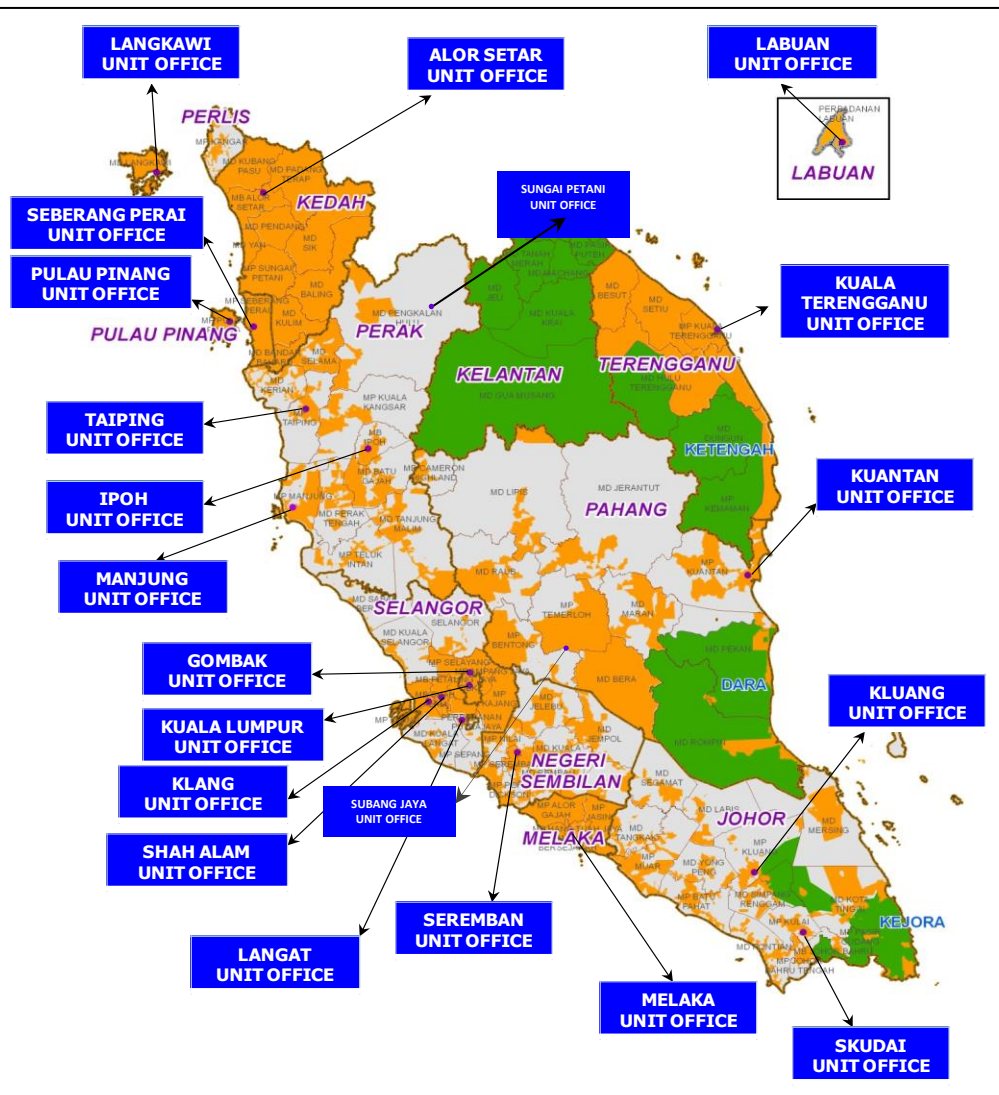
Department of Environment

Ensures a well balanced and sustainable management of natural resources and environment



# IWK Operates in Peninsular Malaysia

## excludes Kelantan, Part of Johor, Sabah & Sarawak



Business Dimension	2000	2016
Total Unit Offices	17	<b>21</b>
No. of Local Authorities	86	<b>87</b>
No. of STP	3,003	<b>6,460</b>
No. of CST	3,454	<b>3,637</b>
No. of IST	890,870	<b>1,278,904</b>
No. of NPS	277	<b>1,063</b>
Sewer length (km)	9,236	<b>18,153</b>
Total PE	9.0Mil	<b>23.1Mil</b>
No. of billed customers	1.4 Mil	<b>3.7 Mil</b>

Data as of 2016

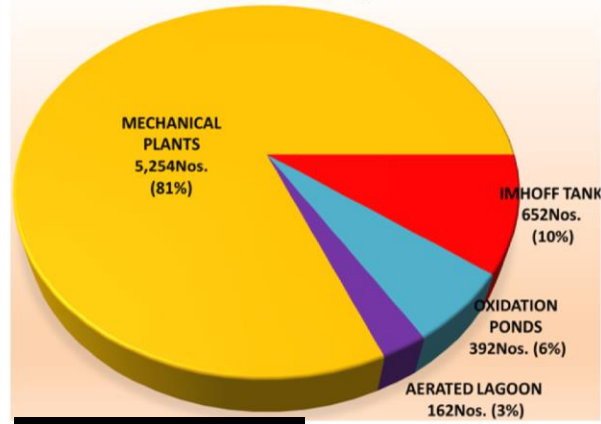
- IWK Operational Area
- Non IWK Operational Area
- Outside Local Authority Areas





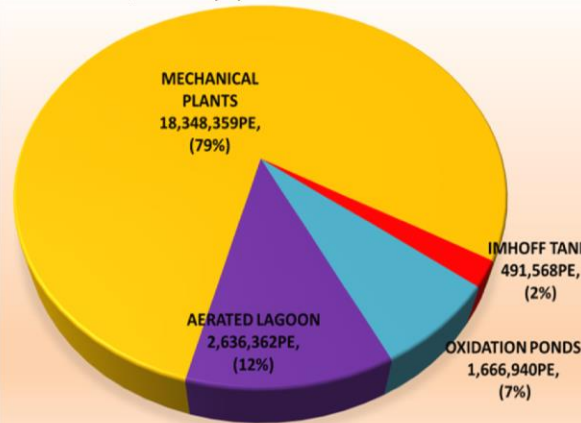
# Profile of Public Sewage Treatment Plants

TYPES OF SEWAGE TREATMENT PLANT (STP) AS OF APRIL 2016



**Total STPs = 6,460**

POPULATION EQUIVALENT (PE) CATERED BY STP AS OF APRIL 2016



**Total PE STPs = 23,143,229**

TYPE OF SERVICE AND POPULATION SERVED

Type of Service	IWK Service Areas				Total PE	%
	Public (IWK)		Private / Individual (Non-IWK)			
	No	PE	No	PE		
Connected	6,460	23,143,229	4,682	2,958,572	26,101,801	70.5
CST	-	-	3,637	412,673	412,673	1.1
Septic Tank	-	-	1,278,904	6,394,520	6,394,520	17.3
Pour Flush	-	-	826,388	4,131,940	4,131,940	11.2
<b>Total</b>	<b>6,460</b>	<b>23,143,229</b>	<b>2,113,611</b>	<b>13,897,705</b>	<b>37,040,934</b>	<b>100</b>

## Aspects

Aspects	% of PE			
	Urban		Rural	
	Connected	Septic Tank	Connected	Septic Tank
Concession Target	84.3%	15.7%	29.5%	70.5%
Current Status	73.2%	17.8%	38.7%	31.1%

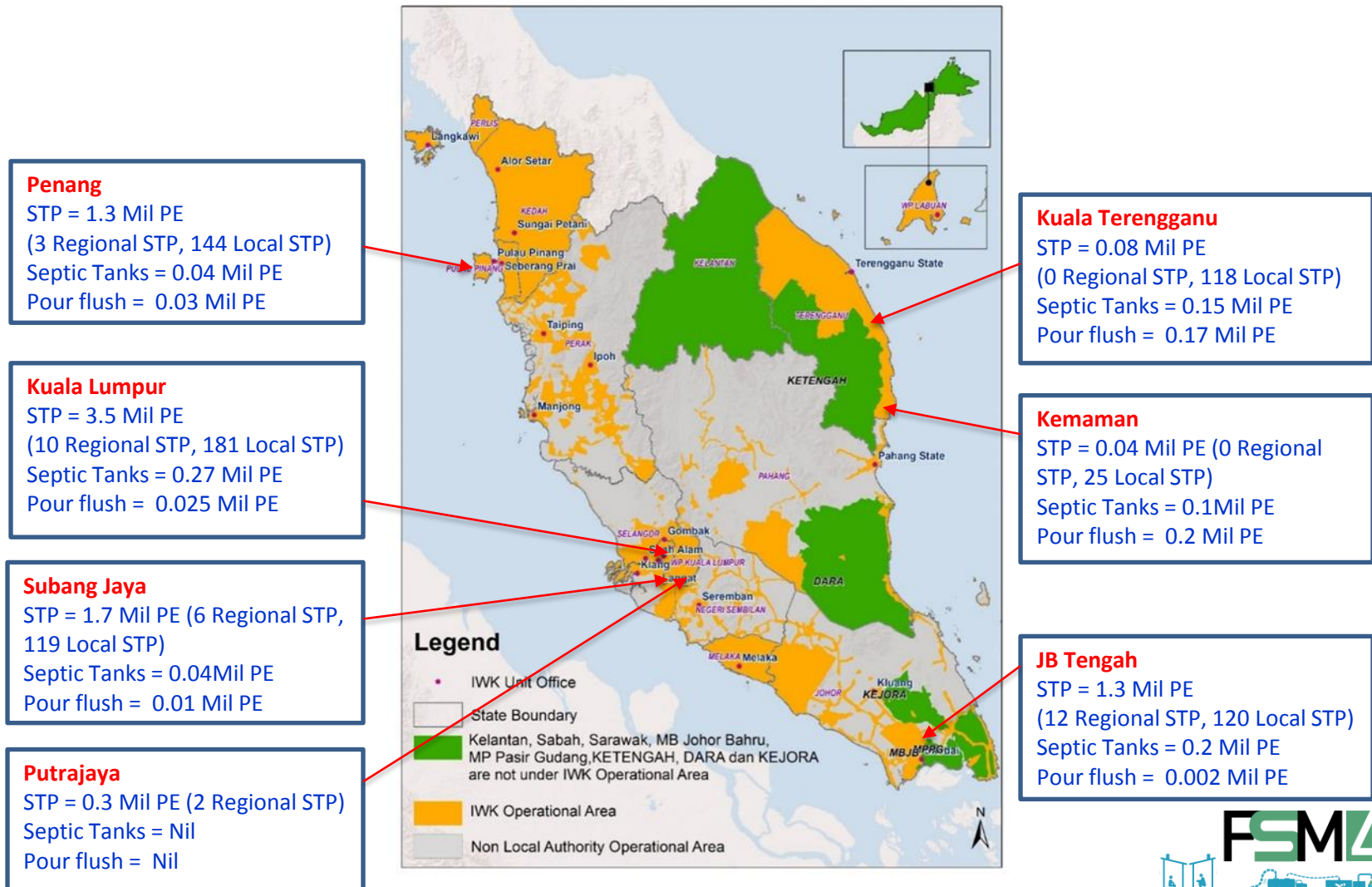
	PE < 5,000	5,000 < PE ≤ 20,000	PE > 20,000	TOTAL
STP No	5,646	654	160	6,460
Total PE	6,503,012	6,109,100	10,531,117	23,143,229

13% STP > 5,000 PE;  
serving 72% of PE

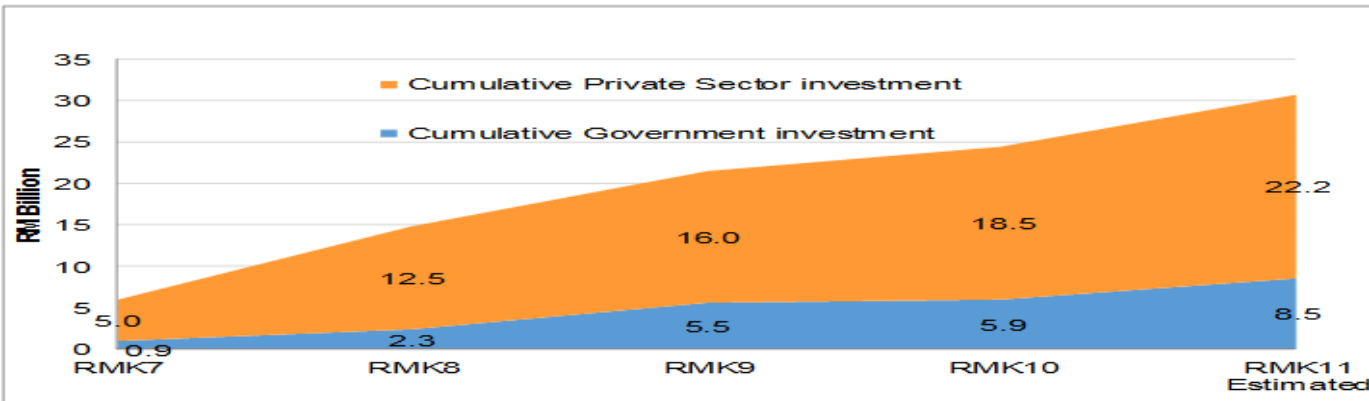
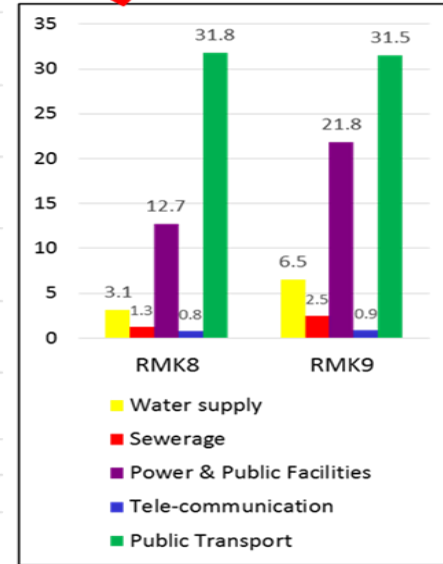
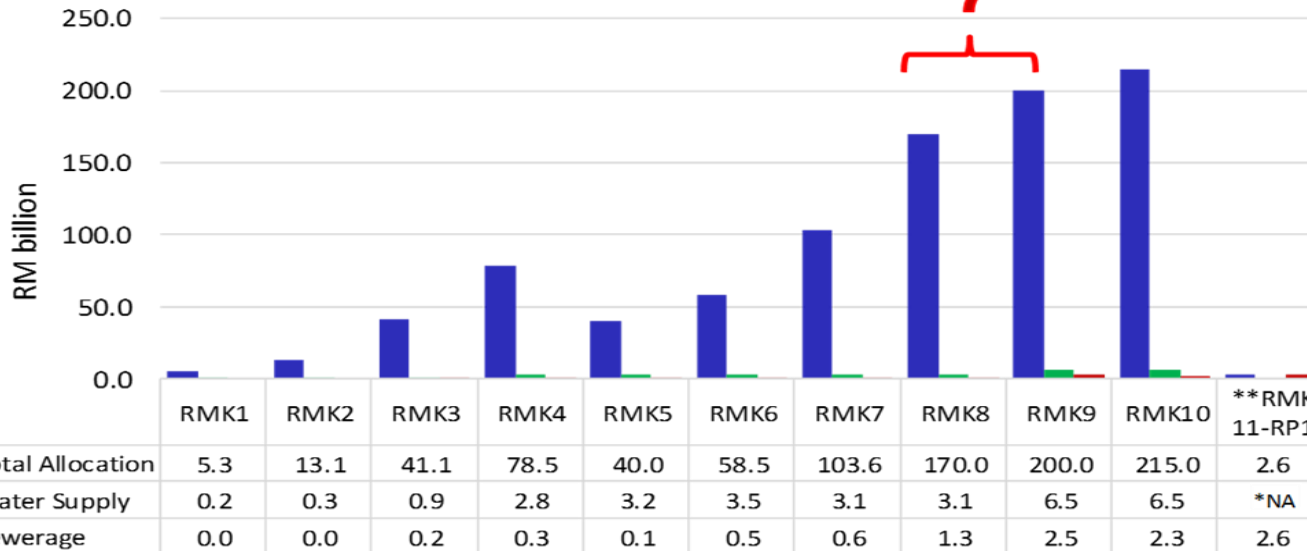




# Various Sewerage System Types Co-exist in a City in varying proportion, based on the need of the City



# Investment In Sewerage Infrastructure



- Government investment in sewerage infrastructure to-date (up to RMK11) is estimated at RM9 billion.
- Private sector is estimated to have invested nearly RM22.2 billion to-date in sewerage infrastructure.
- The sewerage development, which is predominantly driven by developers, has resulted in many problems.

## Impact Due To Shortfall In CAPEX Investment:

- The imbalance in investment by the Government and private sector has resulted in the sewerage industry being not on par with other utilities.
- Ad-hoc development by private sector has caused IWK to increase its operational costs in addition to higher risks to the environment.



# Sewerage Services Tariff in Malaysia

## since 1994

### Regulated under the Sewerage Services (Charges) Regulations 1994

DOMESTIC & GOVERNMENT QUARTERS		
Category / Description	Connected (RM)	Septic Tank (RM)
Domestic premises & Government Quarters class A, B, C, D and E	8.00	6.00
New Village	3.00	3.00
Low Cost premises & Government Quarters class F, G, H and I	2.00	2.00

1 USD = RM 4.45 | RM 1 = INR 15.04

GOVERNMENT PREMISE	
Connected (RM)	Septic Tank (RM)
40.00	25.00
Excess Charge of RM0.45 per m <sup>3</sup> (>100m <sup>3</sup> )	
Excess Charge of RM0.95 per m <sup>3</sup> (>200m <sup>3</sup> )	

INDUSTRIAL PREMISE	
Connected (RM)	Septic Tank (RM)
RM2.50 per person	RM2.00 per person
Min charge of RM25.00 per month	Min charge of RM20.00 per month

COMMERCIAL PREMISES					Avg Water Consumption per month (m <sup>3</sup> )	Excess Charge per m <sup>3</sup> (RM)
Band	Min Annual Value (RM)	Max Annual Value (RM)	Connected (RM)	Septic Tanks (RM)		
1	0	2,000	8.00	7.00	100 or less	Exempted
2	2,001	5,000	14.00	8.00		
3	5,001	10,000	20.00	14.00	Above 100 to 200	0.30
4	10,001	20,000	26.00	19.00		
5	20,001	30,000	29.00	21.00	Above 200	0.45
20	5,000,001	7,000,000	9,200.00	6,000.00		
21	7,000,001	above	9,600.00	6,600.00		



# Improvement in Sewerage Services

## IWK terbaik Asia

**KUALA LUMPUR 2 April** – Korporasi Air dan Sewerajaya (IWK) Asia telah meraih predikat 'IWK Terbaik' dalam kategori 'IWK Terbaik' sebagai pengenal pasti 'IWK' terbaik di Asia. Penghargaan ini diberikan kepada IWK sebagai pengenal pasti 'IWK' terbaik di Asia. Penghargaan ini diberikan kepada IWK sebagai pengenal pasti 'IWK' terbaik di Asia.



- Operations & Maintenance
- Risk Management
- Desludging Services
- Compliances
- Enhanced Security
- Monitoring System

Operational



Infrastructures

- Asset Management System
- Nationwide Catchment Strategy
- Guidelines Standardisation
- Product Standardisation
- STP Standardisation
- Green Technology
- Management IT Support System

Capacity Development

- Training & Certification
- R&D & Innovation

Public Awareness

- Communications
- Public Campaigns
- Education



KEY IMPROVEMENT

Collection Trends

- Billing & Collection Mechanism

Customer Services

- Operational Complaints
- Level of Services

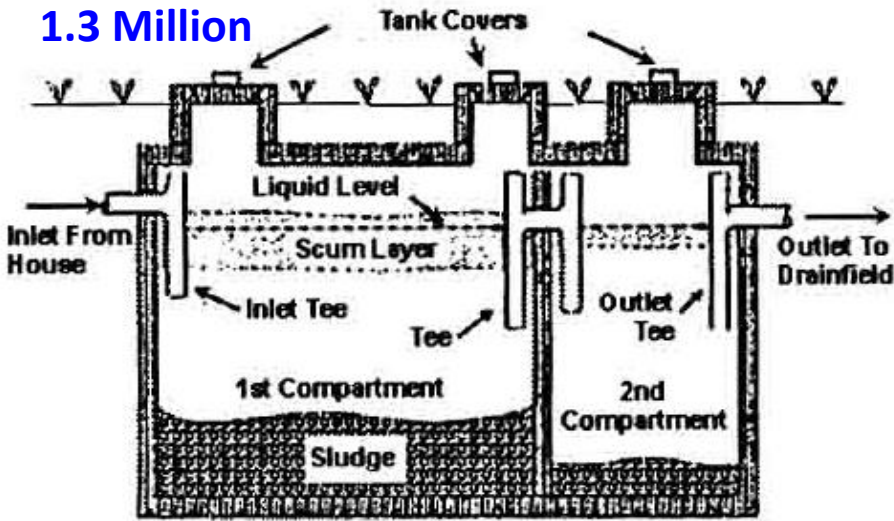




# SEPTIC TANKS IN MALAYSIA

## INDIVIDUAL SEPTIC TANKS

1.3 Million



CAST IN-SITU

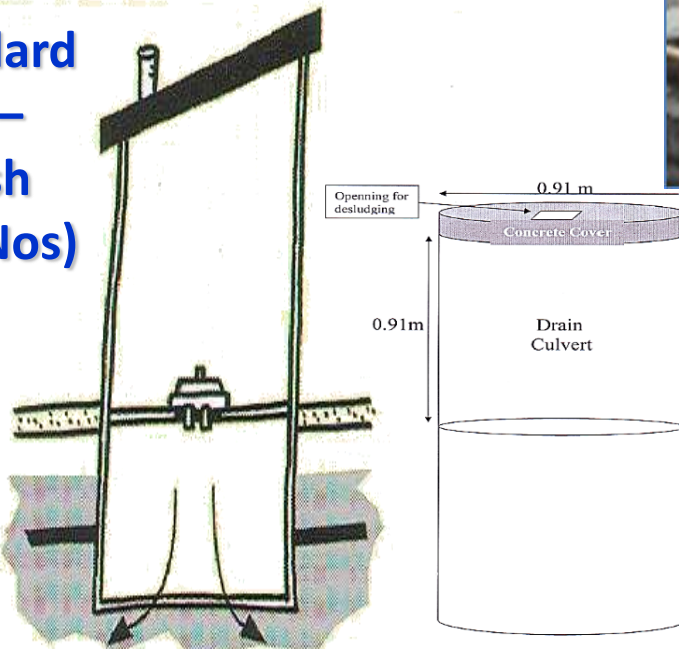


PREFABRICATED

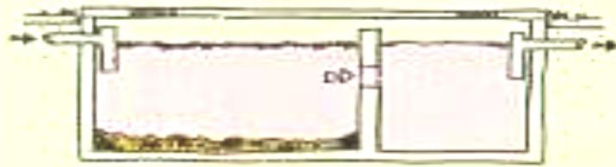


COMMUNAL SEPTIC TANK (3600 Nos)

Non Standard System – Pourflush (800,000 Nos)



# Septic Tanks Need to be Desludged or Emptied 2 to 3 years cycle depending on household occupancy



NEW



BOD = 80  
SS = 120



1 YEAR



BOD = 100  
SS = 180



2 YEARS



BOD = 220  
SS = 250



3 YEARS



BOD = 250  
SS = 300

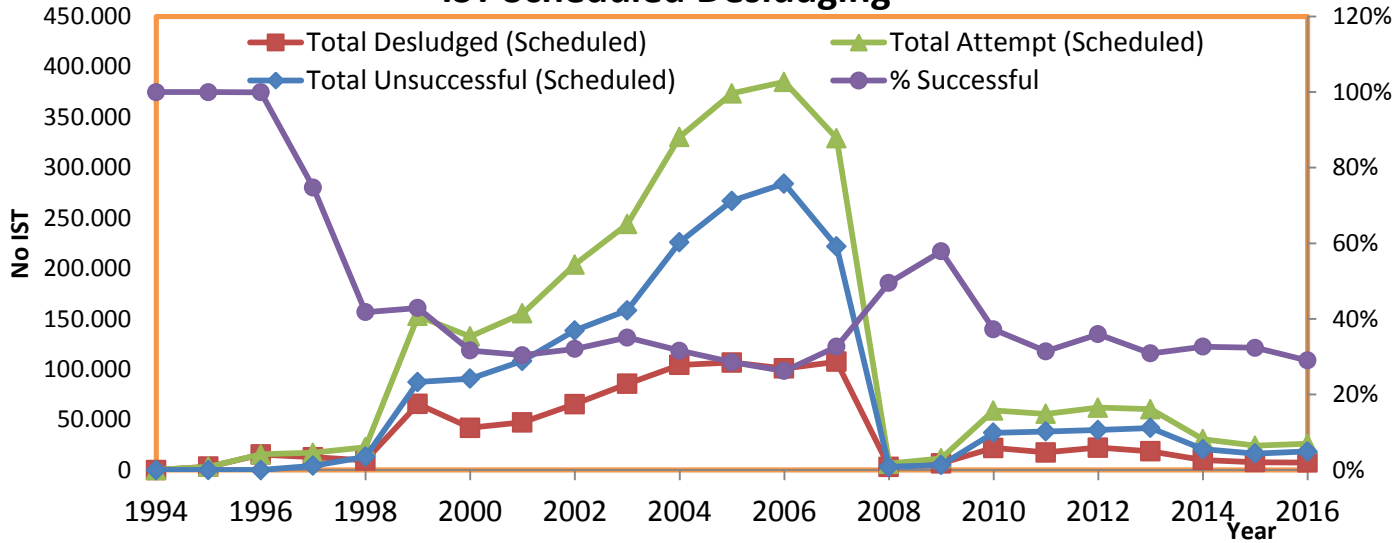




# Septic Tank Desludging Status in Malaysia

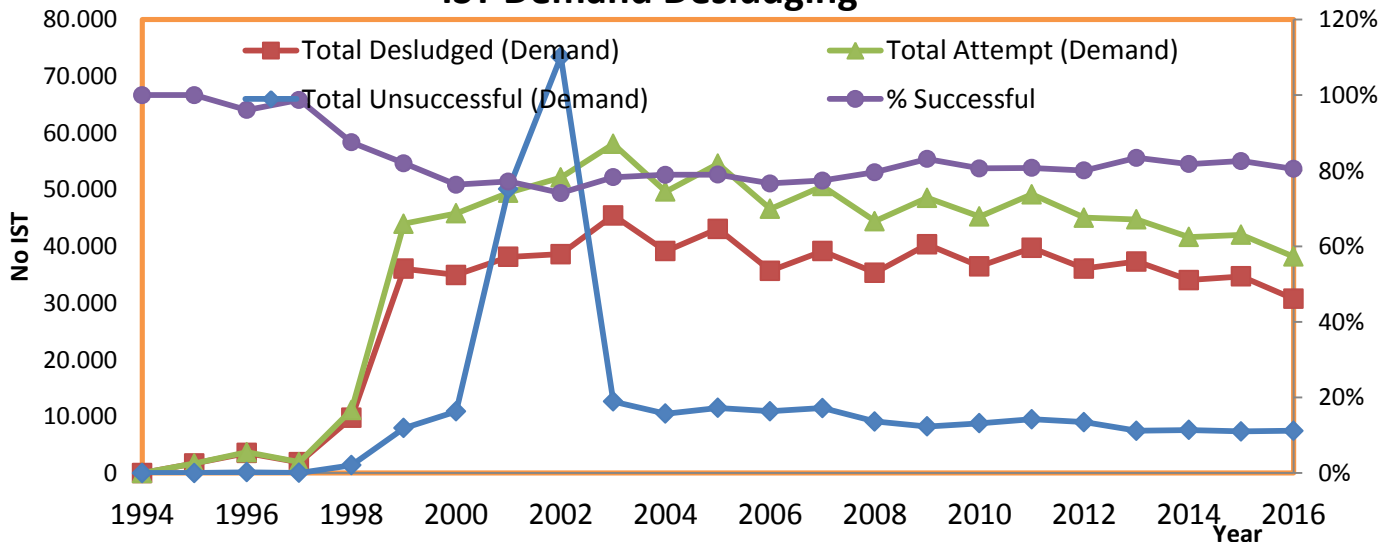
## Two Types of Services – Scheduled and Demand

### IST Scheduled Desludging



- Achieve 30% success rate
- Unsuccessful reasons:
  - Refused access
  - Nobody home
  - Obstruction
  - Inaccessible
  - Lack of enforcement

### IST Demand Desludging



- Liberalization of desludging services
- Onus on the house owners/occupier to ensure septic tank is deslugged – scheduling stopped

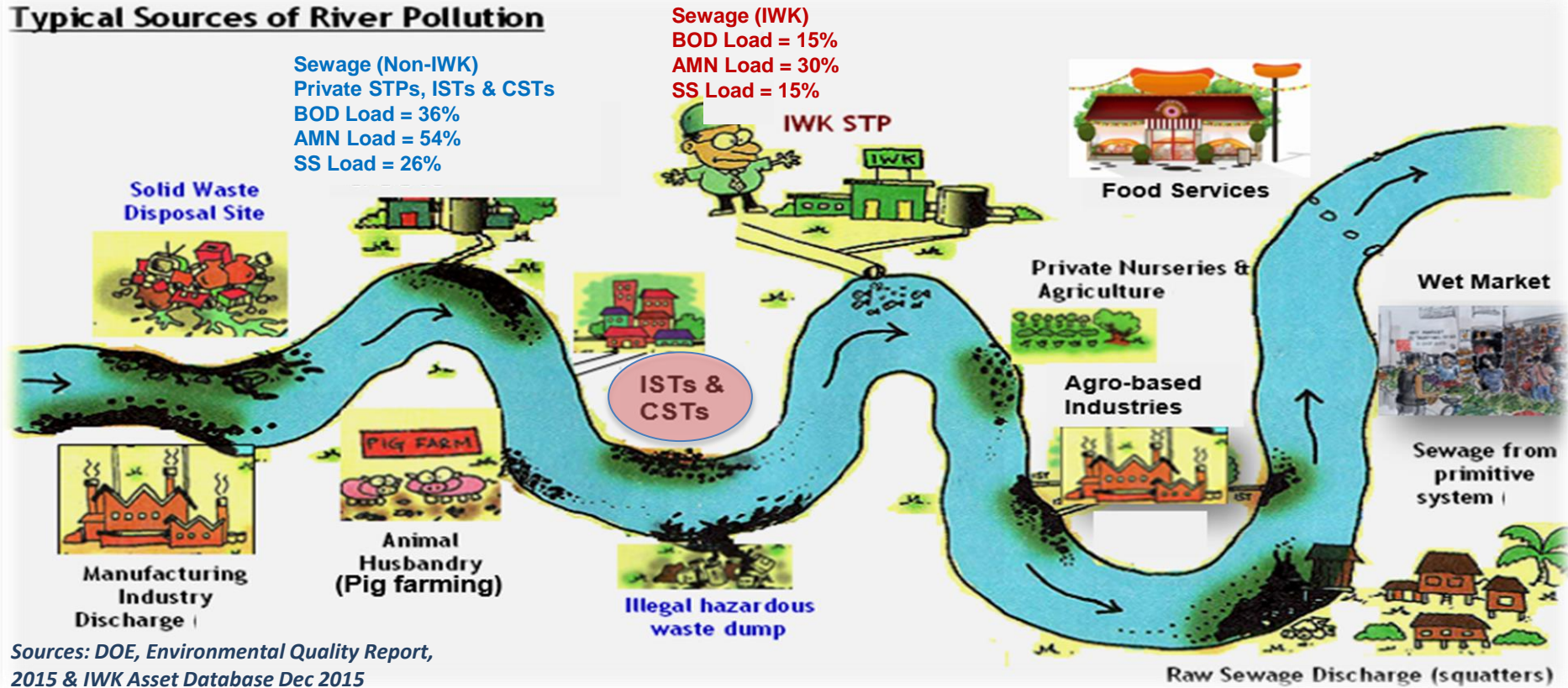




# Sources of River Pollution in Malaysia

## - Sewage Tops the List

### Typical Sources of River Pollution



Sources: DOE, Environmental Quality Report, 2015 & IWK Asset Database Dec 2015

SOURCES	BOD LOAD (%)	SS LOAD (%)	AMN LOAD (%)
Animal farm (Pig farming)	41	49	11.3
Sewage	51	41	83.7
Manufacturing Industries	5	6	1.5
Agro-based Industries	2	3	3.4
Wet Market	1	1	0.1
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>100</b>

Investing in sewerage infrastructure is important but actions are also needed to address other polluters, if river pollution is to be effectively addressed



# Sources of River Pollution in Malaysia

## Septic Tanks are the Major Source

ESTIMATION OF LOADINGS (BOD, SS & AMN) FROM VARIOUS SEWAGE SOURCES (as at December 2015)

Types	Sources	PE	Regulatory Standard	Total Loading (kg/day)		
				BOD	SS	AMN
<b>Public Plants (IWK)</b> 1,2,3	6,397	22.65 mil	EQ(S)R, 2009	80,833	138,183	69,147
<b>Private Plants</b> <sup>4</sup>	4,626	3.03 mil	EQ(S)R, 2009	34,081	68,163	34,081
<b>CST</b> <sup>4</sup>	3,637	0.41 mil	EQ(S)R, 2009	7,428	6,685	3,714
<b>IST (Desludged)</b> <sup>5, 7</sup>	215,463	1.08 mil	No regulatory standard	19,392	17,453	9,696
<b>ISTs (Non Desludged)</b> <sup>6</sup>	1,058,515	5.29 mil	No regulatory standard	119,083	142,899	47,633
<b>Pour Flush / Primitive System</b> <sup>6</sup>	826,388	4.13 mil	No regulatory standard	92,969	111,562	37,187
<b>TOTAL</b>		<b>36.58 mil</b>		<b>353,786</b>	<b>484,945</b>	<b>201,459</b>

Note: Data provided is within IWK services area only

- BOD Actual Load from Public Plants (IWK) is 23% of total sewage load**
- SS Actual Load for Public Plants (IWK) is 29% of total sewage load**
- AMN Actual Load for Public Plants (IWK) is 34% of total sewage load**
- Allowable total load if all plants were to comply to EQ(S)R,2009 Standards
- Total loading from ISTs (desludged) based on effluent discharged of BOD=200 mg/l, SS=180 mg/l, AMN = 100mg/l
- Total loading were taken based on raw sewage discharged (BOD=250 mg/l, SS=300 mg/l, AMN = 100mg/l)
- Total number of ISTs desludged in year 2013, 2014 and 2015 (3 years cycle)



# Fecal Sludge Treatment

## Type of Methods, Systems and Technologies

### Trenching



### Sludge Lagoon



### Drying Bed



### Geobags



### Mechanized Sludge Dewatering Facility



### Centralized Sludge Treatment Facility



- There is no one type that fits all purpose
- Built with environmental mindedness

# Disposal / Reuse of Sludge

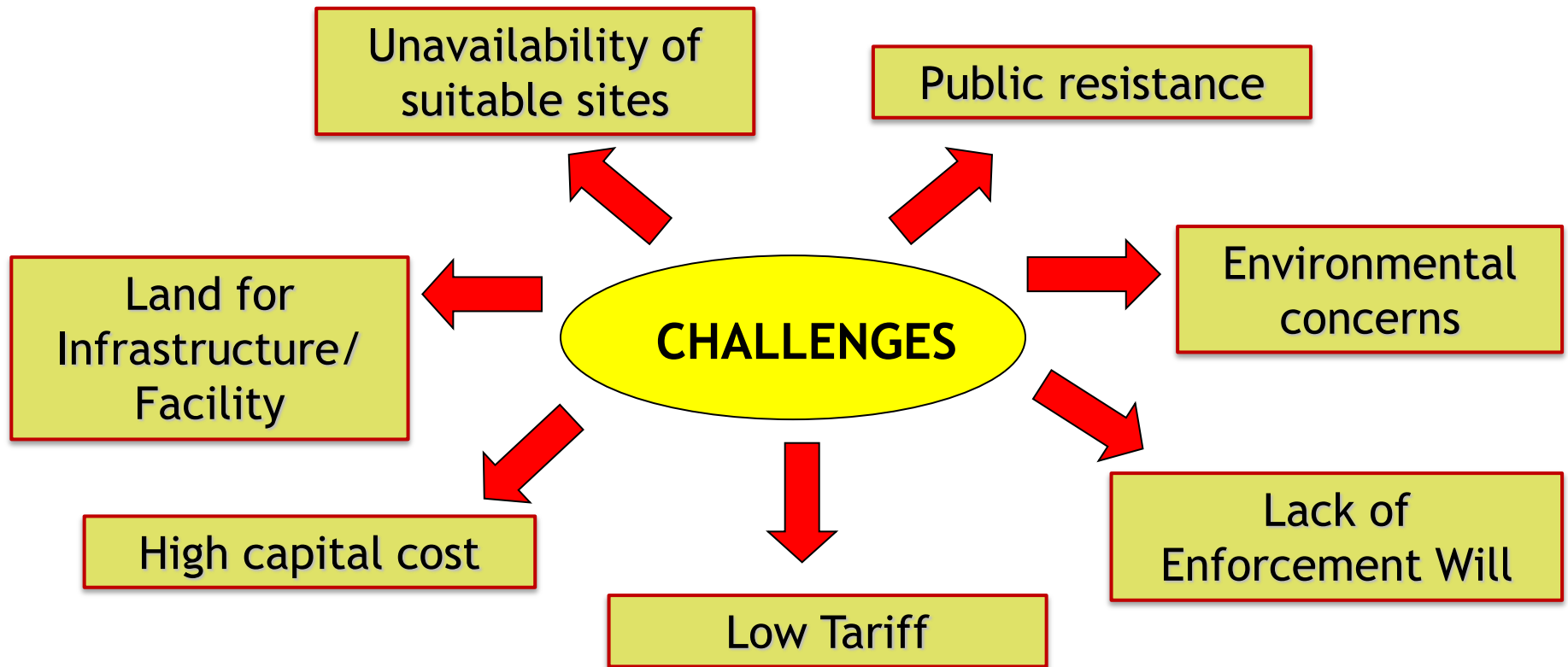
## Treated Sludge is not Fecal Matter

- In Malaysia, dewatered sludge is disposed – landfill
- R&D on reuse extensively done
  - Potential for resource recovery
  - Nutrient, energy value
- Reuse – very marginal but gaining interest.
  - Use for landscaping plants by Municipalities.
- Land application, composting – for non food crop
- Leverage on National Green Technology Policy
- Guidelines being developed by the Regulator



# Challenges in Fecal Sludge Management

## The Malaysian Scenario



# Management of Fecal Sludge

## Summary & Takeaways

- Engage with stakeholders – from regulators to customers/public
- Enforcement
  - Empower the main providers of sewerage and desludging services
- Communications Programme – Public Awareness and Education for ALL stakeholders
  - Use various media forms, from newspapers to Facebook
  - Involve Schools
  - Include Policy and Decision Makers
- Be transparent
  - Institute Customer Charter, Level of Services and Targets
  - Measure, monitor and improve
- Know your customers
  - Collect and capture customer data,
  - Septic tank details – e.g. size, location



# Management of Fecal Sludge

## Summary & Takeaways

- Exploit on IT system
  - Customer care system
  - Mapping of septic tank areas and customers
- Adapt and adopt Technology to facilitate FSM efficiently and effectively
  - Vehicle Monitoring System (VMS)
  - Instant dewatering of sludge – mobile units
- Operations management – desludging works/logistics, outsourcing/term contractors, sludge treatment and disposal facilities at strategic locations, record keeping
- Develop local vendors, service providers and enterprises
  - Partnership programme
- Capacity Building & Training
- Incentive scheme helps





# Management of Fecal Sludge

## Summary & Takeaways

- Selection of Technology for sludge treatment
  - Proven, modular basis, innovative low-medium technology, less demand on operator skill, low energy and O&M cost, efficient land use
  - affordable to the community.
- Be responsible for the fecal sludge
  - Know its quality, quantity and fate (cradle to grave)
- Rebrand “Fecal Sludge” to encourage Recycling and Resource Recovery
- Short Term and Long Term Sludge Management Strategies
- Sustainable tariff and strategies for full cost recovery



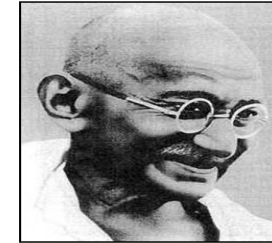
## Quotes on Sanitation



**Indira Gandhi**

*“Sanitation in India is not only cleanliness; it is also an end of the humiliation and miseries of scavengers who carry human excreta on the head.”*

*“ I may not be born again, but if it happens I will like to be born in a family of scavengers, so that I may relieve them of the inhumane, unhealthy and hateful practice of carrying nightsoil.”*



**Mahatma Gandhi**



**Jawaharlal Nehru**

*“The day everyone of us gets a toilet to use, I shall know that our country has reached the pinnacle of progress.”*

# THANK YOU

**For Any Enquiries, Please Contact:**

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# Lessons Learned from Malaysian Sewerage Management

## Water & sewerage to be managed as a full water cycle

- Integration of water & sewerage services

## Reduce proliferation of small plants

- Rationalization of plants

## Mixed Sewerage Systems in a Catchment/Local Areas

- Institute effective management

## Many plant types & sizes affecting efficiency & effectiveness

- Standardization of plants

## Escalating cost of operations vs Tariff is not sustainable

- Optimize cost
- Risk management
- Engagement with stakeholders

