AN OVERVIEW OF MALAYSIA’s SEWERAGE MANAGEMENT

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BACKGROUND OF SEWERAGE MANAGEMENT IN MALAYSIA

Mostly urban by Municipalities, rural by the 144 Individual Local Authorities

A new sewerage Act 1993 (Act 508) was passed by the parliament
Sewerage Services Department (SSD) was formed as a regulator Agency for Sewerage under the new Act
Indah Water took over sewerage management (O & M) in most states in Peninsular Malaysia
Indah Water provides sewerage services in 88 out of the 144 Local Authorities in Malaysia (however not on holistic manner) Rest of the areas is still managed on Ad-Hoc basis

Indah Water & Maajari as Service licensee under WSIA regime.

BEFORE - INDEPENDENCE
- 1957
AFTER - INDEPENDENCE
- 1987
PRE-1994
- June 1993
- Dec 1993
1994 ONGOING
- Up to 2008
CURRENTLY

Mostly Managed by local Sanitary Board
Urban by Municipalities, Rural by Ministry of Health

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EVOLUTION OF SANITATION IN MALAYSIA

Early Days in Malaya

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology</th>
<th>Year</th>
<th>Technology</th>
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</thead>
<tbody>
<tr>
<td>1950-s</td>
<td>Pour Flush</td>
<td>1960-s</td>
<td>Septic Tank</td>
</tr>
<tr>
<td></td>
<td>Primitive / Primary Treatment</td>
<td></td>
<td>Imhoff Tank</td>
</tr>
<tr>
<td>1970-s</td>
<td>Partial / Full Secondary Treatment</td>
<td>1980-s</td>
<td>OP/AL Activated Sludge/Biological Filters</td>
</tr>
<tr>
<td></td>
<td>(Address Public Health)</td>
<td></td>
<td>Fully Mechanised Plant</td>
</tr>
<tr>
<td>1990-s</td>
<td>Future Tertiary Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Address River Pollution)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Future Tertiary Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Address Environment)</td>
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Governance Structure of Sewerage Services

Ministry of Energy, Green Technology & Water

Regulator of Sewerage Services

1. Policy & Control of National Sewerage Agenda
2. Capital projects (CAPEX)
3. Refurbishment/upgrading projects.

Ministry of Finance

1. 100% Equity Govt. Support Loan & Subsidy

1. Sewerage Services
2. Operator in 102 Local Authority Areas.
4. Refurbishment/upgrading projects funded by government.

Ministry of Natural Resources & Environment

Regulator of Effluent Standards

Control of Pollution and Environment
THERE IS A NEED FOR COORDINATED FINANCIAL INVESTMENT TO FURTHER IMPROVE QUALITY

SEWERAGE CAPITAL WORKS

GOVERNMENT FUNDED
- Every 5 years National Plans
- Sewerage Capital Contribution

CONCESSIONAIRE FUNDED
- Soft Loan and Capital Markets
- Built into Tariff Structure

DEVELOPER FUNDED
- Part of Land and Property Development
- Major Contributor of Sewerage Capex

SPAN and Water Services Industry Act

- Provide policy direction, goals & targets in line with National needs
- Economic regulation to protect customers and ensure sustainability

Government Capital Projects
- Assess asset needs of SL
- Determine funding and procurement strategies
- Provide assets & lease

Facility Licensee
- In line with policy direction, goals & targets determine asset needs
- Provide service to meet stakeholder expectation

Service Licensee
Areas of Sewerage Services Coverage

- Operations (under IWK) only cover 88 of 144 local authorities in M'sia.
- The entire states of Kelantan (under Maajari), Sabah, Sarawak, Johor Bahru & Pasir Gudang not taken over although provided in Concession Agreement.
- Regional development authority areas such as KETENGAH &KEJORA are excluded.

### TOTAL OPERATIONAL AREA AND POPULATION SERVED

<table>
<thead>
<tr>
<th>AREA</th>
<th>%</th>
<th>POPULATION EQUIVALENT (PE)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWK</td>
<td>68,505.88</td>
<td>-51.79</td>
<td>-19,333,568*</td>
</tr>
<tr>
<td>NON-IWK</td>
<td>63,769.54</td>
<td>-48.21</td>
<td>-7,361,729</td>
</tr>
<tr>
<td>TOTAL</td>
<td>132,275.42</td>
<td>-100.00</td>
<td>-26,695,297</td>
</tr>
</tbody>
</table>

* Exclusive of 2.96 million population utilising primitive (pour flush) systems.

Profile of Public Sewage Treatment Plants (August 2011)

- **Communal Septic Tanks & Imhoff Tank**: 4,369 no.
- **Mechanical Plant**: 4,547 no.
- **Oxidation Ponds**: 422 no.
- **Pipe Network**: 15,154 km

Approx. 1.2 million Individual Septic Tanks but only 35% are accepting Scheduled Desludging services.

Total Population Equivalent Served via connected PE (public plants excluding CSTs) is 19.17 million.

Sewerage Asset (Aug 2011)

- **Length Of Sewerage Pipes**: 15,154 km
- **No of STPs (excludes CST)**: 5,706 units
- **No of Pumping Station**: 825 units
### Sewerage Service Customers & Tariff

<table>
<thead>
<tr>
<th>Type of Premises</th>
<th>Type of Customers</th>
<th>Basis of Billings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>No. of Accounts: 2.5 million</td>
<td>Once Every 6 Months from RM 2, RM 3, RM 6 &amp; RM 8 per month</td>
</tr>
<tr>
<td>Commercial</td>
<td>No. of Accounts: 220k</td>
<td>Monthly with bands based on Annual Value &amp; Excess Charge &gt;100 m³</td>
</tr>
<tr>
<td>Industrial</td>
<td>No. of Accounts: 4k</td>
<td>Monthly with Head Count between RM 2 (IST) or RM 2.50 (Conn) per head &amp; per month</td>
</tr>
<tr>
<td>Government</td>
<td>No. of Accounts: 105k</td>
<td>Monthly with Basic Charge RM 25 (IST) or RM 40 (Conn) per month</td>
</tr>
<tr>
<td>Government</td>
<td>No. of Accounts: 11k</td>
<td>Monthly with Basic Charge RM 25 (IST) or RM 40 (Conn) per month</td>
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**TOTAL** 2.8 million

### What is a Fair & Equitable Sewerage Charging Mechanism?

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Community</strong></td>
<td></td>
<td>Private Good</td>
<td>Polluter Pay</td>
<td><strong>Beneficiary Pay</strong></td>
</tr>
<tr>
<td>USER</td>
<td>Remove wastes from Premises</td>
<td>X</td>
<td></td>
<td>User Charge</td>
</tr>
<tr>
<td>COMMUNITY</td>
<td>Improved Public Health, Enhanced Land / Property Value</td>
<td>X</td>
<td></td>
<td>Community Tax/Property tax</td>
</tr>
<tr>
<td>WATER RESOURCE</td>
<td>Social and Economic Activities Associated to Waterways</td>
<td>X</td>
<td>X</td>
<td>Cess Tax</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
<td>Healthier &amp; Pleasant Place to Live</td>
<td>X</td>
<td></td>
<td>Environmental Tax</td>
</tr>
<tr>
<td>ECONOMY / INDUSTRY</td>
<td>Development of Commercial / Industrial Enterprise e.g. tourism, businesses, etc.</td>
<td>X</td>
<td></td>
<td>Industry Tax</td>
</tr>
<tr>
<td>CITY / STATE</td>
<td>Overall Benefits for Progression</td>
<td>X</td>
<td>X</td>
<td>Government Tax (Quit Rent)</td>
</tr>
</tbody>
</table>

- Pay for damages caused to environment
- **Pay for benefits gained from clean environment**

THE CURRENT THOUGHTS OF FULL COST RECOVERY FROM USERS MAY NEED TO BE REVIEWED TO INTRODUCE A FAIR AND EQUITABLE CHARGING FOR SEWERAGE SERVICES
Communications Programmes To Increase Willingness to Pay

Communications Programs through the APPEAL APPROACH by:

1. Educating users (present & future)
2. Environmental & Health Awareness Campaigns
3. Customer Friendly
4. Community Support
5. Corporate Social Responsibility

Tools/Avenues Employed:

1. Community Events
2. Media Outreach (TV/Radio/News Print Educational Avertisals)
3. Briefing/Dialogues
4. Display Materials
5. Educational Materials
6. Schools Program
7. Homepage/Website

Sustainable Sewerage Planning & Development

Planning Strategy

- Sewerage Catchment Strategy (SCS) to provide systematic and integrated development of sewerage infrastructure and sludge management facilities
- Strategies based on drainage basin or by Local Authorities
- Long term regionalization concept coupled with interim strategies to address current issues
- Prioritization based on availability of funds and affordability
- Application of Integrated GIS system with comprehensive asset database for effective development planning
Example of Improvement After Effective Planning & Development Controls

**Jelutong Sewage Outfall**
- Before: Sewage discharged direct to coastal waters
- After: New STP (design PE: 1.2 million)

**Jelutong Sewage Treatment Plant**
- Before: Undersized Lagoons (design PE: 20,000) was grossly overloaded
- After: New STP (design PE: 200,000) meets environmental requirements with higher efficiency

Planned Refurbishment Works to Improve Public Sewerage Facilities

- Refurbishment and upgrading of existing public treatment plants and sewers to ensure acceptable performance
- Refurbishment is prioritised according to several categories as follows:
  - Refurbishment of STPs:
    a) Safety & aesthetics
    b) Mechanical works
    c) Electrical works
    d) Civil works
    e) Major Treatment Performance (process)
  - Refurbishment of Sewer network:
    a) CCTV investigations
    b) Rehabilitation
Before and After Refurbishment

Before

Taman Bunga Raya (Semenyih) - Biosoil to Mechanical Plant

After

Taman Semenyih Jaya (Semenyih) - Biosoil to Mechanical Plant

Sewerage Development Controls & Guidelines

Development Controls-National Guidelines

- Nationwide standardization of sewerage infrastructure requirements. Developer Guidelines ensures new plants are built to comply with Department of Environment Standard.

Development Controls-Certification Services

- Instituted certification process for take over of sewerage assets from private developers. Since 1994, processed approximately 15,000 submissions per year.
- Established system to ensure sewage treatment plants are designed & built to required quality to meet Health & Safety, Environmental and Operational requirements.
Operate & Maintain Sewage Treatment Plants:

- Expertise in wide range of treatment technologies and systems
- Monitoring of treatment process performance & plant optimisation
- Scheduled equipments & instrumentations maintenance works (Preventive maintenance)
- Manage automated control systems (e.g. SCADA for large plants)
- Repair works: structures, fences, internal road
- Housekeeping, cleaning, aesthetic, safety
- Laboratory analysis of effluent and sludge quality as required by Department of Environment Malaysia

Operation & Maintenance of Sewerage Systems

- Sewer Blockages, Desludging Services & Sludge Management

* Systematic program for septic tank desludging services were put in place by Operator
* Dedicated sludge treatment facilities with Environmental Assessment approval nationwide

* On the average, 22,610 cases of blockages were received in a year or 1,884 cases per month.
* About 97% of the cases were resolved within the Level of Service of within 48 hours. From 2006, the Level of Service improved from 48 hrs to 24 hrs.

* Note: With WSA implementation in 2008, IWK is not responsible for providing schedule desludging services of septic tank and CSTs
Operation & Maintenance of Sewerage Systems
- Sewer Blockages, Desludging Services & Sludge Management Cont'

Dedicated sludge treatment facilities with Department of Environment approval nationwide

CURRENT SLUDGE FACILITIES

- Trenching System Completed: 25 Nos.
- Sludge Lagoon System Completed: 1 Nos.
- Dedicated Sludge Drying Beds Completed: 3 Nos.
- Trenching System Completed: 25 Nos.
- Integrated Sludge Treatment Facility Completed: 9 Nos.

Filter Press 83 units
Belt Press 58 units
Centrifuge 19 units

Mechanical Dewatering Unit Completed: 23 Nos.
Dedicated Centralised Sludge Treatment Completed: 8 Nos.

Effluent compliance based on 12 months average have shown marked increase.

% compliance to EQA standard (based on 12 months average) has increased from 65.6% to 72.7% over the years.
Operation & Maintenance of Sewerage Systems
- Improvements to the River Water Quality

- The number of river basins monitored increase from 90 (in 1990) to 143 (in 2008)
- The number of clean rivers increase from 28% (1993) to 53% (2008)
- The number of slightly polluted rivers has reduced in the last few years
- The number of polluted rivers has been consistent
- There has been significant improvements since 1997 (after Federalization of Sewerage Services)

- The number of clean rivers decrease from 334 nos. in 2008 to 306 nos. in 2009
- The number of polluted rivers increase from 48 nos. in 2008 to 54 nos. in 2009
- Water quality trend shows a depreciation in 2008-2009. This is partly contributed by the stoppage of scheduled desludging carried out by Operator pursuant to the enforcement of SPANWSIA Laws effective from 1st January 2008.

Creating Value for Sewerage Developments
- R&D Findings for Operational, Environmental & Socio-Economic Benefits

- Treatment Technology
  (e.g: Sewerage system improvement, Energy Efficiency & Savings)

- Environmental Solutions
  (e.g: Sewage by-products recycling & environmental assessment)

- Socio-Economic Evaluation
  (e.g: Social study, economic evaluation of treatment system)

- Technical Training, Certification & R&D

- O&M Operators Training
  (e.g: O&M of sewer network, STP equipment Maintenance)

- Construction Contractors Training
  (e.g: M&E of STP construction, Health & Safety)

- Specialized Training
  (e.g: Planning & Design Sewerage System, Nutrient Removal Process, CCTV Training.)
### Summary of Key Achievements

#### Operation & Maintenance (O&M) Achievements
- O&M expertise for varied sewerage systems.
- Efficient desludging services and septage management.
- Effluent Compliances that contributes to improved water quality.

#### Sustainable Sewerage Planning & Development for Infrastructure Improvements
- Develop Guidelines and Standards
- Nationwide Catchments Strategy
- Integrated Financing strategy for Sewerage development

#### Customer Service & Awareness Program for Sustainable Services
- Efficiently address operational complaints
- Improved Level of Service for customers
- Comprehensive Billing & Collection systems
- Communications and public outreach and education

#### Creating Value For The Sewerage Industry
- R&D for operational improvements & sustainable services
- Training & Accreditation services to develop skilled and knowledgeable workforce

### COMPONENTS OF NSDP

- **Refurbishment works**
  - Upgrading and consolidation of sewage treatment plants to meet standards
  - includes network rehabilitation for critical sewer networks experiencing poor structural, hydraulic or operational conditions.

- **Sludge**
  - Provision of a total of sludge facilities for all priority Local Authority areas to handle sludge from desludging of ISTs and multipoint plants.

- **Regionalisation**
  - expansion of sewer networks, construction of new STPs and networks to enable regionalisation of all key urban areas.
  - Sub-components include acquisition of land for siting of facilities.

- **Property connection**
  - maximise benefits of new projects.

- **Pour flush system conversion**
  - convert all of pour flush/sub-standard septic tanks to a basic septic tank system.

- **Sullage connection**
  - program of replumbing of such properties to intercept sullage wastes into sewerage systems.
DEVELOPMENT EXPENDITURE ON SEWERAGE PROJECTS 2001-2011

MINISTRY OF ENERGY, GREEN TECHNOLOGY AND WATER

SEWERAGE PROJECT UNDER NKEA
21 projects
Project cost– RM 5,616,686,000

GREATER KL – RIVER OF LIFE
9 projects
Project cost– RM 2,233,262,000

BUSINESS OPPORTUNITY – SEWERAGE NON RIVER
12 projects
Project cost– RM 3,383,424,000
12 LOCATION PROJECT UNDER SEWERAGE-NON RIVER

1. LAYING OF SEWER NETWORK AT JALAN KLANG LAMA, PETALING JAYA & SEPUTEH
2. CHERAS BATU 11 STP & SEWER LINES
3. CHERAS JAYA STP AND SEWER LINES
4. KAJANG 2 STP AND SEWER LINES
5. KAJANG 1 & 3 STP AND SEWER LINES

6. SEWER REHABILITATION PROJECTS AT KELANG, SHAH ALAM, SUBANG JAYA DAN PETALING JAYA
7. RATIONALISATION 27 STP AT OLD KLANG ROAD
8. RATIONALISATION 33 STP AT PUCHONG
9. SEWER REHABILITATION AT SELANGOR (GSR)
10. LOT 130 STP AND SEWER LINES
11. REFURBISHMENT, & UPGRADING 70 STP
12. RESEARCH ON GREEN TECHNOLOGY APLICATION TO THE EXISTING STP

9 LOCATION RIVER OF LIFE PROJECTS

1. RATIONALISATION 17 STP
2. RATIONALISATION AND UPGRADING STP AT BUKIT ANTARABANGSA
3. PREMIS CONNECTIONS
4. JINJANG KEPONG STP AND SEWER LINES
5. BUNUS STP AND SEWER LINES

6. RATIONALISATION 19 STP AT DAMANSARA
7. SEWER REHABILITATION
8. UPGRAADING 16 STP AT SELAYANG
9. RESEARCH ON STP
Conclusion

- Malaysia has seen spectacular sewerage development over the last 20 years through public-private partnership.
- Conflicts in water management needs to be resolved via social, environmental and economic balances.
- Moving towards full cost recovery is tough but a share from beneficiaries may make the sewerage services sustainable.
- There are potential of resource recovery in the sewerage sector - bioeffluent, biosolids and biogas - plus others than can move the industry from utility to new ventures.
- There is a need for structured capacity development programmes in the sewerage industry to lift the standard of the sector in the future.