“Towards Sustainable Sewerage Development - Sharing Malaysia’s Experiences For Replication”

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6th Ministerial Conference on Environment and Development in Asia and the Pacific (MCED-6)
Astana, Kazakhstan,
27 September to 2 October 2010
## Background of Sewerage Management in Malaysia

<table>
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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Before Independence</td>
<td>Mostly Managed by Local Sanitary Board</td>
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<tr>
<td>After Independence</td>
<td>Urban by Municipals &amp; Rural by Ministry of Health</td>
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<tr>
<td>June-93</td>
<td>Sewerage Act 1993 (Act 518) was passed by Parliament</td>
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<td>December-93</td>
<td>Dept. of Sewerage Services was formed as regulator for sewerage services under the SSA.</td>
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<td>Before 1994</td>
<td>Sewerage Services were managed by 144 Individual Local Authorities</td>
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<td>April-94</td>
<td>Indah Water took over sewerage management in most states in Peninsular Malaysia</td>
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<tr>
<td>June-00</td>
<td>Govt. Under Minister of Finance Incorporated took over IWK</td>
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<td>June-06</td>
<td>Water Services Industry Act 2006 &amp; SPAN approved by Parliament</td>
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<td>Currently</td>
<td>Indah water provides sewerage services in 87 out of the 144 Local Authorities in Malaysia (however not on holistic manner). Rest of the areas is still managed on Ad-Hoc basic</td>
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</table>
Governance Structure of Sewerage Services

1. Sewerage Services
2. Operator in 88 Local Authority Areas.
4. Undertakes Refurbishment/Upgrading Projects Funded by Govt.

Policy & Control of National Sewerage Agenda

Ministry of Energy, Green Technology & Water

Regulator of Sewerage Services

Ministry of Finance

• 100% Equity
• Govt. Support Loan & Subsidy

Ministry of Natural Resources & Environment

Regulator of Effluent Standards
Indah Water Konsortium Sdn Bhd (IWK), a national sewerage company, wholly-owned by the Government of Malaysia, is responsible for providing sewerage services, operating and maintaining over 5,567 public sewage treatment plants and 14,190km networks of sewerage pipelines as well as deslugding and septage management for 1 million ISTs since April 1994.

IWK covers most parts of Malaysia for operation and maintenance whilst providing technical expertise to the remaining un-serviced area.
# Improvements in Sewerage Services Since Federalisation in 1994

- IWK’s experience can benefit other countries -

## 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
**IWK’s Operation & Maintenance Achievements**

- **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

- **Maintenance of Sewer Networks**
  - Clearing of blockages, cleaning and repair of sewers
  - Manhole cleaning
  - Preventive maintenance with high pressure jetting
  - CCTV for sewer inspection

- **Operate & Maintain Sludge Treatment Facilities**
  - Desludging of ISTs and STPs
  - Sludge treatment
  - Septage treatment
  - Sludge reuse and ultimate disposal
IWK’s Operation & Maintenance
- Asset Status & Services Coverage

**Sewerage Asset**
- No of STPs (excludes CST): 5,567 units
- No of Pumping Station: 773 units
- Length Of Sewerage Pipes: 14,190 km

**IWK Resources and Area of Coverage**
- Staff: 2,800
- Vehicle (tanker, lorry, van): 625 units
- Central Lab Facility: 3 units
- No of sample / year: 70,000 units
- No of Unit Offices: 17 units
- Population served: 18.9 million
- No of Local Authorities: 87
IWK’s Operation & Maintenance - Expertise in Varied Treatment Systems

Various Type of Treatment Plants

Population Equivalent Catered by Treatment Plants

Approx. 1 million Individual Septic Tanks.

Total Connected Population Equivalent Served by IWK is 18.9 million
## Some Examples of Regional Facilities:

<table>
<thead>
<tr>
<th>Location</th>
<th>Volume Capacity</th>
<th>Design PE</th>
<th>Process Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pantai, STP</td>
<td>84,825 m³/day</td>
<td>377,000</td>
<td>Advance Activated Sludge with Digester</td>
</tr>
<tr>
<td>Bandar Tun Razak</td>
<td>22,500 m³/day</td>
<td>100,000</td>
<td>Sequencing Batch Reactor (SBR)</td>
</tr>
<tr>
<td>Taman Tun Dr Ismail</td>
<td>22,500 m³/day</td>
<td>100,000</td>
<td>Oxidation Ditch</td>
</tr>
</tbody>
</table>
IWK’s Operation & Maintenance
- Sewer Blockages, Desludging Services & Sludge Management

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

• On the average, 22,900 cases of blockages were received in a year or 1,900 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.
IWK’s Operation & Maintenance
- Sewer Blockages, Desludging Services & Sludge Management Cont’

Dedicated sludge treatment facilities with Department of Environment approval nationwide

IWK CURRENT SLUDGE FACILITIES

Trenching System
- Completed: 31 Nos

Drying Beds
- Completed: 1,799 Nos

Sludge Lagoon System
- Completed: 1 Nos

Sludge Reception Facility
- Completed: 12 Nos

Mechanised Dewatering Unit
- Completed: 8 Nos

Filter Press
- 83 units

Belt Press
- 58 units

Centrifuge
- 19 units

IWK’s Operation & Maintenance
- Sewer Blockages, Desludging Services & Sludge Management Cont’
• Despite the increasing number of plants handed over to IWK to operate & maintain, the % of effluent compliance based on 12 months average have shown marked increase.

• % compliance to EQA standard (based on 12 months average) has increased from 26% to 68%.
IWK’s Operation & Maintenance
- Improvements to the River Water Quality

- Almost all river basins with IWK’s presence, are categorised by Malaysia Department of Environmental as clean or slightly polluted.

Note: River basins without IWK’s presence are categorised by Malaysia Department of Environmental as polluted. Exception is Penang in the north which is a highly industrial area.

- The number of river basins monitored increase from 90 (in 1990) to 143 (in 2007)
- The number of clean rivers increase from 28% (1993) to 64% (2007)
- 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 (IWK fully operational)
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 by IWK

Jelutong Sewage Outfall

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

Jelutong Sewage Treatment Plant

Bayan Baru Sewage Treatment Plant

Before: Sewage discharged directly to coastal waters

Example of Improvement After Effective Planning & Development Controls by IWK

Upgraded Bayan Baru Sewage Treatment Plant
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) Category 5: Safety & aesthetics
  b) Category 4: Mechanical works
  c) Category 3: Electrical works
  d) Category 2: Civil works
  e) Category 1: Major Treatment Performance (process)

  Refurbishment of Sewer network:
  a) CCTV investigations
  b) Rehabilitation
Before & After Refurbishment

Before

After

Taman Bunga Raya (Semenyih) - Biosoil to Mechanical Plant

Taman Semenyih Jaya (Semenyih) - Biosoil to Mechanical Plant
Sewerage Development Controls and 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

IWK provided 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.
IWK’s Engineering Design Team provides a broad range of support services:

- Investigation works
- Design brief, detailed design and tender documentation
- Process and engineering reviews
- EIA / EA, hazops studies
- Collaborative R&D
- Sewerage development quality systems
- Development of in-house technical systems

- Professional Project Management Team of Professional for the sewerage projects
- Managed full range of project management activities from conceptual design, EIA, procurement of consultancy and construction contract up to testing and commissioning
- Ensuring high quality health, safety and environment practices in design and construction practices
**Customer Service & Awareness For Sustainable Services**

IWK uses a customized system for managing customer enquiries, requests & complaints:

- **24 Hours**
  - Complaints
    1. Overflowing Manhole / Toilets
    2. Plant Problems
    3. Missing Manhole Cover
  - Tracking & Resolution
    - Enquiry Records
    - Action
    - Call back
    - Closed

- **48 Hours**
  - Requests for Services
    1. Desludging of Septic Tank / Traditional Systems
    2. Clear Blockages

IWK’s awareness programs educate the people on the importance of efficient sewerage system to safeguard our life and protect our environment.

- Television Commercials
- Radio Advertisement
- Educational Materials
- Newspaper Advertisement
- Schools Program
- Government Liaison
- Exhibition
- Media Relations

**Over the 9 years review period, the number of complaints for every 1,000 customers per year has reduced by 63% from 24 to 9.**

**The number of complaints had gradually reduced with higher frequency of plant maintenance, which had minimized equipment downtime; & also increase in regular maintenance of sewer networks at critical areas to minimize the number of spillage at manholes.**
Creating Value for Sewerage Developments
-R&D Findings for Operational, Environmental & Socio-economic benefits -

Treatment Technology
1. Innovative Process improvements
2. Establish local sewage characteristics for design
3. Biochemical solutions for Treatment Processed
4. Biotechnology to improve sludge treatment
5. Energy Efficiency & Savings
6. Inflow/Infiltration & Sewer Line Studies

Environmental Solutions
1. Green Technology in bio-effluent, biogas and biosolids reuse.
2. Sewage loading and river water quality modeling.
3. Odor study at IWK’s facilities (baseline impacts, mitigation & modelling)
4. Septic tanks performance & pollution load
5. Pollution impact of sullage

Socio-Economic Evaluation
1. The impact of STPs location unto communities
2. Socio economic concerns and social behavior towards bio-effluent & biosolids reuse
3. Economic & technical feasibility of treating industrial discharge at STPs
4. Decision making tools for biosolids management
Creating Value for Sewerage Developments
-Technical Training and Competency Certification-

**O&M Operators Training**
- Key Areas:
  - Treatment Plant Operations & Maintenance
  - Sewer Network Maintenance
  - Desludging Services
  - M&E of Sewerage Equipments
  - Health & Safety

**Construction Contractors Training**
- Key Areas:
  - Sewage Treatment Plant Construction
  - M&E of Sewage Treatment Plant
  - Construction Sewer Laying
  - On-site Material Handling
  - Health & Safety

**Specialized Training**
- Key Areas:
  - Planning of Sewerage System
  - Design of Sewerage System
  - Nutrient removal in Treatment Plant Process
  - CCTV Training
  - Project Management
Technical Training Facilities

- Well equipped training rooms
- A basic research laboratory for in-house experiment and to facilitate technical teaching and learning
- Collection of Sewerage equipment for training and learning purposes
- Basic amenities for participants
Technical Training Conducted for Internal Staff

Training in progress – at BJTTC

Demonstration – SCV training

Demonstration – SCV training

Mock facility – Control Panel training

Mock facility – Confined Space Training

Mock facility – Pump Station
Capacity Building Initiative at International Level

Indah Water Konsortium (IWK) & Environment Cooperation – Asia (ECO-Asia)

Capacity Building for Urban Environmental Company URENCO Halong City, Vietnam

Objective: Improve Capabilities of URENCO’s Bai Chay Wastewater Treatment Plant (WWTP) Operators.

Twinning partnership with Perusahan Daerah Air Minuman (PDAM) Tirtanadi, Medan, Indonesia

Objective: Improve Demand & Connection to WWTP in Medan.

REGIONAL WATER AND SANITATION WORKSHOP AND TRAINING - Developing Comprehensive Septage Management Programs in Asia

Objectives: IWK as the model operator shares on the best practices in sanitation management; the other countries share on their local scenario, identify gaps and strategy for improvements.

Capacity Building for Urban Environmental Company URENCO Halong City, Vietnam

Objectives: to promote Water Operator Partnerships (WOPs) in the ASIA region; and platform for networking and establishing new WOPs.
Capacity Building Activities for Indonesia

Comparative study visit by Indonesia Delegate (Malang City, Surabaya City & East Jawa Disctrict)
Date Visit: 5 – 9 December 2005
Outcome: The delegates learnt a range of options for improving sanitation services, guidelines for sewerage development and process control.

Comparative study visit by Indonesia Delegate (Bandung City, Medan City, West Jawa Disctrict, IATPI & BAPPEDAS)
Date Visit: 15 – 20 May 2006
Outcome: IWK’s shared the best practices of sewerage management in Malaysia with the delegates.

Study visit by Denpasar Sewerage Development Project (DSDP) Bali Delegates
Date Visit: 18-20 September 2006
Outcome: The delegates were gain hands on exposure and training for their newly completed STP. The training by IWK focus on best practices for O&M.

Visitation from Perusahaan Daerah Air Minum (PDAM) Kota Bandung, Indonesia
Date Visit: 24 August 2007
Outcome: IWK provided advisory services to improve PDAM’s financial & technical knowledge for better sewerage services.
## Capacity Building Activities for Middle East

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<tr>
<th>Study Visit from TAIZ Water &amp; Sanitation Local Corporation, Yemen</th>
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<tr>
<td>Date Visit: 22-26 January 2007</td>
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Outcome: The delegates were given a technical brief on IWK’s regional plant at Bandar Tun Razak. IWK shared on O&M best practices of plant process control and maintenance.

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<th>Study visit from Oman Wastewater Services Company</th>
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<td>Date Visit: 10-12 September 2007</td>
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Outcome: IWK shared experience particularly on the O&M of sewerage systems. The delegates were exposed to IWK’s training facilities.

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<th>Technical Study Visit by Iranian Delegates</th>
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<tr>
<td>Date Visit: 13 November 2009</td>
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Outcome: IWK shared with the delegates on: sewerage management, plant operation control at IWK’s Regional Bunus STP and R&D in biosolids.
### Some Example of Technical Visit & Regional Involved Hosted by IWK

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<tr>
<th>Event</th>
<th>Date</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
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<td>Study visit by NGO bodies from various city of Philippines</td>
<td>14 December 2006</td>
<td>The delegates were given technical exposure on Sewage Treatment Plant and IWK contribution towards river protection</td>
</tr>
<tr>
<td>Technical visit from Vietnam Coastal City Environmental Sanitation</td>
<td>5 – 7 October 2009</td>
<td>The delegates were given technical exposure on centralised Sewage Treatment Plants and process control of plant</td>
</tr>
<tr>
<td>Project</td>
<td></td>
<td>Outcome: IWK was invited to present working papers on historical perspective of sewerage management in Malaysia and pilot benchmarking exercise initiative</td>
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<tr>
<td>15th African Water Association Congress at Kampala</td>
<td>15 – 18 March 2010</td>
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<td>Most Recent 23 April 2010: Delegation of Mayors from Bangladesh</td>
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Vision

To be the Leading Organization in Capacity Development for Water & Wastewater Industry

Missions

1. To create a Centre of Knowledge & Excellence for capacity development & technology enhancement in the water & wastewater industry

2. To groom & nurture young professionals and produce quality human capital asset in the water & wastewater industry

3. To increase public awareness & involvement for water sustainability.

The MWAcademy is envisaged as the Regional Hub for Capacity Building, Technical Knowledge Advancement, R&D and Innovations for the water & wastewater sector. It will stimulate growth in skill, knowledge, capabilities and novel technology that will benefit the water & wastewater industry in Asia.
IWK'S ACHIEVEMENT RECOGNISED - LOCALLY

INDAH WATER WINS MALAYSIA WATER AWARD FOR MANAGEMENT 2005

In his acceptance speech, Suhaime Kamaluzaman, the CEO of Indah Water Konsortium said the unceasing work by Indah Water – which is to improve the quality of life in this country through more efficient sewerage management – has finally been formally recognized. “Rightfully, the truly deserving recipients of this auspicious award are the 2,200 highly committed people behind Indah Water. They are the unsung heroes who carry out the dirty work to serve over 14 million users while being hurled with accusations and abuse.”

Suhaime also mentioned that in the course of this work, Indah Water has sailed through rough and troubled seas. For Indah Water, it has not been merely about showing a positive balance sheet but being custodian of the national sewerage systems. “We ensure sewage is appropriately and adequately managed to safeguard public health and to protect our water resources for the long-term preservation of the environment.”

Despite what has been said, we need to recognize that there have been great improvements in the management of sewerage in Malaysia over the past decade.

He concluded his speech by saying “The Government’s decision to consolidate the management of water and sewerage to reshape and enhance the service delivery system in the water sector holistically is seen as a complete solution to the issue of domestic wastewater pollution. This is for both the medium and long-term needs of the nation. And Indah Water is ready for this exciting new chapter.”
IWK’s Success Globally

IWK terbaik Asia

Kuala Lumpur: 2 April -
Kajian semula IVK atas pencapaian IWK di Asia telah menunjukkan pencapaian Malaysia dalam memanfaatkan teknologi konsortium. Indah Water Konsortium Sdn Bhd (IWK), sebagaimana dalam majelis perasmian programnya di Kuala Lumpur, menyatakan peningkatan penggunaan teknologi konsortium dalam pengangkutan air dan pembangunan jambatan air dan pembangunan di bandar-bandar kecil.

"Kajian ini membantu IWK memberi sumbangan kepada kemajuan perancangan dan pembinaan infrastruktur dalam memenuhi kebutuhan air dan pembangunan di bandar-bandar kecil," kata Kajian semula IVK atas pencapaian IWK di Asia...
Next Steps:
Towards Developing Sewerage Management

Develop Sewerage Masterplan

Implement Immediate Strategy

Implement Short to Long Term Strategy

Monitor Impact & Identify Areas for Improvements

Sustainable Environment

• Develop Policy & Legislations
• Develop Guidelines
• Conduct Awareness Programme
• Implement Technology, fit for purpose

Assess Environmental Condition
• Identify Catchment Plan
• Formulate & Implement Strategy
• Asset Management Strategy
• Prioritize Implementation Schedule
• CAPEX & OPEX Requirements
• Financial & Funding Strategy & Modules

IWK being instrumental and at the forefront of the tremendous change management in sewerage development for Malaysia, has the comprehensive experience to share with other developing nations.
Our niche technical capabilities & expertise for the domestic wastewater sector include:

- Operation and Maintenance
- Septage Management and Desludging of Septic Tanks
- Sewerage Planning, Certification and Process Design
- Technical Audit, Environmental Assessment, Hazard & Operability “HAZOP” studies
- Project Management Consultancy Services
- Development of Sewerage Standards and Guidelines
- Customer Relationships Management, Billings and Collection of Sewerage Services Charges
- Capacity Building & Research and Development Programs
- Public Awareness and Educational Programs

Contact us for Possible Collaborations:
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Thank You