PROGRESS OF WATER ENVIRONMENT GOVERNANCE IN MALAYSIA

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National Hydraulic Research Institute of Malaysia (NAHRIM)

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INTRODUCTION

• Water resources in Malaysia – rivers, lakes, groundwater
• Annual rainfall around 3000mm
• Some 200 river systems
• Water pollution – population growth, urbanization, land clearing, increase of commercial area, industrial effluent discharge, agricultural activities

• Standards/ Criteria related to WQ in Malaysia:
  • National Water Quality Standards for Malaysia, Water Quality Index (WQI) – River
  • National Lake Water Quality Standards (NLWQS)
  • Marine Water Quality Standard and Criteria for Malaysia, Marine Water Quality Index
  • National Drinking Water Quality Standards
2017: Total rivers: 477 rivers; Total samples: 5,897 samples; Total manual monitoring stations: 891; 801 ambient & baseline stations, 55 upstream water intakes station, 35 stations for ROL project

Clean: 219 rivers (46%); Slightly polluted: 207 rivers (43%); Polluted: 51 rivers (11%)
CLASSIFICATION OF THE RIVER WATER QUALITY IN MALAYSIA 2017

Total number of river = 477 rivers

- Class II: 305 (63.94%)
- Class III: 144 (30.19%)
- Class IV: 26 (5.45%)
- Class V: 1 (0.21%)
- Class I: 1 (0.21%)

Source: DOE EQR 2017
MAJOR POLLUTANTS IN RIVERS AND ITS SOURCES

• Biochemical Oxygen Demand (BOD)
  • Sources: Sewage, agro-based, manufacturing industries

• Ammoniacal Nitrogen (AN)
  • Sources: Animal farming, domestic sewage

• Suspended Solids (SS)
  • Sources: Earthworks, land clearing activities

Source of pollution: sewage, agro-based, manufacturing industries
Pollution indicator: Biochemical Oxygen Demand (BOD)

Source of pollution: Animal farming, domestic sewage
Pollution indicator: Ammoniacal Nitrogen (NH₃-N)

Source of pollution: Earthworks, land clearing activities
Pollution indicator: Suspended Solids (SS)
WATER POLLUTION LOAD

• 5 major type of water pollution sources
  • Manufacturing industries, agricultural industries, sewage treatment plant, piggery and wet market

• 3 prime parameters with high impact to the water body:
  • Biochemical Oxygen Demand (BOD)
  • Suspended Solids (SS)
  • Ammoniacal Nitrogen (AN/ NH₃-N)
BOD LOAD BY WATER POLLUTION SOURCES IN 2017

- Sewage: 268 tonnes/day (49%)
- Piggery: 210 tonnes/day (39%)
- Agro-based Industries: 11 tonnes/day (2%)
- Wet Market: 6 tonnes/day (1%)
- Manufacturing Industries: 50 tonnes/day (9%)

Total: 545 tonnes/day

Source: DOE EQR 2017
SS LOAD BY WATER POLLUTION SOURCES IN 2017

- Sewage: 355 tonnes/day (39%)
- Piggery: 437 tonnes/day (48%)
- Agro-based Industries: 26 tonnes/day (3%)
- Wet Market: 8 tonnes/day (1%)
- Manufacturing Industries: 83 tonnes/day (9%)

Total: 909 tonnes/day

Source: DOE EQR 2017
AN/ NH$_3$-N LOAD BY WATER POLLUTION SOURCES IN 2017

Source: DOE EQR 2017
### TYPE OF SERVICES AND APPLICATION

<table>
<thead>
<tr>
<th>Type of Services</th>
<th>Units (PE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFF-SITE TREATMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Multipoint</td>
<td>10,373 (20,487,766)</td>
</tr>
<tr>
<td>Centralized (Regional)</td>
<td>101 (8,132,260)</td>
</tr>
<tr>
<td><strong>ON-SITE TREATMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Individual Septic Tank</td>
<td>1,354,986 (6,547,041)</td>
</tr>
<tr>
<td>Communal Septic Tank (CST)</td>
<td>4,359 (531,127)</td>
</tr>
<tr>
<td>Small Sewage Treatment System (SSTS)1</td>
<td>24,001 (240,000)</td>
</tr>
<tr>
<td>Cess Pit (Pour Flush)</td>
<td>1,171,555 (5,857,775)</td>
</tr>
</tbody>
</table>

Source: Malaysia Water Industry Guide 2017

Note: 1. Estimate installation of SSTS since year 2008

1 PE = 0.225m³
DOMESTIC WASTEWATER MANAGEMENT
-COMPLIANCE WITH EFFLUENT STANDARD-

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Suspended Solids (SS)</td>
<td></td>
<td>97.8%</td>
<td>97.1%</td>
<td>97.0%</td>
<td>96.9%</td>
<td>97.3%</td>
<td>98.1%</td>
<td>98.5%</td>
<td>98.2%</td>
<td>97.6%</td>
</tr>
<tr>
<td>Biological Oxygen Demand (BOD)</td>
<td></td>
<td>95.2%</td>
<td>94.8%</td>
<td>93.9%</td>
<td>93.7%</td>
<td>94.7%</td>
<td>96.3%</td>
<td>96.2%</td>
<td>97.7%</td>
<td>95.3%</td>
</tr>
<tr>
<td>Chemical Oxygen Demand (COD)</td>
<td></td>
<td>97.7%</td>
<td>97.5%</td>
<td>97.1%</td>
<td>96.9%</td>
<td>97.9%</td>
<td>98.5%</td>
<td>98.6%</td>
<td>99.1%</td>
<td>97.9%</td>
</tr>
<tr>
<td>Oil and Grease (O&amp;G)</td>
<td></td>
<td>99.1%</td>
<td>99.1%</td>
<td>99.1%</td>
<td>98.6%</td>
<td>99.1%</td>
<td>99.5%</td>
<td>99.6%</td>
<td>99.5%</td>
<td>99.2%</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td></td>
<td>99.6%</td>
<td>99.4%</td>
<td>99.5%</td>
<td>99.2%</td>
<td>99.1%</td>
<td>98.9%</td>
<td>99.8%</td>
<td>99.9%</td>
<td>99.4%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td>97.9%</td>
<td>97.6%</td>
<td>97.3%</td>
<td>97.1%</td>
<td>97.6%</td>
<td>98.3%</td>
<td>98.5%</td>
<td>98.9%</td>
<td>97.9%</td>
</tr>
</tbody>
</table>

- Total Public STPs in December 2017 (exclude East Malaysia): 6,687 unit
- Total samples taken and analyzed: 81,859 samples (2017)

Source: SPAN Water Services Industry Performance Report 2017
SEWAGE POLLUTANT LOADS IN DISCHARGED EFFLUENTS (2011 – 2013)

Source: Indah Water Konsortium Sustainability Report 2012-2013
## INDUSTRIAL WASTEWATER MANAGEMENT - COMPLIANCE STATUS OF INDUSTRY -

<table>
<thead>
<tr>
<th>YEAR</th>
<th>INDUSTRIAL EFFLUENT REGULATIONS</th>
<th>SCHEDULED WASTE REGULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Inspections</td>
<td>Compliance (%)</td>
</tr>
<tr>
<td>2014</td>
<td>11,410</td>
<td>99</td>
</tr>
<tr>
<td>2013</td>
<td>7,201</td>
<td>99</td>
</tr>
<tr>
<td>2012</td>
<td>6,590</td>
<td>98</td>
</tr>
</tbody>
</table>

### Industry Action 2015 - 2018

<table>
<thead>
<tr>
<th>Industry</th>
<th>Action</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm Oil Factory</td>
<td>Court</td>
<td>62</td>
<td>17</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Notices</td>
<td>261</td>
<td>187</td>
<td>177</td>
<td>181</td>
</tr>
<tr>
<td>Natural Rubber Factory</td>
<td>Court</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Notices</td>
<td>24</td>
<td>12</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>
LEGISLATIVE FRAMEWORK TO CONTROL WATER POLLUTION

ENVIRONMENTAL QUALITY ACT 1974

38 subsidiary environmental regulations introduced to deal with specific issues ranging from:
- agro-based and manufacturing industries
- air emissions from stationary & mobile sources
- noise from motor vehicles
- management of scheduled wastes
- environmental impact assessment.
REGULATIONS UNDER EQA 1974 FOR WATER ENVIRONMENT

EQ (PRESCRIBED PREMISES) (CRUDE PALM OIL MILL) 1977
EQ (PRESCRIBED PREMISES) (RAW NATURAL RUBBER) 1978
EQ (ENVIRONMENTAL IMPACT ASSESSMENT) 2015
EQ (SCHEDULED WASTES) 2005
EQ (SEWAGE) 2009
EQ (INDUSTRIAL EFFLUENT) 2009
EQ (LEACHATE) 2009
CONTAMINATED SOIL ANIMAL FARMING SILTATION (FUTURE)

UNDER ENVIRONMENTAL QUALITY ACT, 1974

Source: Majid (2015)
WATER SERVICES INDUSTRY ACT (WSIA) 2006 [ACT 655]

- An Act to provide for and regulate water supply services and sewerage services
- Objective: to establish a licensing and regulatory framework for regulatory intervention to promote national policy objectives for the industry.
- Does not affect general applications of existing laws on environment quality and land matters and existing State powers on water source.
- Approved in Parliament in June 2006 and gazetted on 20<sup>th</sup> July 2006
- Came into force on 1<sup>st</sup> January 2008
INSTITUTIONAL FRAMEWORK FOR WATER ENVIRONMENTAL GOVERNANCE

Source: Adapted from Abidin (2015)
<table>
<thead>
<tr>
<th>INSTITUTION/ AGENCY</th>
<th>RESPONSIBILITY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Government (Ministry of Water, Land and Natural Resources (formerly known as Ministry of Natural Resources and Environment), Ministry of Energy, Science, Technology, Environment and Climate Change, other related ministries)</td>
<td>Policy matters</td>
<td>Development of a holistic water policy for the country by setting policy directions</td>
</tr>
<tr>
<td>State Government (e.g. Forestry Department, Town and Planning Department, Water Supply Department and other related agencies)</td>
<td>Raw water and land development matters</td>
<td>Regulate raw water abstraction and catchment management</td>
</tr>
<tr>
<td>National Water Services Commission</td>
<td>Regulatory matters (Water Services Industry Act 2006 as legal instrument)</td>
<td>Regulate the water services industry (water and sewerage services)</td>
</tr>
</tbody>
</table>
INSTITUTIONAL FRAMEWORK FOR WATER ENVIRONMENTAL GOVERNANCE
-Governance Structure of Sewerage Services-

Ministry of Water, Land and Natural Resources
- Policy & Control of National Sewerage Agenda
- Capital projects (CAPEX)
- Refurbishment/upgrading projects.

Ministry of Finance
- 100% Equity
- Govt. Support Loan & Subsidy

Ministry of Energy, Science, Technology, Environment and Climate change

Regulator of Sewerage Services

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

Regulator of Effluent Standards

Control of Pollution and Environment
WATER QUALITY MONITORING FRAMEWORK

**River**
- Total rivers: 477 rivers
- Total monitoring station: 891 stations
- Ambient & baseline station: 801 stations
- Upstream of water intakes: 55 stations
- River of Life (ROL) project: 35 stations
- Water Quality Index (WQI) – used to indicate the level of pollution
- National Water Quality Standards of Malaysia (NWQS) – Suitability in terms of water uses
- 6 parameters: DO, BOD, COD, AN, SS, pH

**Marine & Island**
- Monitoring since 1978 (Peninsular Malaysia)
- Sabah & Sarawak (1985)
- Objectives: to establish marine WQ status and pollution level from land-based and sea-based sources
- Coastal: 188 stations
- Estuary: 88 stations
- Island: 95 stations
- Marine Water Quality Index (Excellent to Poor)
- Marine Water Quality Criteria and Standard
- 7 parameters: DO, Nitrate (NO₃), Phosphate (PO₄), Unionized Ammonia (NH₃), Faecal Coliform, Oil & Grease (O&G), TSS

**Groundwater**
- Monitoring program established in 1997
- Total: 110 tube wells
- Monitoring based on specific land uses:
  - Agricultural (13), Urban & Suburban (12), Industrial Sites (19), Solid Waste Landfills (23), Golf Courses (7), Rural Areas (4), Ex-mining Area (Gold Mine) (3), Municipal Water Supply (6), Animal Burial Areas (14), Aquaculture Farms (7), Radioactive Landfill (1) and Resort (1)
- National Guidelines for Drinking WQ (Revised December 2000)
- VOCs, pesticides, heavy metals, anions, coliform, phenolic compounds, total hardness, TDS, pH, Temperature, conductivity & DO
ENFORCEMENT & COMPLIANCE MANAGEMENT

By Department of Environment (DOE)

- Preparation of field inspection
  - In house documentation (EKAS, OER, ESVIS, CEMS, GIS
  - Equipment checklist
  - Team briefing
  - Final compliance and status

- Inventory of pollution sources
  - KPI setting
  - Problematic/Risk base
  - Frequency setting
  - Complaint
  - Above water intake

- Enforcement Programme

- Field Inspection
  - Assess compliance EQA 1974

- Reporting
  - On site
    - Competent person
    - Performance Monitoring
    - Production area/capacity
    - Black smoke observation
    - Scheduled Waste Storage

- Verification & Validation
  - In-situ measurement
  - Sampling
  - Cross check water quality
  - Span-check (smoke density meter)
  - Third party audit
  - Record keeping
ENFORCEMENT & COMPLIANCE MANAGEMENT

By Department of Environment (DOE)
ENFORCEMENT STRATEGIES

IE 2009 Section 7:
Monitoring effluent discharge – submit monitoring records monthly (30 days from previous month)

IE 2009 Section 9:
Performance Monitoring of IETS – based on Guidance Document on Performance Monitoring of Industrial Effluent Treatment System

IE 2009 Section 32:
Penalty – If convicted, maximum penalty of RM 100,000 or and maximum 5 years jail

Self Regulatory Mechanism:
- Performance monitoring of IETS
- Competent person to operate IETS
- Online reporting
- eSWIS - Electronic scheduled waste information system (Hazardous waste)
- OER – online environmental reporting (effluent discharge)
- Notification and Registration of Environmentally Hazardous Substances – EHSNR (chemicals)

EQ Industrial Effluent 2009
WAY FORWARD

**National Water Policy**
- Under development (2018 – present) by Ministry of Water, Land and Natural Resources
- Formerly was National Water Resources Policy

**Marine Water Quality Standard and Criteria for Malaysia**
- Revised by Department of Environment in 2018

**National Water Quality Standard for Malaysia and Water Quality Index (WQI)**
- Proposed revision of National Water Quality Standards of Malaysia and Water Quality Index in 2019 by DOE
- Determine the suitable parameter e.g. physical, chemical, biological, nutrient and emerging pollutants

**Palm Oil Effluent Discharge Standard**
- Proposed stage to revise the effluent discharge standard into water ways and land
- Not executed yet

**Rubber Effluent Discharge Standard**
- Proposed stage to revise the effluent discharge standards
- Not executed yet
REFERENCES


5. IWK. IWK Sustainability Report 2012-2013.


