Solid Waste Management
IN MALAYSIA: THE WAY FORWARD
DATO’ NADZRI BIN YAHAYA, Ph.D
Director General
National Solid Waste Management Department, Ministry of Housing and Local Government,
19TH JULY 2012 : WASTE MANAGEMENT 2012
CHALLENGES IN SWM

Attitude

Legislation

Services
Solid Waste Management History - The Timeline

1997
- Local Authorities provide SWM services / given to small contractors

1997
- Interim Privatisation Concession companies

2007
- Act 672 passed by Parliament

2011
- Enforcement of Act 672 & Full Privatisation

2020
- THE WAY FORWARD
  - 40% Waste Reduction to Landfill
  - 38% Reduction of GHg from solid waste disposal

FEDERAL GOVERNMENT (NSWMD & SWPCMC)

LOCAL GOVERNMENT / STATE GOVERNMENT
**WE FEDERALISED SOLID WASTE MANAGEMENT**

### Solid Waste and Public Cleansing Management Act 2007 (Act 672):

- Enforced 1 Sep 2011 in 8 States and Federal Territories (Peninsular Malaysia)
- Provides Executive Authority to Federal Government on SWMPC

<table>
<thead>
<tr>
<th>Department of National Solid Management</th>
<th>Solid Waste and Public Cleansing Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Propose Policy. Plans and Strategies,</td>
<td>● Implement policy, plan, strategies</td>
</tr>
<tr>
<td>● Formulate plans for SWM facilities (location, types and size)</td>
<td>● Monitor compliance with the standards, specifications and codes of practice</td>
</tr>
<tr>
<td>● Sets standards, specifications and codes of practices</td>
<td>● Implement and enforce the laws and regulation</td>
</tr>
<tr>
<td>● Exercise regulatory functions</td>
<td>● Implement measures to promote public participation and to improve public awareness</td>
</tr>
<tr>
<td></td>
<td>● Maintain and improve the standard and level of the SWPCM services</td>
</tr>
</tbody>
</table>
**WE PRIVATISED**

**COLLECTION OF HOUSEHOLD SOLID WASTE AND SIMILAR SOLID WASTE**

1ST SEPTEMBER 2011

<table>
<thead>
<tr>
<th>SWM ENVIRO (SOUTH)</th>
<th>E IDAMAN (NORTHERN)</th>
<th>ALAM FLORA (CENTRAL &amp; EASTERN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>● JOHOR</td>
<td>● PERLIS</td>
<td>● KUALA LUMPUR</td>
</tr>
<tr>
<td>● MELAKA</td>
<td>● KEDAH</td>
<td>● PUTRAJAYA</td>
</tr>
<tr>
<td>● NEGRI SEMBLAN</td>
<td></td>
<td>● PAHANG</td>
</tr>
</tbody>
</table>
WE FOCUSED AND TAKE ACTION ON SPECIFIC STAGE/VALUE CHAIN

FOCUS AREA

Municipal Solid Waste: Waste that includes predominantly household waste and commercial waste

Construction & Demolition Waste: Waste from demolition and construction activities

Hazardous / Toxic Solid Waste: Waste that poses threats to public health or the environment

Bio-medical (Clinical) waste: Waste products that are produced from healthcare premises

Electronic Waste (E-Waste): Waste type consisting of any electrical or electronic appliance

WE FOCUSED AND TAKE ACTION ON SPECIFIC STAGE/VALUE CHAIN

<table>
<thead>
<tr>
<th>Generation</th>
<th>Collection</th>
<th>Transport</th>
<th>Recovery / Treatment</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Generation of solid waste at households / commercial • Sorting waste</td>
<td>• Scheduling of compactors or trucks for waste collection • Providing bins for recyclables</td>
<td>• Transportation of waste to sites for transfers, recovery, or disposal</td>
<td>• Secondary sorting of waste, e.g. plastic, glass, paper, aluminium • Treatment and recovery of other waste streams</td>
<td>• Landfilling or incineration • Environmental management</td>
</tr>
</tbody>
</table>
WE LOOKED INTO 5 stages of Waste Management

**Current Landscape**

- Around 25,000 tonnes generated per day in Peninsular Malaysia (2012 projections)
- High amount of food waste generated from municipal solid waste
- Mechanism of separation at source between recyclables and non-recyclables on voluntary basis, with the collection mechanism starting in 1 Sept 2012
‘Waste to wealth’ – recycling in Malaysia is a thriving industry driven by informal players

Recycling is a thriving industry
- Industry value is estimated at RM476mil in 2005 and more than RM600mil in 2011
- There is already an establish informal recycling network that covers every part of the SWM value chain from storage to disposal

Price of recyclables is highly market driven
- Demand price for recyclables is highly dependent of commodity prices – highly seasonal in nature
- Uncertainty of demand price and fluctuations leads to lack of incentives to end consumers
- Collectors and middleman traders will ‘hoard’ recyclables until the selling price is right, leading to feedstock issue for recyclers

Lack of regulation leads to inaccurate data
- Current recycling rate of 5% is underestimated since recycling activities are still not regulated (thus no proper data is collected)
- Recycling rate by market players is estimated higher than 15%

<table>
<thead>
<tr>
<th>Composition</th>
<th>Percentage (%)</th>
<th>Amount (tones/year)</th>
<th>Market price (RM/kg)</th>
<th>Values (Million RM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papers</td>
<td>17.1</td>
<td>1,026,000</td>
<td>0.20</td>
<td>205.2</td>
</tr>
<tr>
<td>Plastics</td>
<td>9.1</td>
<td>546,000</td>
<td>0.30</td>
<td>163.8</td>
</tr>
<tr>
<td>Glass</td>
<td>3.7</td>
<td>222,000</td>
<td>0.05</td>
<td>11.1</td>
</tr>
<tr>
<td>Aluminium</td>
<td>0.4</td>
<td>24,000</td>
<td>2.00</td>
<td>48.0</td>
</tr>
<tr>
<td>Scrap Metals</td>
<td>1.6</td>
<td>96,000</td>
<td>0.50</td>
<td>48.0</td>
</tr>
<tr>
<td>Other non-recyclables</td>
<td>88.1</td>
<td>4,086,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>6,000,000</td>
<td>-</td>
<td>476.1</td>
</tr>
</tbody>
</table>

Note: 1) Waste composition data obtained from Ministry of Housing and Local Government (2005)
2) Total waste generation was estimated at 6 million tones per year
3) Average market prices were based on prices at recycling centre as of September 2005; actual prices at recyclable agents, middleman and end buyers (industries) are usually much higher
WE LOOKED INTO 5 stages of Waste Management

Generation → Collection → Transport → Recovery / Treatment → Disposal

Current Landscape
Privatisation of collection of household and similar solid waste and public cleansing with long term concession:

- Alam Flora Sdn Bhd (Central & Eastern Region)
- SWM Environment (Southern Region)
- Environment Idaman Sdn Bhd (Northern Region)

Enforcement by 1 September 2012:

- 2+1 collection system – 2 days for Residual, 1 day for recyclable waste includes bulky waste, green waste
- New standards on waste bin and garbage collection trucks
- Enforcement of KPI on collection schedule
- Enforcement on leachate spillage and cleansing
WE LOOKED INTO 5 stages of Waste Management

Generation → Collection → Transport → Recovery / Treatment → Disposal

Current Landscape

- **Highly dependent on landfills**:  
  - 165 operational landfills across Malaysia catering to 95% of Malaysian waste  
  - Only 8 sanitary landfills operational and 11 more under various stages of implementation & construction  
  - Many landfills are reaching design capacity; environmental challenges in closing landfill and land scarcity in opening new ones

- **Very limited treatment facilities**:  
  - 1 REFUSE DERIVED FACILITY (RDF): WTE PLANT  
  - 4 mini incinerator under various stages of implementation on Langkawi, Tioman, Pangkor, & Cameron Highlands

Source: JPSPN
Management of Solid Waste is a high cost to the government

- **40-80%** - LA expenditure on solid waste & public cleansing
- **RM14.80** - Cost of SWM Services per premise
- Privatisation cost to Federal Government: **RM300M** and counting
- CAPEX of new Landfill: **RM30mil ++** (average)
- OPEX of landfill: **RM28.80 – RM49/tonne** (average)
## Comparison of key parameters based on existing technology in the market – Thermal Treatment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>MRF/WtE</th>
<th>Mass Burn</th>
<th>Circularized Fluidised Bed</th>
<th>Mass Burn Stoker</th>
<th>Rotary Kiln</th>
<th>Plasma Gasification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPACITY</strong></td>
<td>Ton/Day</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>100</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td><strong>CAPEX</strong></td>
<td>RM (million)</td>
<td>250</td>
<td>360</td>
<td>550</td>
<td>68</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td><strong>OPEX</strong></td>
<td>RM/ton</td>
<td>85</td>
<td>110</td>
<td>102</td>
<td>249</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td><strong>Revenue/ton</strong></td>
<td>RM/ton</td>
<td>101</td>
<td>129</td>
<td>124</td>
<td>-</td>
<td>202</td>
<td></td>
</tr>
<tr>
<td><strong>Technology status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readiness</td>
<td>Ready</td>
<td>Ready</td>
<td>Ready</td>
<td>Ready</td>
<td>Ready</td>
<td>Ready</td>
<td></td>
</tr>
<tr>
<td>Commercial Scale</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (100tpd)</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Local/Foreign</td>
<td>Local</td>
<td>Local/Foreign</td>
<td>Foreign</td>
<td>Local</td>
<td>Local/Foreign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track Record for MSW</td>
<td>10 years</td>
<td>&gt; 10 years</td>
<td>&gt; 50 years</td>
<td>&lt; 1 year</td>
<td>&lt; 8 year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology Competitiveness</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Lab Analysis
* Figures are indicative
RECOGNISED Solid Waste Management: Business-as-usual is not sustainable

Urgency to move away from landfills -

• Lack of areas for new landfills especially within major conurbation and corridors
• Unsanitary landfills increase methane and GhG emissions causing global warming
• Negative public perception on landfills

New sustainable SWM technologies are required to address environmental issues.
Emerging technologies are available and looks promising but viability needs to be verified.

International tender next year to build thermal treatment facilities
The selection framework for Recovery/Treatment facility will look at multiple angles

Objectives of the facility establishment:
1. Sustainable model of implementation
2. Minimum risk exposure to the government
3. Minimum impact to the environment and natural resources
4. Commercially proven technology and high reliability for long term solution
5. Maximum reduction of waste
Proposed Treatment Facility Selection Framework

**Economic**
- CAPEX
- Land Cost
- OPEX
- Business model (eg. Profit sharing, govt procurement)
- Revenue
- Net cost per ton
- Uncertainty in cost estimates (financial risk, financing arrangement & revenue)

**Technical**
- Adequacy of the technology
- Feasibility
- Technology track record (commercial running plant - equivalent scale)
- O&M experience (equivalent scale)
- Adaptability to local conditions (whether it can be adopted to Malaysian's solid wastes)
- Flexibility to cope with the change in waste quantities, waste composition and source material of separation
Proposed Treatment Facility Selection Framework

**Environmental**
- Public health
- Water pollution
- Air pollution (dust, odour, noxious gases)
- Quantity and quality of residual waste
- Noise
- Traffic
- Aesthetic

**Political**
- Equity between communities or interest group
- Flexibility in location in facilities
- Public acceptance
- Number of job recreated
- Employee acceptance
- Political willingness (to accept technology)

**Use of energy & conservation of resources**
- Product recovered
- Market Potential
- Net Effect on primary supply (energy recovered)
- Energy requirements
- Net effect on supply of material
- Raw material usage
- Land usage
- Volume reduction and land reclamation
- Water requirement
PRIORITISATION CRITERIA TO BUILD TREATMENT FACILITIES

- Focus on conurbations & sites with high density population
- Focus on sites reaching landfill design capacity
- Focus on sites with land scarcity for new landfill

Quick Wins:
- Identified sites based on current land availability
Facility planning and prioritisation will be done based on waste generation, composition and specific location requirements

<table>
<thead>
<tr>
<th>Waste Generation</th>
<th>&gt; 1000 tpd</th>
<th>500 – 1000 tpd</th>
<th>&lt; 500 tpd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended Type of Facility</strong></td>
<td>Integrated Waste Management Facility:</td>
<td>• MRF</td>
<td>• MRF</td>
</tr>
<tr>
<td></td>
<td>• Biological / Thermal Treatment</td>
<td>• Biological Treatment</td>
<td>• Biological Treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Landfill</td>
<td>• Landfill</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>• Sg. Petani</td>
<td>• Kedah Utara</td>
<td>• Perlis</td>
</tr>
<tr>
<td></td>
<td>• Pulau Pinang (Seberang Perai)</td>
<td>• Taiping</td>
<td>• Manjung</td>
</tr>
<tr>
<td></td>
<td>• Ipoh/Batu Gajah</td>
<td>• P. Pinang (Pulau)</td>
<td>• Gerik</td>
</tr>
<tr>
<td></td>
<td>• Shah Alam/ PJ/SJ/ Klang</td>
<td>• Kuantan/ Kemaman</td>
<td>• Perak</td>
</tr>
<tr>
<td></td>
<td>• Kuala Lumpur (Utara)</td>
<td>• Kuala Terengganu</td>
<td>• Selatan</td>
</tr>
<tr>
<td></td>
<td>• Kuala Lumpur (Selatan)</td>
<td>• Kota Bharu</td>
<td>• Sepang/ Kuala Langat</td>
</tr>
<tr>
<td></td>
<td>• Negri Sembilan</td>
<td></td>
<td>• Segamat</td>
</tr>
<tr>
<td></td>
<td>• Melaka</td>
<td></td>
<td>• Temerloh</td>
</tr>
<tr>
<td></td>
<td>• Muar/Batu Pahat</td>
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<tr>
<td></td>
<td>• Pasir Gudang</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Gelang Patah</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Prioritisation Criteria:**
- Focus on conurbations & sites with high density population
- Focus on sites reaching landfill design capacity
- Focus on sites with land scarcity for new landfill

**Quick Wins:**
- Identified sites based on current land availability (Johor Utara, Melaka)
Common enablers key in reduction of waste and sustainability of SWM practices

Education and awareness key in reduction of waste
- The amount of waste generated will continue to increase without a conscious decision by consumers to reduce, reuse and recycle
- Early age education is key to ensure future generations contribute to sustainable SWM practices

Data management for SWM requires coordination
- No coordination of multiple stakeholders data & many independent studies across several agencies and organisations
- SWM data is key in decision making for waste management
- Current waste management decision made without proper information
- Need for current and accurate data for future planning

Enforcement of regulation ensures rules are adhered to
- Recycling activities is unregulated and most data are unaccounted for
- Lack of facilities for data collection such as weight bridge at collection points
Consolidated Timeline

1. **Establishment of Waste Market in retailers**
   - Establishment of Central Data Repository for Waste

2. **22% recycling rate**
   - 100 waste banks established at community & retailers

3. **Establishment of 4 Thermal Treatment / Biological Treatment facility**

- **2012**
  - Waste Stream Characteristic Study completed
  - 30 community waste banks established
  - Waste banks at 180 schools & 90 kindergartens
  - Appointment of consultant for open tender

- **2013**

- **2014**

- **2015**

- **2016**

- **2017**

- **2018**

- **2019**

- **2020**

*Source: Lab analysis*