Extracting the Highest Value from Organic Waste
Questions??

• Does ‘waste’ mean ‘throw’? This is the first idea that needs to be changed.

• ‘Waste’ means ‘waste money’ Do you know why?

• Do you know what happens to your ‘waste’ now?

• Observe what happens in Nature, is there any waste?
Federal Regulations and Strategies

• Federalised SWM Since 1st September 2011

• Privatised Household Solid Waste Collection And Public Cleansing Services

• Embarked on New Technologies and Techniques to Treat and Dispose Waste
### SHIFT IN THE GOVERNANCE OF SOLID WASTE MANAGEMENT

<table>
<thead>
<tr>
<th>Before Solid Waste and Public Cleansing Management Act 2007 (AKTA 672) Enforced (1 Sep 2011)</th>
<th>After Act 672 Enforced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Government</td>
<td>Federal Government</td>
</tr>
<tr>
<td>Local Authorities</td>
<td></td>
</tr>
</tbody>
</table>

- **Federal Government**
- **State Government**
- **Local Government**

**Federal Government Department Of National Solid Waste Management**

Extracting the Highest Value from Organic Waste
Generation of waste in Malaysia

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION</td>
<td>26.6 M</td>
<td>28.3 M</td>
</tr>
<tr>
<td>AMOUNT OF SOLID WASTE</td>
<td>19,000 t/D</td>
<td>33,000 t/D (12,045,000 t/YR)</td>
</tr>
<tr>
<td>GENERATED</td>
<td>FORECAST : 30,000 t/d - 2020</td>
<td></td>
</tr>
<tr>
<td>COMPOSITION</td>
<td>Food waste : 45%</td>
<td>44.5%</td>
</tr>
<tr>
<td></td>
<td>Plastic: 24%</td>
<td>13.2%</td>
</tr>
<tr>
<td></td>
<td>paper: 7 %</td>
<td>8.5%</td>
</tr>
<tr>
<td></td>
<td>Disposable Diapers: ???</td>
<td>12.1%</td>
</tr>
<tr>
<td>GENERATION PER CAPITA</td>
<td>0.85 kg/d</td>
<td>1.17 kg/d</td>
</tr>
<tr>
<td>RECYCLING RATE</td>
<td>5%</td>
<td>10.5%</td>
</tr>
</tbody>
</table>

Extracting the Highest Value from Organic Waste
Waste Hierarchy, any corrections?

- Minimisation
- Re-Use
- Recycling
- Treatment
- Disposal

Extracting the Highest Value from Organic Waste
Waste Generation Potential

KL - Population Growth

Population (millions)

2000 2010 2020

0 0.5 1 1.5 2 2.5
Significant Business Opportunities

- Environmental Drivers
- Economic Incentives
- Thriving Economy
- Strategic Targets
- Feedstock Certainty
- Site for Development

BUSINESS OPPORTUNITY

Extracting the Highest Value from Organic Waste
Waste Cycle

Extracting the Highest Value from Organic Waste
Global MSW Production Average

- Organic: 46%
- Paper: 17%
- Plastic: 10%
- Metal: 4%
- Glass: 5%
- Other: 18%

Extracting the Highest Value from Organic Waste
High Middle Income MSW Production Average

- Organic: 54%
- Paper: 14%
- Plastic: 11%
- Glass: 5%
- Metal: 3%
- Other: 13%
# Waste Streams in Malaysia

<table>
<thead>
<tr>
<th>Waste Stream</th>
<th>Tonnes per day</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food waste</td>
<td>11,141</td>
<td>33.6%</td>
</tr>
<tr>
<td>Garden waste</td>
<td>1,392</td>
<td>4.2%</td>
</tr>
<tr>
<td>Other organic waste</td>
<td>206</td>
<td>0.6%</td>
</tr>
<tr>
<td>Paper</td>
<td>5,437</td>
<td>16.4%</td>
</tr>
<tr>
<td>Plastics</td>
<td>6,985</td>
<td>21.1%</td>
</tr>
<tr>
<td>Glass</td>
<td>900</td>
<td>2.7%</td>
</tr>
<tr>
<td>Metals</td>
<td>1,399</td>
<td>4.2%</td>
</tr>
<tr>
<td>E-waste</td>
<td>33</td>
<td>0.1%</td>
</tr>
<tr>
<td>Batteries</td>
<td>25</td>
<td>0.1%</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>358</td>
<td>1.1%</td>
</tr>
<tr>
<td>Diapers</td>
<td>2,641</td>
<td>8.0%</td>
</tr>
<tr>
<td>Textiles</td>
<td>875</td>
<td>2.6%</td>
</tr>
<tr>
<td>Rubber</td>
<td>399</td>
<td>1.2%</td>
</tr>
<tr>
<td>Leather</td>
<td>139</td>
<td>0.4%</td>
</tr>
<tr>
<td>Wood</td>
<td>521</td>
<td>1.6%</td>
</tr>
<tr>
<td>Others</td>
<td>670</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33,130</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

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## Calorific Value Comparison

<table>
<thead>
<tr>
<th>Fuel Source</th>
<th>Approximate Calorific Value</th>
<th>Equivalent to 1 m³ Biogas (approx. 6 kWh/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas</td>
<td>6–6.5 kWh/m³</td>
<td></td>
</tr>
<tr>
<td>Diesel, Kerosene</td>
<td>12 kWh/kg</td>
<td>0.50 kg</td>
</tr>
<tr>
<td>Wood</td>
<td>4.5 kWh/kg</td>
<td>1.30 kg</td>
</tr>
<tr>
<td>Cow dung</td>
<td>5 kWh/kg dry matter</td>
<td>1.20 kg</td>
</tr>
<tr>
<td>Plant residues</td>
<td>4.5 kWh/kg dry matter</td>
<td>1.30 kg</td>
</tr>
<tr>
<td>Hard coal</td>
<td>8.5 kWh/kg</td>
<td>0.70 kg</td>
</tr>
<tr>
<td>Propane</td>
<td>25 kWh/m³</td>
<td>0.24 m³</td>
</tr>
<tr>
<td>Natural gas</td>
<td>10.6 kWh/m³</td>
<td>0.60 m³</td>
</tr>
<tr>
<td>Liquefied petroleum gas</td>
<td>26.1 kWh/m³</td>
<td>0.20 m³</td>
</tr>
</tbody>
</table>
Waste Utilisation

<table>
<thead>
<tr>
<th>Composting</th>
<th>- organic matter that has been decomposed and recycled as a fertilizer and soil amendment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal feed</td>
<td>- the feeding of food scraps to animals is historically the most common way of dealing with household food waste. Animals turn a third of ingested food into meat or dairy products</td>
</tr>
<tr>
<td>Industrial</td>
<td>- Used cooking oil is a common waste that can be turned into biodiesel</td>
</tr>
<tr>
<td>Energy</td>
<td>- anaerobic digestion is the process by which organic matter such as animal or food waste is broken down in the absence of oxygen to produce biogas and biofertiliser</td>
</tr>
</tbody>
</table>
Biogas Production Process

SUBSTRATE CHAIN (Input)
Various organic wastes → Collection & transport → Pre-treatment

TRANSFORMATION (AD process & technologies)
- pH
- Temperature
- Feeding mode
- Solids contents
- n° stages
- HRT
- OLR
- C/N-ratio

PRODUCT CHAIN (Output)
Biogas → Post-treatment → Utilisation
Digestate → Post-treatment → Utilisation

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Extracting the Highest Value from Organic Waste
SEPARATION AT SOURCE!

• This means that wherever waste is produced it must be separated.
• This separation can start with all kitchen waste that is wet and smelly goes into one bin whilst all the waste from the rest of the house goes into another, including sardine tins and mineral water bottles and such from the kitchen.
• This is very important as it is the secret to waste not ending up in dumpsites.
• One bin will be ‘dry’ waste and the other will be ‘wet’ waste.
• Now the ‘dry’ waste can be further separated and used by recyclers easily because you have already separated the ‘wet’ waste from it.
• All the ‘wet’ waste can now be converted into energy using a method called bio digestion OR it can be made into organic fertiliser by a method called compost.
Sustainable Waste Management

• Wet or organic waste is turned into energy by adding bacteria to the waste and having the bacteria to digest the waste and produce methane gas which can be used as an environmentally friendly fuel.

• Methane can also be fed to a special generator to produce clean electricity.

• Such practices will eventually achieve ‘zero’ waste to dumpsites.

• Do you now know why throwing waste is wasting money?

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Sustainable Waste Management

- Nature has no waste because nature recycles everything eg when the leaves from a tree fall, it rots on the ground helped by rain and sunshine then becomes compost which is food for the plants that are growing on the soil where the leave had fallen.

- Insects help this process too with all other waste that nature produces like animal droppings, dead animals etc.
Extracting the Highest Value from Organic Waste

Organic Waste - ROI Brief

Organic Waste
(20 Mt/Day)
RM2,400,000

Waste disposal & reduction
of pollution by way of
separation and diversion

Fertiliser
(70 M³ / Month)
Estimated RM0.20/KG
= RM14,000

Biogas
1,000 M³/Day

Cooking 6 stoves
(24 hours/day)

Gas generator
(1,000 M³/hr = 2,000kW/hr)
(RM0.40 X 2,000kW =
RM800/day)

Electricity
RM800 X 30 days
= RM24,000/Month

Simulation based on 10,000 people population

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Extracting the Highest Value from Organic Waste

Simulation based on 10,000 people population

**Waste Cooking Oil - ROI Brief**

**UCO Collection**
- (2 Mt/Day)
- RM4,000 + RM800 (Chem)

**BIODIESEL PLANT**
- (2 Mt/Day)
- RM250,000

Glycerine
- (0.4 Mt/day)
- Est. RM0.60/kg
- = RM6,240/month

Biodiesel
- (2 Mt/Day)
- RM5,508/2KL

Opex: RM10,000/Month
- Fuels 21 vehicles per day

Estimated return on investment = 2.5 Years

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MGBC

Extracting the Highest Value from Organic Waste
Extracting the Highest Value from Organic Waste
Towards Zero Waste

- Used Cooking Oil
  - Bio Diesel
- Organic Waste
- Sewage
  - BIO Gasify (ENERGY)
- Garden Waste
- Inorganic Waste
  - RECYCLE
- Others

Extracting the Highest Value from Organic Waste

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thank you for your time and Qs? please…. 

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ESTABLISHED MEMBER OF: