

TRANSFORMATION OF WASTE MANAGEMENT SERVICES TO MATERIAL RECYCLING AND WASTE-TO-ENERGY INDUSTRY: PROPOSED POLICY-LEGAL FRAMEWORK

By

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PREAMBLE

"Litter, litter everywhere, but no one picks it up!" Why? ...

Please join me in sharing our thought ...

it is my life-time dream to seeing our streets, drains, public watercourses, and the surrounding seas free from litter, rubbish, garbage, and all kinds of waste. Waste-to-Resource, through the required regulatory and necessary economic Policy framework, is the solution to this long outstanding 18th Century problem, based on the emerging Principle that "indifferent consumers must pay ...".

A Typical Disposal Site in Malaysia



IN THE HIP ...

- *Waste Generation* in P. Malaysia: 19,100 tonnes/day (0.8 kg/capita/day);
- *Waste Composition*: Food Waste (45%), Plastic (24%), Paper (7%), Iron (6%), Glass & Others (3%);
- *Rate of Recycling*: less than 5%

Solid Waste Management : Business-as-usual is not sustainable

Current state of affairs

Increasing amount of solid waste

- Generates 21,000 tons/day - in 2010, it was reported by UNDP that Malaysia generated 7.34mt of solid waste per year.
- Only an estimated of 5% recycled. Source separation scheme ongoing but still at early stage.

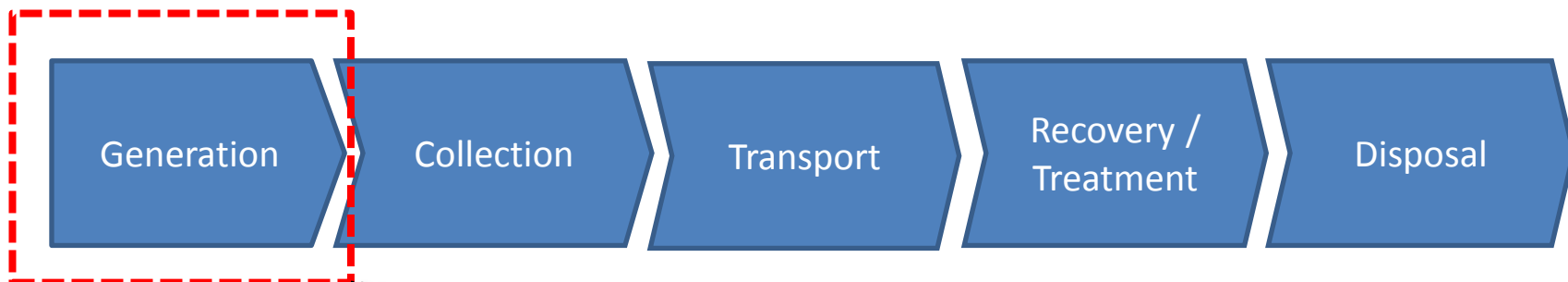
Landfills are the only disposal means in Malaysia

- 95% waste land-filled. Around 300 sites but only 60% in operations.
- Not more than 10 sanitary landfills have been built (vs 22 specified in NSP).

Current treatment and disposal methods are not environmental friendly

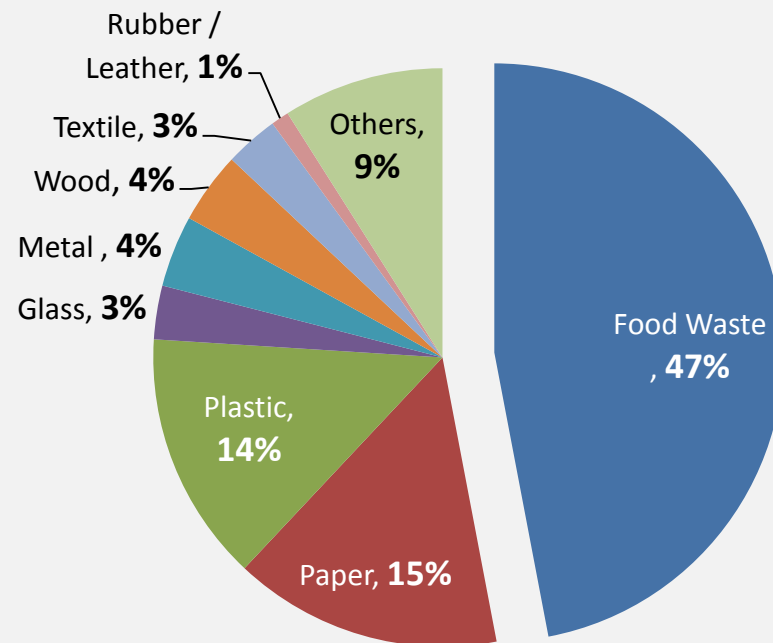
- Dependence on landfills will increase GHG emission by 50% in Peninsular Malaysia by 2020
- Incinerators releases toxic gases like dioxins

5 stages in the activity chain of Waste Management

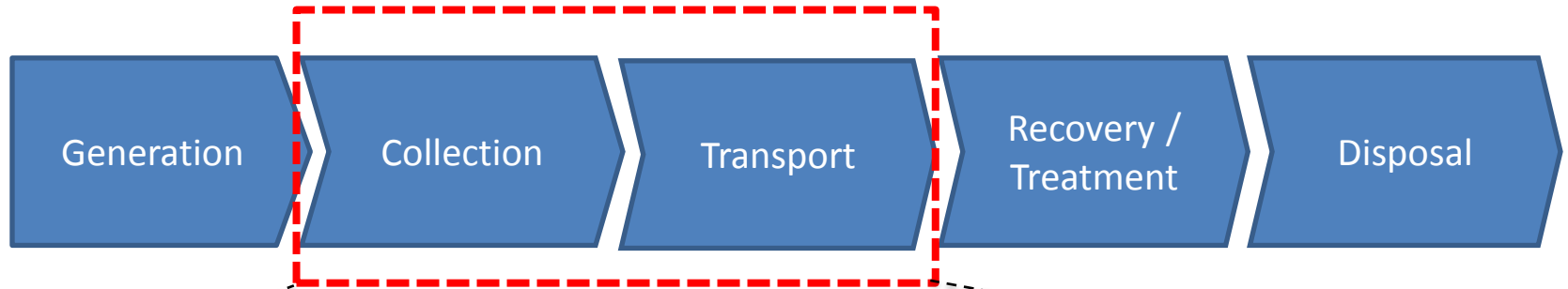


Current Landscape

- Around 23,000 tonnes generated per day all over Malaysia
- 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
- Uncoordinated and unregulated ecosystem for recycled waste



5 stages in the activity chain of Waste Management



Current Landscape

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

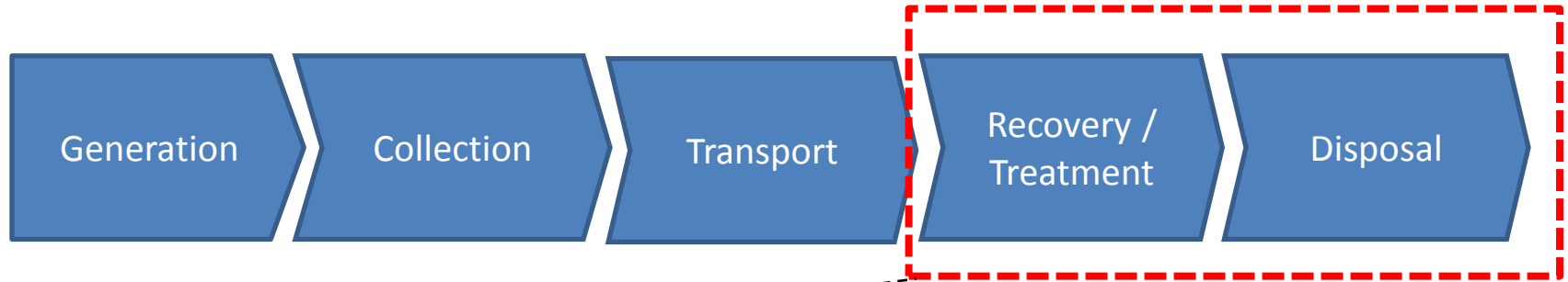
- Alam Flora Sdn Bhd (Central & Eastern Region)
- SWM Environment (Southern Region)
- Environment Idaman Sdn Bhd (Northern Region)

Enforcement by 1 September 2012 :

- 2+1 collection system – 2 days for organic waste, 1 day for recyclable waste
- New standards on waste bin and garbage collection trucks
- Enforcement of KPI on collection schedule
- Enforcement on leachate spillage and cleansing

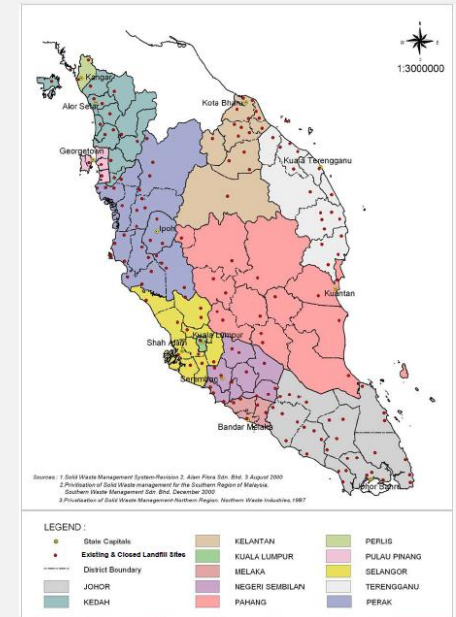
**** With the pending enforcement mechanism to be in place, the collection and transport value chain is not a focus area in the lab**

5 stages in the activity chain of Waste Management



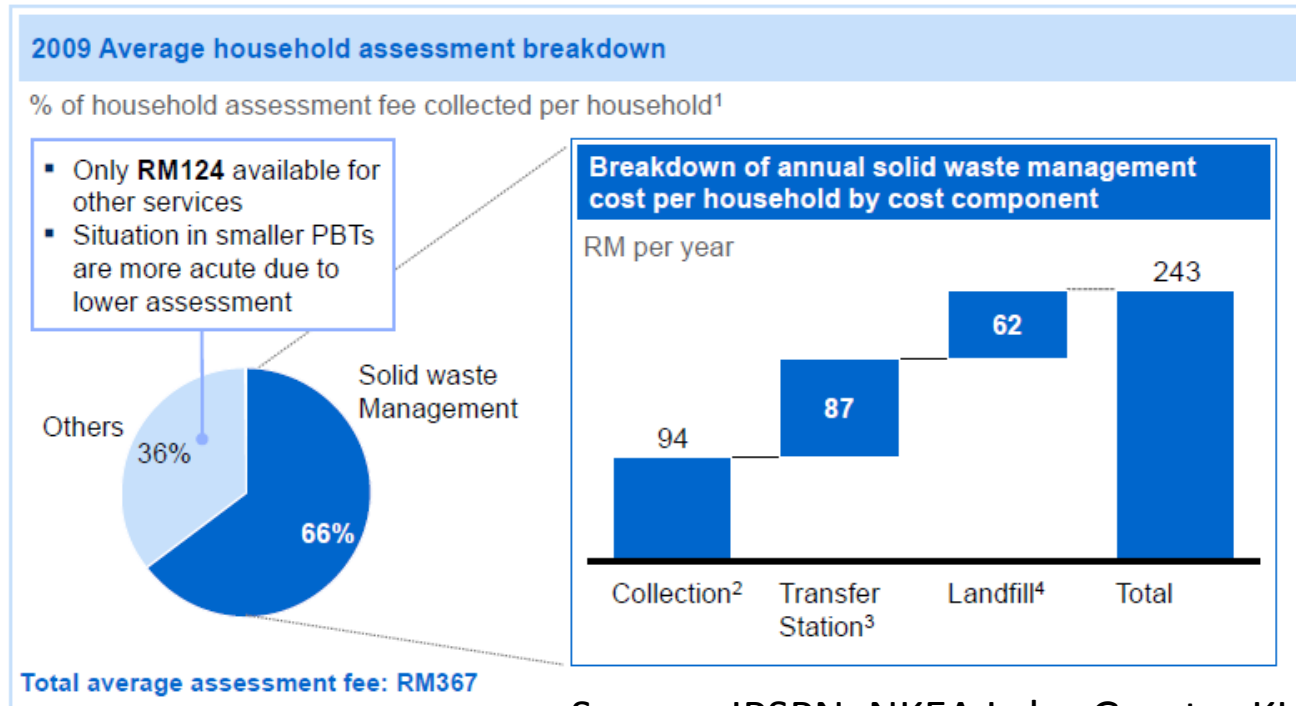
Current Landscape

- 165 operational landfills across Malaysia catering to 95% of Malaysian waste
- 8 sanitary landfills operational and 11 more under various stages of implementation & construction
- 1 private operated technology-based treatment facility (integrated material recovery, biological and thermal treatment) operational in MP Kajang generating energy from waste
- 5 small capacity incinerators under various stages of implementation on four islands (Langkawi, Tioman, Pangkor, Labuan) & Cameron Highlands



Management of Solid Waste is a big cost to the government

- 40-80% - solid waste & public cleansing expenditure vs total PBTs' Expenditure
- RM14.80 - Cost of SWM Services per premise
- Privatisation cost to Federal Government: RM300M and counting
- CAPEX of new Landfill: RM30mil ++
- OPEX of landfill: RM28.80 – RM49/tonne



Source: JPSPN, NKEA Lab - Greater KL

1 DBKL Assessment rates assuming 4 persons per household

2 Cost of collection from average household to transfer station

3 Average cost of collection from transfer station to landfill using Jeram as an example landfill destination

4 Landfill includes cost of land and rehabilitation

PROPOSITION

- A Comprehensive Regulatory and Policy Framework, including the Application of Recently Proposed “Indifferent Consumers-pay (ICP)” Principle

WHAT IS THE DIFFERENCE BETWEEN “WASTE” AND “RESOURCE”?

- Physically, no difference;
- Socio-Culturally, there is ... in “Value”

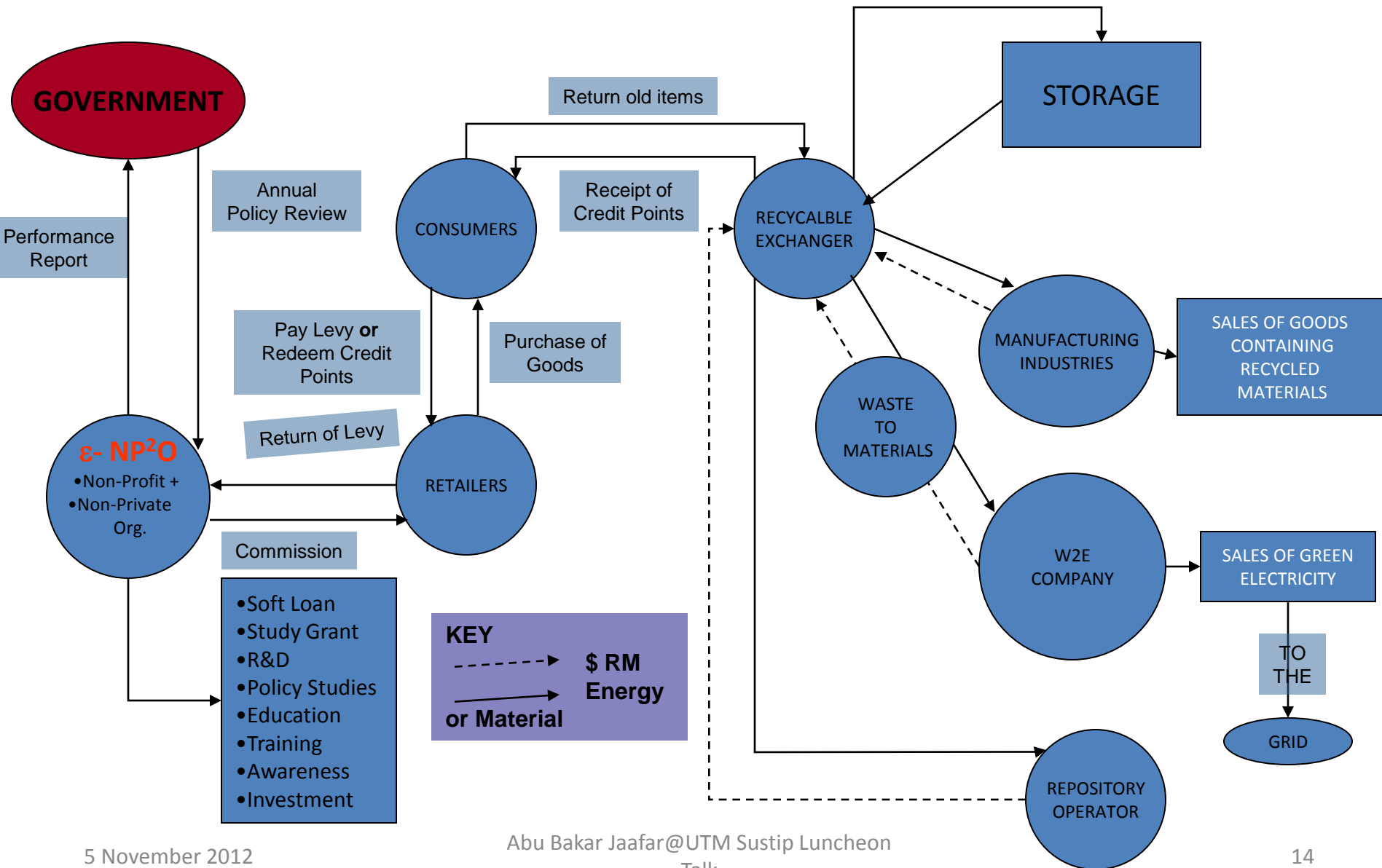
CHALLENGE TO THE PROBLEM

- How to give “value” to “waste” in order to turn it into “resource” either in terms of “material” or “energy”?
- Proposition: By applying the proposed “Indifferent Consumers-pay (ICP)” Principle complemented by regulatory measures and other economic instruments

HOW WOULD THE PROPOSED *ICP* PRINCIPLE WORK?

- Consumers who return targeted items after use for Reuse, Recycle, or Recovery (3Rs) would be rewarded with some “credit points”;
 - When they purchase the targeted items, they could redeem the collected “credit points”;
- if not they have to pay a certain amount of levy, say RM 0.10 sen/unit volume or weight;
- The targeted items would be pre-determined based on the types of litter, rubbish, garbage, or waste found in the public or deserted places.

PROPOSED SCHEME by INDIFFERENT CONSUMERS-PAY PRINCIPLE



EXPECTED OUTCOME

1. Public places would be *free any form of waste*, and thus, saving in public cleansing expenditure;
2. Waste materials would be captured and *sorted* at various recycling centres;
3. Wastes would be sorted out or *segregated* at source, the “dry ones” from the “wet, perishable” waste and that of “hazardous or toxic nature”, and thus, reduction in the frequency of “waste collection services” and reduced cost of waste-transportation, and
4. Emerging Waste-to-Resource (W2R) Industries.

eMerging W2R INDUSTRIES

1. Composting of *perishable, organic, or green household waste*;
2. Anaerobic digestion of *perishable, organic, or green household and commercial* to produce biogas and compost;
3. Materials collected at recycling centres, or “recyclables” be traded as “commodity” at Malaysia Commodity Exchange;
4. Manufacturers would produce new products or new packaging containing recyclables, with eco-labelling (*Mobius Loop*); and
5. High calorific recyclables, if not taken up by manufactures, be converted to liquid fuel or electricity that could be fed to the national grid.

Special Management of Hazardous or Toxic Waste

- Any consumer or person who collects and return to the environment authority hazardous or toxic waste be rewarded with some financial incentives, through DOE Toxic and Hazardous Trust Fund, in order for such waste neither to adulterate the non-hazardous household or commercial waste streams nor to pollute the environment

eMerging W2R Technologies

1. Software and Material Sensors for 3R-Recycling Centres, for the measurement of different types of waste material and volume and the issuing of “credit points”;
2. Tracking of recyclers with MyKad, in order to prevent “petty theft”;
3. Processes and Engineering for Sustainable Design and Production of Eco-Products; and
4. Green Technologies for the conversion of various sorted-waste streams into material or energy: from composting, anaerobic digestion, fermentation, torrefication, pyrolysis, to plasma

“GREEN” TECHNOLOGY AND SELECTED OPTIONS

- IN-SITU AND COMMUNITY COMPOSTING;
- ANAEROBIC DIGESTION FOR FOOD-WASTE, AND CATALYTIC FERMENTATION FOR OTHER PERISHABLE OR GREEN WASTE;
- “SMART” RECYCLING BINS;
- ICT FOR RECYCLABLE EXCHANGE AND FOR LOGISTICS AND MATERIAL TRACKING SYSTEM;
- WASTE-TO-CARBON/ENERGY OR WASTE-TO- MATERIAL FACILITIES
- INNOVATIVE DESIGN AND MANUFACTURING OF NEW PRODUCTS FROM RECYCLABLES

IN-SITU COMPOSTING FOR LANDED PROPERTY OWNERS



SEPARATION @ SOURCE



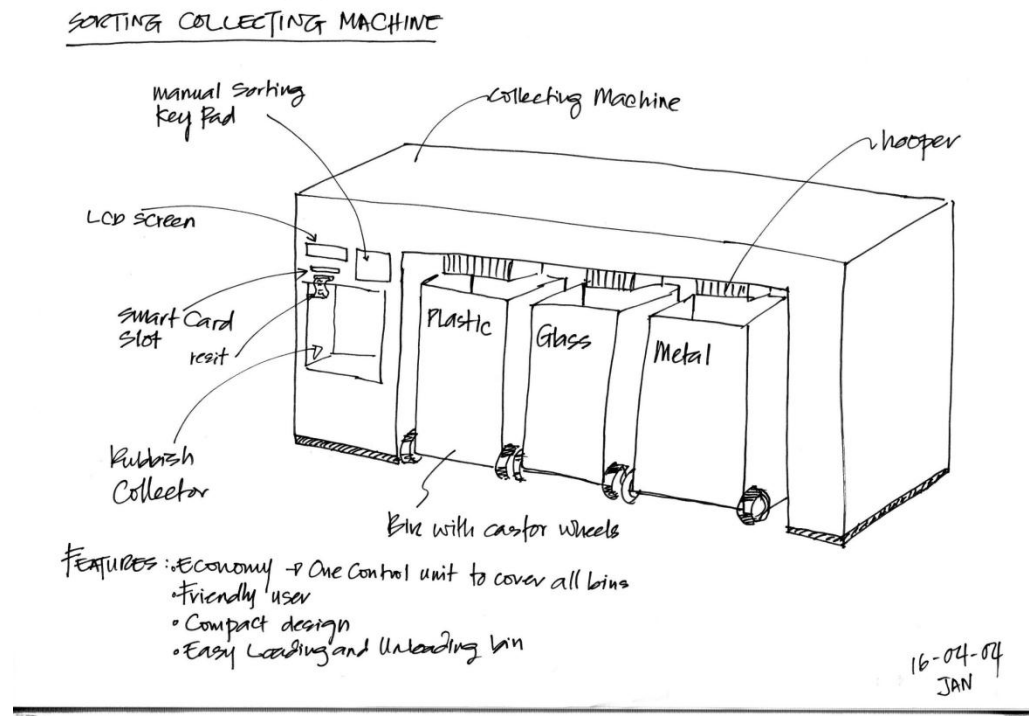
With the Courtesy of Alam Flora Sdn Bhd



Envisaged Practices Drawn From the ICP-Principle

Waste generators would voluntarily sort the items to be “disposed off” into: “Toxic”, “Dry” or not perishable, and “Wet” or perishable, and deposit them, in order to earn “credit points” with equivalent cash value, at designated collection centres,

Those who gather, sort, and deposit any “toxics” at the designated centres would earn premium credit points.



REVERSE-VENDING MACHINE OF NORWAY BY TOMRA



IUT Global: Anaerobic Digestion of Food Waste in Singapore

“... \$60 million plant ... processing about 300 tonnes of food waste a day, generating three megawatts of power in the process - enough to power about 5,000 households ...”

Edwin Khew

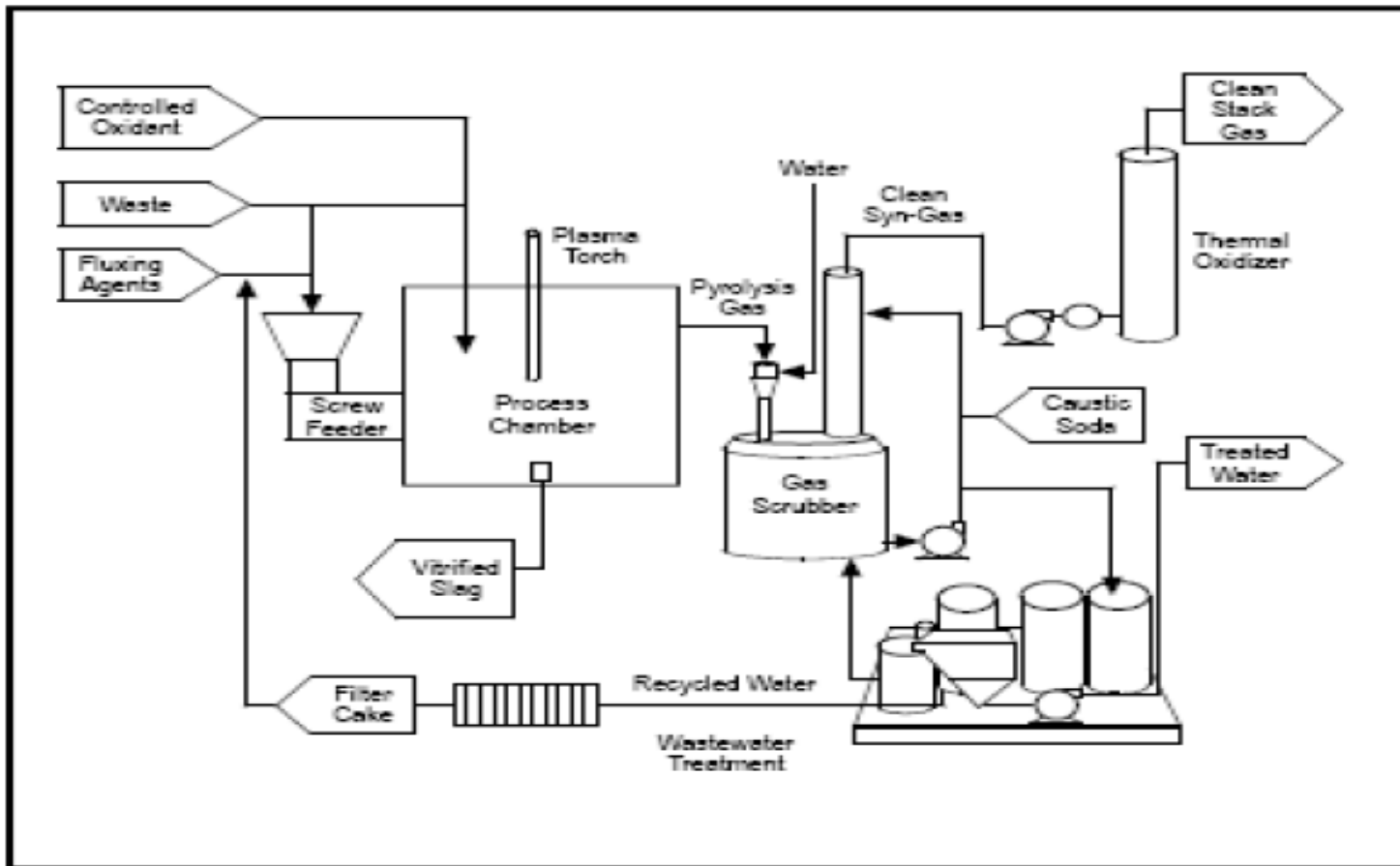
MASADA OxyNoI™ HYDROLYSIS PROCESS FOR THE PRODUCTION OF ETHANOL (C₂H₆O)



MSW TO ETHANOL

- Pencor-Masada OxyNol LLC
Location: Middletown, New York
- \$200 million plant on 22 acres of an old city landfill off Dolson Avenue
- The facility is permitted to accept 800 tons of municipal solid waste per day. The recyclables will be removed, and the leftover organic matter—primarily paper waste —will be converted to ethanol.

PLASMA ARC VITRIFICATION-GASIFICATION PROCESS



2003 R.W. Beck, Inc. City of Honolulu.
Review of Plasma Arc Gasification &
Vitrification Technology for Waste Disposal

1

REGULATORY AND POLICY FRAMEWORK UNDER REVIEW: PAST AND CURRENT

1. 1972 Malaysia Statement at UN Conference on Human Environment, Stockholm;
2. Five-Year Malaysia Plans (MPs) since 1976: 3MP, 4MP, 5MP, 6MP, 7MP, 8MP, 9MP;
3. Current 10MP (2011-2015)
4. Solid Waste Management and Public Cleansing Act, 2007
5. Solid Waste and Public Cleansing Corporation, 2007

1972 Statement of Malaysia at the UN Conference on Human Environment in Stockholm

In urban areas “solid waste collection was satisfactory but the disposal system was largely by controlled tipping and burning. The disposal of waste was like those in many countries, and an organized programme in this direction was needed. The local authorities in many cases were hampered by lack of trained and experienced personnel, financial resources and knowledge of the effects of health.” In rural areas, “solid wastes were buried or burnt but there was room for considerable improvement in this area.” (Malaysia, 1971:10, 12).

The Outline Perspective Plan (2001-2010) (OPP3),

- To adopt “a comprehensive waste management policy ... as well as to formulate strategies for waste reduction, reuse, and recycling.”
(Malaysia, 2001:187).

The 8th Malaysia Plan (MP) (2001-2005)

inter alia “to introduce various initiatives and appropriate economic approaches such as incentives and collection charges to reduce the amount of solid waste.”(8th MP: 550).

9TH MALAYSIA PLAN (2006-2010) & SOLID WASTE MANAGEMENT

THE NATIONAL *STRATEGIC* PLAN FOR SOLID WASTE MANAGEMENT (SWM)

- Upgrading unsanitary landfills, construction of new sanitary landfills & transfer stations with integrated Materials Recovery Facilities;
- 4 Rs: Reduction, Reuse, Recovery, and Recycling;
- Use of environment-friendly materials eg bioplastics;
- Legislation to streamline SWM as per the Strategic Plan;
- Awareness campaigns, public education on the benefits of practising sustainable consumption; and
- Establishment of Solid Waste Management Department.

MAIN FUNCTIONS OF SW MANAGEMENT DEPARTMENT

- To implement the National Strategic Plan for Solid Waste Management (*Strategic Plan*); and
- To administer solid waste *policy*, planning and management in *holistic* manner.

ECONOMIC APPROACHES

- To expand the use of economic instruments and market-based measures *inter alia* the *polluters-pay principle*, user-fees, & economic-valuation techniques;
- To use innovative funding mechanisms; and
- To conduct pilot studies and projects to operationalise the implementation of such innovative market-based instruments.

PAST POLICY FRAMEWORK

GENERAL:

- OPP-3: waste-recycling industry; yet to happen!
- 8th & 9th Malaysia Plans: “Polluters-pay Principle” (PPP); Not Applicable Nor Relevant!

SPECIFIC:

- Non-Applicability of PPP; Need “*Indifferent Consumers-pay*” (ICP) Principle and other economic-instruments

NON-APPLICABILITY OF “POLLUTERS-PAY” PRINCIPLE

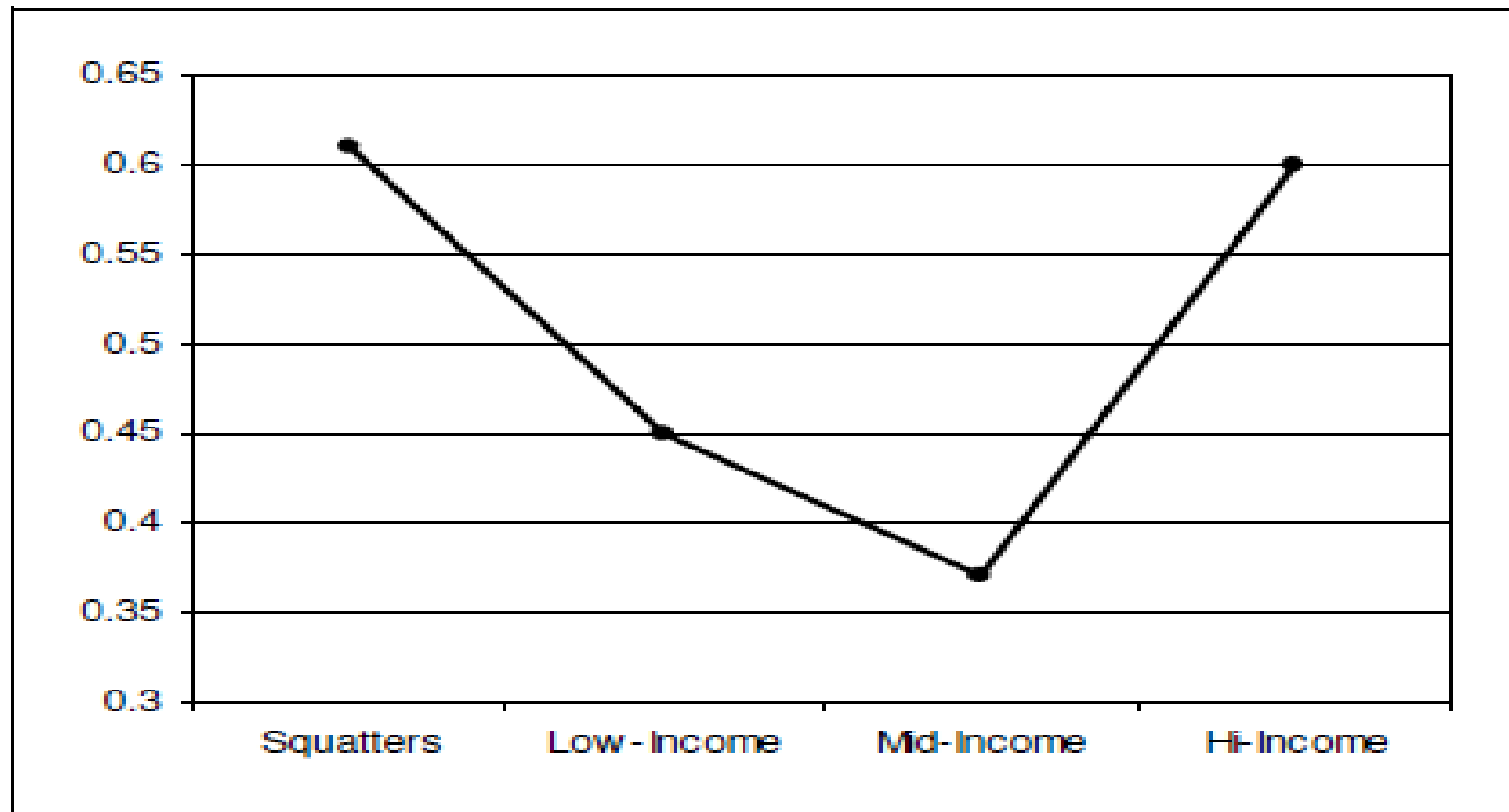


Figure 3: Comparison of Income Status to Waste Generation (kg/capita per day)

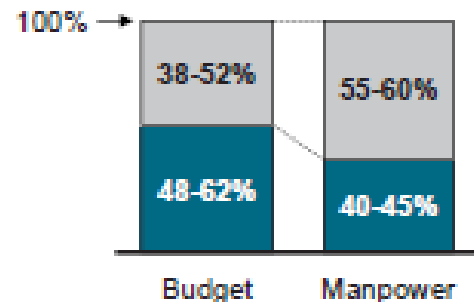
Source: Petaling Jaya Municipal Council (1990)

10TH MALAYSIA PLAN

Federalisation of solid waste management and public cleansing functions to drive improved outcomes for the public and environment

Local authorities will be able to focus on core functions

Local Authority Resources¹
Percentage of resources



- With federalisation, Solid Waste Management (SWM) and Public Cleansing (PC) responsibilities will be transferred to the federal government
- This allows local authorities to focus on core functions such as licensing, enforcement, planning and development

Significant improvements in outcomes for the public and the environment

Residential and commercial premises

- Sanitary handling with modern trucks and standardised bins for collection
- Frequent pickups from two to seven times a week depending on type of premise
- Wider coverage with 3.7 million premises, 0.6 non-residential premises and 5,800 shared facilities covered by 2015
- Improved environment for shared infrastructure such as drains, roads, markets and beaches

Safeguarding the environment

- Closure of unsanitary dumpsites with 112 closed by 2015
- Separation at source by households to facilitate recycling
- Increased household recovery of waste from 15% to 25% by 2015
- New technology for improved disposal and treatment for maximising resource and energy recovery

¹ Based on survey of three local authorities in 2008 – Pulau Pinang, Ipoh and Kota Bharu

SOURCE: Ministry of Housing and Local Government

Ensuring Waste is Managed in a Sustainable Manner

The Government will close and rehabilitate the existing 112 unsanitary landfills across the nation and upgrade some of them to sanitary landfills. In addition, transfer stations, integrated material recovery facilities, sanitary landfills and other disposal and treatment facilities will be built. Separate collection will be done for bulky waste, garden waste and recyclables from the rest of the household solid waste to facilitate recycling and recovery of waste.

Options to make it compulsory for homeowners to separate waste at source to facilitate recycling will be reviewed. The Government will require private sector commitment, in particular manufacturers, to improve solid waste management, especially through the Reduce, Reuse and Recycle (3R) programmes. As part of this effort, a deposit refund scheme and a take back system will be implemented. This systems allows consumers to receive refunds upon return of used recyclable products and requires manufacturers and supplier to take back specified products after use.

REQUIRED POLICY INSTRUMENTS

INDIFFERENT CONSUMERS-PAY (ICP) PRINCIPLE:

- Those who recycle, get rewarded with “smart credit points”; if not, pay a certain “Blue or Green” Levy when purchasing new targeted items e.g. goods in plastic bottles or containers

OTHER SUPPORTIVE ECONOMIC POLICY INSTRUMENTS

OTHER SUPPORTIVE ECONOMIC POLICY INSTRUMENTS [for food waste and other perishable or green waste]

1. “PROXIMITY” PRINCIPLE: In-Situ Compositing by landed-property owners, and community-based composting;
2. “Carbon Credits” for “methane” generated from anaerobic digestion facilities;
3. Very attractive tariff for “heat” or “electricity” generated from waste;

... OTHER SUPPORTIVE ECONOMIC POLICY INSTRUMENTS [for non-perishable]

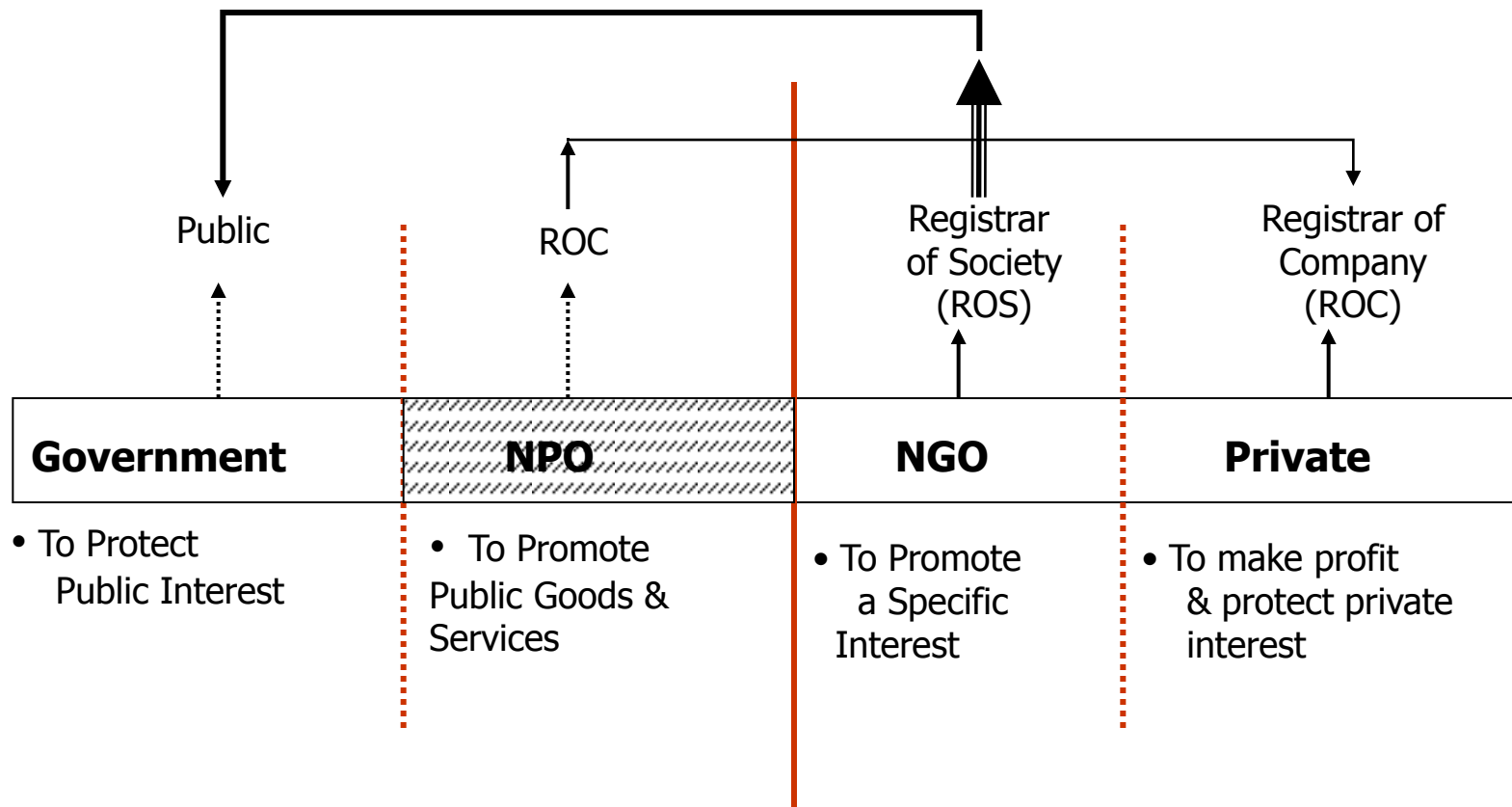
1. Establishment of **MALAYSIA ReCyclable EXCHANGE (myReX)**;
2. Product Stewardship: “... take-back policy ...”
3. Producers Responsibility: “... new products or packages containing a certain percentage of recyclables”;
4. Eco-labelling of new products or packages containing “recyclables”;

... OTHER SUPPORTIVE ECONOMIC POLICY INSTRUMENTS [for green electricity & for safe disposal of HHW]

1. Attractive Feed-in-Tariff for Electricity generated from Waste as from other renewable energy sources;
2. Monetary rewards for “sorted” household hazardous waste (HHW)

/ INSTITUTIONAL ARRANGEMENT

- National Solid Waste Management Department and Solid Waste;
- and Public Cleansing Management Corporation; and
- Other Agencies or Ministries to introduce various policy instruments and other fiscal measures outlined above: LAs; MEGTW; MITI, MDTCA, MOF, MNRE, DOE, etc



**Figure The Need for Establishment of the 4th Institution :
Non-Private Organisation for Helping the Government to Protect Public Interest
and for Promoting Public Goods & Services**

PERFORMANCE MEASURES

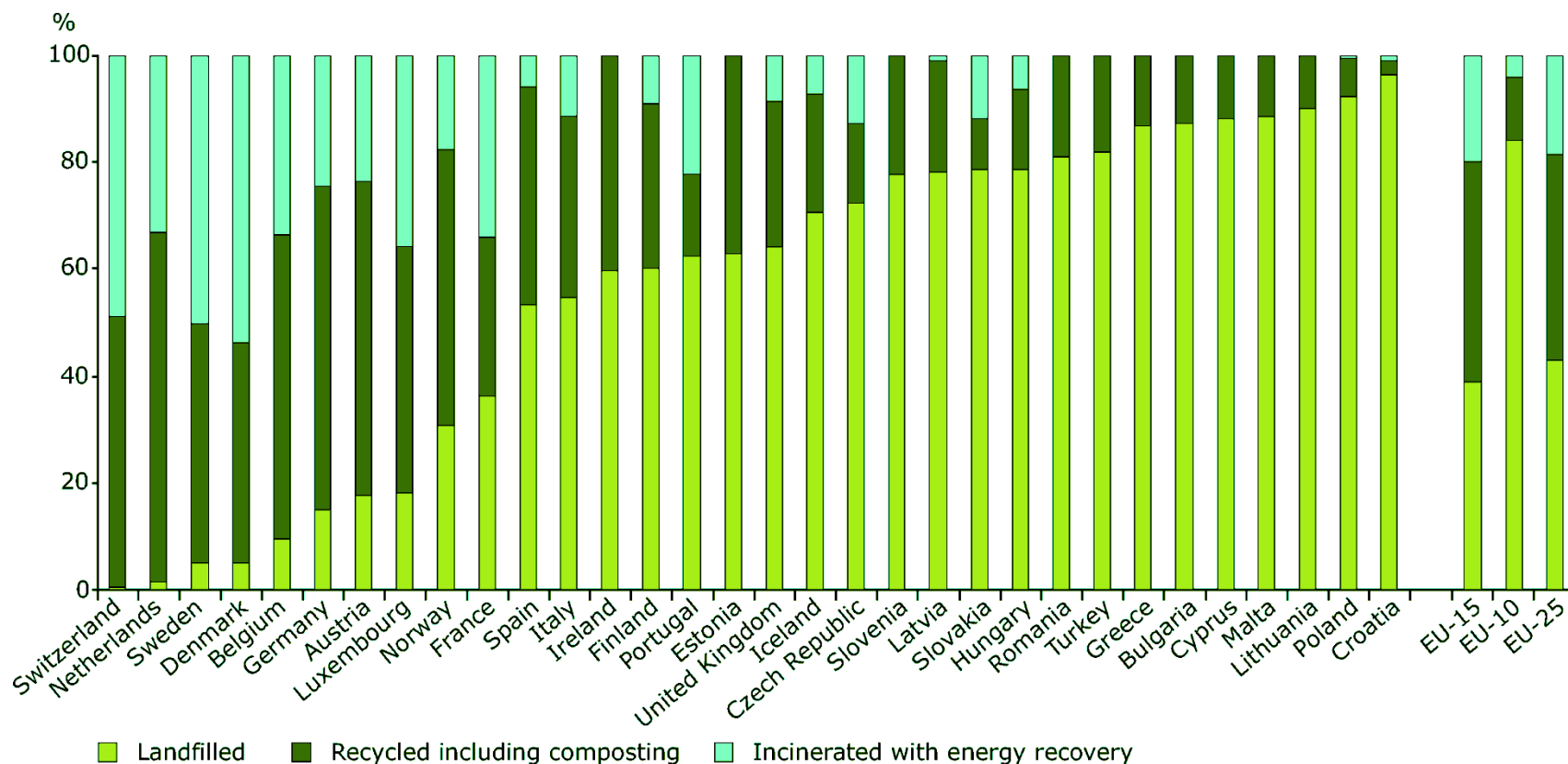
Charges based on KPIs:

- Waste-collection efficiency;
- Cost-Effectiveness in providing services (RM/tonne);

With Specific Targets:

- High degree of cleanliness;
- High rate of recycling.

WASTE MANAGEMENT IN EU



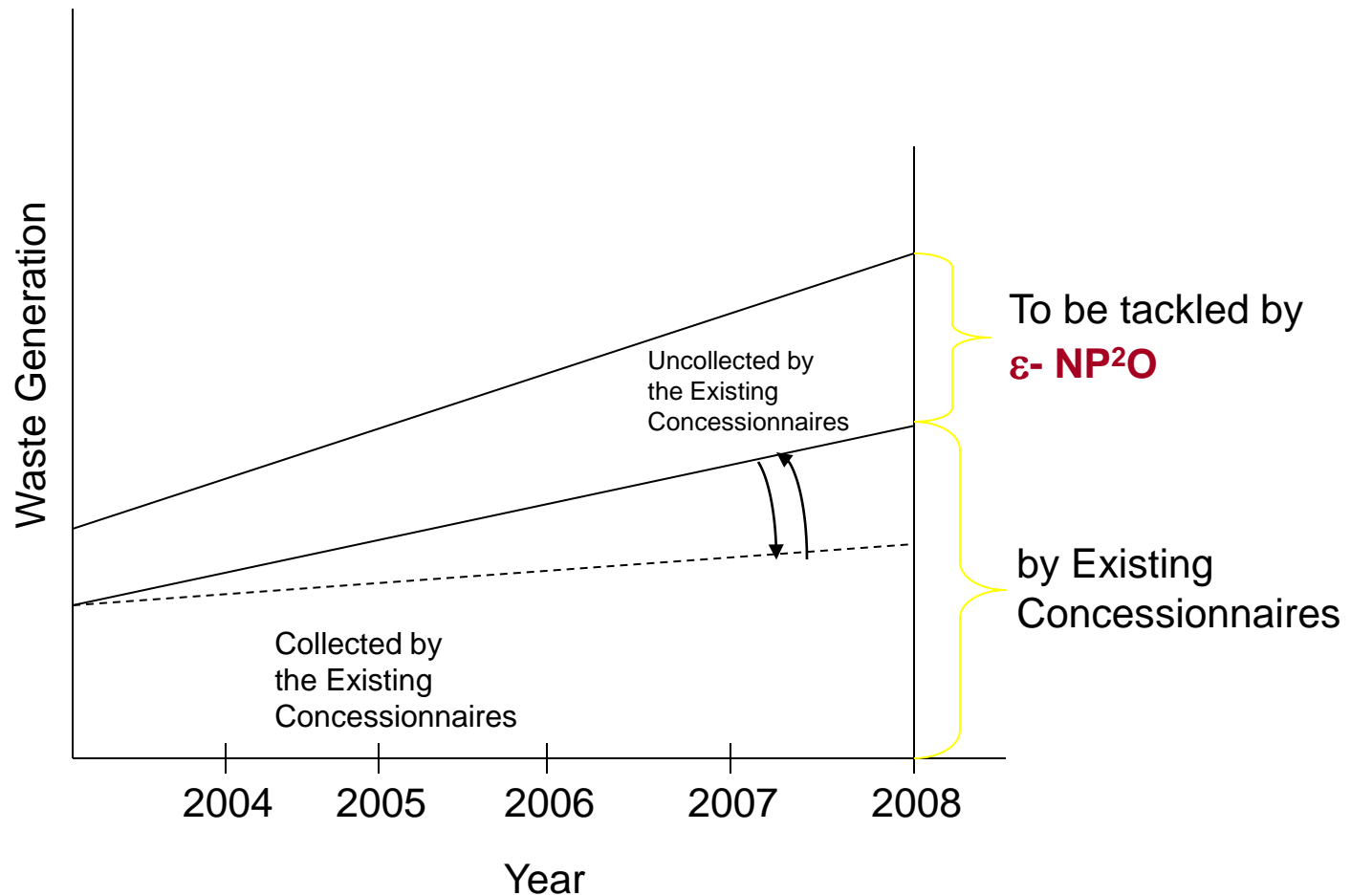
<http://dataservice.eea.europa.eu/atlas/viewdata/viewpub.asp?id=2752> 8 June 2009

RATE OF RECYCLING IN OTHER SELECTED COUNTRIES

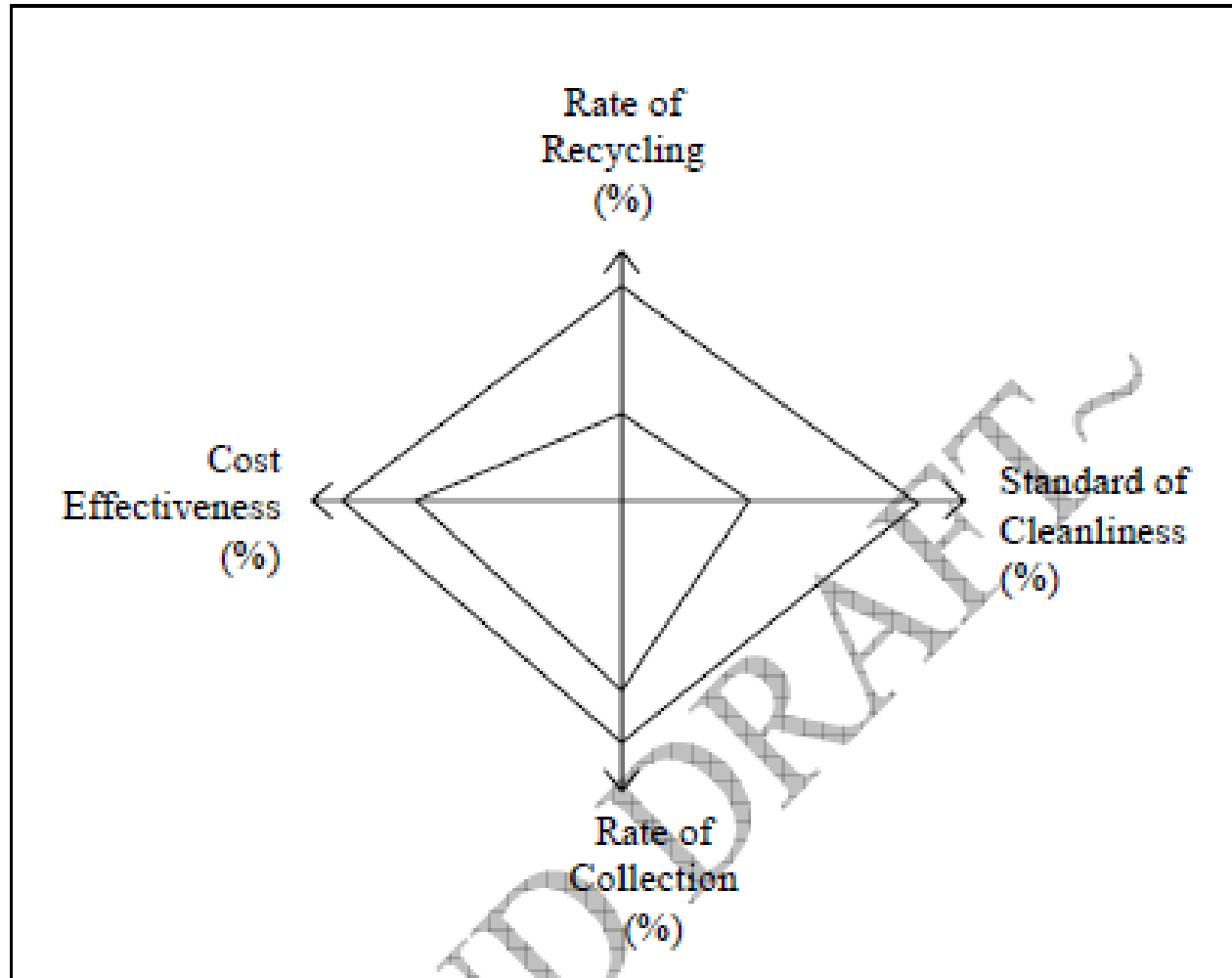
- Flanders-Belgium (62%)
- Netherlands (47%)
- Switzerland (45%)
- Sweden (38%)
- Denmark (32%), and
- USA (30%).

(Ref: Professional Services Development Corporation (PSDC) and EEC (2004). "World Scenario of MSW Management," Power-point presentation to Al-Ghurair Group, Dubai, UAE.)

Projected Waste Generation in Malaysia: Collected & “Uncollected” Portion, 2003-2008



THE EXPECTED BALANCED SCORE-CARD



KEY OBJECTIVES /RESULTS IN SOLID WASTE MANAGEMENT

1. “Our” place and the environment is kept CLEAN;
2. The rate of RECYCLING keeps increasing;
3. The EFFICIENCY of services, particularly in waste collection and cleansing of public places continues to improve; and
4. The most COST-EFFECTIVE solutions to the waste problems is achieved.

LEGAL-REGULATORY FRAMEWORK

LEGAL:

- Solid Waste and Public Cleansing Management Act 2007;
- Solid Waste and Public Cleansing Corporation Act 2007

SPECIFIC REGULATIONS

- Waste Segregation or Separation @Source?

Federalisation of Solid Waste Management has been enforced since Sep 2011

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

Department of National Solid Management

- Propose Policy, Plans and Strategies,
- Formulate plans for SWM facilities (location, types and size)
- Sets standards, specifications and codes of practices
- Exercise regulatory functions

Corporation of Solid Waste and Public Cleansing

- Implement policy, plan, strategies
- Monitor compliance with the standards, specifications and codes of practice
- Implement and enforce the laws and regulation
- Implement measures to promote public participation and to improve public awareness
- Maintain and improve the standard and level of the SWPCM services

ENFORCEMENT, AS A DETERENCE, BUT NOT FOR COST-EFFECTIVENESS

Litterbugs may have to pay fines of RM1,000

PURAJAYA: The government may impose a fine of up to RM1,000 on litterbugs if they continue to throw garbage in public places, Housing, and Local Government Minister Datuk Seri Chor Chee Heung said yesterday.

As a first step, he said Solid Waste and Public Cleansing Management Corporation (PPSPM) enforcement officers had been authorised to issue warnings to the culprits.

"The issuance of the warning notice is to educate and create awareness among the public on their roles and responsibilities in solid waste management and keeping public areas clean.

"If the individual is a repeat offender, there is no other way for us but to take action against him or her.

"An investigation file will be opened and it will be submitted to the attorney-general and he will then decide on the action that should be taken," he said.

Chor was speaking at a press conference after launching a 3R (Reduce, Reuse, Recycle) and Anti-Litter Campaign.

He said the penalty would only come into force in the future, as creating awareness and educating the public on proper waste management was the government's main priority.

"For now, we want to educate the people

through various awareness campaigns so that they know their responsibilities when it comes to disposing waste, but after a certain period of time, we will decide on whether to enforce the penalty or not," Chor said.

"We want to give people the chance to practise proper waste management as we aim to make Malaysia a clean and prosperous nation."

"We want to give people the chance to practise proper waste management as we aim to make Malaysia a clean and prosperous nation."

Datuk Seri Chor Chee Heung

Chor said in line with the month-long campaign, guidebooks on solid waste disposal and recycling would be distributed to houses.

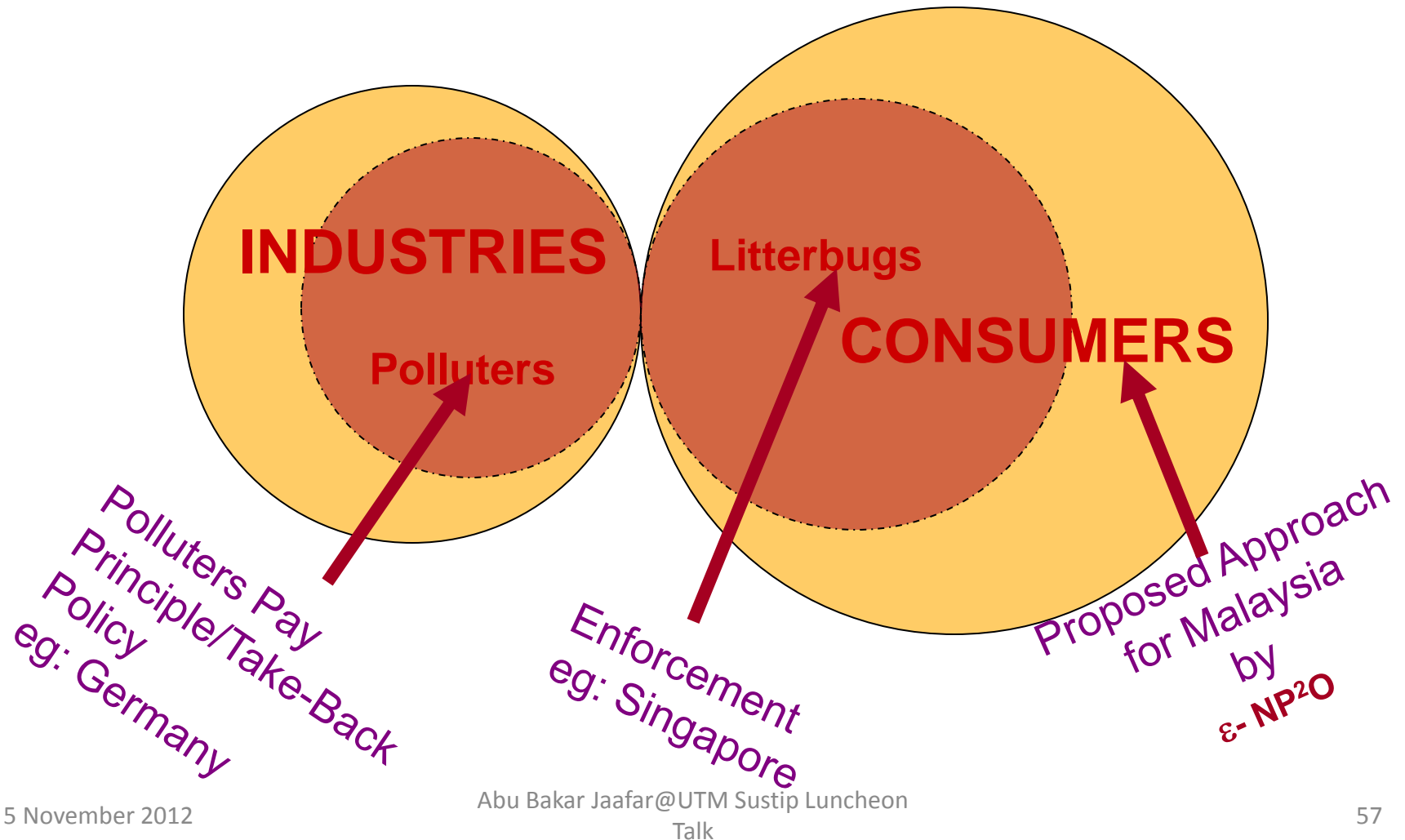
The public can report their grievances on waste and poor drainage maintenance by calling the toll free hotline at 1-800-88-7474 (SISA) 8am to 8pm.

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NATION

FRIDAY, NOVEMBER 2, 2012

COMPARATIVE APPROACH BY COUNTRY



CONCLUSIONS

- Commentary on Past Policy: *“They say things, that they themselves do not do ...” [Al-Quran, 26:226]*
- *Commentary on Current Policy: More regulatory, more enforcement ... no signs of any movements toward the application of market-based instruments*

RECOMMENDATIONS

For integrated solid waste management in Malaysia to be in place, it would require at least:

- ONE Policy Directive,
- ONE Awareness Campaign;
- ONE Regulatory Measure;
- ONE Fiscal Measure;
- EIGHT Enviro-Economic Policy Instruments

THE EIGHT ENVIRO-ECONOMIC POLICY INSTRUMENTS RECOMMENDED

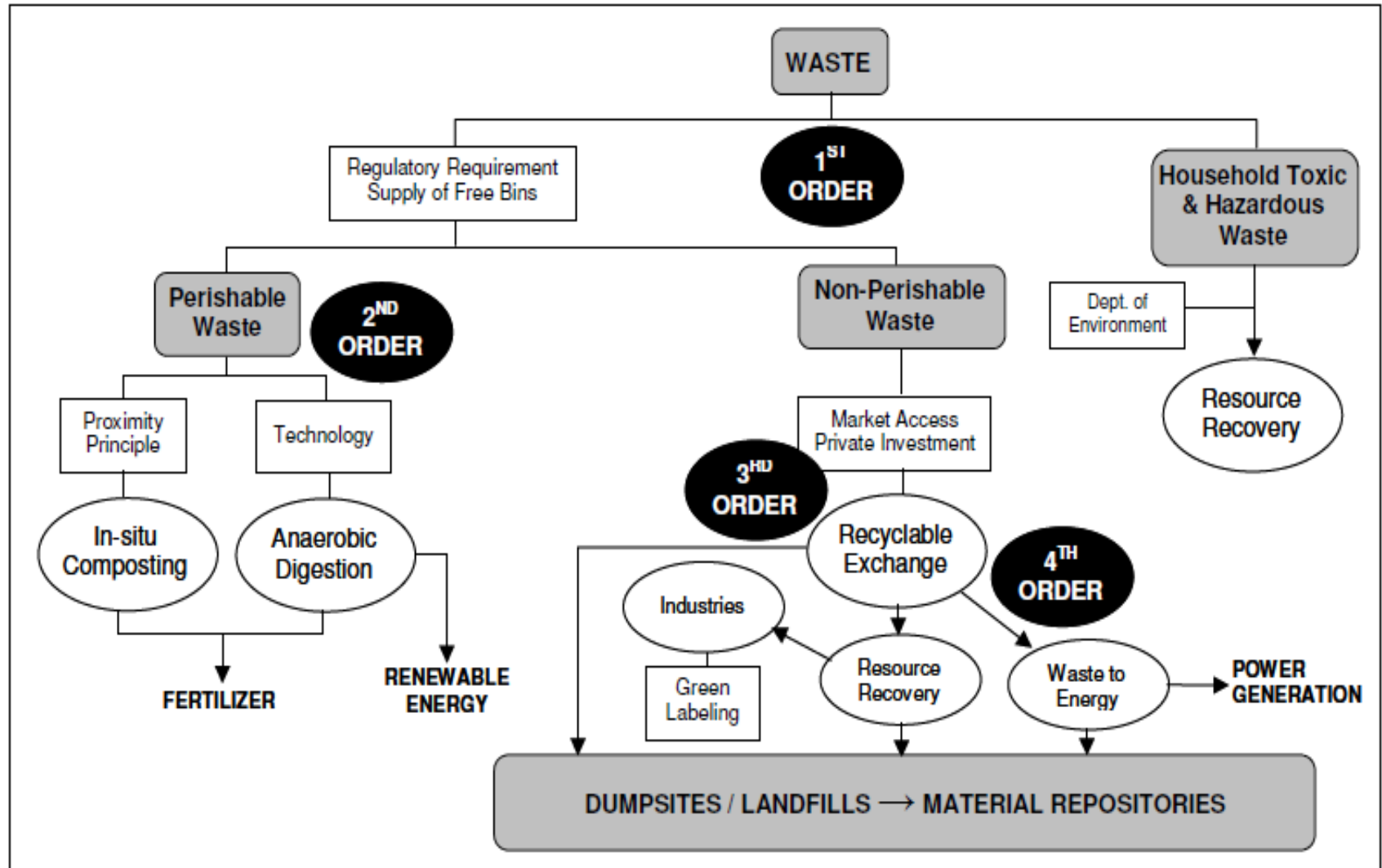
1. Indifferent Consumers-pay Principle and Levy;
2. Recycling Reward Points;
3. Recyclables in Commodity Exchange;
4. Producers' Responsibility;
5. Eco-Labelling;
6. Attractive Feed-in Tariff for Energy from Waste;
7. Compost Product Certification; and
8. Carbon-Credits.

Thus, the need for Transformation: another Lab and lap for a W2R Premier Summit with Relevant Ministers and Heads of All State Governments

... INSTITUTIONAL ARRANGEMENT

- MHLG/LAs “... waste segregation @source ...”;
- **MOF**: “... blue-green LEVY ... & SMART Credit Points”; Malaysia ReCyclable ExCHANGE;
- MITI: “... Producers’ Responsibility ...”;
- **MODTCA/SIRIM**: “...Product Eco-Labelling ...”;
- **MNRE**: “CDM Project Approval & Carbon Credit ...”;
- MEGTW: “Very Attractive Feed-in-Tariff”;
- **DOE**: “Trust Fund for sorted HHW ...”

IN SUMMARY ...



UNDER-PRICED OF RECYCLABLES, UNLESS TRADED IN COMMODITY EXCHANGE

Composition	Percentage (%)	Amount (tones/year)	Market price (RM/kg)	Values (Million RM)
Papers	17.1	1,026,000	0.20	205.2
Plastics	9.1	546,000	0.30	163.8
Glass	3.7	222,000	0.05	11.1
Aluminium	0.4	24,000	2.00	48.0
Scrap Metals	1.6	96,000	0.50	48.0
Other non-recyclables	68.1	4,086,000	-	-
Total	100.0	6,000,000	-	476.1

*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, middlemen and end buyers (industries) are usually much higher*

IN SHORT: SAVING TO TAXPAYERS & CREATION OF W2RM INDUSTRY

- POTENTIAL SAVING
UP TO RM 4 BILLION
PER YEAR;
- CREATION OF WASTE-
TO-RESOURCE &
RENEWABLE-ENERGY
INDUSTRY, WORTH
RM 2 BILLION

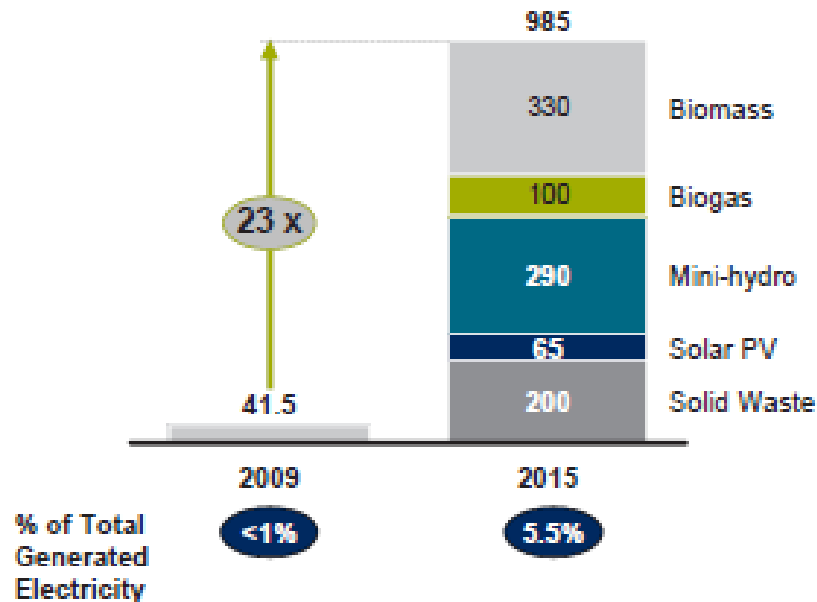


SOLID WASTE MAKING UP OVER 20% OF RENEWABLES

Renewable energy will increase from <1% in 2009 to 5.5% of Malaysia's total electricity generated by 2015

Moving towards renewable energy replaces the need for fossil-fuel power plants

**Planned increase in renewable energy capacity
MW**



RE investments will receive a huge push through FiT

- Introduction of Feed-in Tariff (FiT) of 1% to be incorporated into the electricity tariffs of consumers
- Establishment of a Renewable Energy Fund from the FiT to be administered by a special agency under KETTHA
- This provides an annual CO₂ avoidance of 3.2 million tonnes

SOURCE: Ministry of Energy, Green Technology and Water

TERIMA
KASIH

شكر (syukran)

谢谢 (xiè xiè)

Thank You

Merci

Gracias

Спасибо



SELECTED BIBLIOGRAPHY

- **Abu Bakar Jaafar, and Maheswaran, A., (1978), “Recovery Against Disposal of Wastes for A Sustained National Development,” Paper presented at the MOSTE Seminar on the Application of Science and Technology to Development, Kuala Lumpur, June 15-16. 18p.**
- **A. Bakar Jaafar, (1999), “Promotion of Mentor-Mentee Concept Towards Corporate Environmental Management,” Paper presented at the ICM Workshop on Waste Management 2000, Radisson Plaza Hotel, 6-7 April. 23p.**
- **A. Bakar Jaafar, (2000), “Challenges in the New Millenium: A Perspective of Environmental Consulting and Contracting Services,” Paper presented at the Environmental Management Seminar on Challenges in the New Millennium, 15 September. Hotel Pacific Hotel, Kuala Lumpur. 9p.**
- **A. Bakar Jaafar, (2001), “Prospects for Alternative Management of Waste in Malaysia,” Paper presented at the 2001 Waste Management: ASIA Solid & Hazardous Waste Management Trade Expo & Conference, 7-9 November, Sunway Pyramid Convention, Petaling Jaya, Malaysia.**
- **Abu Bakar Jaafar, (2001), “Greening of the Industry: Industrial Response to Sustainable Development,” Paper presented at the Academy of Sciences of Malaysia Seminar on Sustainable Development: A Blueprint for Asia, 13 February. Kuala Lumpur. 50p.**
- **A. Bakar Jaafar, (2001), “Sustainable Consumption,” Universiti Putra Malaysia National Seminar “Penggunaan Lestari: Cabaran Globalisasi,” Equatorial Hotel, Bangi, Selangor, 17May. 32p.**

... (continued) SELECTED BIBLIOGRAPHY

- Abu Bakar Jaafar and Noor Mohamed Haniba, (2002), “The Role of Non-Private Organization (NPO) in Waste Management,” Paper presented at the AAAWM Symposium: Charting Strategies for Waste Management in Developing Countries, 9-12 September. Nikko Hotel, Kuala Lumpur. 10p.
- Ackerman, F (1997). Why Do We Recycle? Markets, Values, and Policy. Washington, DC: Island Press.
- Jamal Othman and Nur Azura Sanusi (2001). “Notes on Potential Economic Instruments for Municipal Solid Waste Management in Malaysia,” in Policies to Improve Municipal Solid Waste Management. Chamhuri Siwar et al (Eds.). Bangi, Selangor: UKM LESTARI, pp. 53-58.
- Malaysia, (1971), Government of , Report for the United Nations Conference on Human Environment. April 1. 22p.
- Malaysia, Statement of, (1972), UN Conference on Human Environment, Stockholm, 1-5 June. 4p.
- Malaysia, (2001). Eighth Malaysia Plan (2001-2005) (8MP). Kuala Lumpur: Percetakan Nasional Berhad. p.550.
- Malaysia, (2001), The Third Outline Perspective Plan (2001-2010). Kuala Lumpur: Percetakan Nasional Berhad, p. 187.
- Malaysia (1991): The Way Forward (Vision 2020). Kuala Lumpur: National Printing Department, “Seminar Kebangsaan Wawasan 2020”, 5-7 December. p.28 (<http://www.wawasan2020.com>)

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