

From the Linear to Cyclic Approach for Sustainable Waste Management in Malaysian City

**Ahmad Fariz Mohamed, Abdul Samad Hadi,
Shaharudin Idrus & Abdul Hadi Harman Shah**

**Institute for the Environment and Development
(LESTARI), Universiti Kebangsaan Malaysia, 43600,
Bangi, Selangor, Malaysia**

E-mail: fariz@ukm.my, afm3778@hotmail.com



L E S T A R I

Introduction



- Waste important resource generated from the cities metabolism process.
- Sustainable waste management is critical as it's generation increases with increasing urban metabolism process.
- Cities with limited resources such as space will require strategic management system for a sustainable waste management.
- Waste recovery able to reduce dependency on limited space and natural resource.
- Important for urban ecosystem and able to change from linear model of waste management focusing on end-of-pipe approach towards cycle of waste as resources.

Introduction



- This paper highlights what Malaysian cities have gone through in waste management.
- The transition of linear model of waste management focusing on end-of-pipe approach towards cycle of waste as resources, prioritising waste recovery.

Urban Growth and Waste Management in Malaysia

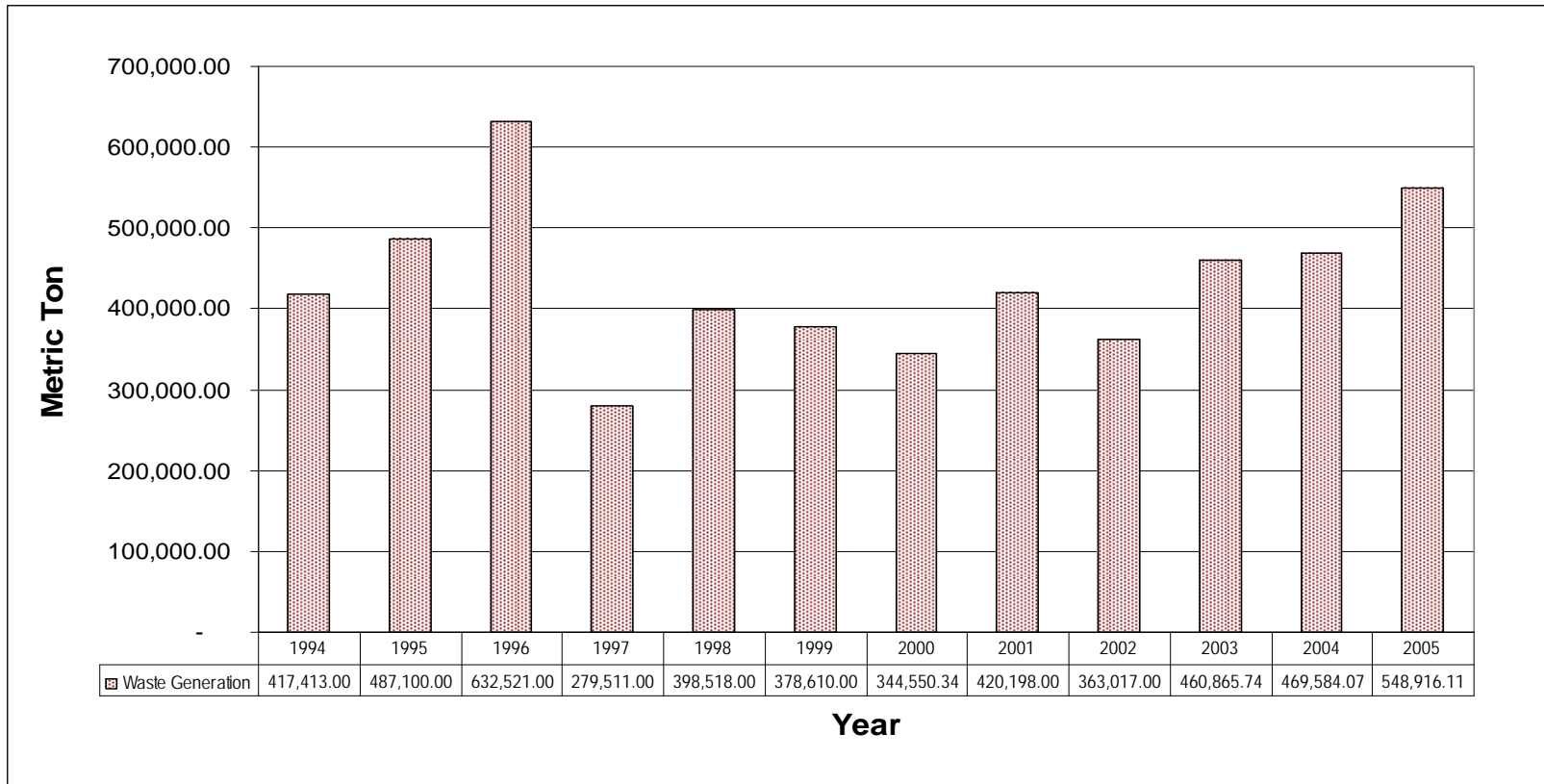
- Since independence in 1957, urban expansion in Malaysia has been experiencing rapid change especially during the period from 1991 to 2000 along with population increased.
- Solid waste generation in Malaysia increased from 16,200 tonnes per day in 2001 to 19,100 tonnes in 2005 or an average of 0.8 kilogram per capita per day (JICA, 2006).
- Studies conducted by Hassan et al. (1998) reveal that Malaysian municipal solid waste (MSW) generation ranges between 0.45 and 1.44 kg waste/capacity/day with an average 0.81kg waste/capita/day.

Urban Growth and Waste Generation

Year	Population Live in Local Government Area (million) (increase 3% annually)	Estimated Solid Wastes Manage by Local Government (Million ton)
1991	13,727	2.5
1992	14,139	2.6
1993	14,563	2.8
1994	15,000	2.9
1995	15,146	3.0
1996	15,450	3.2
1997	15,524	3.4
1998	16,312	3.5
1999	16,310	3.7
2000	16,718	3.9
2001	17,136	4.5
2002	17,564	4.6

Urban Growth and Waste Generation

- Industrial scheduled waste generation trends from industry in urban areas varied from 417,413 metric tons in 1994, increase to 632,521 in 1996 then reduced to 363,017 metric tons in 2002, increased again to 548,910 metric tons in 2005.



The Need for Change from Linear to Cyclic Approach in Urban Waste Management

- Financial: 30 – 40% of local government expenditure was used for waste management.
- Financial: 1998 to 2007 MHLG provided additional fund for all local government amounted to RM 68.4 million on top of it's existing budget for waste management (KPKT, 2009).
- Waste stream in Malaysian cities still goes into the environment and affects the health of the ecosystem
- Land or water contamination impact to the environment and affects the health of the ecosystem may not suitable for other uses, such as for property and agriculture.
- Land availability for wastes disposals in cities boundary has become limited and expensive to maintain.

The Need for Change from Linear to Cyclic Approach in Urban Waste Management

- Other issues includes human health, odour, leachate pollution and aesthetic problems.
- Illegal dumping of wastes into many secluded areas such as plantations, rivers, lakes and ex-mining pools.
- The problem will continue if wastes are seen as a non valuable resource.
- Changing the perception of wastes to valuable resources will reduce dependency of ecosystem as space for waste disposals.
- Hence waste recovery important for transition from linear to cyclic approach.

Waste Recovery a Key Activity for Urban Ecosystem Metabolism Process

- Continuous flow of materials or resources within the urban ecosystem will ensure efficiency of its metabolism process.
- The existing linear flow will not be able to sustain increasing demand of material or resources for the urban ecosystem in Malaysia.
- Waste recycling in Malaysian cities are becoming important activities.
- It is estimated that 70% of total solid wastes generated were recovered. From 5,405.1 ton/day in 1994, increased to 8,063.47 ton/day in 2005.
- Approximately 45.75% of scheduled wastes have been recovered from total wastes generation from 2000 to 2005.

Waste Recovery a Key Activity for Urban Ecosystem Metabolism Process

- Initiatives to use waste as energy materials has been started in Malaysia.
- Example Recycle Energy has a capacity of processing 700 tons of MSW per day at its Refuse Derive Fuel - Waste to Energy (RDF-WTE) plant in Semenyih for the Kajang Municipal Council and district of Hulu Langat.
- The plant has the capacity to produce 5 Megawatt (MW) of electricity per month which was supplied to the national grid.

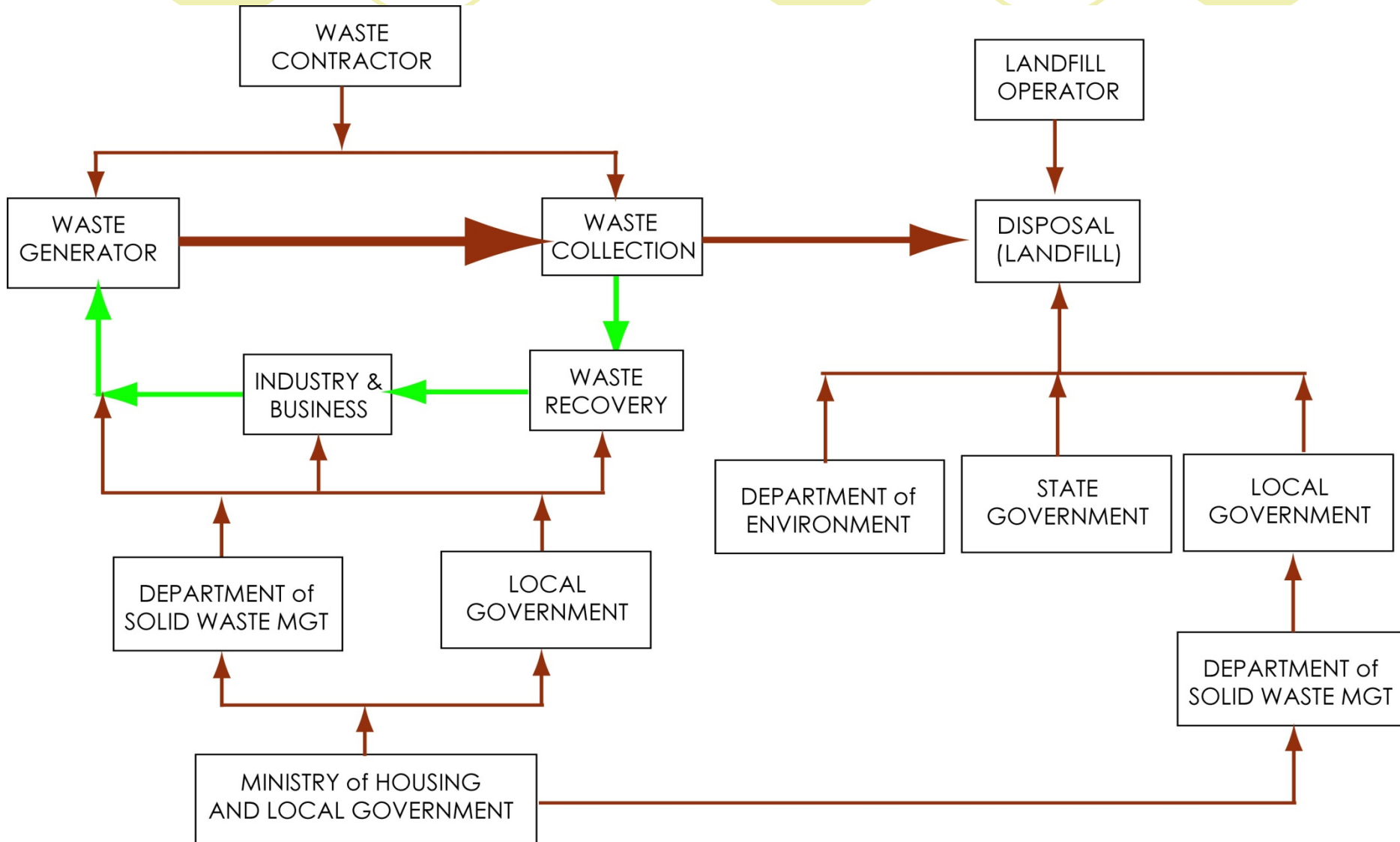
Framework for Sustainable Waste Management in Malaysian City

- Efficient waste management in urban ecosystem is very important to assure the sustainability of city in the future.
- The cyclic approach identified as an approach emphasizes resource recovery.
- Ensure in achieving the ultimate objective of an economy that cycles virtually all of the materials it uses, emitting only micro amounts of wastes and pollutants within the urban ecosystem.

Framework for Sustainable Waste Management in Malaysian City

- Main factors in making the urban ecosystem works are to understand the integration and synergism of stakeholders, resources and support system.
- To implement ecosystem approach will require paradigm shift form all key stakeholders especially by the government agencies, communities, industries and business.
- There are four important factors which play important role for sustainable waste management in the urban ecosystem; legislation, institutional, financial and technology.
- The four must be integrated into a holistic system to make the urban ecosystem work.

Framework for Sustainable Waste Management in Malaysian City

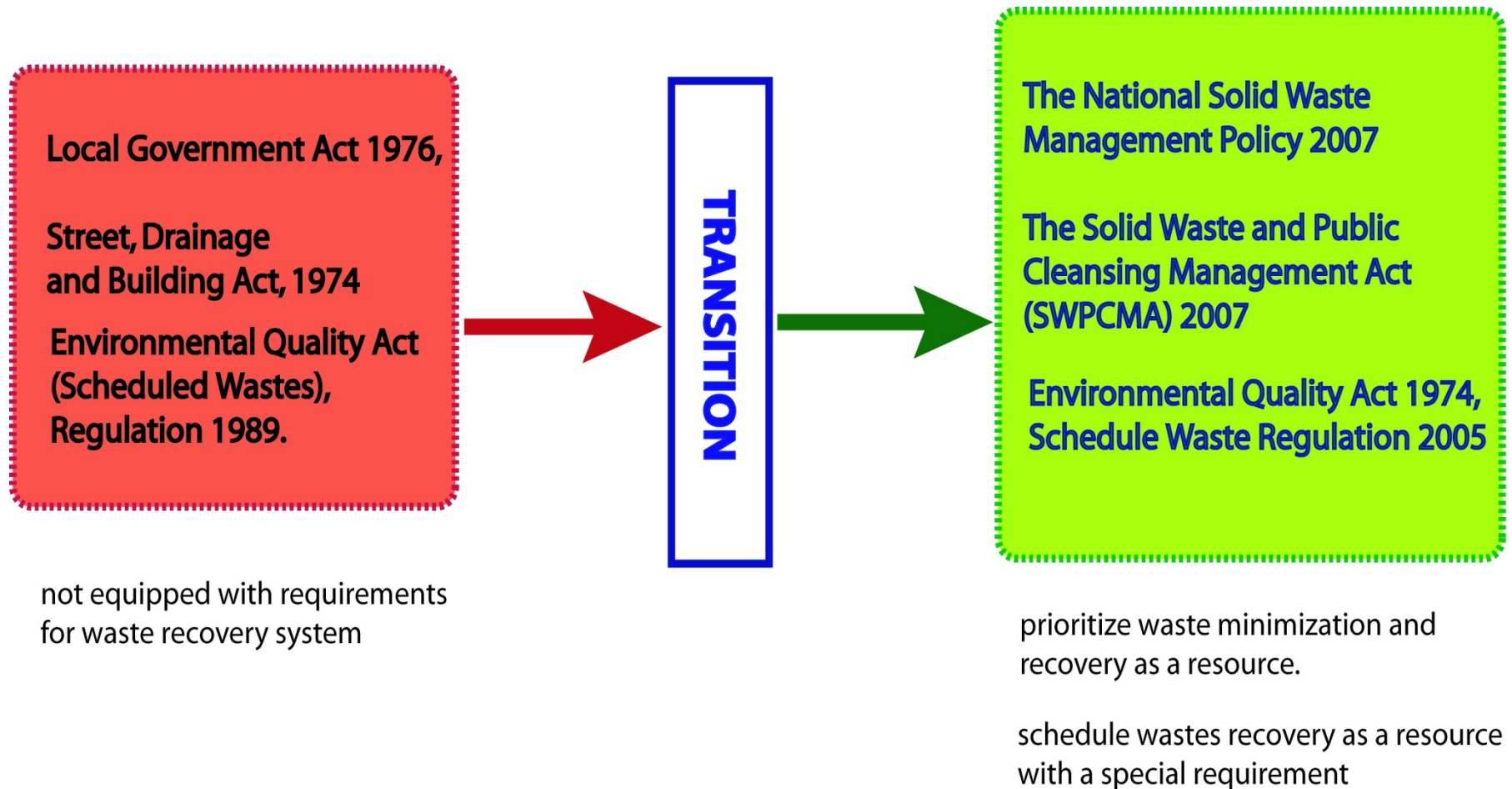


Transition: Ecosystem Approach for Sustainable Waste Management



- The latest development is the transition establishing policy and legal system prioritizing waste recovery and minimization shows the government commitment.
- The National Solid Waste Management Policy 2007 and the Solid Waste and Public Cleansing Management Act (SWPCMA) 2007 were established to prioritize waste minimization and recovery as a resource.
- Schedule wastes Environmental Quality Act 1974, Schedule Waste Regulation 2005 promotes schedule wastes recovery as a resource with a special requirement.

Transition: Ecosystem Approach for Sustainable Waste Management



Conclusion

- Waste management approach for cities in Malaysia needs changes as the impacts become critical to the health of the urban ecosystem and its people.
- Waste management system changes from linear approach to cyclic approach focusing on waste recovery as resource will help to minimize impacts and create many opportunities.
- A strategic framework to improve knowledge and decisions include systems that promote waste minimization, waste recovery, waste exchange and environment conservation must be established within the urban ecosystem institutional mechanism.
- This framework in place will ensure the urban ecosystem able to maintain its ecosystem function and services in ensuring its sustainability.



THANK YOU



L E S T A R I

