

Integrated Solid Waste Management in Singapore



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Presentation Outline

- Introduction
- Overview of Solid Waste Situation
- Waste Challenges
- Waste Management Strategies
- Conclusion



Introduction

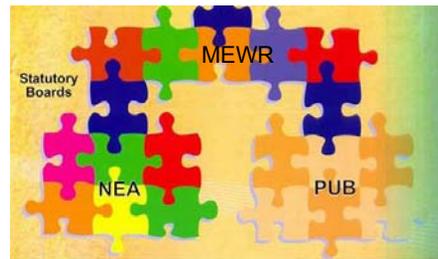
- Small island city-state
 - Total land area of 697 sq km
- High population density
 - Population of ~4.2 mil
- Highly industrialised economy
- Lack of natural resources and renewable energy sources



Part of the MEWR Family

MEWR's Role - Policy Formulation

NEA's Role - Strategy and Implementation



Formed 1 July 2002

Transferred to MEWR on 1 April 2001



Our Mission

To ensure a sustainable clean and healthy environment in Singapore.



Our Vision

an **Enterprising Agency**, Embracing All in Caring for Our Clean and Healthy Environment – Today for Tomorrow



Desired Outcomes

As Regulator, Facilitator and a Promoter



and National Pride

Our Ultimate Goal:

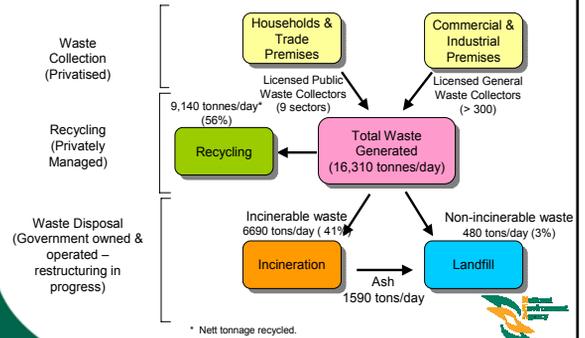
Environmental Sustainability



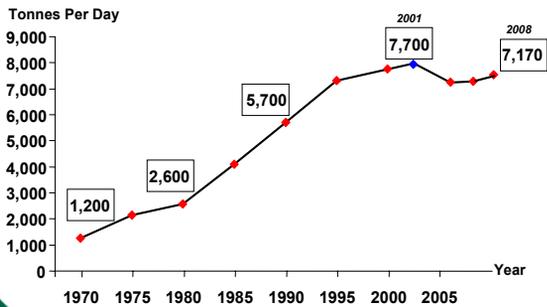
Overview of Solid Waste Situation



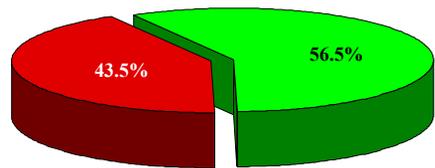
Solid Waste Management System



Waste Disposed (Daily Average 1970 - 2008)



Waste Output (2008)



Waste Output : 7,170 tonnes/day



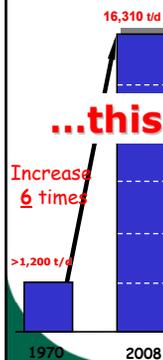
Waste Challenges



UNABATED WASTE GENERATION

• Due to population & economic growth

...this is not sustainable Explosion



- 1 new incineration plant every 5-7 years
- 1 new landfill (350ha) every 25-30 years

WASTE CHALLENGES

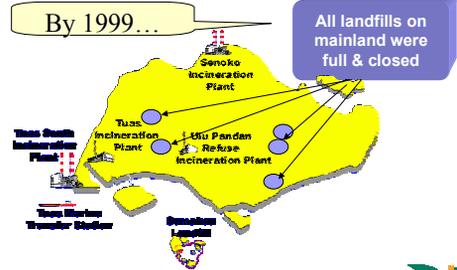
- Expensive to build and maintain IPs and Landfill

IPs & Landfill	Year	Capacity	Cost
Ulu Pandan	1979	1,100 t/d	130 million
Tuas	1986	1,700 t/d	200 million
Senoko	1992	2,400 t/d	580 million
Tuas South	2000	3,000 t/d	890 million
P. Semakau	1999	630million m ³	610 million



WASTE CHALLENGES

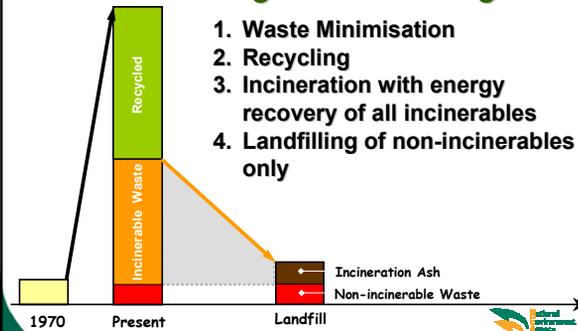
-Limited land space



-Need to conserve our resources



Waste Management Strategies



Strategy 1 : Waste Minimisation



Waste Minimisation

Minimise waste at source

- Design/Use less packaging
- Use packaging that can be recycled



The Singapore Packaging Agreement jointly developed by Government, Industry & NGOs; w.e.f. 5 Jul 07.

Objectives

- Reduce packaging waste (currently 35 % of household waste)
- Raise awareness/ educate public

Signatories:

- Food and Beverage Industry , NGOs, Waste Management & Recycling Association of Singapore, Public Waste Collectors

Roles of Signatories

Industry's Role

- Review or redesign packaging
- Cut down packaging material usage
- Use packaging that is easily recyclable
- Implement programmes to reuse or recycle packaging waste
- Educate industry partners and customers on packaging waste minimisation & recycling

Government's Role

- Promote waste minimisation & recycling at a national level
- Facilitate & provide support for building industry knowledge and technological capability to recycle & reduce waste
- Implement & enhance the National Recycling Programme to provide a convenient means to recycle waste from households, including packaging waste



Non-Governmental Organisations/Community's Role

- Educate consumers and businesses on packaging waste minimisation & recycling



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Some of the participating retailers

Waste Minimisation

Bring Your Own Bag Day (BYOBD)

➢ Aim : encourage shoppers to bring their own shopping bags and reduce excessive use of plastic bags.

➢ Inaugural day : 18 Apr 07, every 1st Wed of month

➢ From 4 Jun 08 : every Wed





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Waste Minimisation

Singapore Green Label

- A scheme which awards environment-friendly products with eco-labels.




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Strategy 2 : Recycling




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Recycling Incinerable Waste

... to reduce waste to incineration plants



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Recycling Incinerable Waste

Domestic Waste

- Provide infrastructure for recycling
 - National Recycling Programme - All households in HDB and landed properties have access to recycling receptacles (bins/bags)
 - Condominium Recycling - Mandate provision of receptacles for recycling in condominiums and private apartments from 1st Nov 08
 - 3,800 public recycling bins





MAIN TYPES OF RECYCLABLES COLLECTED

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➤ Recyclables

- ❖ Paper & Carton boxes
- ❖ Drink cans/ metal containers
- ❖ Glass bottles/jars
- ❖ Plastic bottles



National Recycling Programme

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- HDB flats & landed properties
- Place these bags/bins at doorstep on collection date indicated on the bag/bins



- Participation rate: 63% (2008)



National Recycling Programme

- 1600 Centralised Recycling Depositories

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Condominiums Recycling

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2002 : Launch voluntarily recycling programme

- Work with residents, cleaners & recycling companies to encourage condominium management to introduce recycling voluntarily



With more requests from residents for recycling & low participation rate for voluntary recycling programme

1 Nov 2008 : Mandate provision of recycling receptacles in condominiums (to be rolled out in phases)

30 Mar 2009: New residential property to have designated recycling point and/or recyclables chute system

Public Recycling Bins

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- ❖ Outside MRT Stations
- ❖ Changi Airport
- ❖ Shopping Malls
- ❖ Food courts



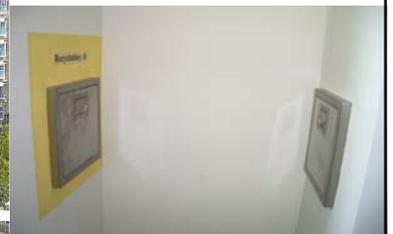
Recycling Incinerable Waste

Promoting New Waste Collection System to increase recycling

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Twin Pneumatic Refuse Collection System

- Separate chutes for refuse and recyclables



Recycling Incinerable Waste

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Public Education & Community Participation

- School Recycling Corner Programme (97%)
- Annual Recycling Day partners:
 - Residents
 - Companies
 - Schools
 - Grassroots organizations
 - Government agencies
 - Non-Governmental Organisations



Recycling Incinerable Waste

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Industrial and Commercial Waste Recycling:

Statistics as of 2007

- Paper / Cardboard (619,000 tonnes, 51% recycled)
- Wood / Timber (127,800 tonnes, 52%)
- Horticultural Waste (91,100 tonnes, 41%)
- Plastics (75,000 tonnes, 11%)
- Food Waste (51,200 tonnes, 9%)



Recycling Non-incinerable Waste

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.... to reduce waste to landfill



Recycling Non-Incinerable Waste

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Industrial and Commercial Waste

Statistics as of 2007

- Used Slag (520,000 tonnes, 99% recycled)
- C & D Waste (759,300 tonnes, 98%)
- Ferrous Metal (668,000 tonnes, 91%)



Recycling Non-incinerable Waste

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...Construction & Demolition Waste Recycling



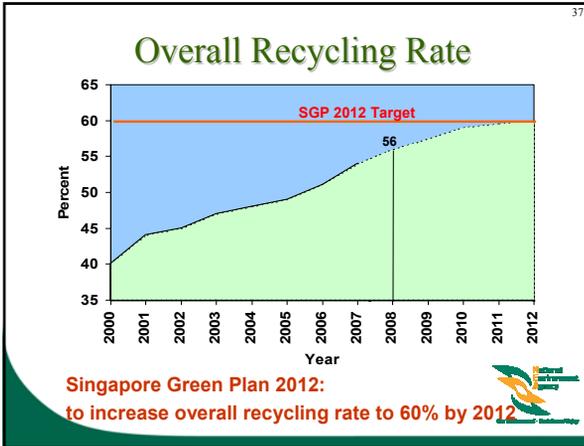
Recycling Non-incinerable Waste

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Incineration Bottom Ash

- 1,340 t/d
- Successful trial use in road construction





Strategy 3 : Incineration

Waste Collection

Domestic & Trade Premises

- ❖ Collection service corporatised in 1996
- ❖ Fully privatised collection service in Sep 01
- ❖ Improve collection efficiency and service quality



Waste Collection

Industrial & Commercial Premises

- ❖ By licensed general waste collectors



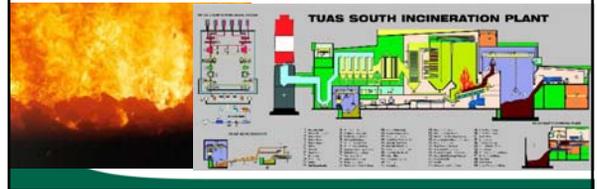
Waste Disposal Facilities



Incineration

Cost-effective disposal in land-scarce situations:

- volume of refuse can be reduced by 90%
 - only 10% landfill space required
- energy can be recovered for power generation
- scrap metal can be recovered for recycling



Performance (2007)

Refuse incinerated

- 2.38 million tonnes

Electricity generated

- 975 million kWh of electricity generated
- 2 to 3% of the electricity demand for Singapore

Scrap metal recovered

- 13,800 tonnes



Privatisation to improve efficiency

Incineration plants

- Construction of 5th waste-to-energy plant by Keppel Seghers under a Design-Build-Own-Operate (DBOO) model
- Divestment of Senoko IP via an Infrastructure Fund



Strategy 4 : Landfilling



Semakau Landfill



- Commenced operations on 1 Apr 99
- Cost : \$610 million
- Area : 350 ha
- Capacity : 63 million m³

Semakau Landfill

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- Only landfill in Singapore
- Incorporated pollution control measures to minimise impact on marine ecosystem
- Preserved ecosystem & biodiversity of Pulau Semakau
- Opened up for recreational activities since July 2005
- Strike a balance between economic development and environmental protection



Recreational Activities



Sport Fishing

Bird Watching

Inter-tidal Walk

Star Gazing

Short-term Outcome

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- Lifespan of Semakau landfill
 - Estimated extension from 25 - 30 years to 35 - 40 years
- Need for new IP
 - Estimated extension from 5 - 7 years to 10 - 15 years



In the longer term....

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- SGP 2012 - our environmental blueprint for next 10 years to help Singapore achieve environmental sustainability
- Target is 60% recycling rate by 2012

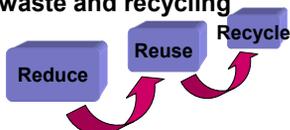
<http://www.mewr.gov.sg/sgp2012/>



Conclusion

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- Integrated waste management is important to :-
 - extend lifespan of Semakau Landfill
 - reduce the need for new waste-to-energy plants
 - Towards Zero Landfill
 - Towards Zero Waste
- 3P Partnership is needed to sustain efforts in minimising waste and recycling



Thank You

