

Solid Waste Management in Singapore

**2nd Regional 3R Forum in Asia
Kuala Lumpur, Malaysia**

4 - 6 October 2010

**Christopher Lee
Senior Engineer
National Environment Agency
Singapore**





Outline

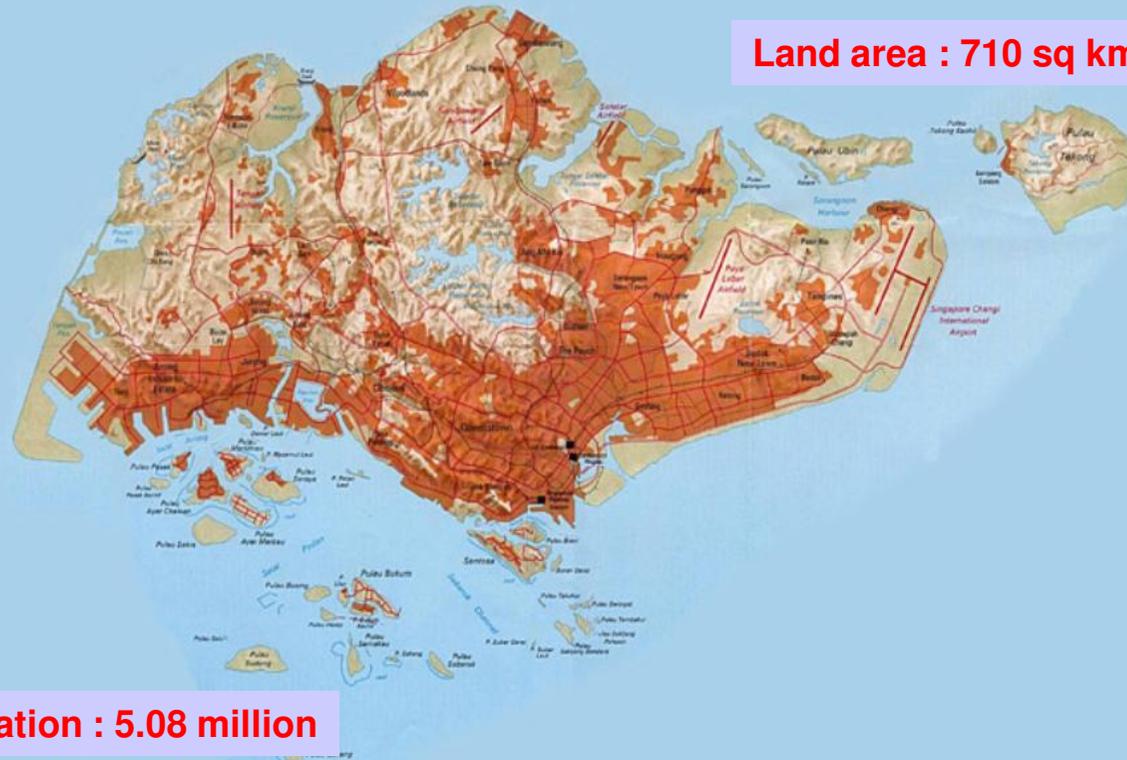
- **Overall Solid Waste Situation**
- **Waste Management Strategies**
- **Outcome**
- **Future**
- **Conclusion**



Singapore – A highly urbanized and densely populated city state

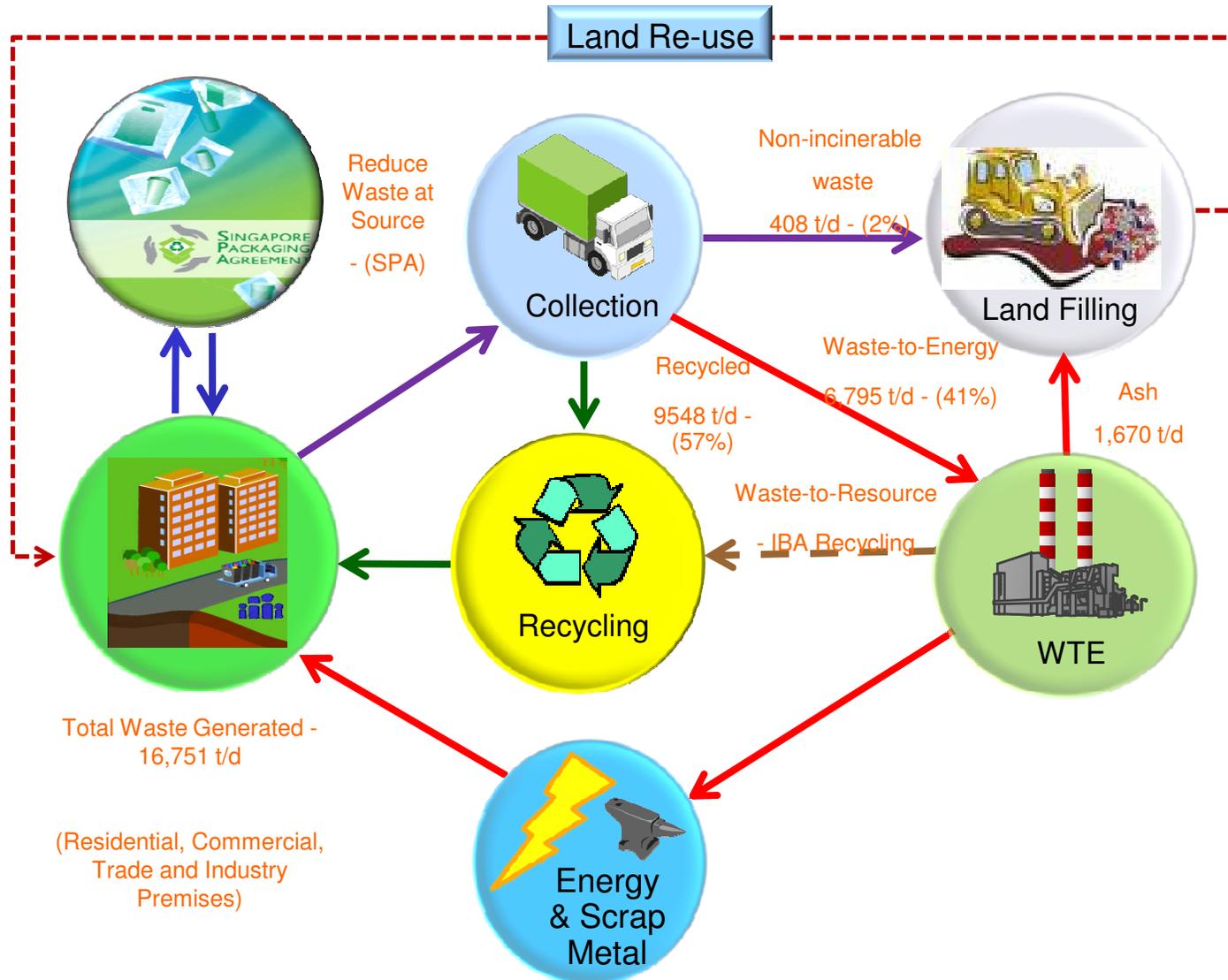
Land area : 710 sq km

Population : 5.08 million



Closing The Waste Loop

Towards Zero Landfill; Towards Zero Waste



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. 1 Jul 07.

Signatories:

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

Waste Minimisation



REBATE2EARTH
With effect from
4th Feb 08,
Plastic bags
will cost
10 cents*
each!

Starting from
**NUS
COOP**

Plastic bags don't come for free! They cause pollution, death to marine animals and a strain on non-renewable resources. Yet they are being used at a rate of 1,000,000 per minute globally. In 2007, NUS COOP gave out an average of 40,000 bags per month! As a rebate to the environment, plastic bags will now cost 10 cents each. You can choose to pay or simply...

Refuse, Reduce n' Reuse!

*Collections will go to Rebate2Earth funds for future environmental projects

Any comments?
Email: rebate2earth@gmail.com
Website: livingwithcaia.com

NUS
FIGHTS
CLIMATE
CHANGE

Living with Caia

Students Against
Vandalism n' Earth



IKEA and NUS charges for plastic bags

- 5 to 10 cents per bag
- 80% reduction in plastic bag consumption



NTUC Fairprice's Green Rebate Scheme

- 10-cent rebate for customers who bring their own bags with purchase of at least \$10
- Given out more than \$600,000 in rebates and saved more than 43 million plastic bags.

Recycling

Public Education & Community Participation

- School Recycling Corner Programme (100%)
- Annual Recycling Week
 - Residents, Companies, Schools, Grassroots organizations, Government agencies, and Non-Governmental Organisations
 - Launched 3R booklet cum exhibition
 - Recognition to communities
 - E-waste take back



Recycling

Domestic and Trade Waste

- **Provide infrastructure for recycling**
 - National Recycling Programme
 - all households have access to recycling receptacles (bins/bags)
 - 4,100 public recycling bins
- **63% of households participate**



Recycling

Industrial and Commercial Waste Recycling:

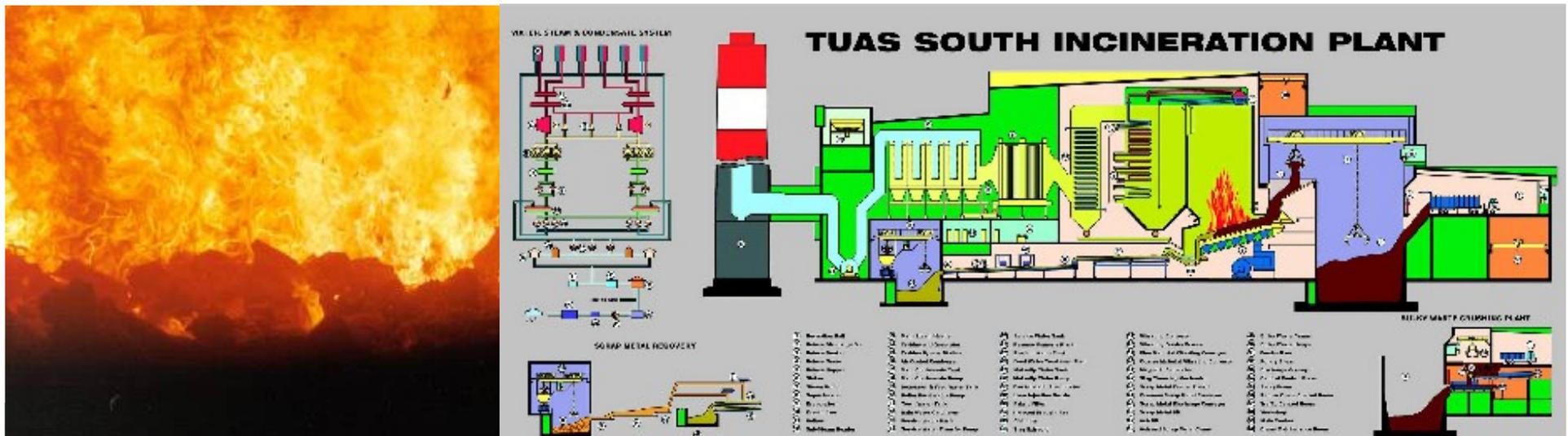
- Wood (207,400 tonnes, 72% recycled)
- Horticultural Waste (93,500 tonnes, 39%)
- Used Slag (418,600 tonnes, 99%)
- C & D Waste (1,150,700 tonnes, 98%)
- Ferrous Metal (806,200 tonnes, 92%)



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

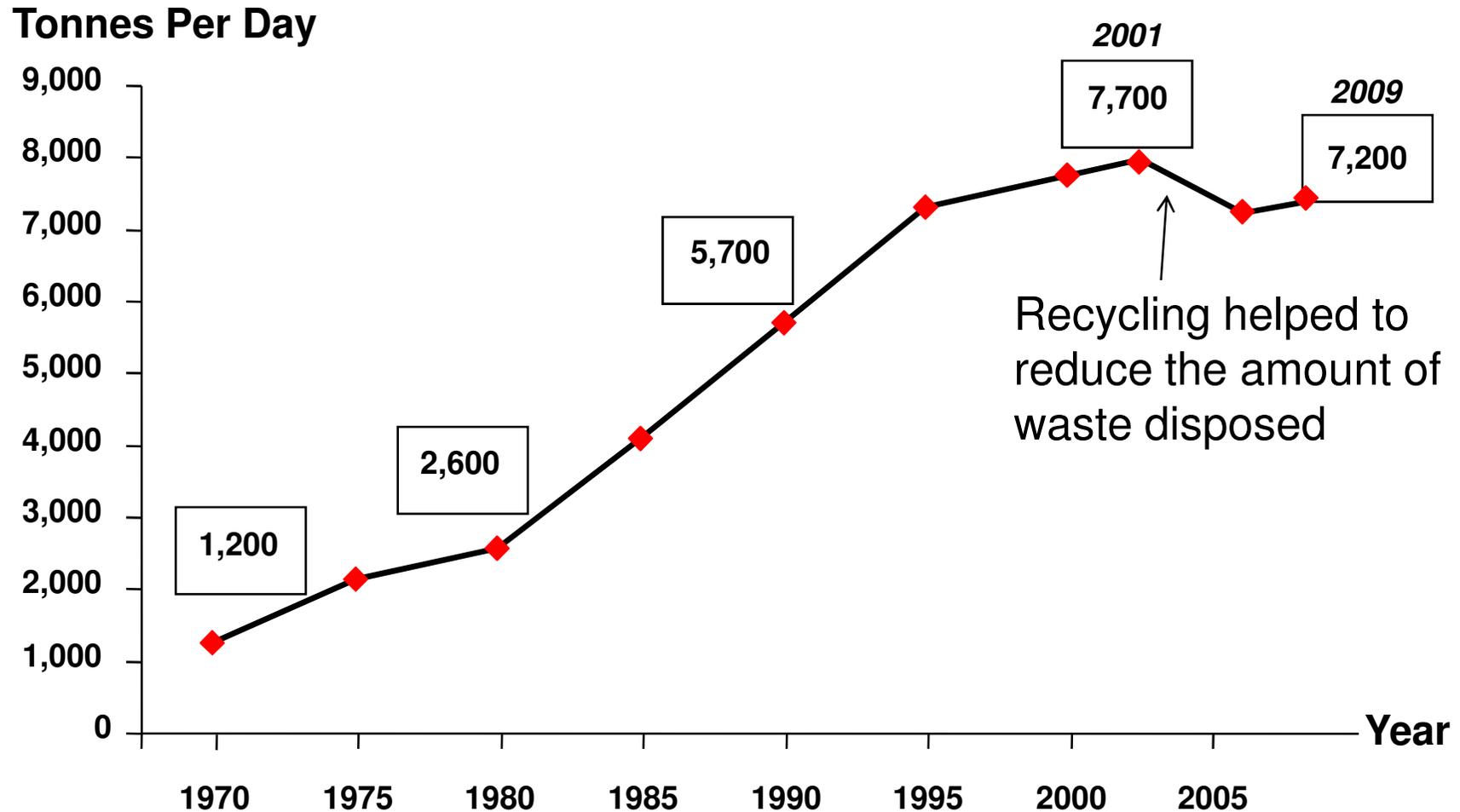


Incineration

	Tuas Incineration Plant	Senoko Waste-to-Energy Plant	Tuas South Incineration Plant	Keppel Segghers Waste-to-Energy Plant
Year Commissioned	1986	1992	2000	2009
Capital Cost (\$million)	200	560	890	160 (Estimated)
Designed Capacity (tonnes/day)	1,700	2,100 (Contracted)	3,000	800 (Contracted)



Daily Average Waste Disposed



Landfilling

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

Landfill Operation

1

Dump Truck at Tip-site



2

Tipping of waste at landfill cell



3

Leveling by Bulldozer



4

Compactor in operation



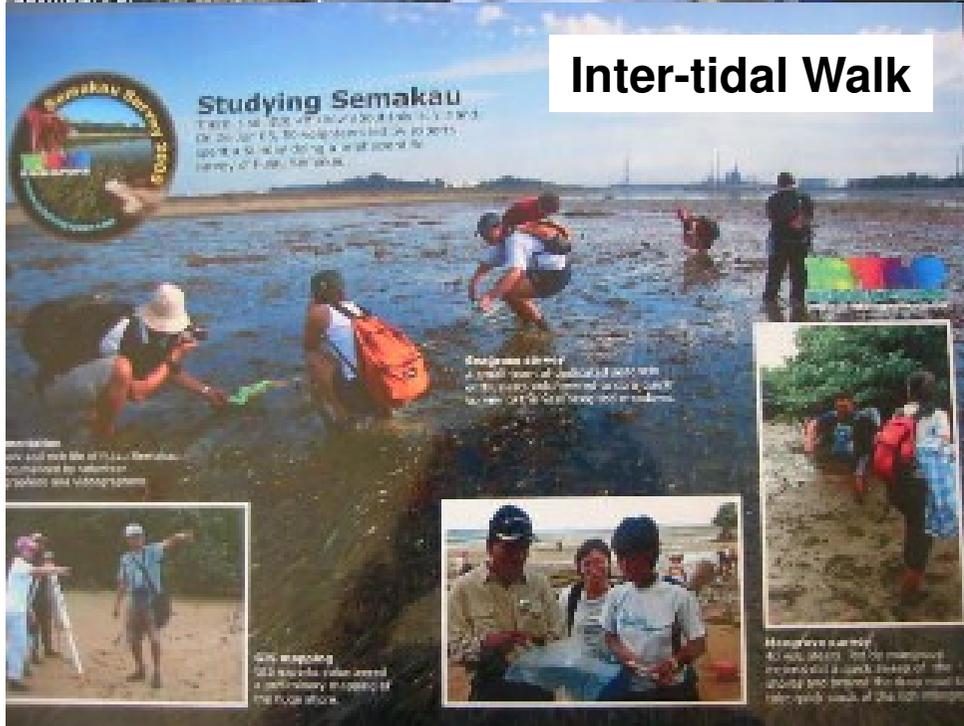
Recreational Activities



Sport Fishing



Bird Watching

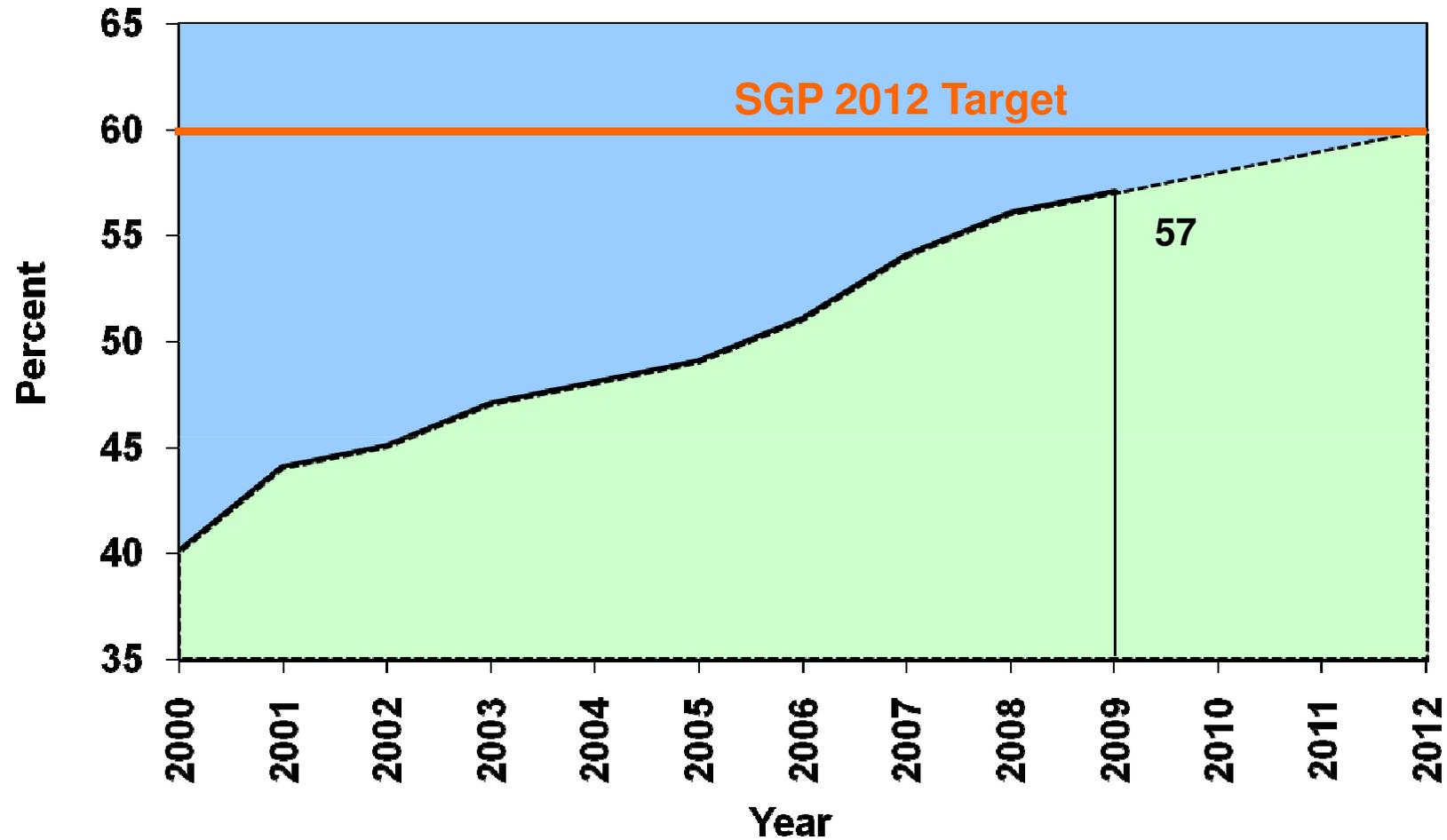


Inter-tidal Walk



Star Gazing

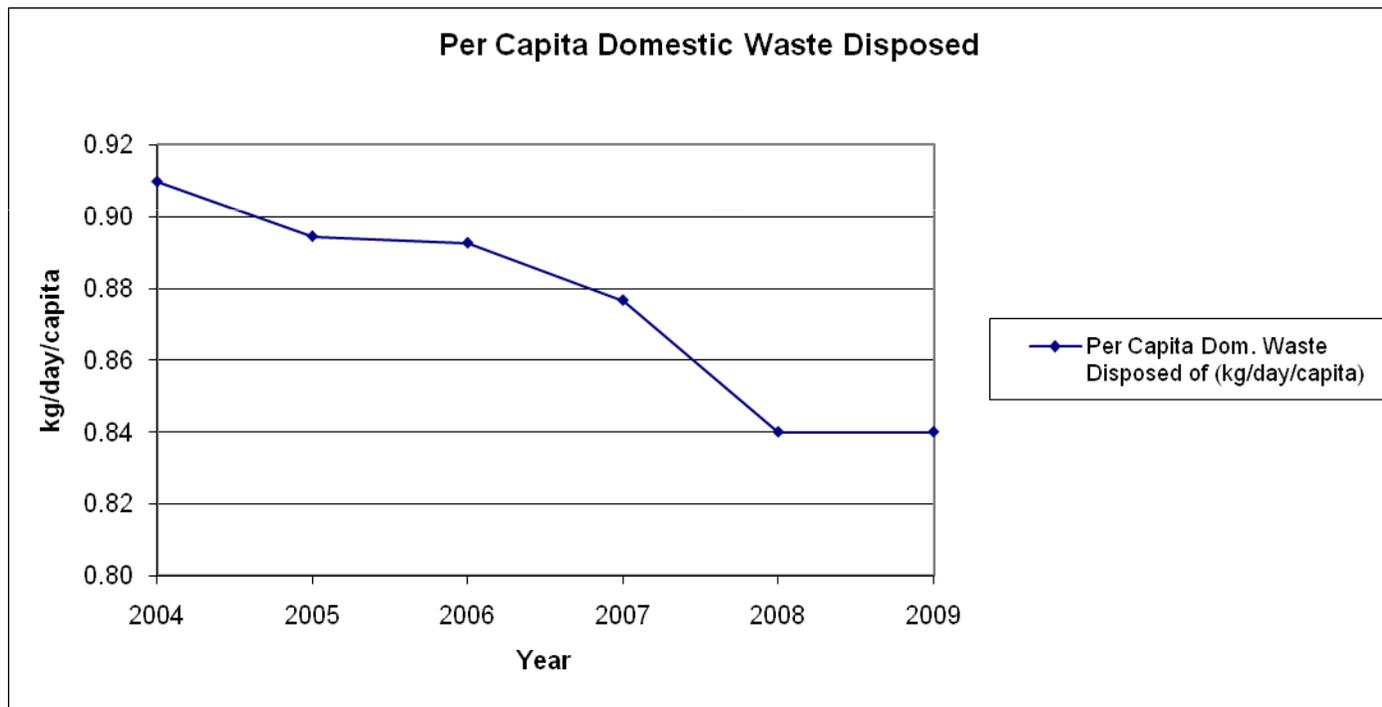
Outcome



Sustainable Singapore Blueprint Target: 65% by 2020 and 70% by 2030

Outcome

Reduction in per capita domestic waste disposed



Outcome

- **Lifespan of Semakau Landfill**

Estimated extension from 25 - 30 years to 35 - 40 years

- **Need for new incineration plant**

Estimated extension from 5 - 7 years to 10 - 15 years



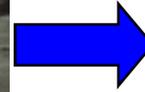
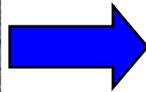
Future

- **Achieving Sustainable Singapore Blueprint targets of 70% overall recycling rate by 2030**
 - Looking into new measures to improve overall recycling
 - Targeting specific waste streams with low recycling rate



Future

- **Reducing Waste to landfill**
 - **Recycling of Incineration Bottom Ash**
 - **Successful trial use in road construction**
 - **CBA study in progress**



Conclusion

- **Extend lifespan of Semakau Landfill for as long as possible**
- **Reduce the need for new waste-to-energy plants**
- **Sustain efforts in minimising waste and increasing recycling to work:**
 - **Towards Zero Landfill**
 - **Towards Zero Waste**



Thank you

