

The background features two large, curved, overlapping bands. One band is a light blue color, and the other is a light green color. They are positioned in the top-left and bottom-right corners, framing the central text.

Singapore Waste Management

Singapore



**Island Nation
City-State**

Land Area
722.5 km²

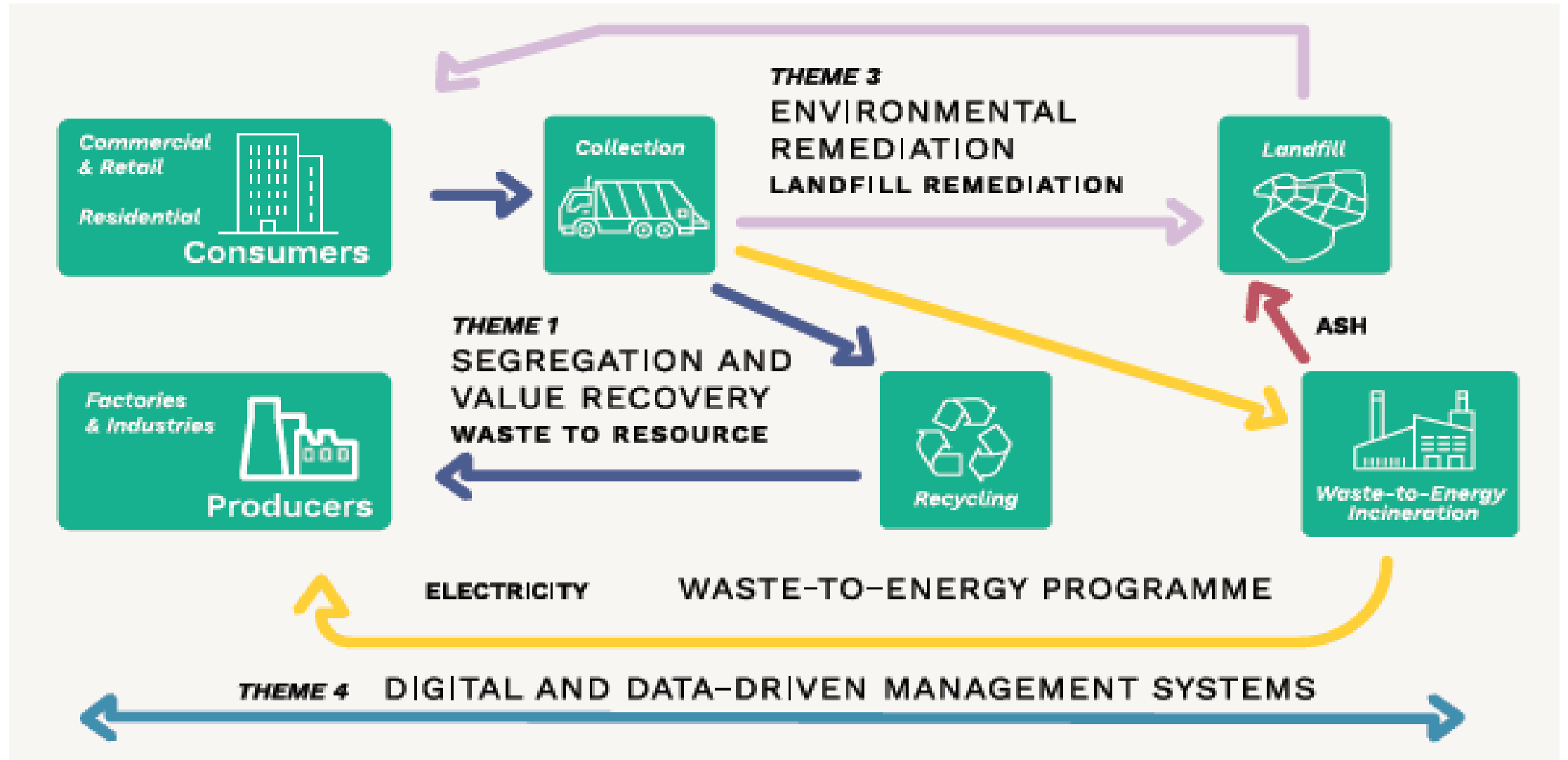
Population
5.69 mil
(7861 pp/km²)

**Limited Natural
Resources**

Before: No proper system



Current Waste Management System



Domestic & Non-Domestic Waste

DOMESTIC



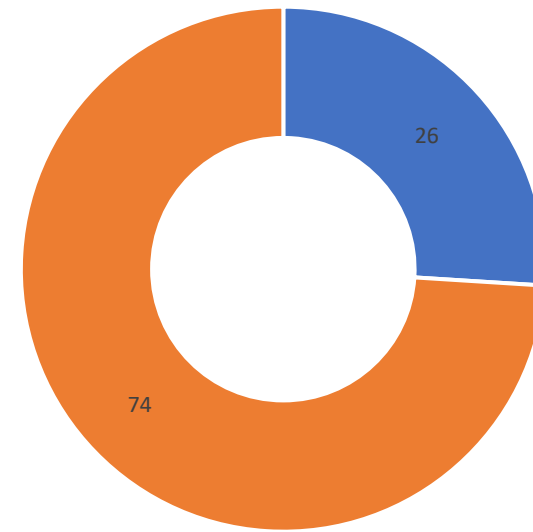
+



NON-
DOMESTIC

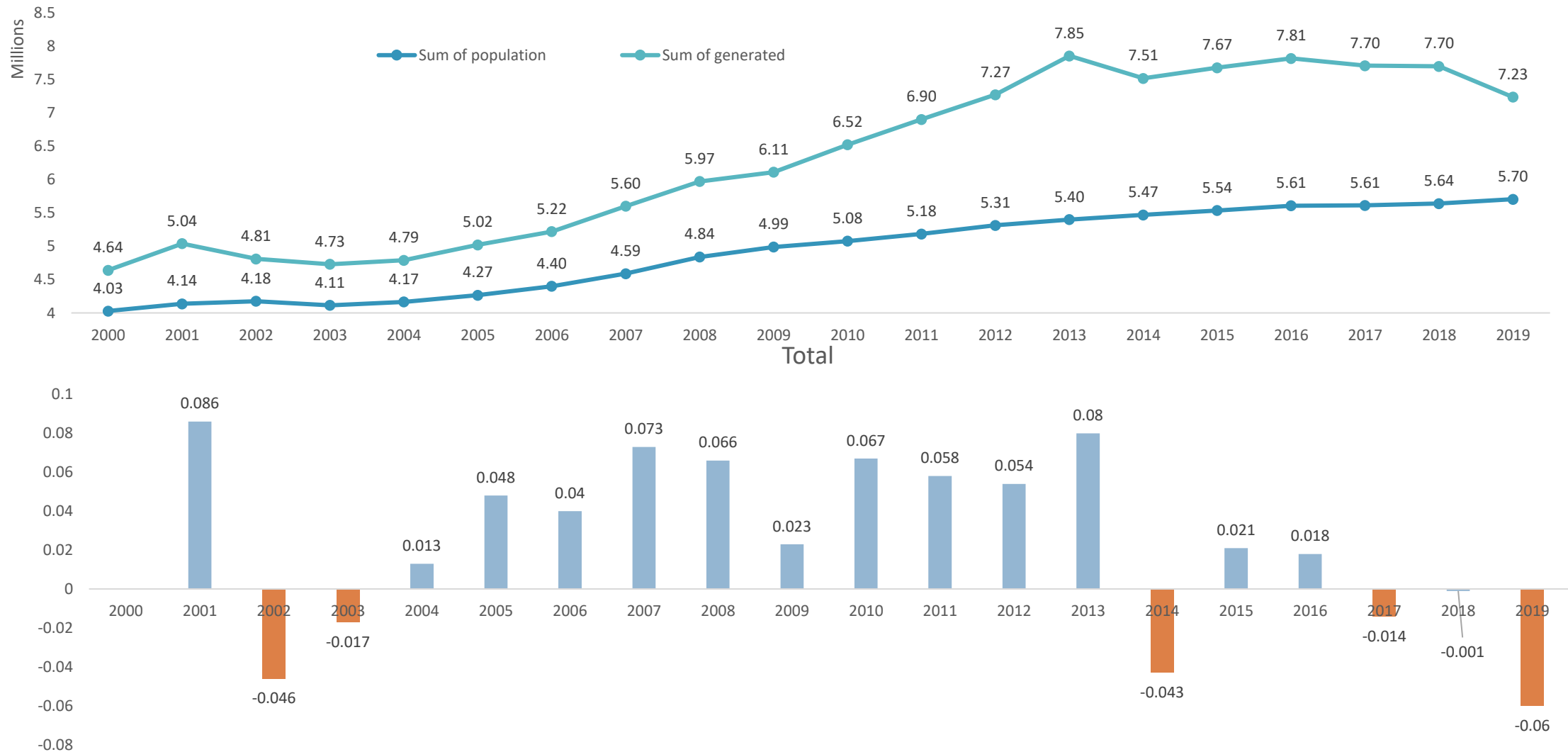


TOTAL
WASTE
GENERATED



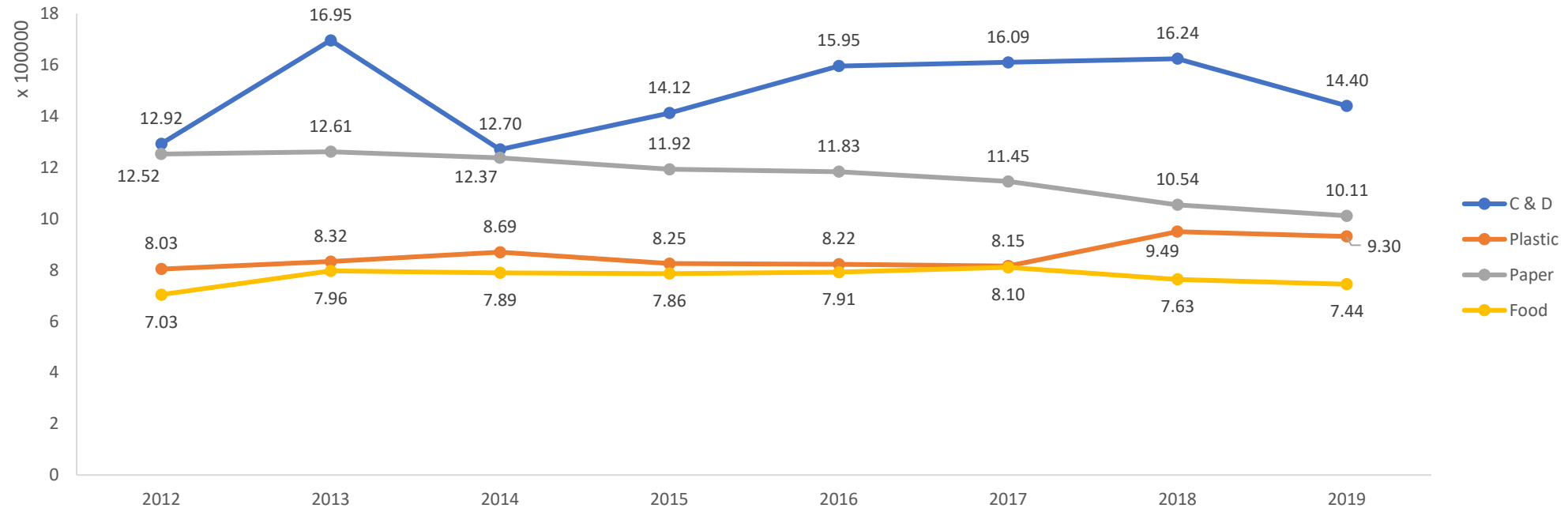
■ % Domestic ■ % Non Dom

Waste Generation Vs Population



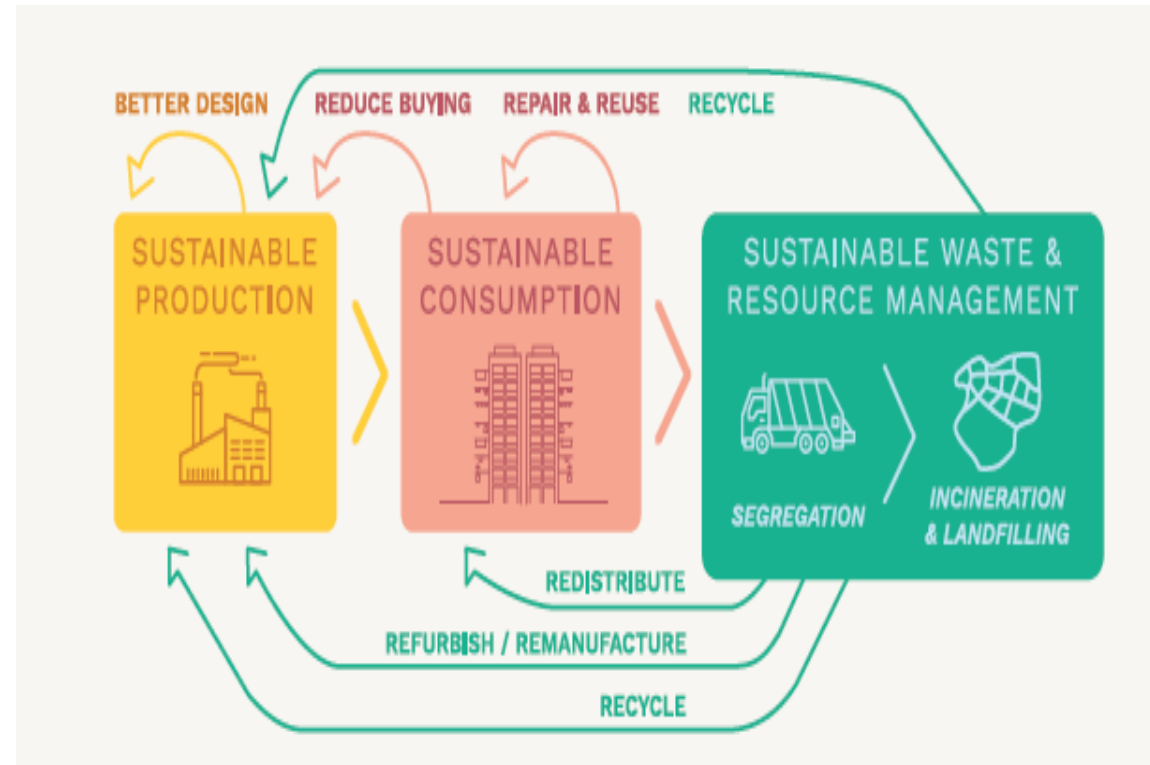
Waste generated Data:

Year	Total	Populatio	Domestic	Non Dom	C&D	Ferrous	NonFerro	Usedslag	Scraptyre	Horticultu	Wood	Papercard	Glass	Food	Ashsludge	Textilelea	Plastic	Others
2019	7234000	5703569	1870000	5364000	1440000	1278000	126000	129000	33000	400000	438000	1011000	75000	744000	252000	168000	930000	210000
2018	7695000	5638676	1990000	5705000	1624000	1269000	171000	181000	32000	521000	320000	1054000	64000	763000	240000	220000	949000	286000
2017	7704300	5612253			1609300	1378800	93700	272500	35900	328300	424100	1144800	71300	809800	243400	150800	815200	326400
2016	7814200	5607283			1595400	1357500	97200	251100	32700	320500	530700	1183100	72300	791000	227300	150700	822200	382500
2015	7673500	5535002	2100000	5573500	1411800	1348500	180000	369900	35500	362000	370600	1192200	75200	785500	196000	156700	824600	365000
2014	7514500	5469724	2114500	5400000	1269700	1445900	118400	366300	26200	278300	367900	1237400	79500	788600	148500	158600	869000	360100
2013	7851500	5399162			1695300	1416000	135100	353700	21600	252600	332400	1261100	73500	796000	190600	156600	832200	334800
2012	7269503	5312437			1291832	1385938	122467	367863	18478	247791	343737	1252027	74879	703188	160217	159266	803395	338425

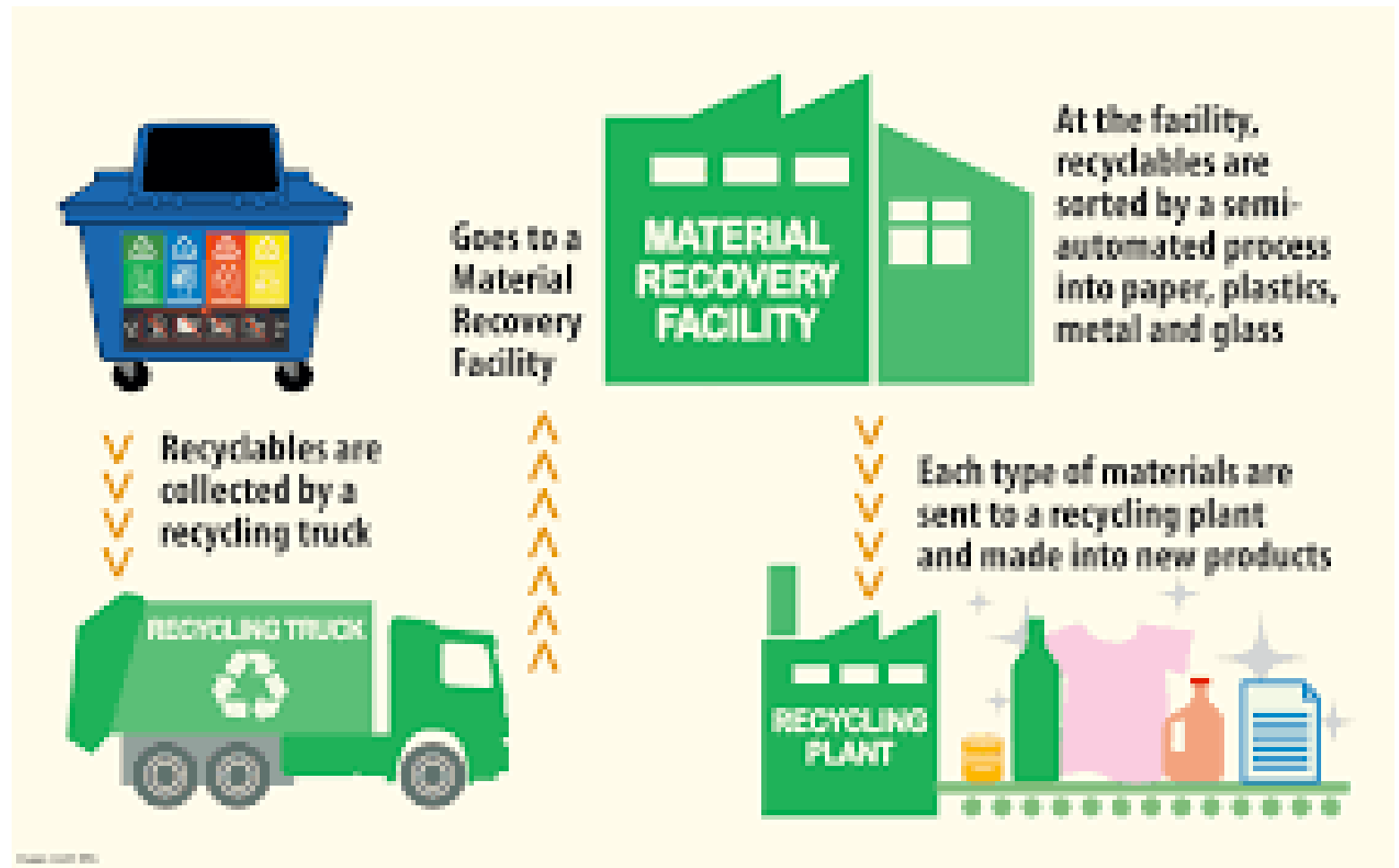


Waste Management Strategies

Waste Minimisation, Closing the Waste loop, Sustainability and circular economy approach



Recycling



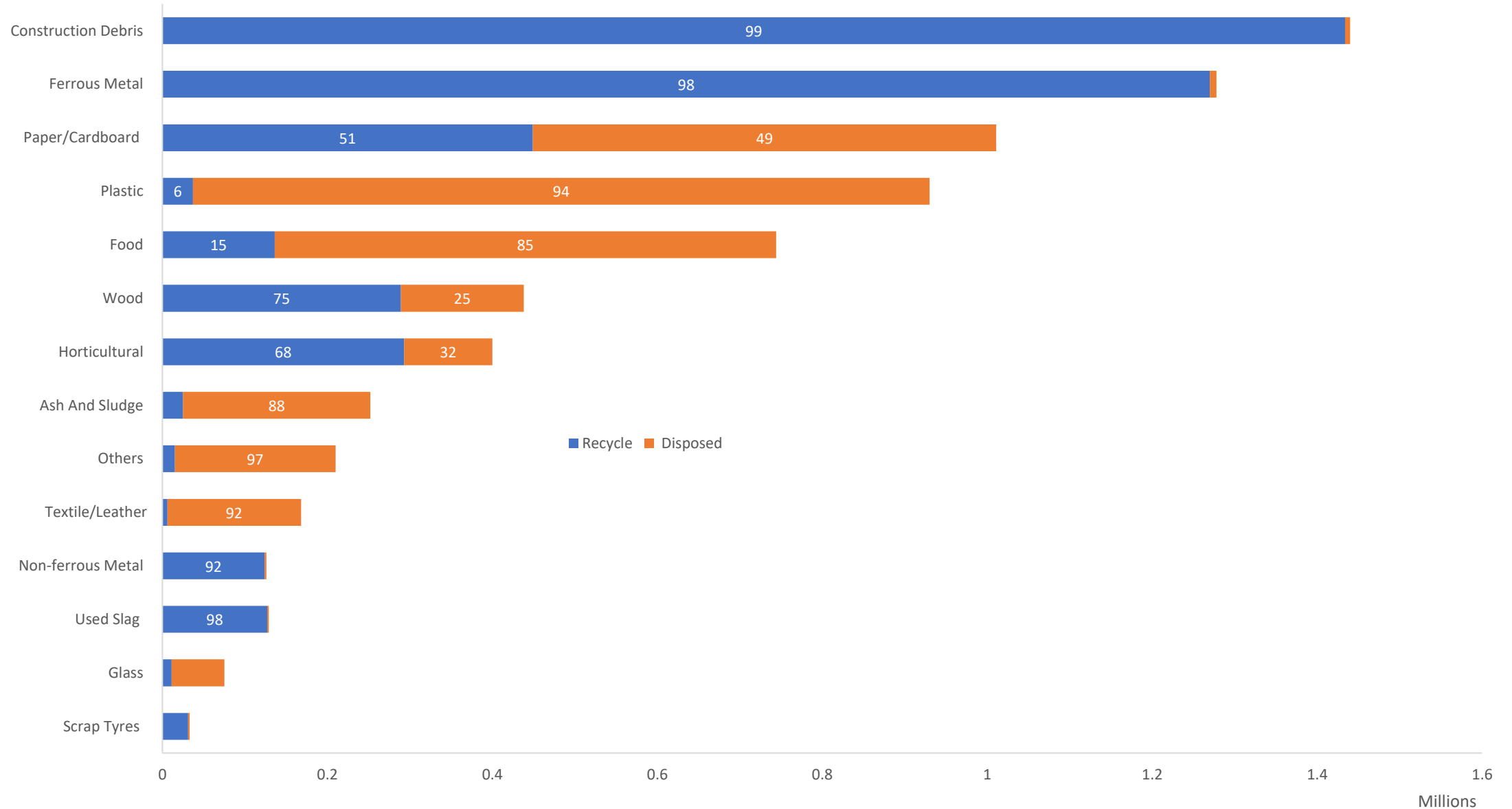


Recycling Initiatives:

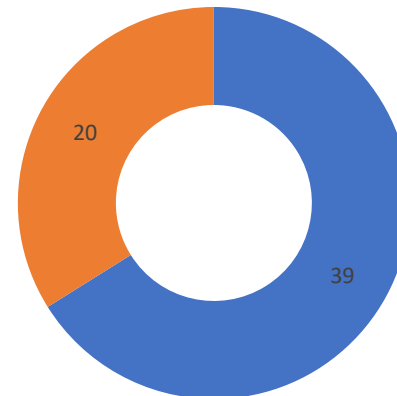
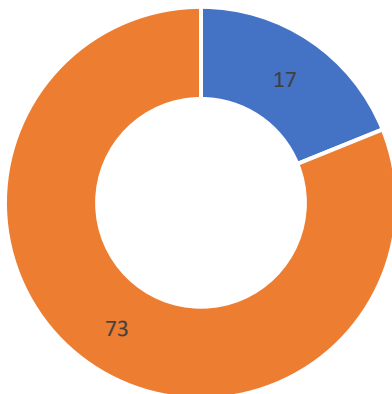
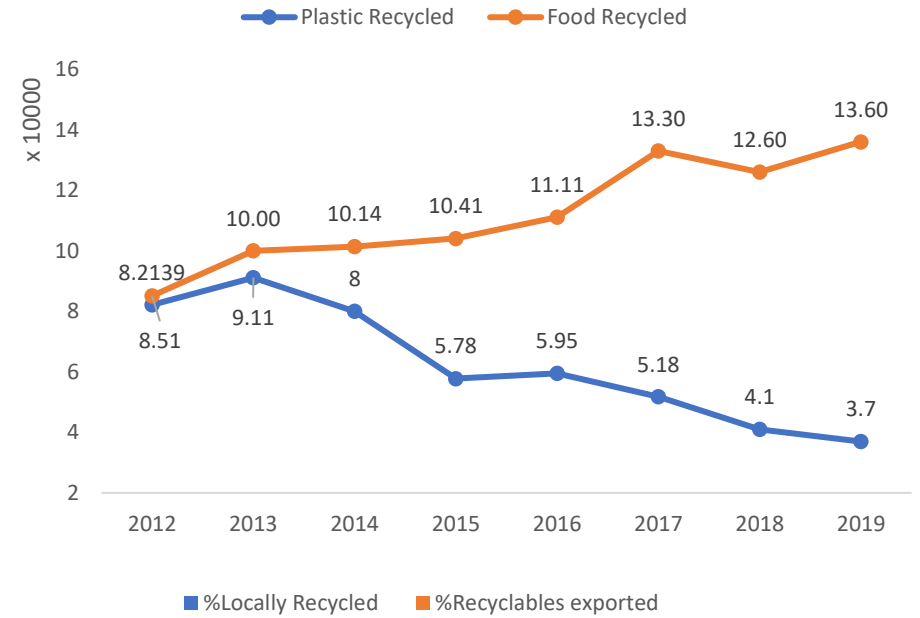
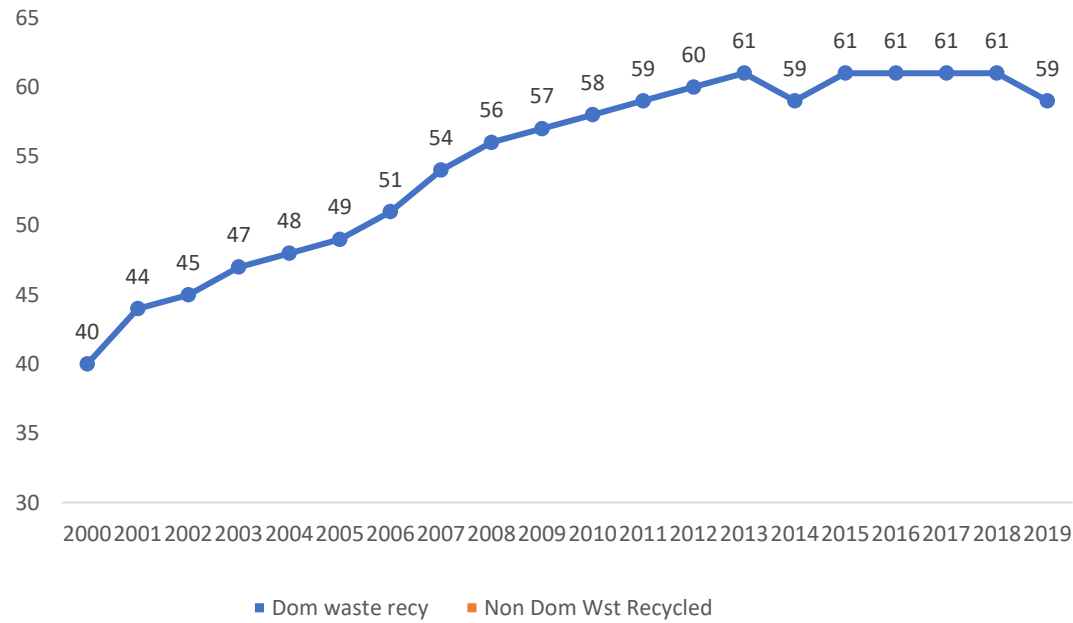
- National Recycling Programme
- Mandatory Waste Reporting
- Brochures, flyers, guides to public
- Awareness programmes at schools
- 3R Awards , 3R Funds
- Reverse Vending Machine –Incentives
- Centralised Recycling Chutes



Recycling(Categorized)

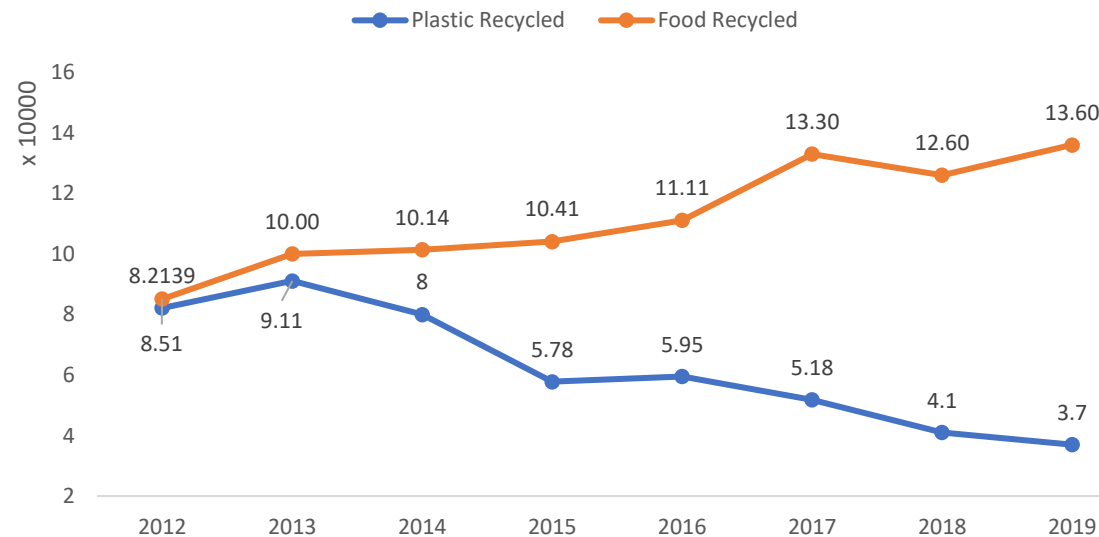


Recycling Rate



Food Waste

- Happens at 1)Production 2)Distribution 3)Retail 4)Consumption
- 2019 - Ard 750000 Tonnes of Food Waste generated, only 15% Recycled, 85% Landfill
- Recycling rate up from 8% to 15%



3R Initiatives for Food Waste Management

Food Waste Reduction

- Food Wastage Reduction Outreach materials targeted at consumers



- Food waste minimisation guidebooks targeted at food manufacturing, food retail establishments and supermarkets



Food Waste Treatment

- On-site treatment of food waste



- Off-site treatment of food waste (co-digested with used water sludge)



E-WASTE



E-Waste

- Electrical & electronic waste (e-waste) makes up around 1% of total waste generated in Singapore
- Around 60,000 to 70,000 Tonnes generated per year
- Equals 11kg of disposed per person per year
- Can cause detrimental effect on the environment if not properly managed
- Great potential for the circular economy approach.

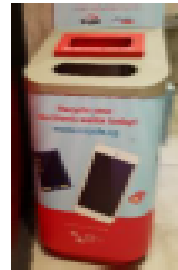
3R Initiatives for E-waste Management

Electrical & Electronic Waste (E-Waste) Recycling

- National voluntary partnership to build public awareness on e-waste recycling
- Examples of e-waste recycling bins for various e-waste



Examples of recycling bins for small e-waste



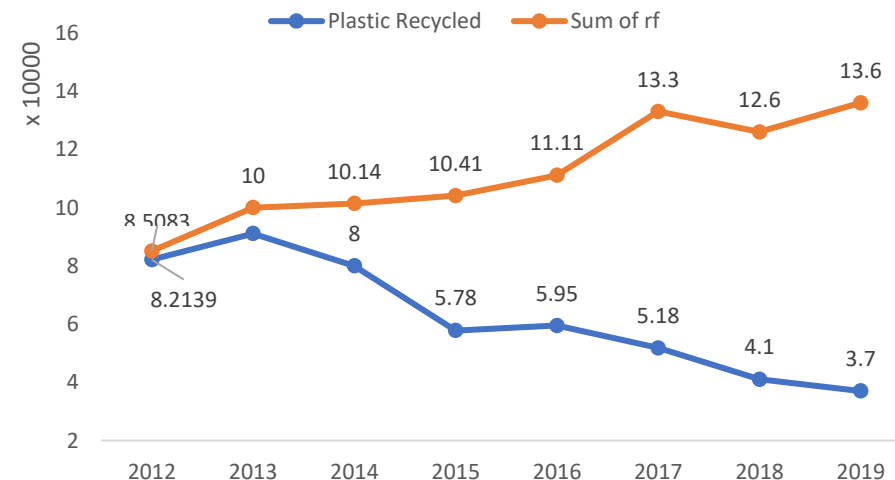
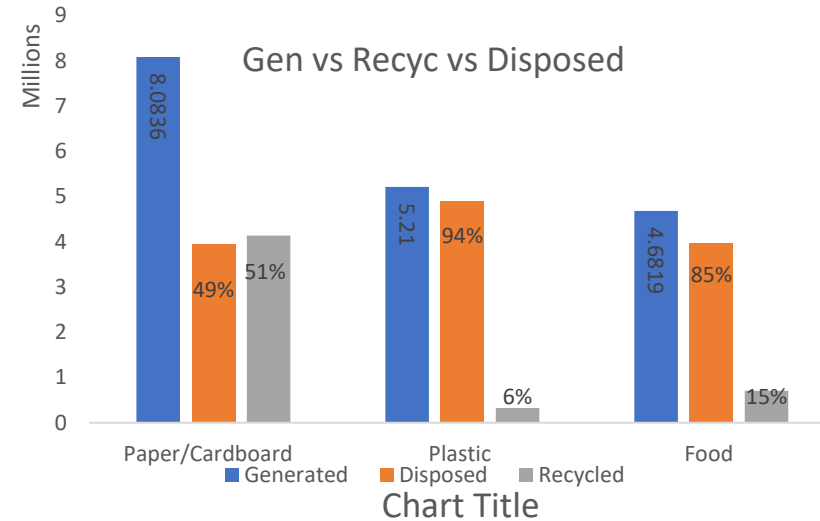
Examples of recycling bins for toner cartridges

E-waste Management Framework

- An e-waste management system will be implemented based on Extended Producer Responsibility (EPR) by 2021
- Producers of ICT equipment, solar panels, batteries, lamps and large appliances will be responsible for collecting and treating e-waste.

Plastic & Packaging Waste

- In 2018, 1/3rd of domestic waste disposed consisted packaging waste.
- 55% of packaging waste was plastic packaging & 25% was paper packaging.
- Hardly reused
- Able to recycle 6% of plastic in year 2019



3R Initiatives for Packaging Waste

Singapore Packaging Agreement



Joint initiative by government, industry, and NGOs to reduce packaging waste

236
signatories



46,000 tonnes
reduced (cumulative)



S\$100 million
in savings



Logo for Products with Reduced Packaging

- Launched in June 2017
- Enable consumers to identify such products and recognise companies that have made the effort to minimise packaging waste.



An initiative of the SPA
www.nea.gov.sg/SPA

Plans for Mandatory Requirements

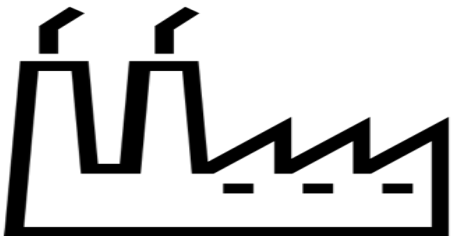
- Introduce mandatory reporting of packaging data (types & amounts placed on the market) and submission of 3R plans for packaging waste in 2020
- Study the feasibility of extending EPR framework to cover packaging waste

Incineration(Trash to Ash)

- A waste treatment process, where the waste materials are burned to ashes.
- Waste volume reduces by 90%.
- Energy(electricity) is produced.
- Advanced combustion system - Waste is completely burnt, metals recovered
- Harmful gases are removed.
- **Singapore's first** Waste-To-Energy Plant opened in 1979.

WASTE-TO-ENERGY PLANTS

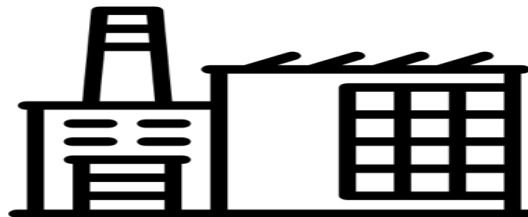
TUAS



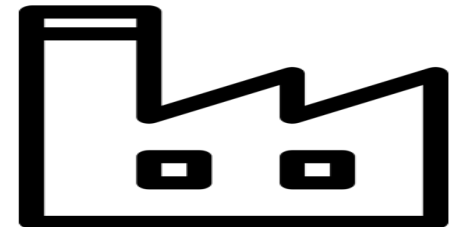
TUAS SOUTH



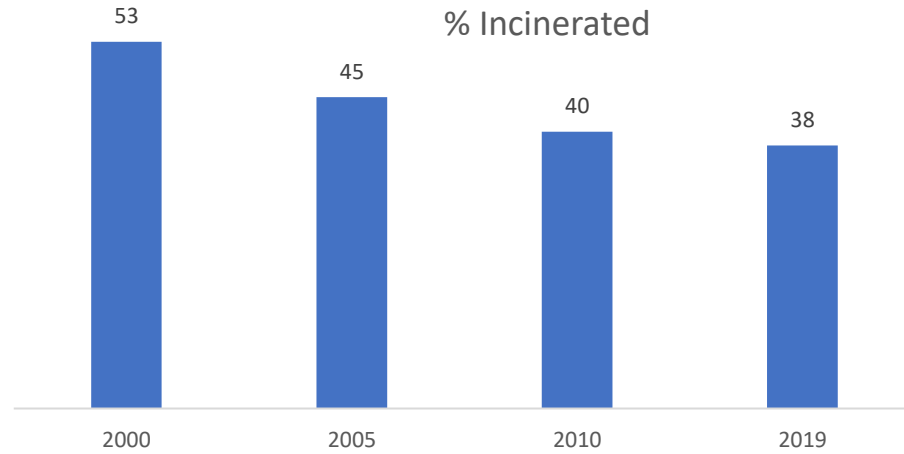
SENOKO



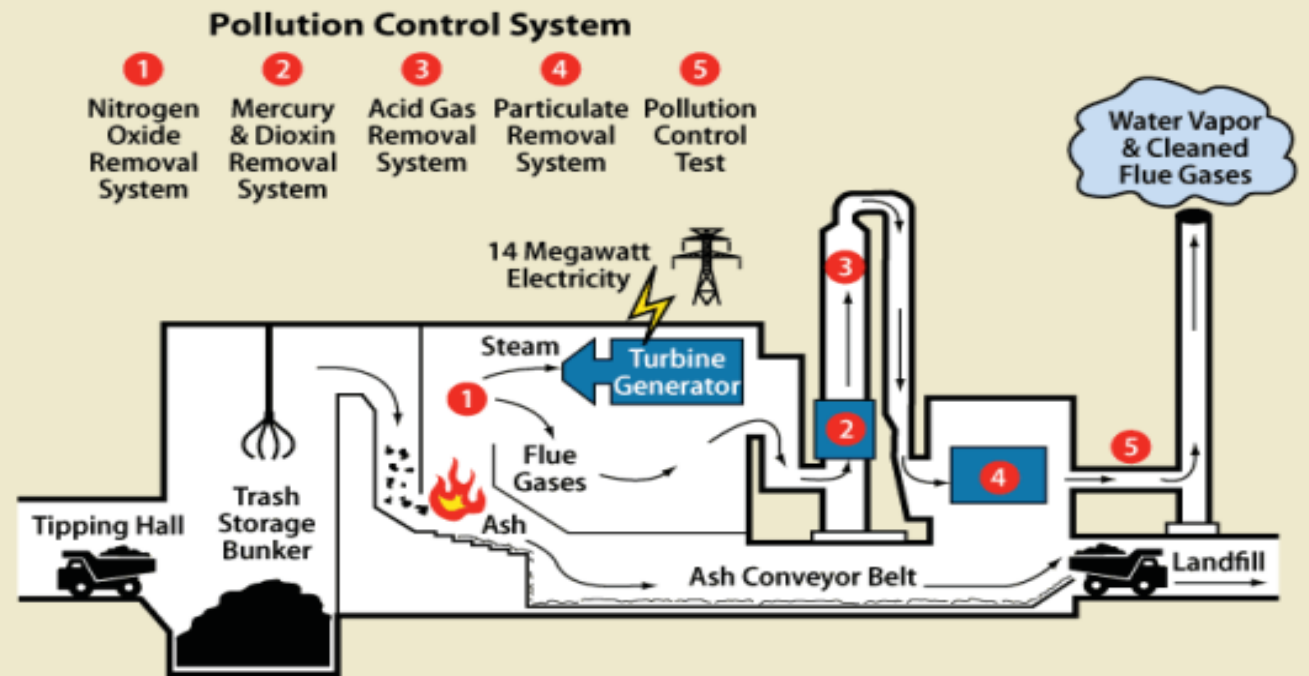
KEPPEL SEGHERS TUAS



Waste-To-Energy Plant



Waste to Energy Plant Diagram



Source: ecomaine.

Waste-To-Energy Plants

Name	Ulu Pandan Incineration Plant	Tuas Incineration Plant	Senoko Incineration Plant	Tuas South Incineration Plant	Keppel Seghers Waste-to-Energy Plant	TuasOne Waste-to-Energy Plant
Operations	1979 to 2009 (30 years of operations)	1986 (34 years old)	1992 (28 years old)	2000 (20 years old)	2009 (11 years old)	Expected January 2021
Capacity	1,100	1,700	2,400	3,000	800	3,600
Rated power capacity	1x16 MW	2x23 MW	2x27 MW	2x66 MW	22 MW	120 MW
Number of incinerator units	4	5	6	6	2	
Cost	S\$170M	S\$200M	S\$560M	S\$890M	S\$160M	S\$750M

Non Incinerable waste

- 1. **Big appliances** such as washing machines, refrigerators and air-conditioning units.
- 2. **Big metal pieces** such as large drums or containers, vehicular parts, metal chairs, wire rope and spring mattress.
- 3. **Bulky waste** that consists of any of the following: a. a solid object exceeding 0.6 m in length or width or 0.1 m in thickness; b. a hollow object exceeding 0.6 m in length, width or height.
- 4. Carbon fibres.
- 5. **Chlorinated herbicides**, chlorinated insecticides and chlorinated fungicides.
- 6. **Chemical waste** with chemical content which is unsuitable for incineration.
- 7. Explosive or highly flammable waste such as ammunition, dry and wet carbide waste, fireworks, self-igniting waste and excessive quantities of films.
- 8. Fire retardants.
- 9. **Human and animal waste**, sludge from neutralisation pits, foul-smelling waste and large whole animal carcasses.
- 10. Insulation materials such as rock wool, asbestos, calcium silicate boards, ceramic fibres and big carpets.
- 11. Large quantities of electrical parts and components such as printed circuit boards, cables and electronic cards. 12. Light materials such as sawdust, feathers, dust and powders.
- 13. Liquid and volatile waste, oil sludge and paints.
- 14. **Poisonous** and radioactive waste.
- 15. Polychlorinated compounds such as Polychlorinated Bi-phenyl (**PCB**).
- 16. Polyvinyl Chloride (**PVC**) waste such as PVC pipes, plastic film, upholstery, containers and packaging materials.
- 17. Smouldering refuse.
- 18. Toxic industrial waste specified in the Schedule to the Environmental Public Health (Toxic Industrial Waste) Regulations (Rg 11).
- 19. Tyres. 20. Construction and renovation debris, earth, concrete, stone, sand, sludge, ash and slag.
- 21. Waste from grease interceptors.
- 22. Waste from **sewerage systems**, including waste from sewage treatment plants, septic tanks and water-seal latrines.
- 23. Waste from sanitary conveniences not part of a sewerage system, including waste from sanitary conveniences which are mobile or in ships or aircraft.

Landfills

- 1) **Lim chu Kang** – 1976 to 1992
Transformed into Sarimbun Recycle park
- 2) **Lorong Halus** – 1970 to 1999,
Transformed into Lorong Halus wetland
- 3) **Semakau Island** – “The Island of Trash”



Lorong Halus



Lorong Halus Wetland: From Garbage Dum...



NEA | Sarimbun Recycling Park



Lim Chu Kang

Semakau Transformation Aerial View

1995

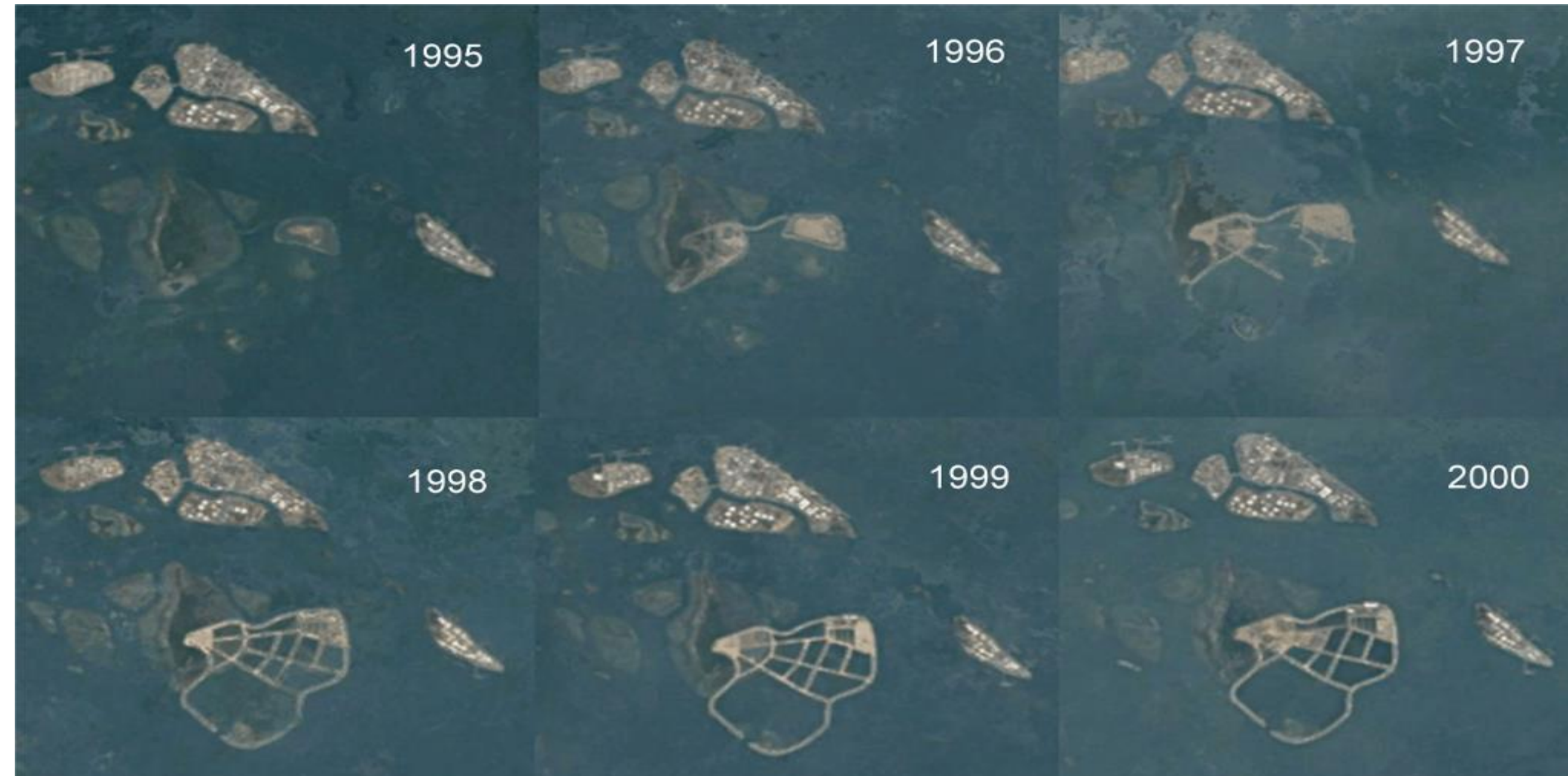
1996

1997

1998

1999

2000



18th April 2000



16th October 2003



4th May 2008



14th August 2012



30th August 2015



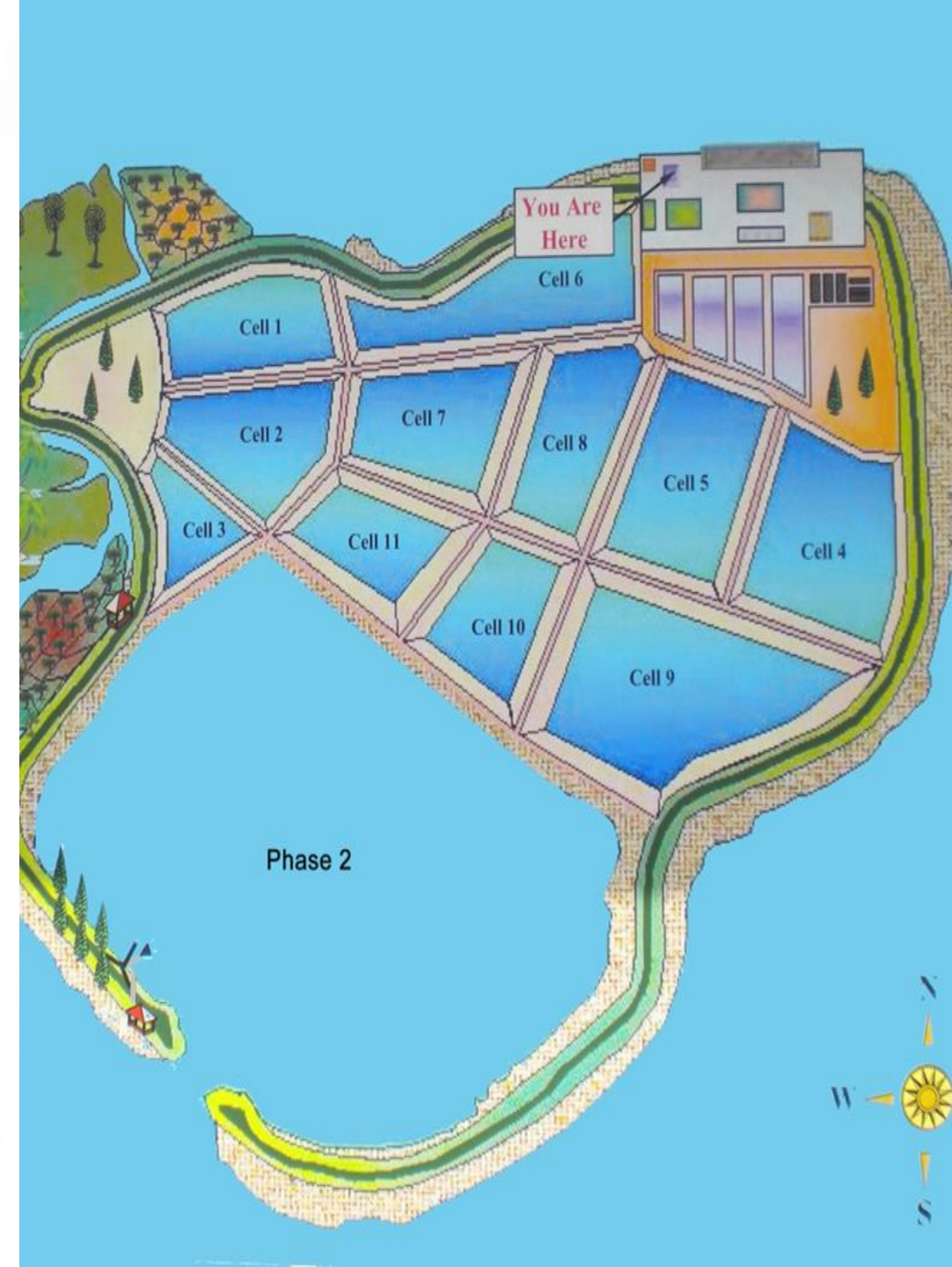
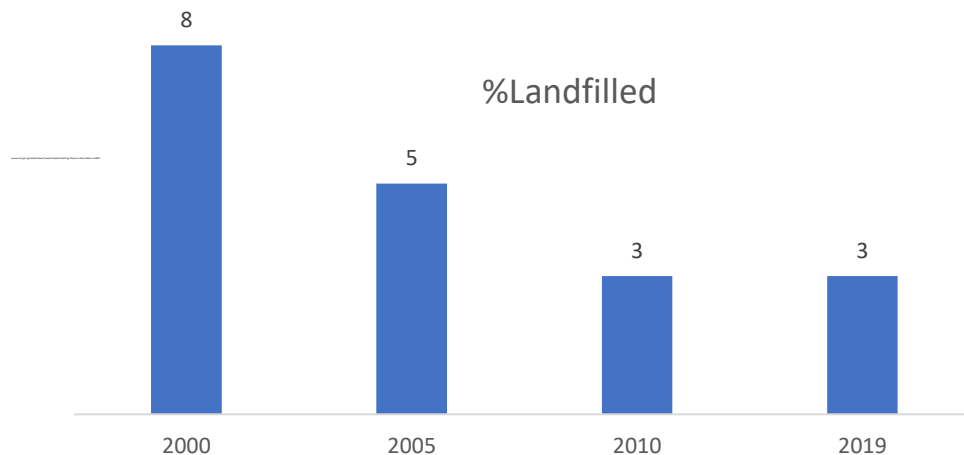
16th September 2019



Landfill

World's first Man- made offshore landfill created entirely out of sea space

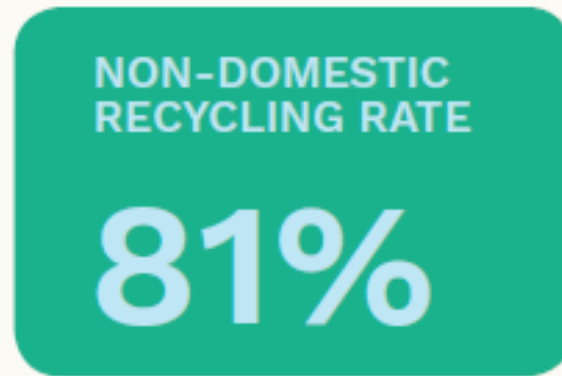
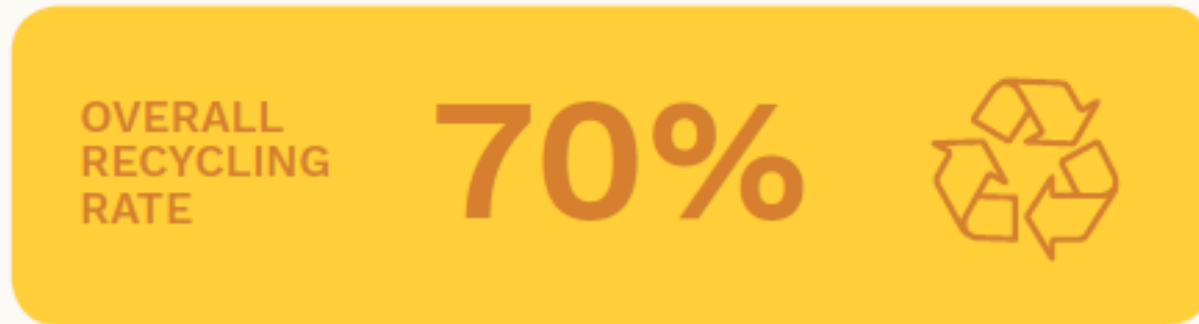
- **Commenced** :1 April 1999
- **Cost** : \$610m (Phase I **1999**) , \$36m (phase II in **2015**)
- **Total Area** : 350 ha
- **Total Capacity** : 63 million cu m
- **Capacity left** : 28 million cu m
- **Expected Lifespan** : **Until 2035 (14 years left)**
- **Daily Landfill** : 2100tons waste(1500t ash + 600t n.incwaste)
- **Open to Public and monthly guided tours are conducted.**



Towards Zero Waste Singapore

Year 2030

Year 2019



- Overall Recycling Rate - 59%
- Domestic Recycling - 17%
- Non Domestic - 73%

Conclusion

- Let's Reduce! Reuse! Recycle!!!
- Work towards Zero waste
- Provide a Clean & healthy environment to our Future Generation

