

Asia 3R Conference

30 Oct – 1 Nov 06

Integrated Solid Waste Management in Singapore

National Environment Agency

And

Ministry of the Environment & Water Resources

Singapore





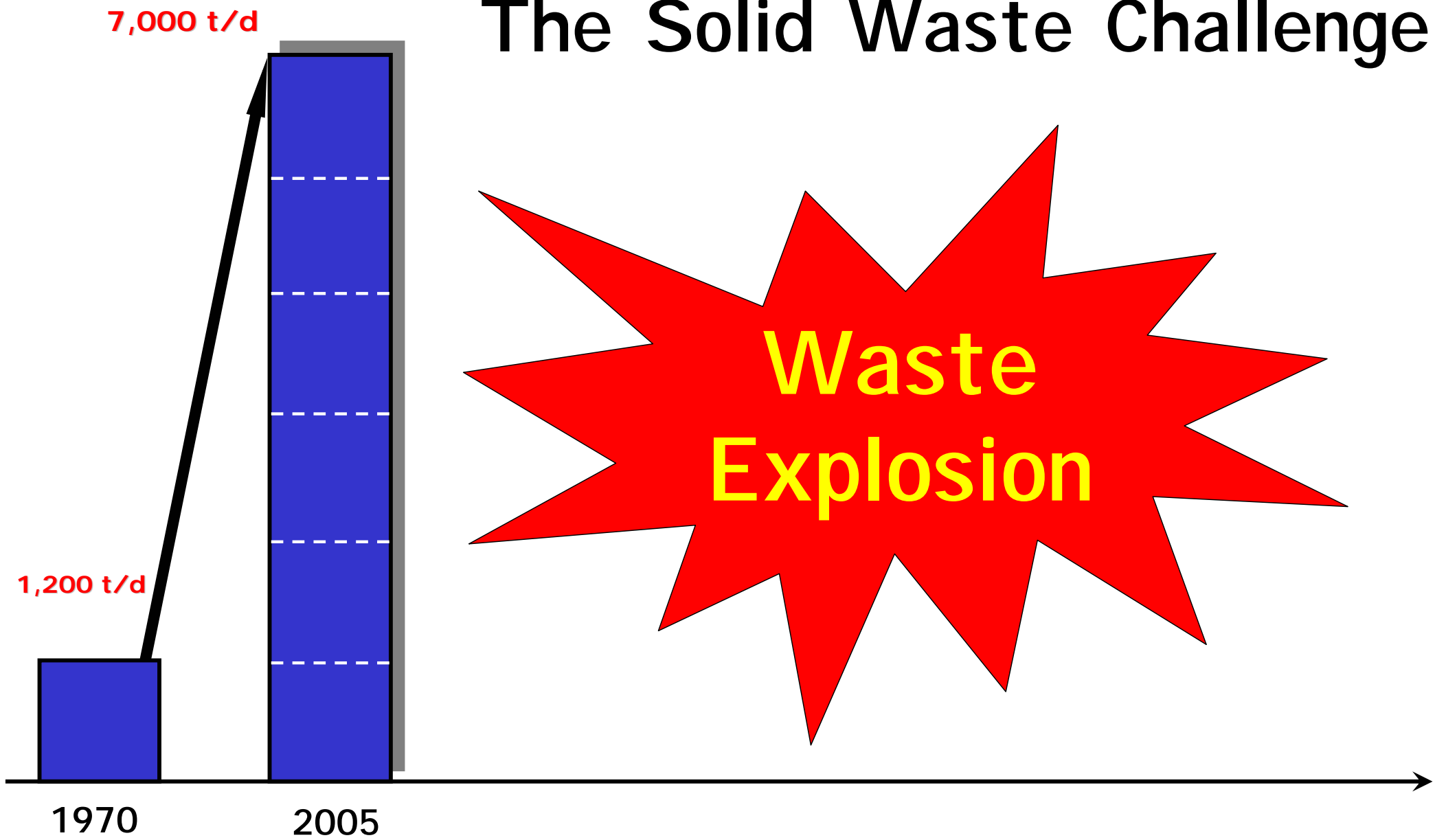
- **Ministry of Environment and Water Resources (MEWR)**
- **National Environment Agency (NEA)**

Integrated Solid Waste Management

- **Waste Collection**
- **Waste Sorting, Recovery and Recycling**
- **Waste Transfer Station**
- **Waste Disposal (Incineration Plants, Sanitary Landfill)**
- **Hazardous Substances and Toxic Waste Management**
- **Cleaning of Public Areas**



The Solid Waste Challenge



Solid Waste Management

- ❖ All waste collected daily and disposed of
- ❖ 90% incinerable waste and disposed of at 4 incineration plants
- ❖ 10% non-incinerable waste and disposed of at Semakau Offshore Sanitary Landfill



OK so far.....

But future?



Challenges

❖ Small land area

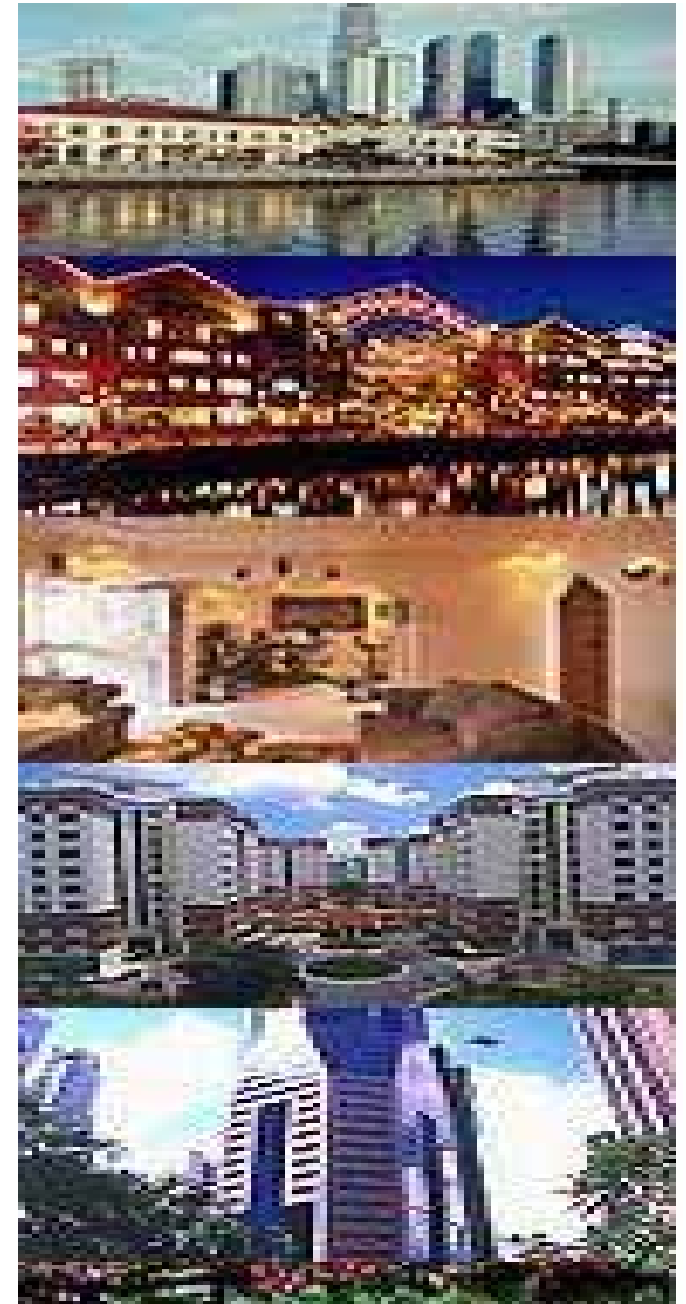
- ❖ One last sanitary landfill (an offshore landfill)

❖ Economic growth

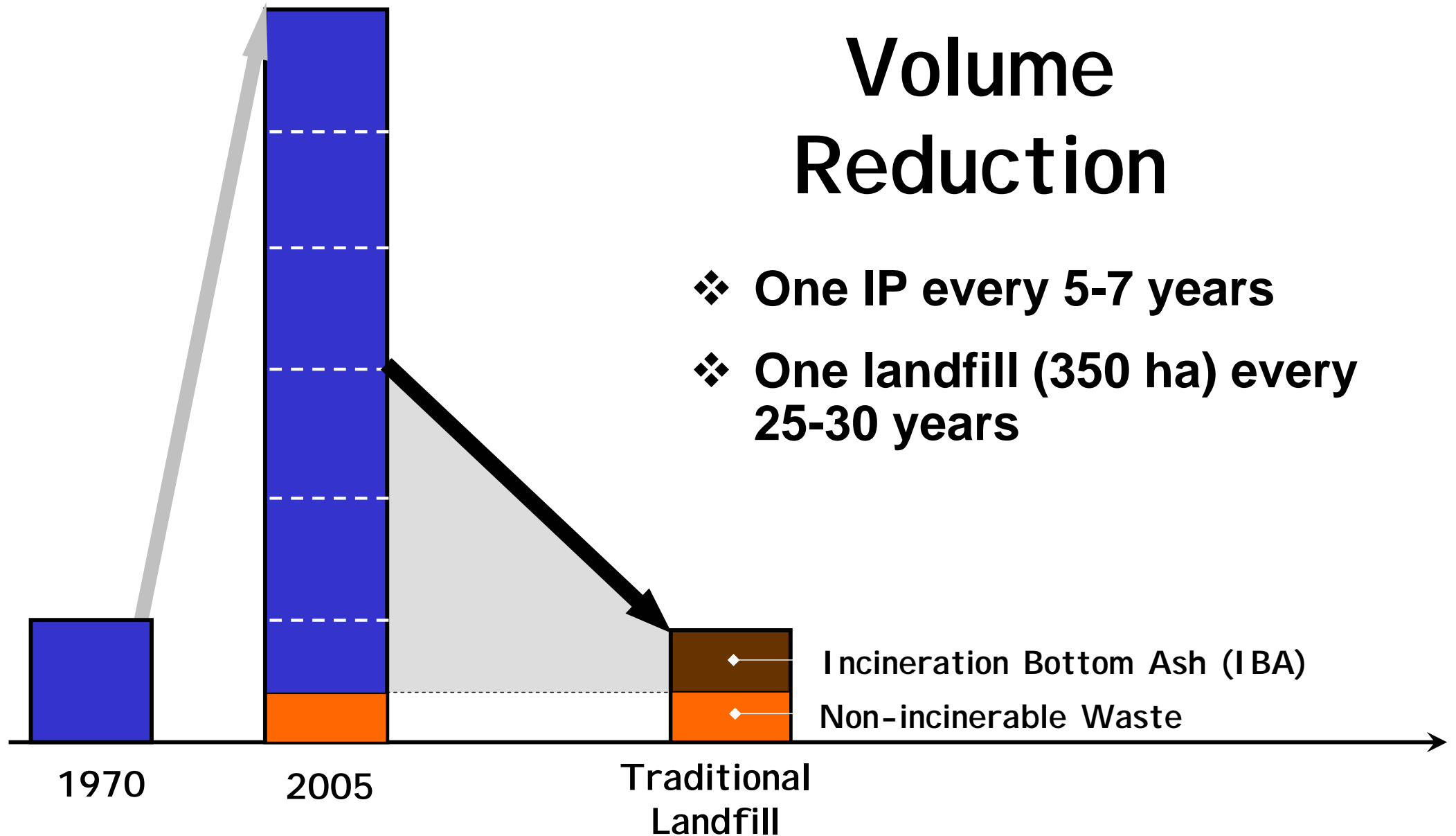
❖ Population growth

❖ Rising affluence

- ❖ High consumption pattern
- ❖ Higher expectations

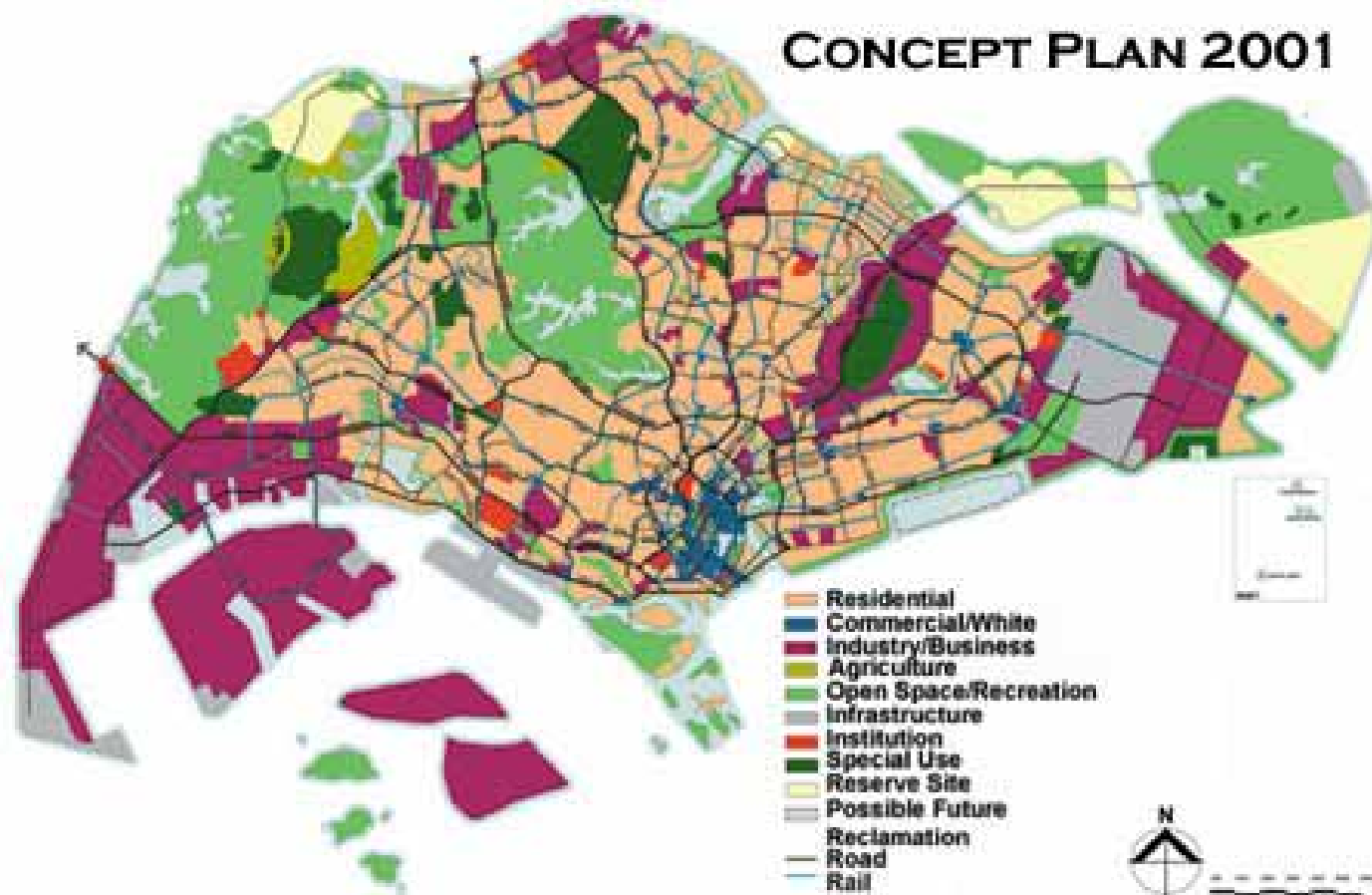


Strategy 1 : Incineration



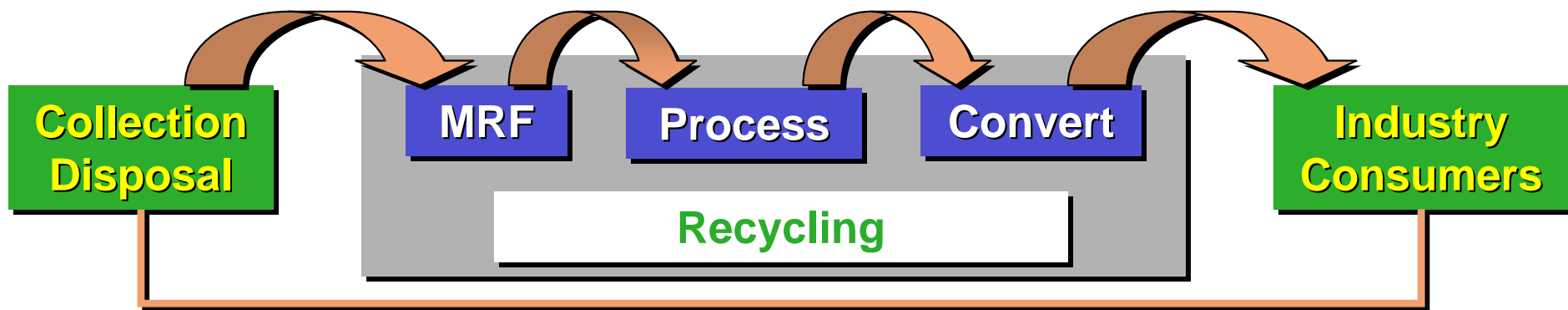
Not sustainable, if we continue business as usual

- ❖ One last sanitary landfill
- ❖ High cost of building and operating IP



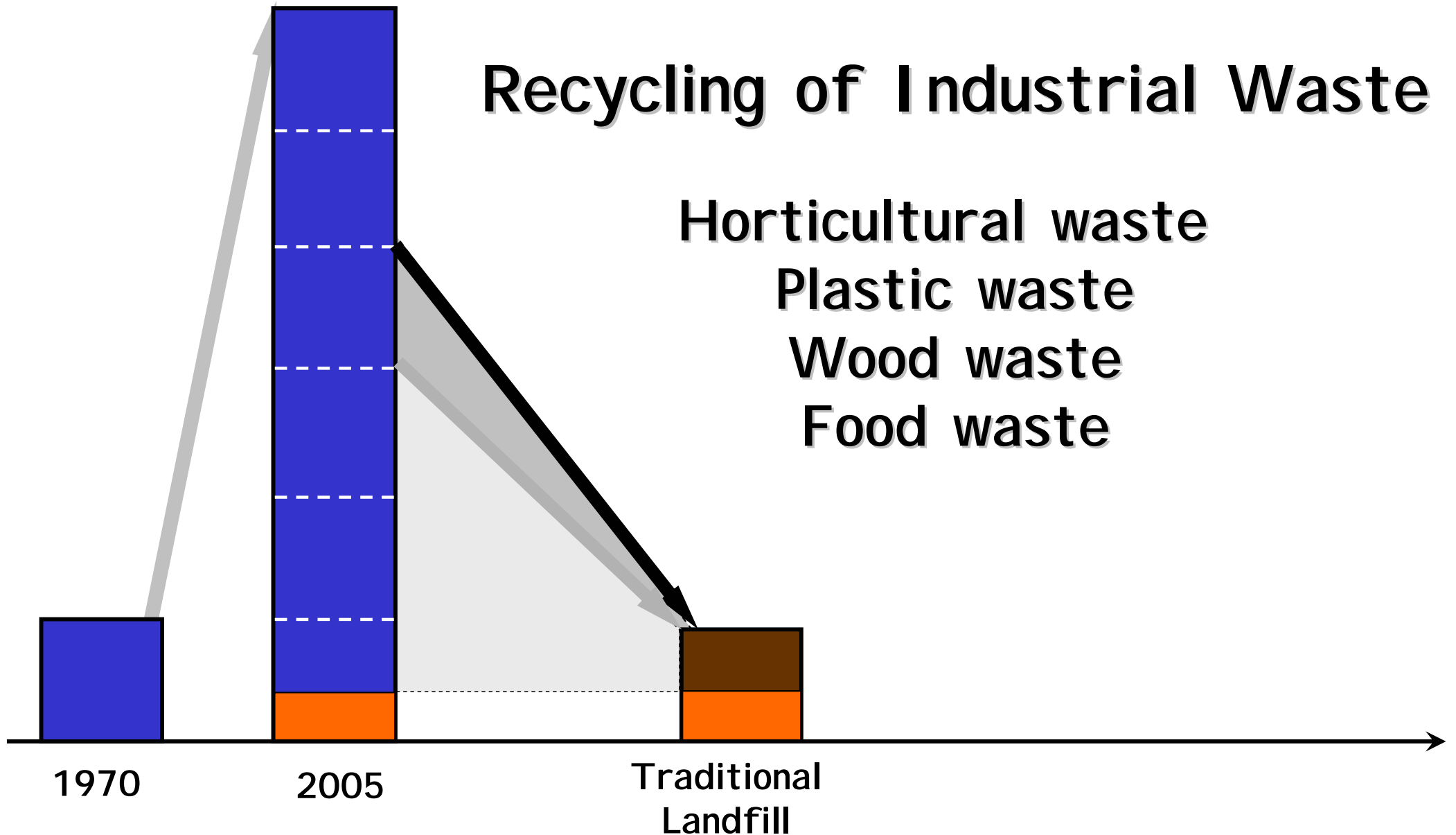
Sustainable Solution

Closing the Solid Waste Loop



Strategy 2 : Recycling

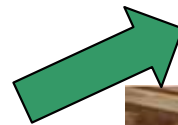
Recycling of Industrial Waste



Wood Waste Recycling

Recycling of wood waste to produce

- ❖ Office furniture
- ❖ Home furniture
- ❖ Pallets

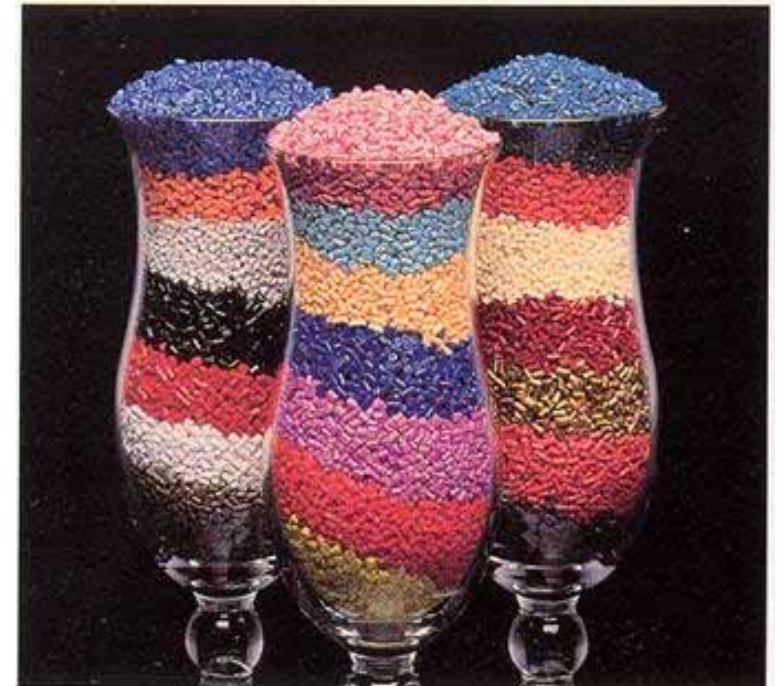


Plastic Waste Recycling

Heating and Extrusion



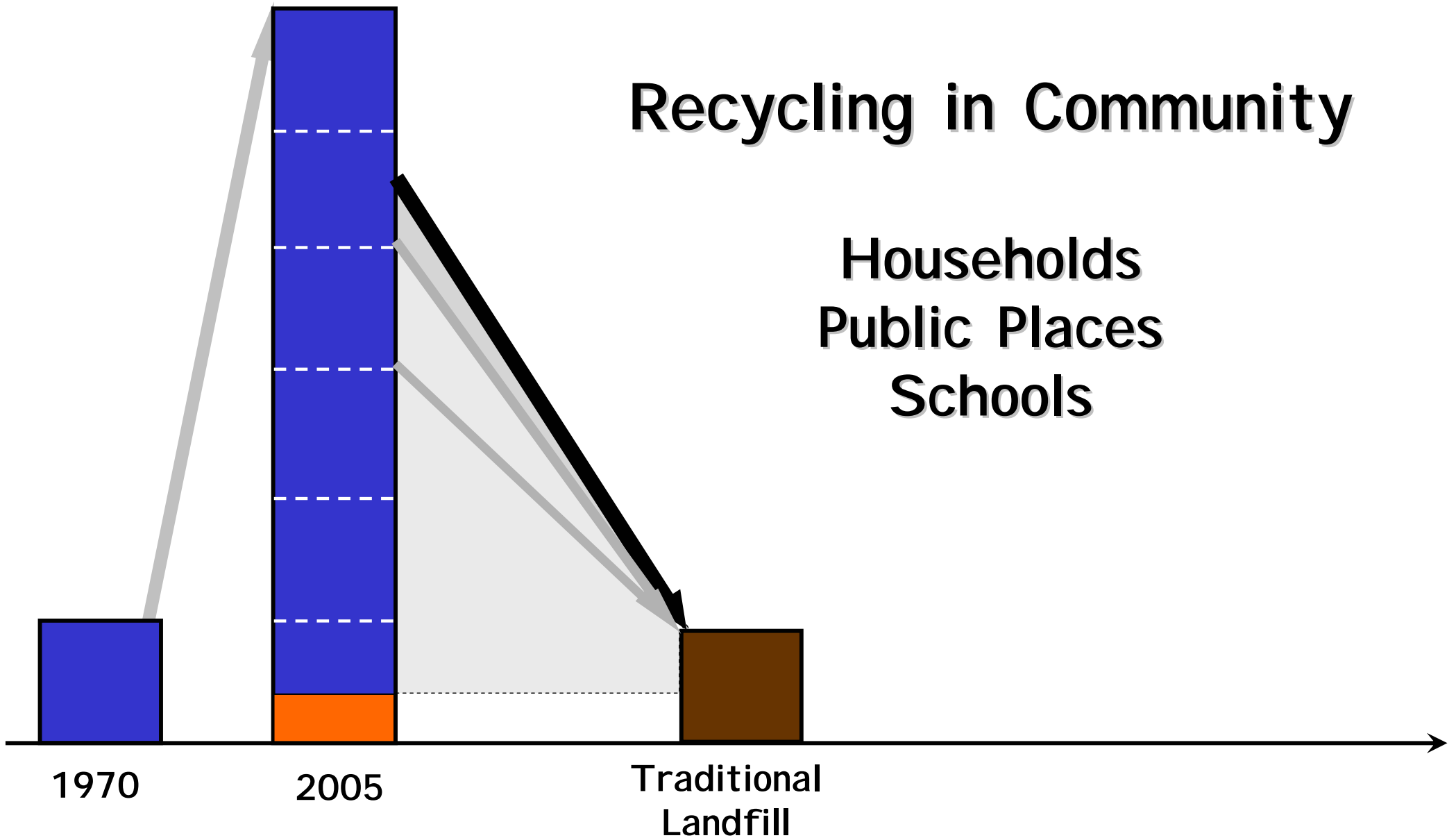
Plastic Pellets



Plastic scraps



Strategy 2 : Recycling



National Recycling Programme

- ❖ **Recycling programme for households launched in 2001**
- ❖ **Collection of recyclable waste and refuse bundled in Public Waste Collection contracts**
- ❖ **Door-to-door collection of recyclables every fortnight**



National Recycling Programme

➤ **Sorting in Material Recovery Facilities**

- ❖ **Paper**
- ❖ **Drink cans**
- ❖ **Glass bottles/jars**
- ❖ **Plastic bottles**
- ❖ **Carton boxes**
- ❖ **Clothing**

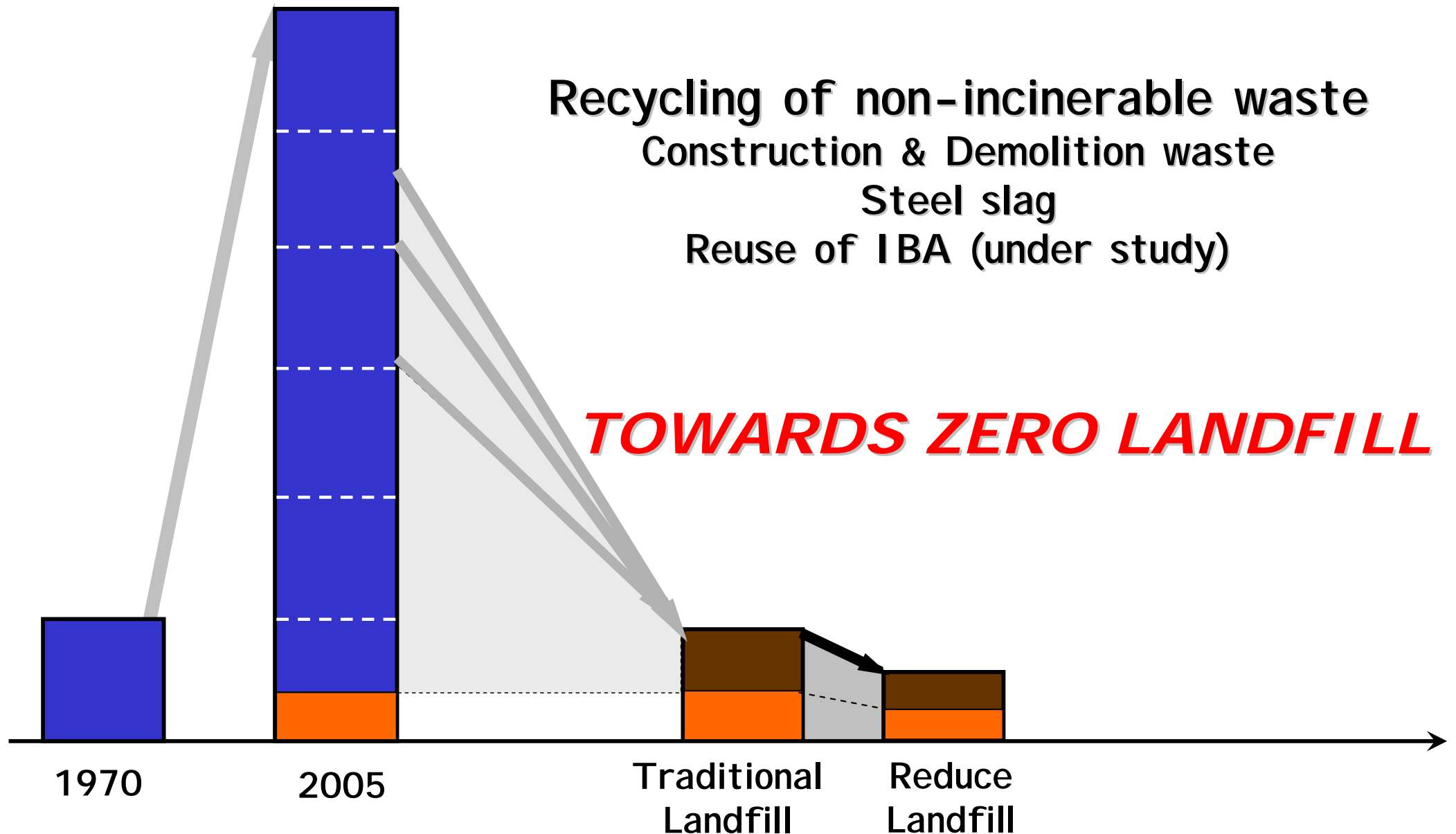


Recycling Bins at Public Places

- ❖ Shopping streets
- ❖ Institutions (schools, offices, etc)
- ❖ Food courts
- ❖ Housing estates



Strategy 3 : Reduce Waste To Landfill



Construction & Demolition Waste Recycling



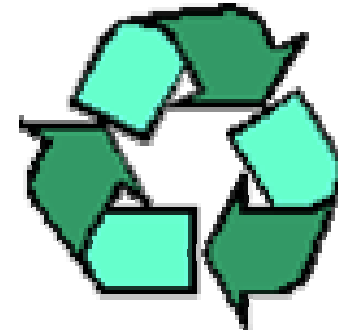
Outcome

❖ Lifespan of Semakau Landfill

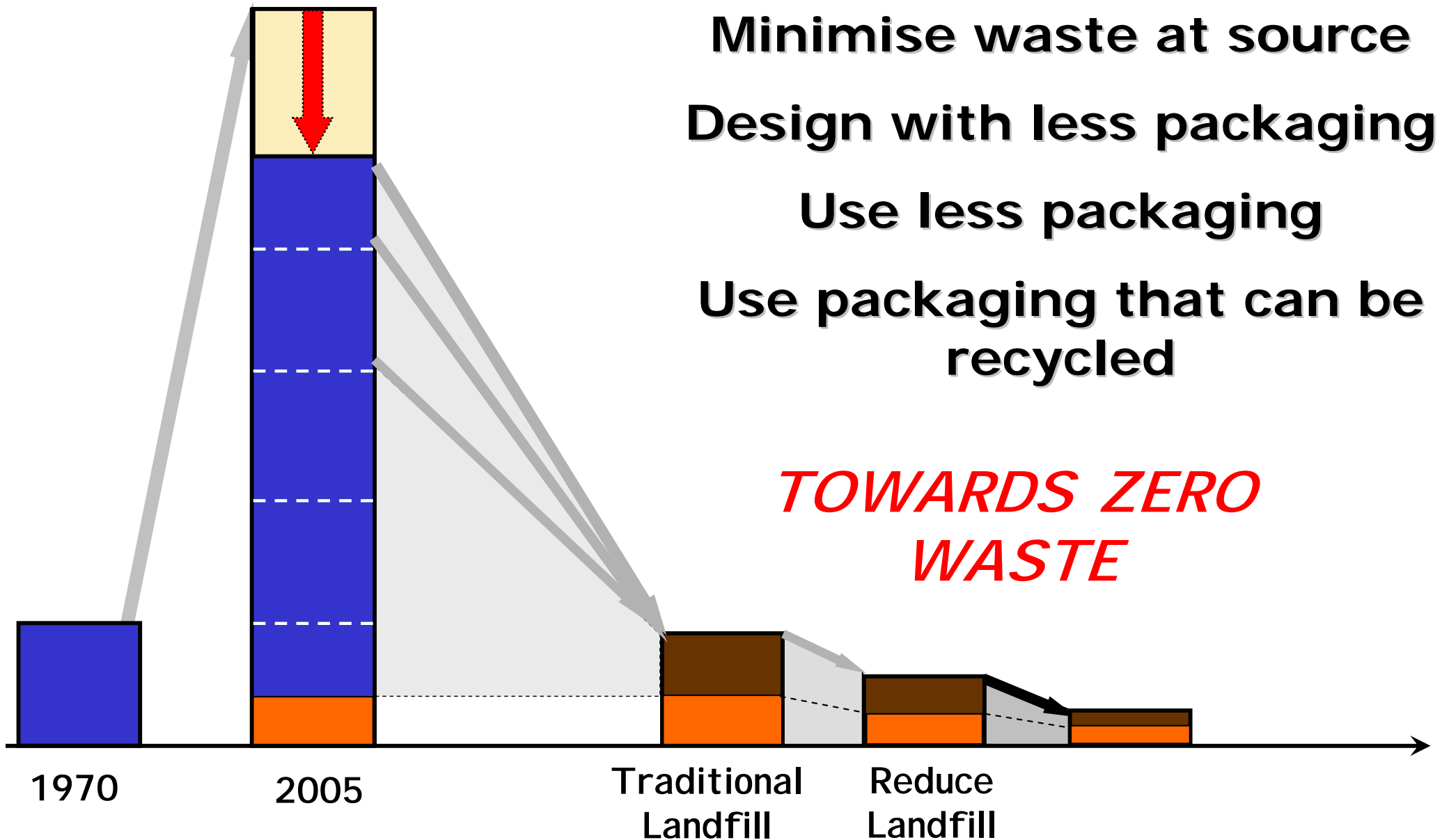
25-30 years to 30-45 years

❖ Need for additional IP

5-7 years to 8-10 years



Strategy 4 : Waste Minimisation



Collection



Waste Collection System

Domestic & Trade Premises

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

Industrial & Commercial Premises

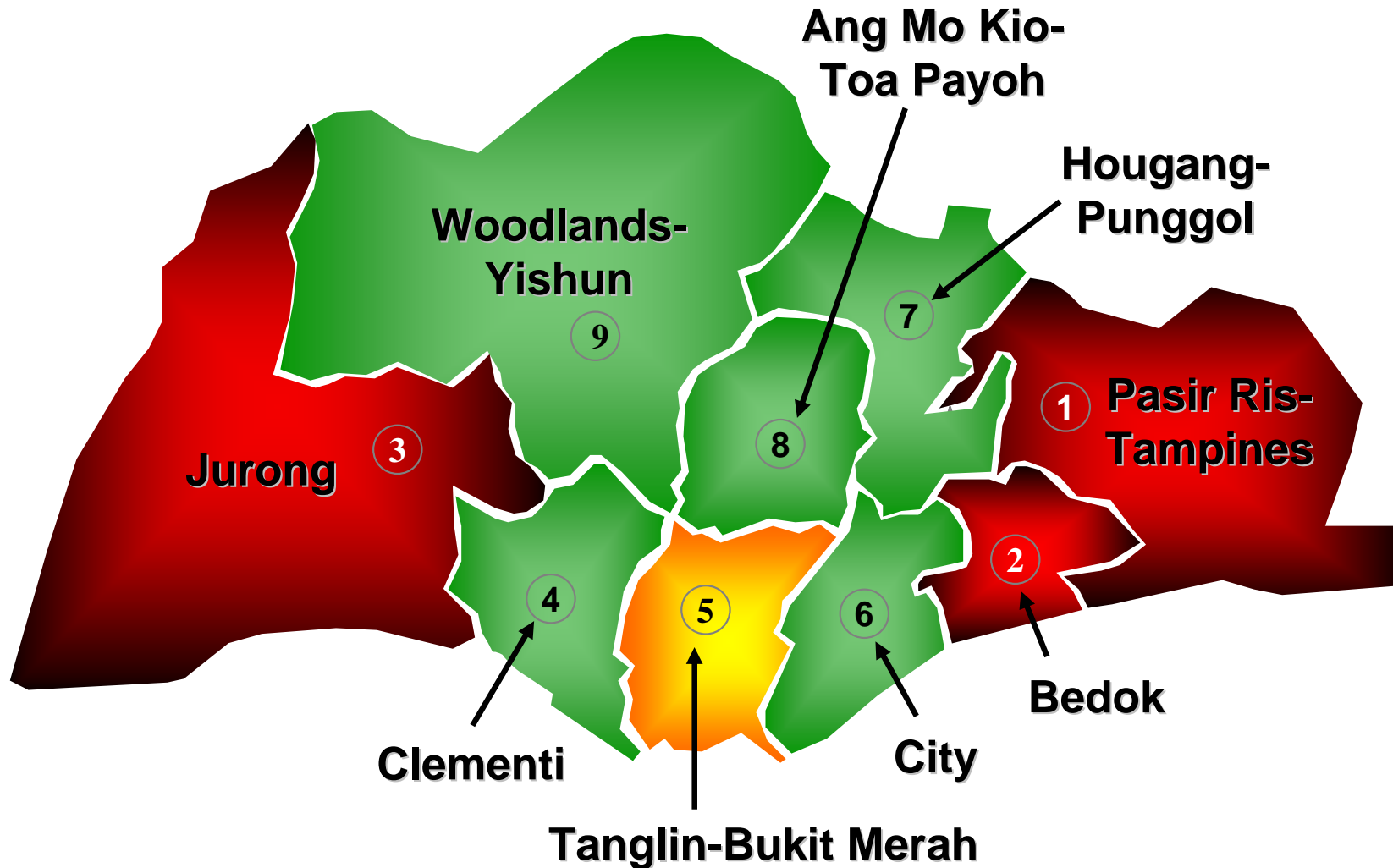
- ❖ By licensed general waste collectors

Medical Facilities

- ❖ Separate collection and disposal by licensed toxic waste collectors
- ❖ Disposal at high temperature biohazardous waste incineration plants



Privatisation of Refuse Collection Service



Disposal

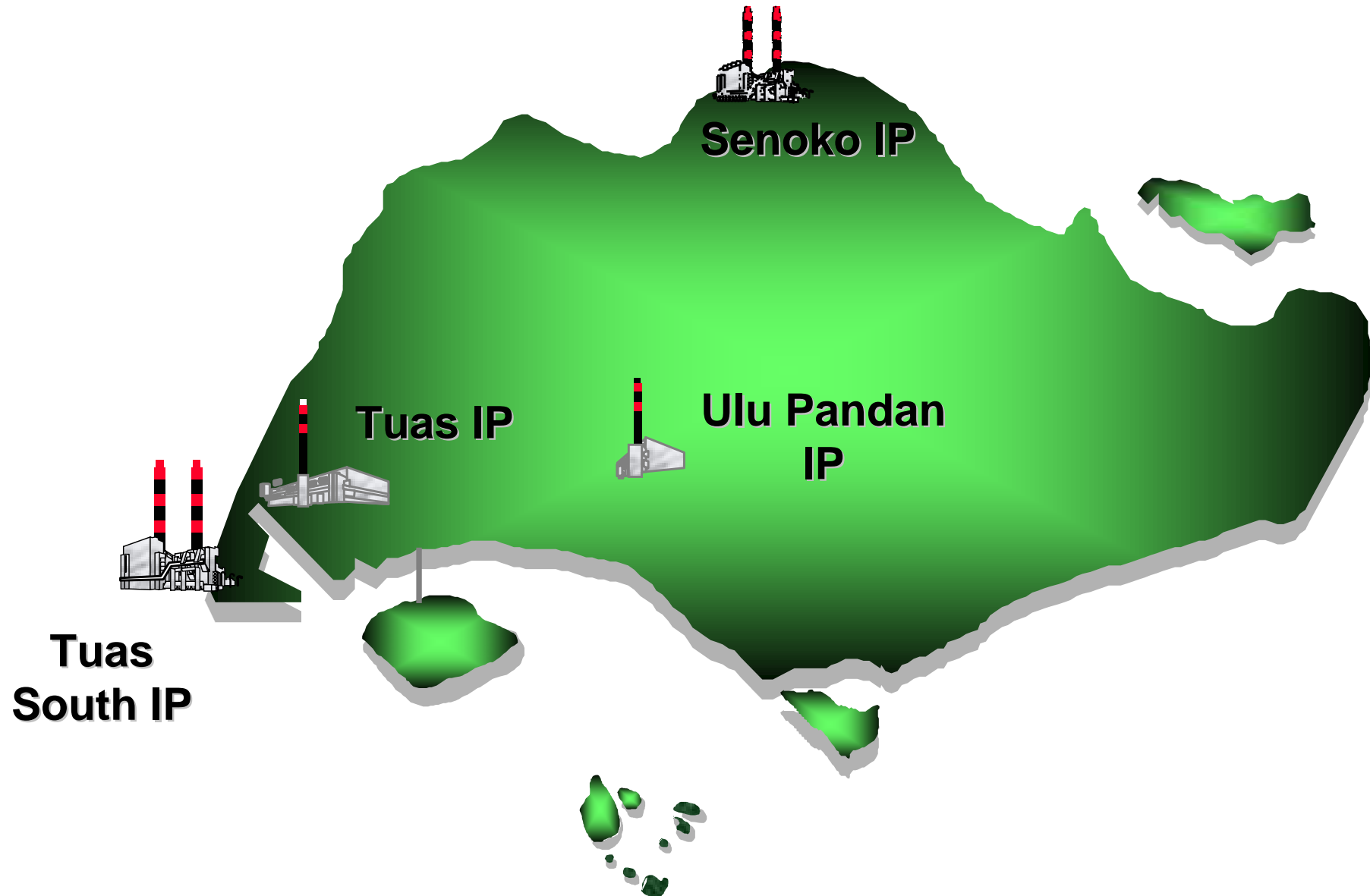


Incineration



- ❖ **90% waste is disposed of by incineration**
- ❖ **Volume of waste is reduced by 90%**
- ❖ **Energy is recovered for electricity generation**
 - ❖ **980 million kWh electricity generated per year**
 - ❖ **2-3% of electricity demand for Singapore**
- ❖ **Scrap metal is recovered for recycling**
 - ❖ **22,800 tonnes/year of scrap recovered**

Incineration Plants



Incineration Plants in Singapore

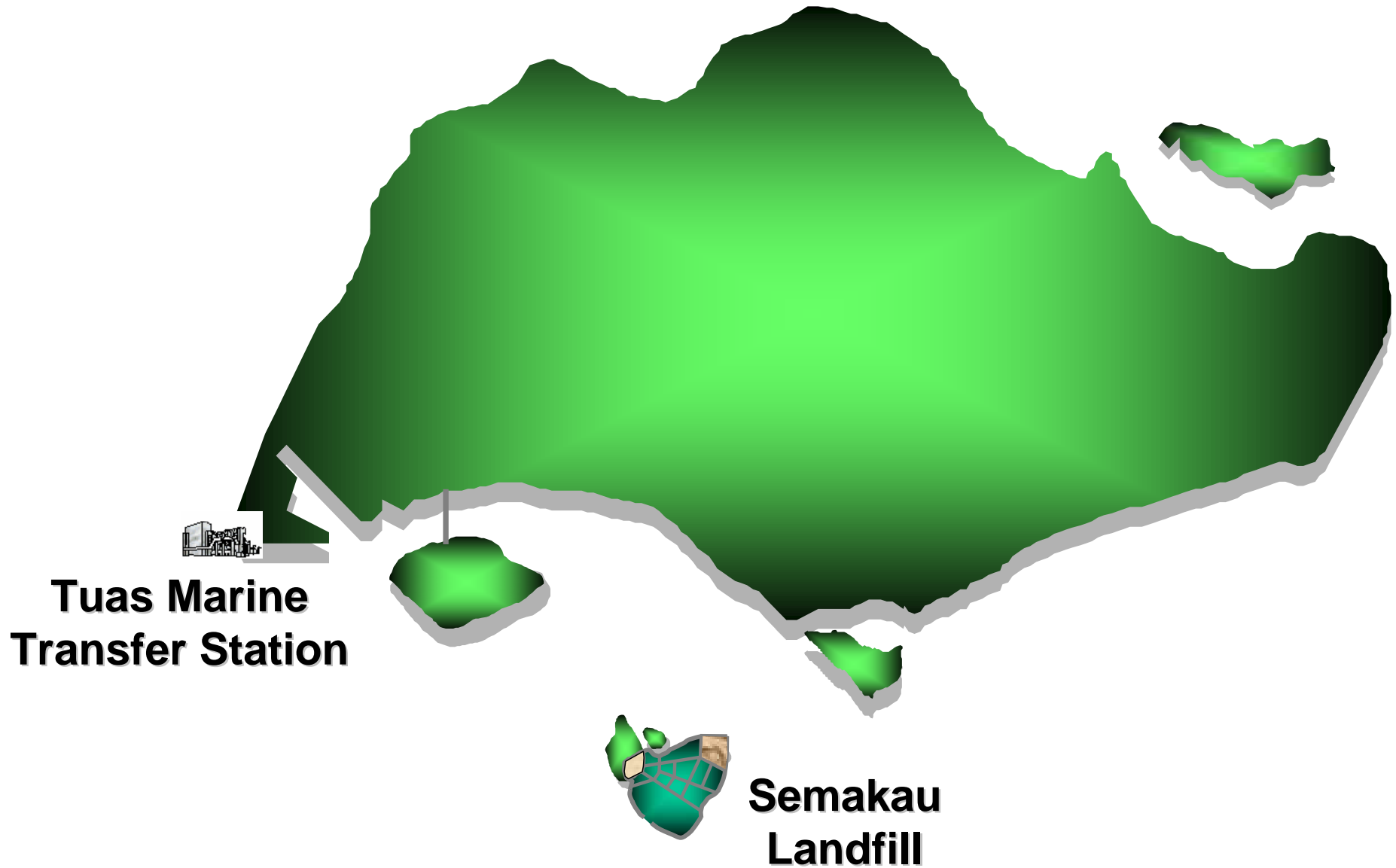
	Tuas South Incineration Plant	Senoko Incineration Plant	Tuas Incineration Plant	Ulu Pandan Incineration Plant
Year Built	2000	1992	1986	1979
Designed Capacity (tonnes/day)	3000	2400	1700	1100
Boiler / Incinerator	6 units	6 units	5 units	4 units
Construction Cost (S\$ millions)	890	560	200	170

Semakau Landfill

- ❖ 600 tonnes/day non-incinerable waste
- ❖ 1,400 tonnes/day incineration ash
- ❖ Commenced operation on 1 Apr 99
- ❖ Capacity : 63 million m³
- ❖ Area : 350 ha
- ❖ Cost : S\$610 mil



Semakau Landfill





Clean Public Areas

- **Cleaning of Public Areas**
 - Expressways/Roads
 - Roadside drains
 - Pavements/Sidewalks
 - Parks
 - Other public areas
- **Strict anti-littering law**



Cleaning Public Areas

Mechanical road sweepers



Pavement sweeper



Litter picking

Outcomes



- Refuse collected daily by Public Waste Collectors and properly disposed of by incineration and landfill
- Streets and public places are clean



Outcomes

Recycling

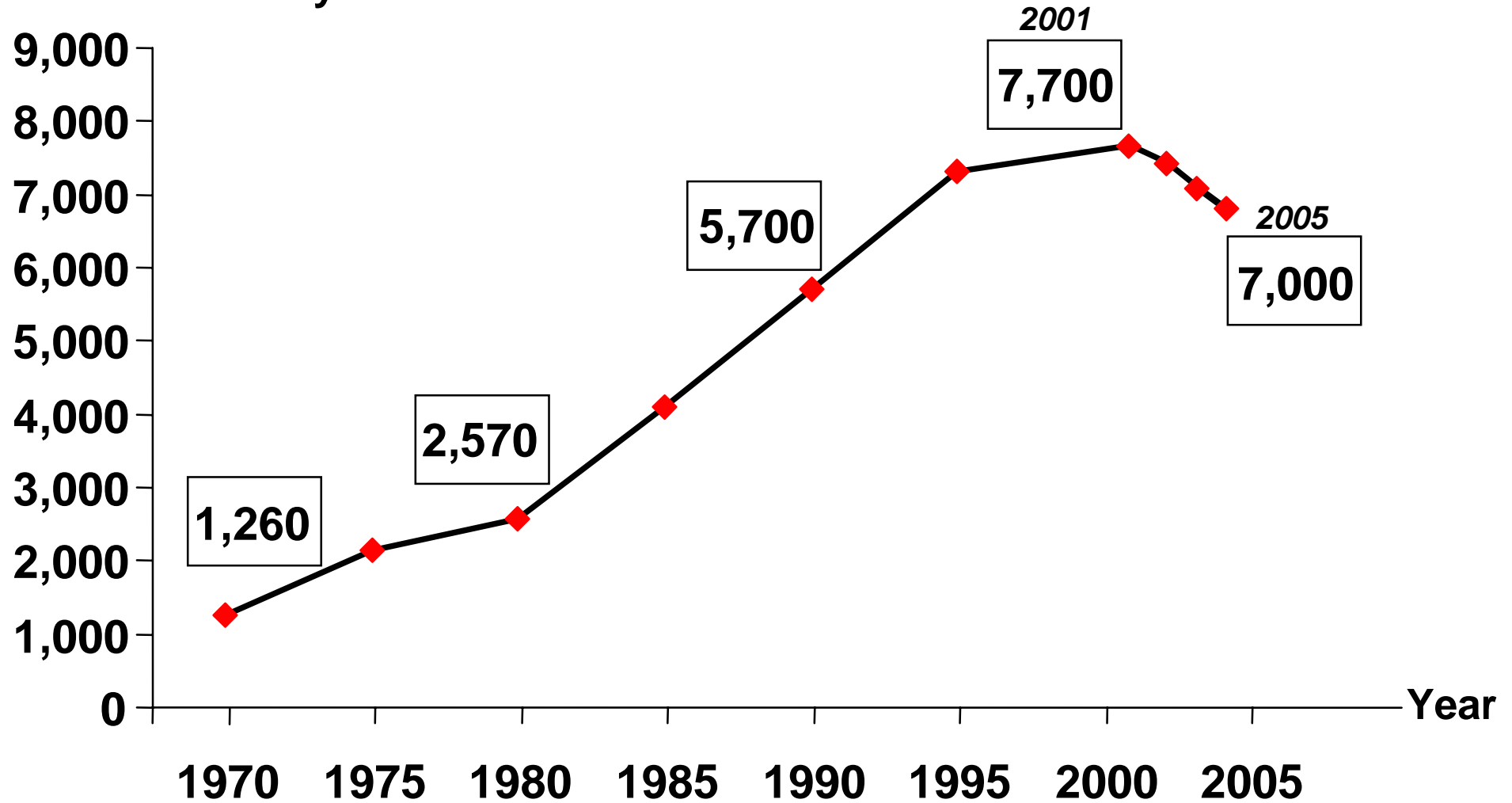
Overall recycling rate gone up : 40% in 2000 to 49% in 2005



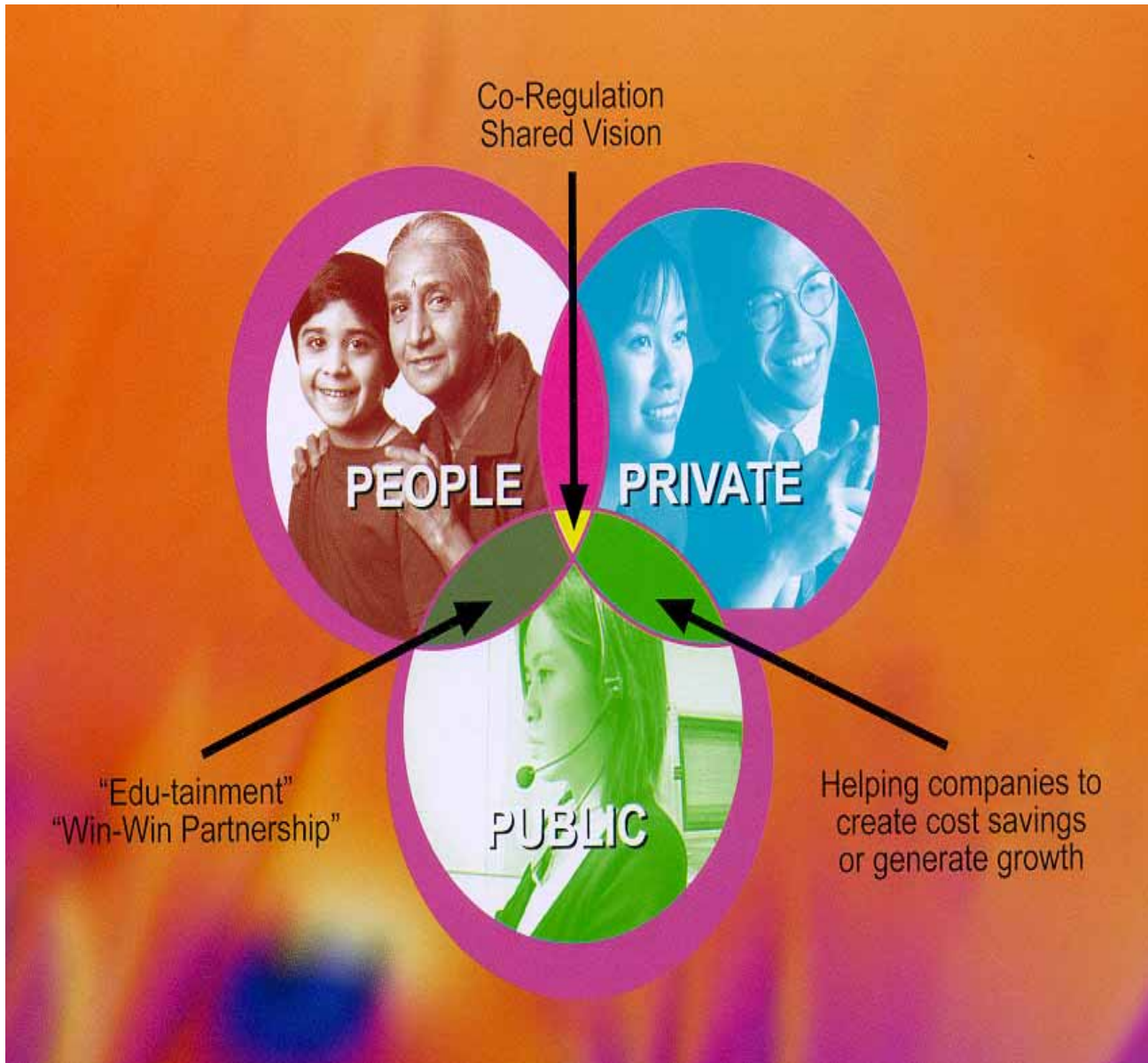
WASTE OUTPUT

(DAILY AVERAGE 1970 – 2005)

Tonnes Per Day



Key to Sustainability



**Involve the
Community
to take
Ownership
of the
Environment**

Community Participation

- Involvement of 3P (Private, Public and People) Sectors
 - Residents
 - Businesses
 - Schools
 - Grassroots organizations
 - Government agencies
 - NGOs



Approach

- **Communication**
- **Engagement**
- **Empowerment**



MISSION: "OWNERSHIP"

Community Participation

- **Programs/Initiatives:**
 - **Recycling Corners in Schools**
 - **Environment Clubs**
 - **Dialogue/feedback**
 - **Community-led activities**
 - **Products stewardship**
 - **Recycling Day**
 - **Clean & Green Week**



Fun activities to teach recycling





Thank You