Inventory Development in Singapore & National Climate Change Strategy

National Environment Agency

Singapore

4th Workshop on GHG Inventories in Asia

14-15 Feb 2007

Singapore's Situation

- Small city-state
  - Land area of 680 km^2
- High population density
  - Population of >4 mil
- Highly industrialised economy
- Dependent on imported fossil fuels
- Lack of natural resources and renewable energy sources

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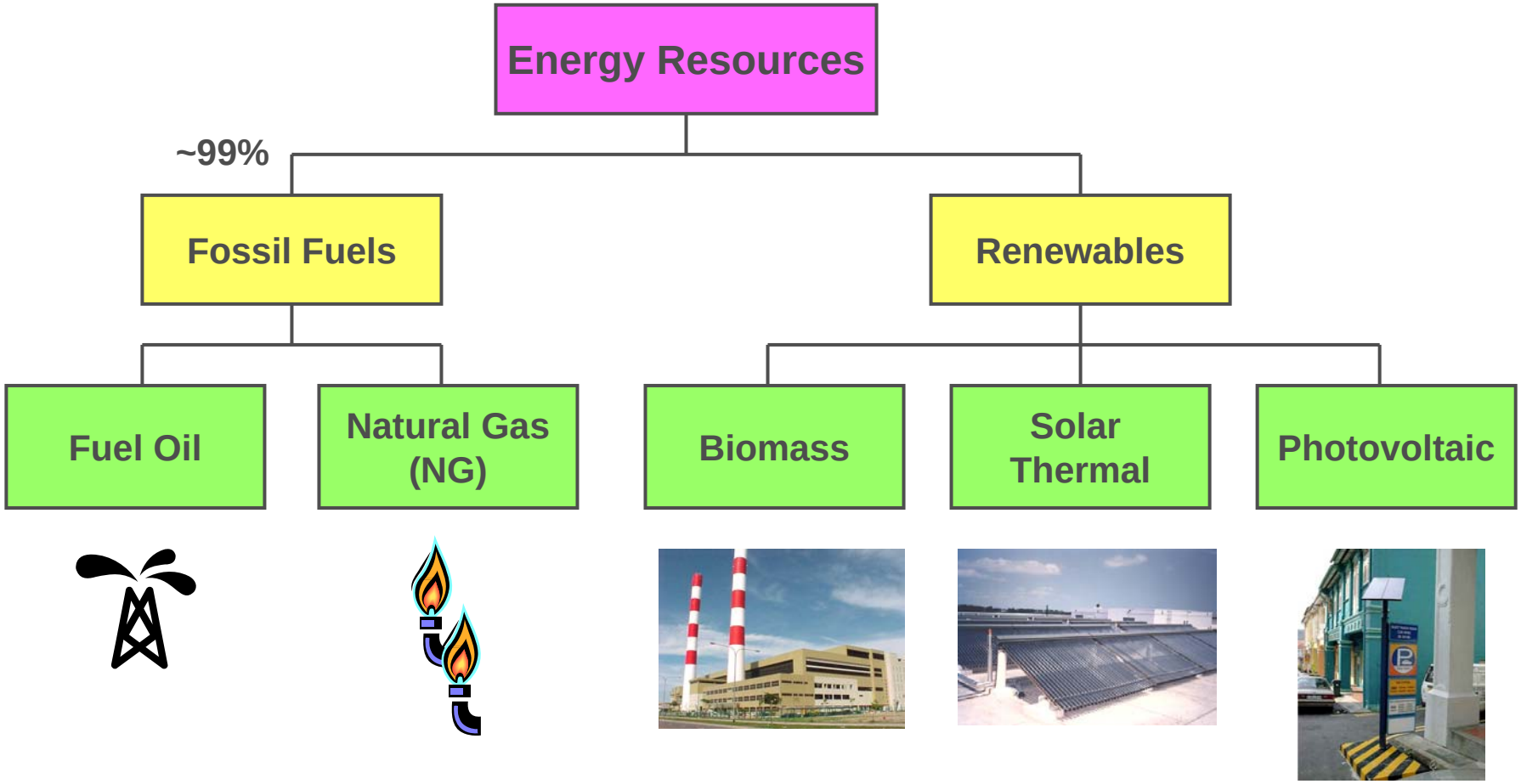
Singapore's Energy Resources



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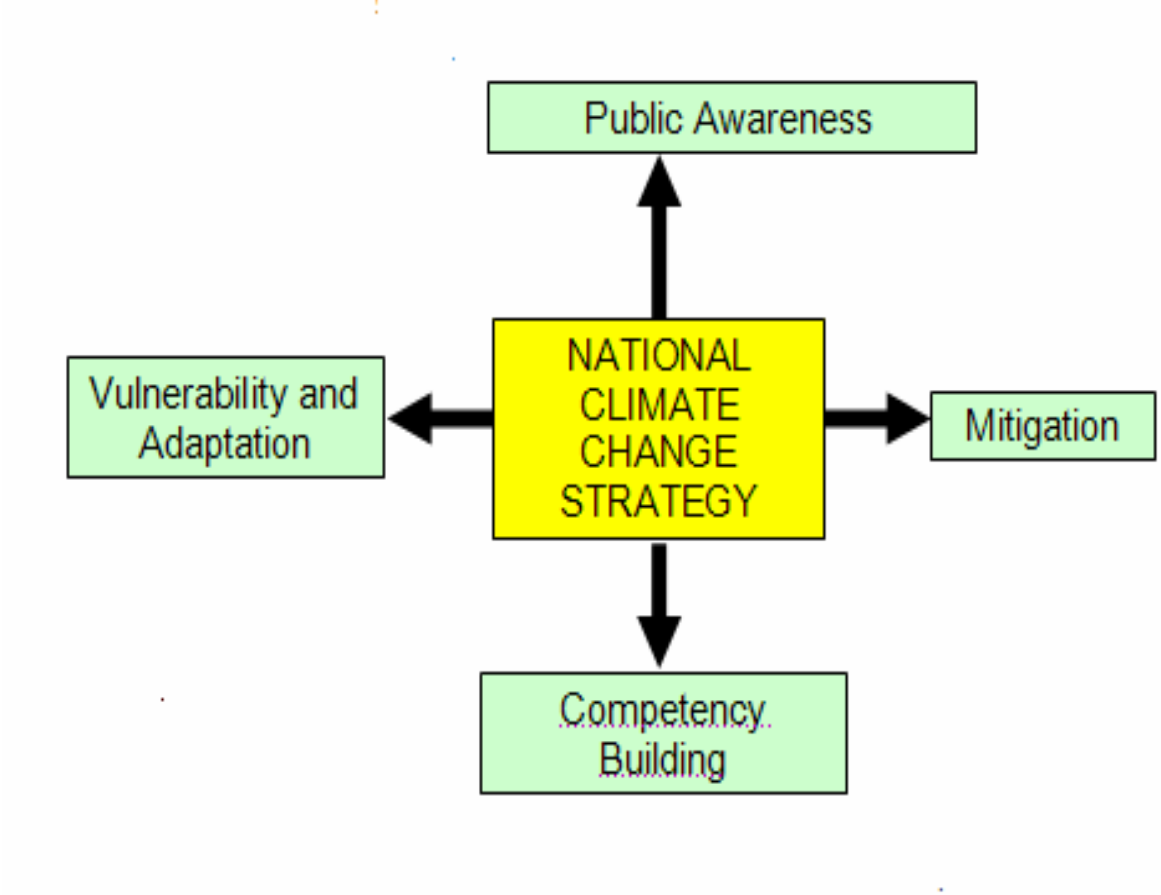
National Climate Change Strategy



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Key CO_2 contributors (2004)

- Main contribution is CO_2 from the use of energy

	 Electricity Generation	 Industry	 Transport	 Buildings	 Consumers/ Households	 Others
Primary Consumption (combust fuel)	48%	33%	17%	1%	~1%	-
Secondary Consumption (use electricity)		44%	5%	30%	18%	3%
Overall		54%	19%	16%	10%	~1%

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TOTAL CO_2 = 40,377 kilo tonnes

Main Mitigation Strategies

Energy efficiency

Clean, less carbon-intensive energy sources

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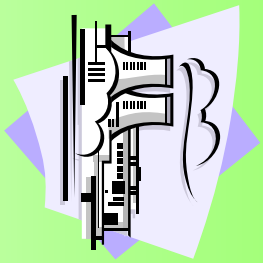
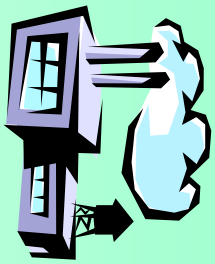
Mitigation Efforts by Sector

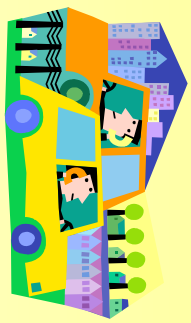
Electricity Generation



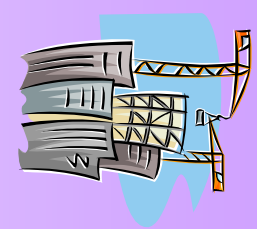
Industry



Transport



Buildings



Consumer/Households

Improving Energy Efficiency in Electricity Generation

Electricity Generation

- New Energy Market introduced in Jan 2003
  - Promotes competition and expected to continue to drive improvements in generation efficiency
- Gencos switching to NG and adopting combined cycle generation technologies (CCGT)
- Cogeneration
  - 815 MW CCGT cogeneration plant
    - ⇨ >30% energy savings and emissions reduction when compared to separate power and heat generation
  - Trigeneration and multigeneration have potential to further improve efficiency

Using Cleaner Fuels & Renewables

- Promoting cogeneration will increase the adoption of NG in industry
- Test-bedding and demonstration of innovative clean energy technologies will help Singapore become an early adopter when these technologies are commercially viable
  - Solar photovoltaics (PV)
  - Hydrogen fuel cells

Electricity Generation

Promoting Greater Energy Efficiency

- Energy Efficiency Improvement Assistance Scheme (EASe)

  Introduced in Apr 2005

  - $10 million incentive scheme
  - Fund limit - 50% of the cost of engaging ESCOs
  - Manufacturing companies and building owners/operators

- Energy Audit Scheme for large energy consumers
  - Launched in Jul 2002
  - Encourage very large emitters of CO_2 to improve their energy efficiency and energy management systems and practices
  - Measures implemented:
    - ⇨ Improvement of furnace efficiencies
    - ⇨ Optimisation of heat recovery, heat integration

Industry

Promoting Greater Energy Efficiency

- Accelerated Depreciation Allowance Scheme
  - Introduced in Jan 1996
  - Allows companies to depreciate qualifying capital equipment in one year instead of three

Energy Efficient Equipment	Energy-Saving Devices
▪ Air-conditioning System	▪ Solar Heating or Cooling System
▪ Boiler	▪ Solar Energy Collection System
▪ Water Pumping System	▪ Heat Recovery System
▪ Washing or Dry-cleaning Machine System	▪ Power Factor Controller
▪ Refrigeration System	▪ High Efficiency Electric Motor
▪ Lift or Escalators	▪ Variable Speed Drive Motor Control System
▪ Instant Hot Water System	▪ High Frequency Lighting System
	▪ Computerised Energy Mgmt System
Replacement Equipment	Energy-saving Devices

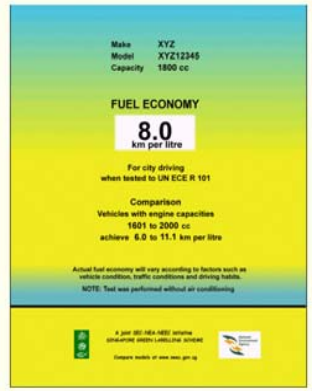
Industry

Promoting Energy Efficiency

- Promote public transportation
- Promote green vehicles
  - Hybrid, fuel cell cars
  - Natural gas for taxis and buses

	MJ / passenger-km
Cars	1.5-2.0
Buses	0.9
MRT	0.2

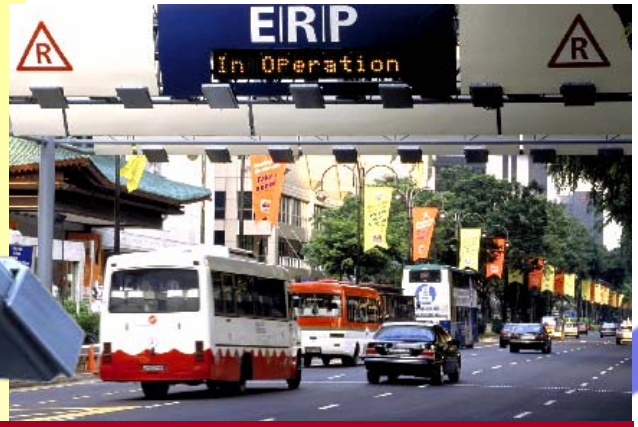
- Green vehicle tax rebates
  - 40% of OMV for electric, hybrid, and CNG cars
  - 5% of OMV for CNG buses
  - Valid until 31 Dec 2007
- Fuel Economy Labelling Scheme
  - Launched in Jun 2003 on Green Transport Day
  - Green Transport Guide



Fuel Economy Label

Transport

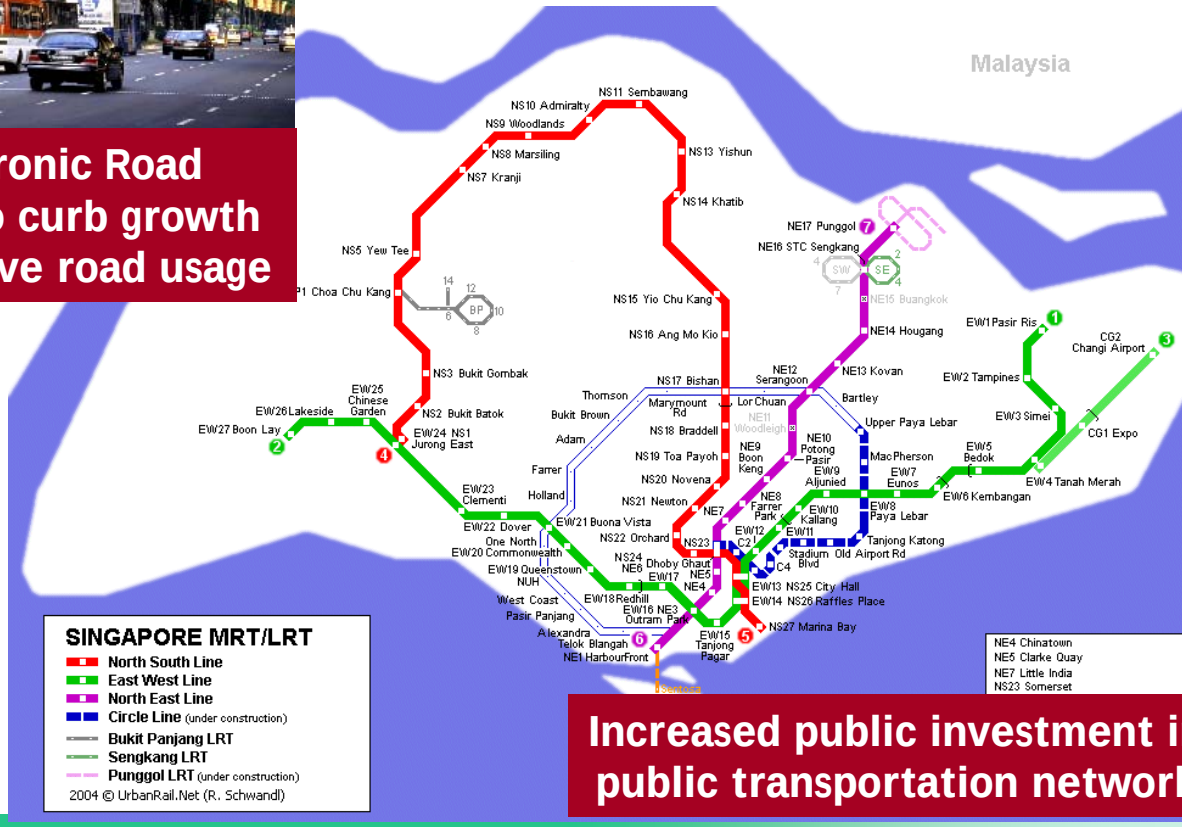
Promoting Energy Efficiency



Vehicle Quota System & Electronic Road Pricing are effective measures to curb growth of vehicle population and excessive road usage

36 carparks included under Park & Ride Scheme

Transport



Increased public investment in public transportation network

Promoting Energy Efficiency

- Regulations and standards
  - BCA's Building Control Regulation for air-con bldgs (revised in Jan 2004)
    - ⇨ Envelope Thermal Transfer Value (ETTV) and Roof TTV (RTTV)
    - ⇨ Minimum efficiency requirements for air-con systems exceeding 30 kW
    - ⇨ Maximum lighting power budget
  - Code of Practice 24 under SPRING Singapore's standards
    - ⇨ Technical workgroup led by NEA
- Energy Efficiency Improvement Assistance Scheme (EASe)
- Energy conservation projects
  - Energy audit of common area services in 40 blocks of Aljunied Town Council
  - 14% - 18% potential energy savings uncovered
  - Results and recommendations were shared with Town Councils and HDB

Singapore's HDB Housing

Buildings

Public Sector to Lead

- Energy efficiency improvement of public sector buildings under Economy Drive initiative
  - 8 public agencies participating
  - Standard performance contracting documents developed
  - Two models: Shared savings & Guaranteed savings
- Energy Smart Building Labelling Scheme to raise awareness
  - Accord recognition for buildings with good energy performance, while maintaining a healthy and productive indoor environment

ENERGY SMART

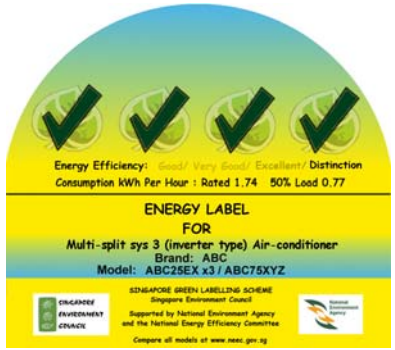
Buildings

Raising Awareness

Consumer/Households

- Energy labelling of household appliances
  - Launched in Apr 2002
  - To-date, about 20% of air-cons and refrigerators in the market are energy labelled
  - Mandatory labelling to be introduced by mid-2007

- Green corners
  - Launched in Mar 2003
  - Showcase energy labelled products
  - 8 green corners island-wide



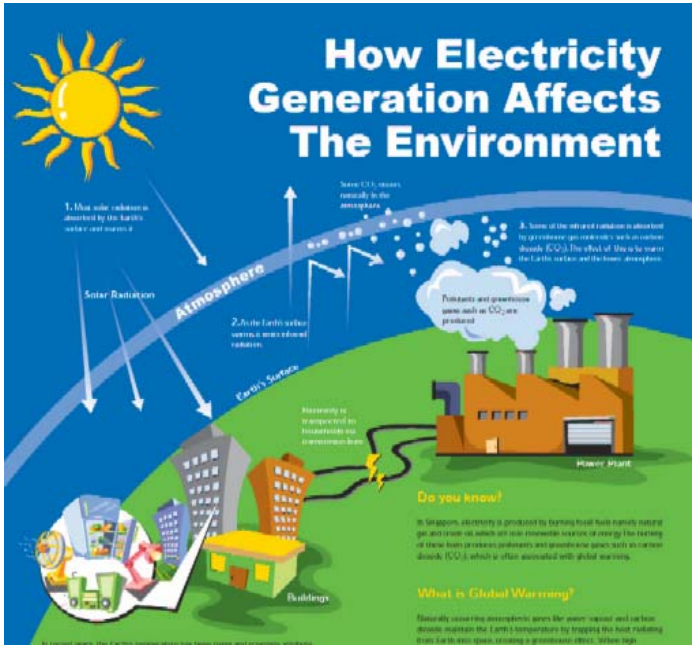
- Associate Green Corners
  - Launched in Jul 2005
  - At least 35% of displayed models are energy labelled
  - 17 associate green corners

- Energy efficiency display at HDB showflats

Raising Awareness

- Energy conservation talks for schools
- Energy conservation educational materials

Consumer/Households



Vulnerability and Adaptation

- As a low-lying island state in tropics, Singapore is vulnerable to climate change
- Areas of vulnerability include:
  - Coastal land loss and flooding
  - Water resource impacts
  - Higher energy demand and heat stress, higher ambient temperature
  - Rise in vector populations and impact on public health
- Study on the effects and impacts of climate change on Singapore is being commissioned

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Competency Building

- Promote demonstration projects and R&D in low-carbon technology through Innovation for Environmental Sustainability (IES) Fund and joint research with tertiary institutions
  - E.g. solar, fuel-cells
- Govt agencies jointly promote sustainable energy industry and build competency to support local and regional CDM projects
  - E.g. ESCO services, solar industry, distributed power generation
  - E.g. carbon trading

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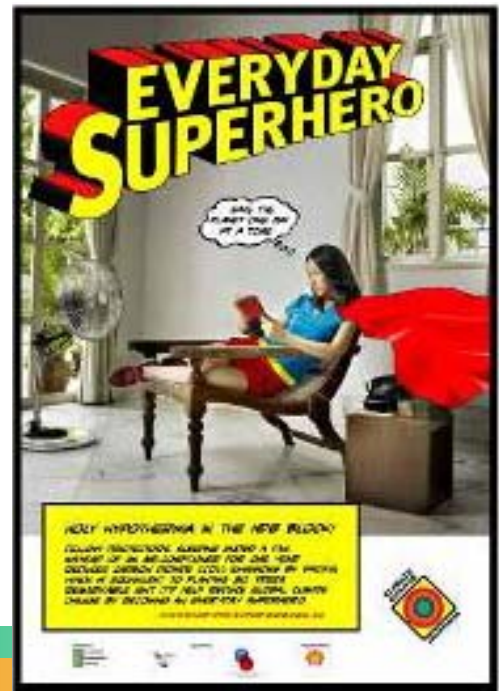
Public Awareness

- Climate Change Awareness Programme (CCAP) aims to:
  - Raise awareness among households and motorists about climate change
  - Encourage the public to reduce GHG emissions through simple changes in lifestyles and habits that would reduce their energy consumption

- CCAP (focusing on consumers) launched on 22 Apr 2006
  - "Everyday Superhero"
  - www.everydaysuperhero.com.sg

- Habits for motorists was launched during Green Transport Week in Aug 2006



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Thank you

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