

FACILITATIVE SHARING OF VIEWS

SINGAPORE



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Singapore – A Green City

Singapore: Island City-State



Image Produced by Meteorological Service Singapore

Small, low-lying island city-state of about 719km²

Lack of natural resources

Water-scarce country



Singapore: Island City-State



Import all our energy needs

- High dependency on fossil fuels due to alternative energy constraints
- No fossil fuel subsidies

Highly urbanised, densely populated

Development constraints

- Lack of natural resources and hinterland required development of strong export-oriented manufacturing base



Singapore's Alternative Energy Options

Low wind speeds

No large river systems

Tidal range is too low

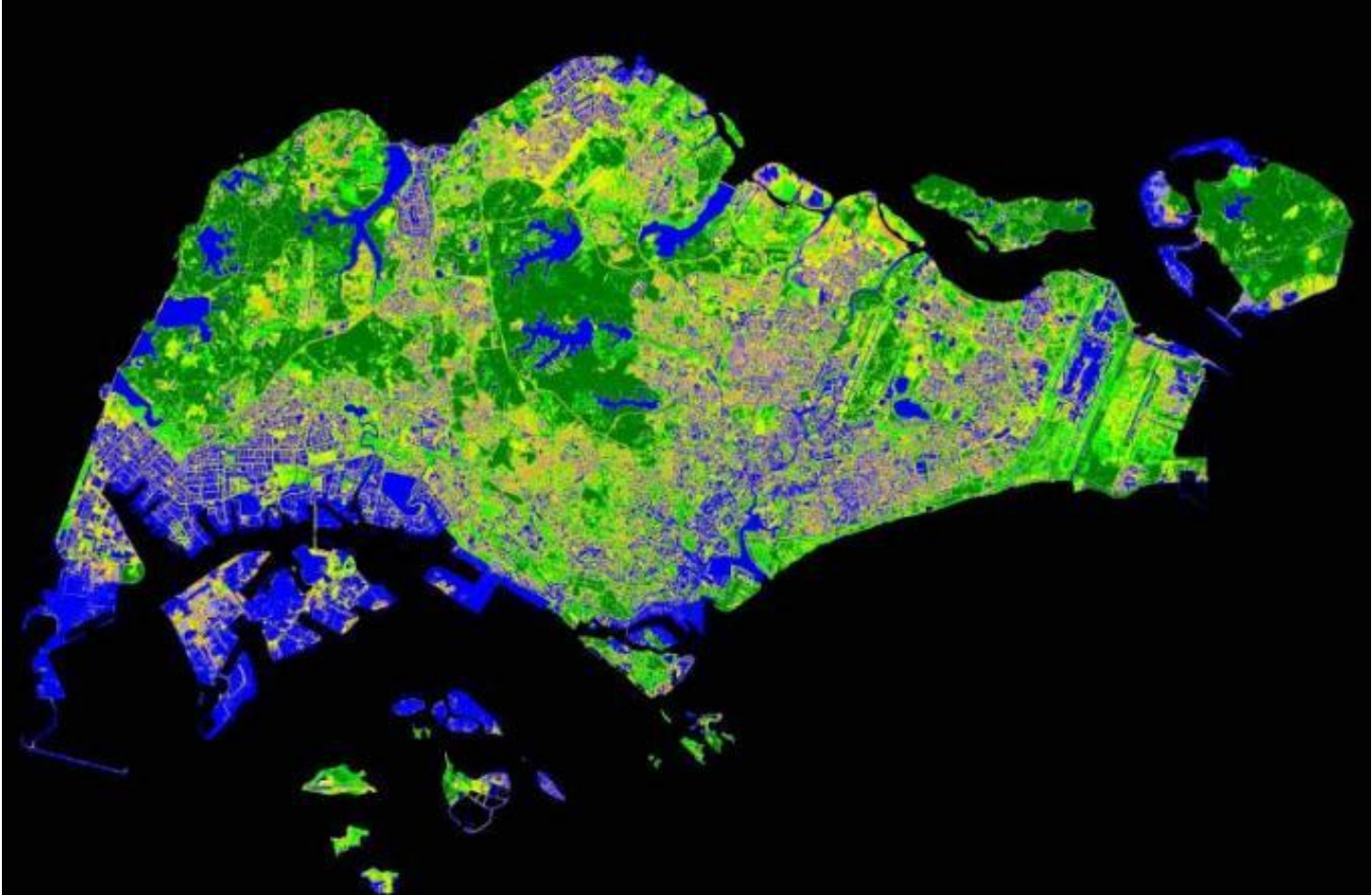
**Lack of conventional
geothermal
resources**

**Nuclear energy not yet
suitable for deployment in
Singapore**

**Solar energy best option
but large scale
deployment limited**



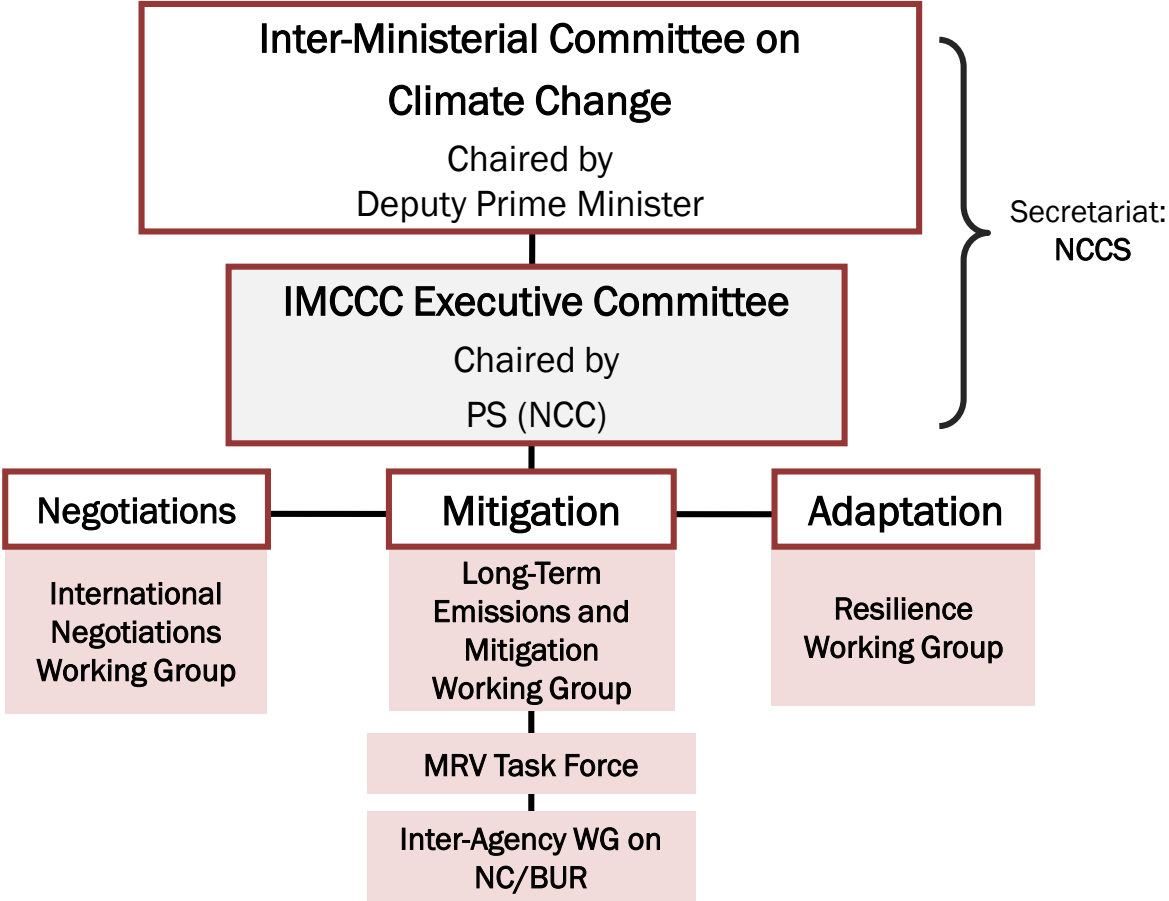
Sustainable Singapore - City in a Garden



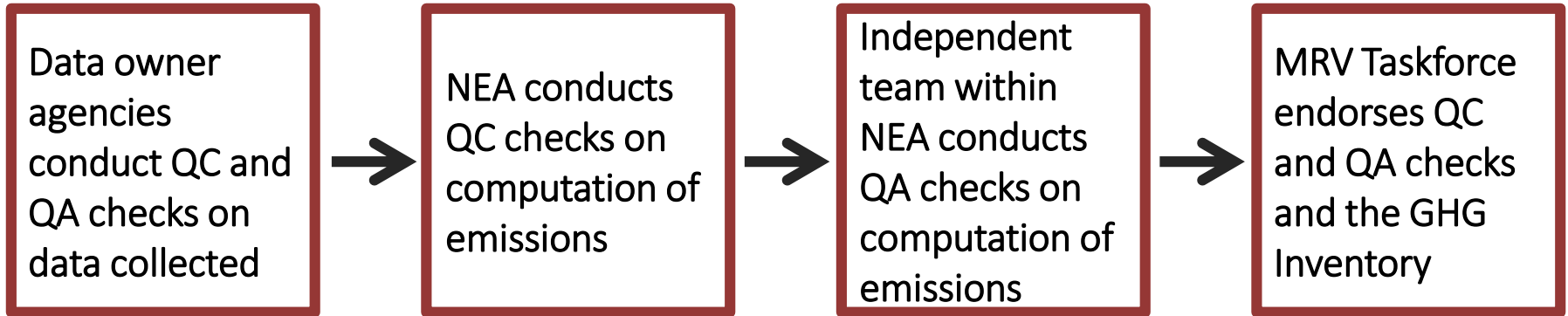
Institutional Structure

Agencies:

- National Climate Change Secretariat (NCCS)
- Ministry of the Environment and Water Resources (MEWR)
- Ministry of Finance (MOF)
- Ministry of Foreign Affairs (MFA)
- Ministry of National Development (MND)
- Ministry of Trade and Industry (MTI)
- Ministry of Transport (MOT)
- National Research Foundation (NRF)

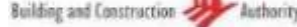


GHG Inventory Preparation Process

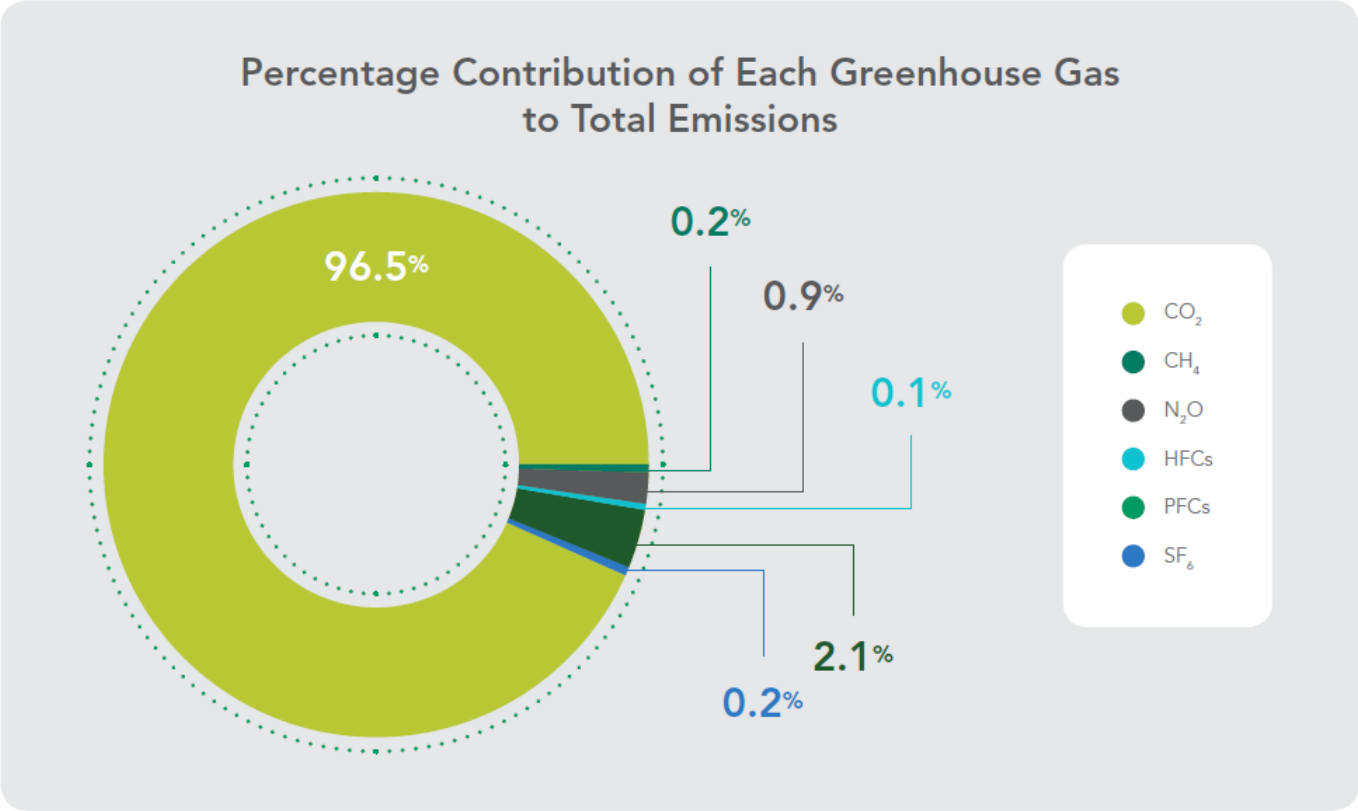


QC – Quality Control

QA – Quality Assurance

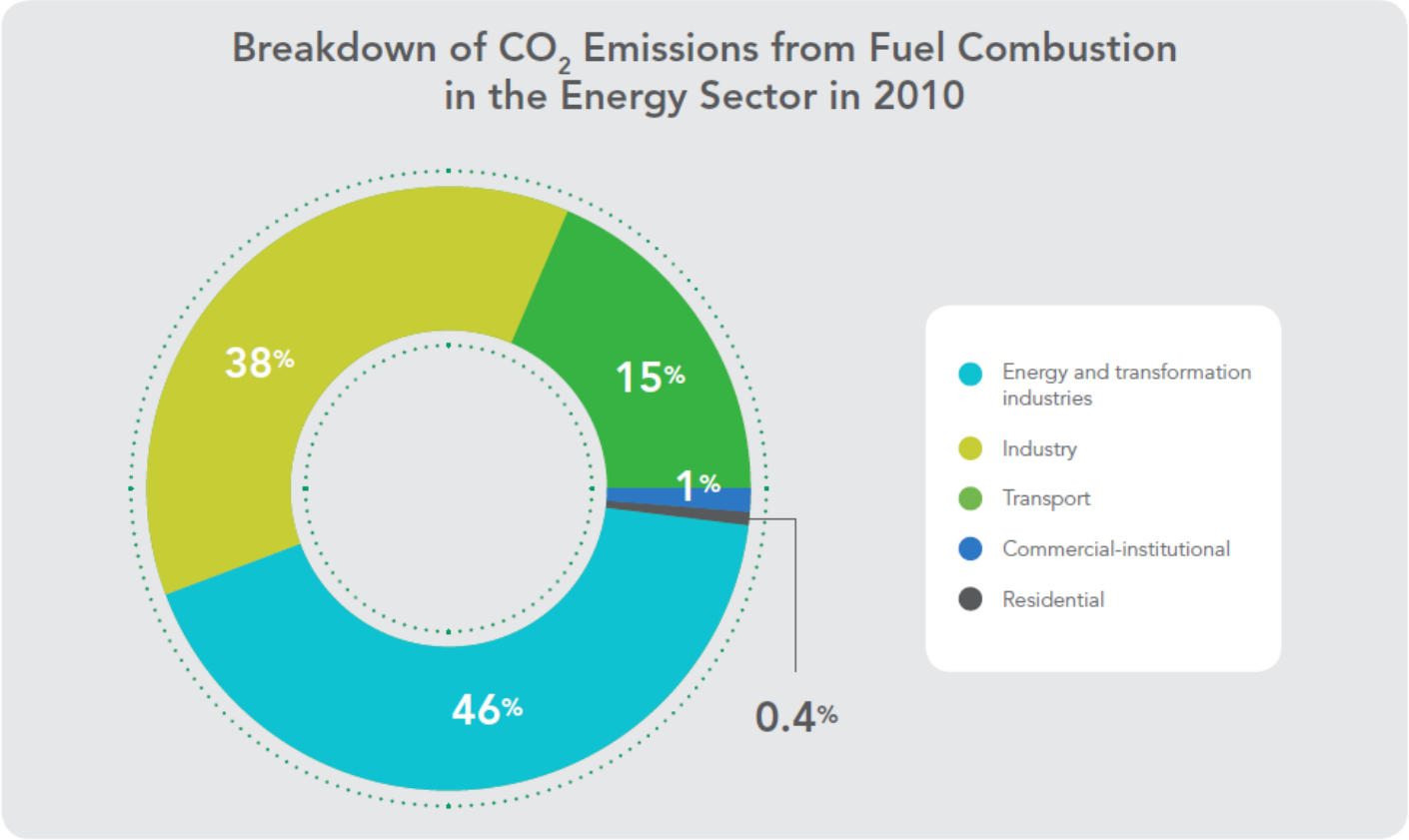


National Inventory



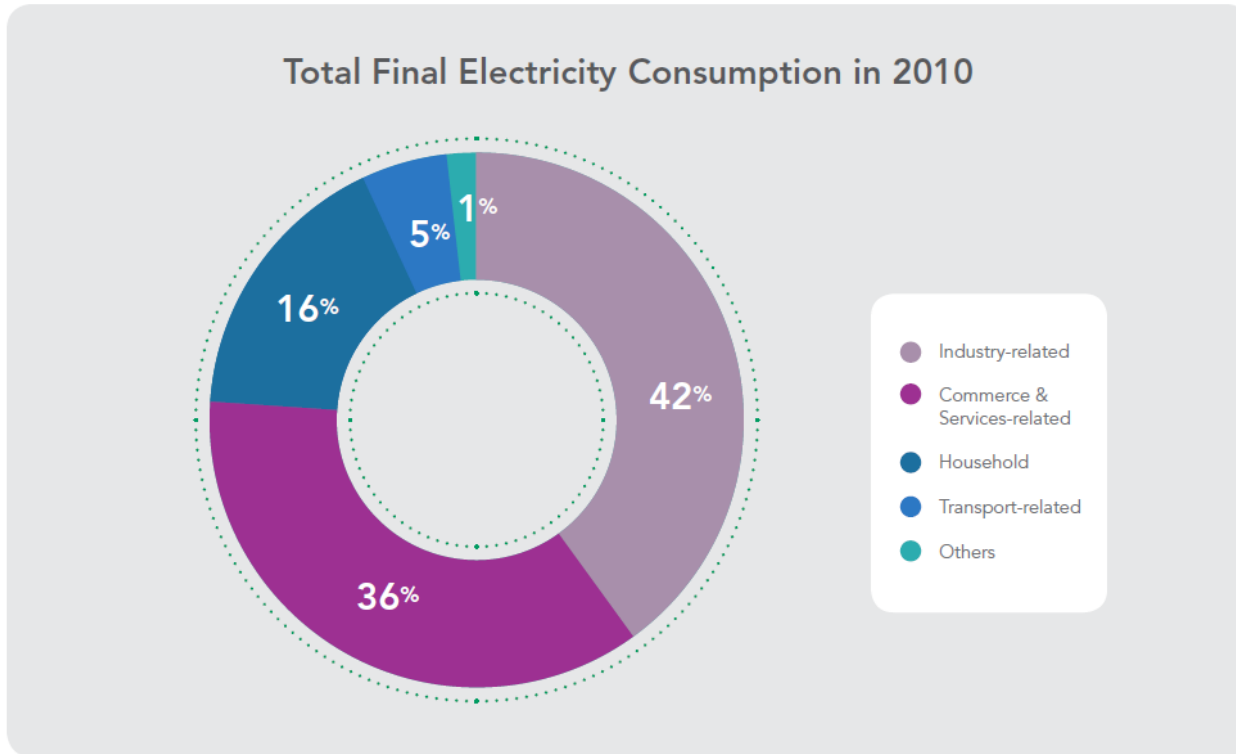
Singapore's GHG emissions (2010): 46,831.68 gigagram CO₂e

National Inventory



Singapore's CO₂ emissions from energy sector: 45,047.04 gigagram CO₂e

National Inventory



Singapore's CO₂ emissions from electricity generation: 20,790.82 gigagram CO₂e

Singapore's Pre-2020 Mitigation Pledge

To undertake mitigation measures leading to a reduction of greenhouse gas emissions by 16% below business-as-usual levels in 2020.

Parameters	Targets
Target Year	2020
Emission reduction target	16% below BAU levels in 2020
Gases Covered	Carbon Dioxide (CO ₂), Methane (CH ₄), Nitrous Oxide (N ₂ O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF ₆)
Coverage	Pledge does not exclude any sectors. Key mitigation measures in following sectors: Energy, industrial processes, transport, commercial, residential, and waste
Global Warming Potential	100 year timescale in accordance with the IPCC's 2nd Assessment Report

Pre-2020 Mitigation Measures

Power generation

- Switch from fuel oil to natural gas
- Encourage solar test-bedding and research

Households

- Mandatory Energy Labelling Scheme (MELS)
- Minimum Energy Performance Standards (MEPS)

Buildings

- Green Mark Certification for all new buildings and existing buildings when retrofitted
- Audit central chilled water systems every 3 years
- Submit building information and energy consumption data annually

Waste and water

- Incinerate sludge rather than dispose in landfills
- Increase overall recycling rate

Transport

- Expanding public transport network
- Carbon Emissions-based Vehicle Scheme (CEVS)
- Fuel Economy Labelling Scheme (FELS)

Industry

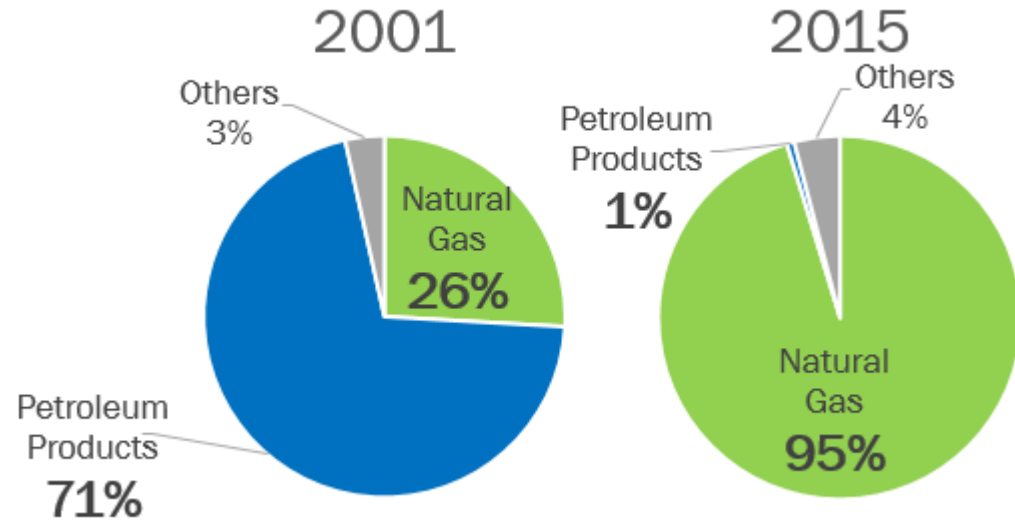
- Encourage new co-generation plants
- Co-funding schemes to improve energy efficiency



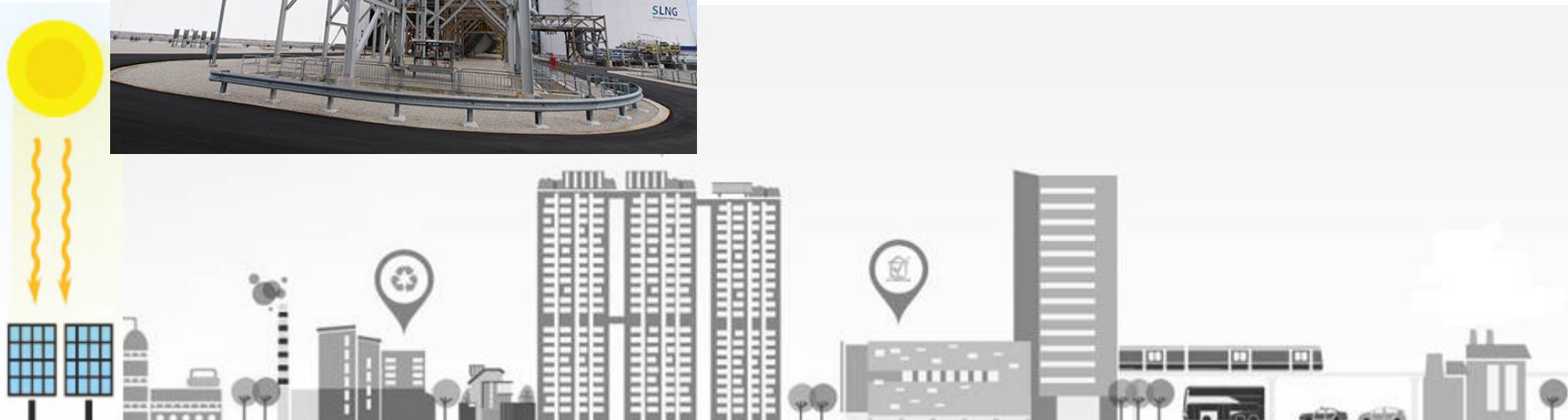
Power Generation

Examples of measures:

- Switch from fuel oil to natural gas for power generation



Fuel Mix (2001 - 2015)



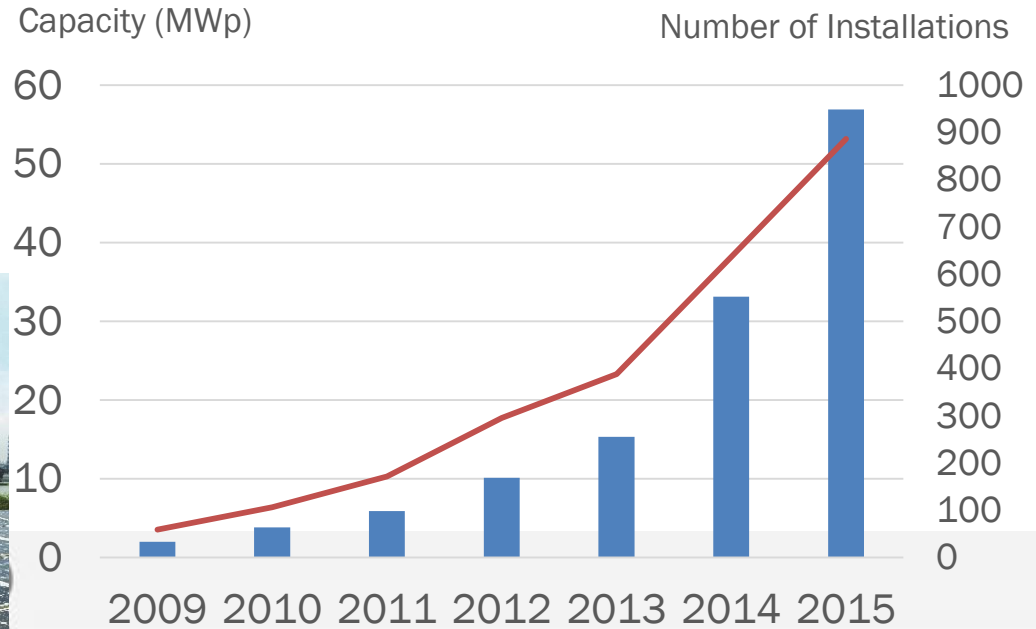
Power Generation

Examples of measures:

- Encourage solar test-bedding and research



Solar Installed Capacity & Number of Installations



Waste and water

Examples of measures:

- Incinerate sludge rather than dispose in landfills
- Increase overall recycling rate



Households

Examples of measures:

- Mandatory Energy Labelling Scheme (MELS) for lighting, televisions, air-conditioners, fridges, clothes dryers
- Minimum Energy Performance Standards (MEPS) for lighting, air-conditioners, fridges, clothes dryers



Mandatory Energy Labelling Scheme.



Buildings

Examples of measures:

- Aim for 80% of buildings to attain Green Mark Certification by 2030
- Require Green Mark Certification for all new buildings and existing buildings when retrofitted
- Audit of central chilled water systems every 3 years in buildings covered under green mark legislation
- Submit building information and energy consumption data annually



Transport

Examples of early actions:

- Encourage greater use of public transport
- Cap vehicle population growth rate at 0.25% annually
- Auctioned permits required to own cars
- High vehicle taxes and registration fees
- Electronic Road Pricing



Transport

Examples of measures:

- Further expand public transport network
- Encourage even greater use of public transport
- Double cycling network by 2030



Transport

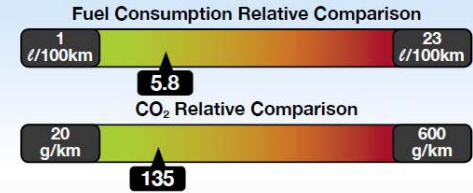
Examples of measures:

- Carbon Emissions-based Vehicle Scheme (CEVS) to encourage switch to low-emissions cars
- Mandatory Fuel Economy Labelling Scheme (FELS)

FUEL ECONOMY

Conventional Vehicle

Fuel Consumption (ℓ/100km)	CO ₂ Emissions (g/km)
5.8	135
Figures from combined test. Tested in accordance with UN ECE R101.	



Make & Model: **ABC XYZ**

Engine Capacity & Fuel Type: **1399 cc Petrol**

Actual fuel consumption and carbon dioxide (CO₂) emissions will depend on driving behaviours as well as other factors such as traffic and vehicle condition.

CARBON EMISSIONS-BASED VEHICLE (CEV) SCHEME BANDING

(applicable from 1 Jan 2013 to 31 Dec 2014)

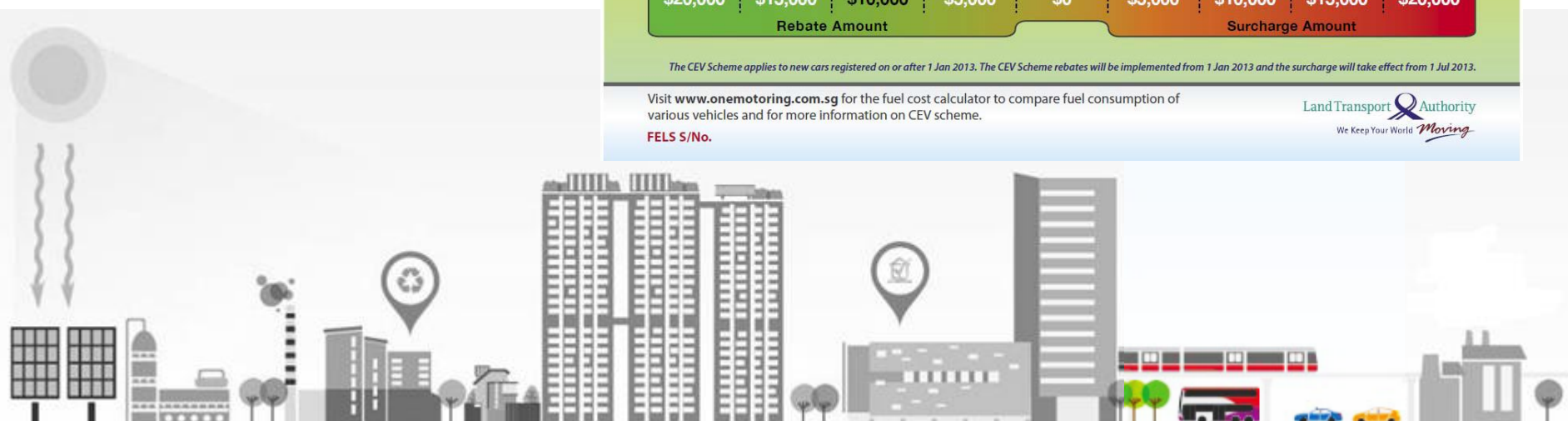
CO ₂ Emissions (g/km)								
A1	A2	A3	A4	B	C1	C2	C3	C4
0-100	101-120	121-140	141-160	161-210	211-230	231-250	251-270	> 270
		135						
\$20,000	\$15,000	\$10,000	\$5,000	\$0	\$5,000	\$10,000	\$15,000	\$20,000
Rebate Amount					Surcharge Amount			

The CEV Scheme applies to new cars registered on or after 1 Jan 2013. The CEV Scheme rebates will be implemented from 1 Jan 2013 and the surcharge will take effect from 1 Jul 2013.

Visit www.onemotoring.com.sg for the fuel cost calculator to compare fuel consumption of various vehicles and for more information on CEV scheme.

FELS S/No.

Land Transport Authority
We Keep Your World Moving



Industry

Examples of measures:

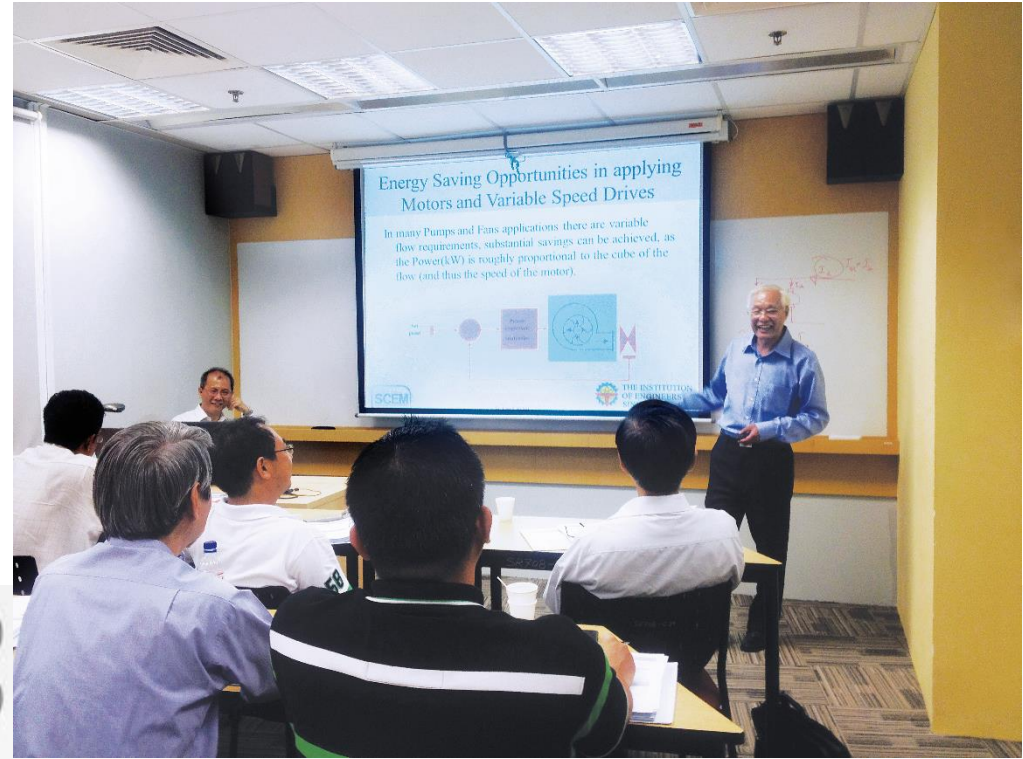
- Encourage new cogeneration plants
- Incentives and schemes to promote energy efficiency (EE)
 - Grant for EE Technologies (GREET)
 - EE Improvement Assistance (EASe)



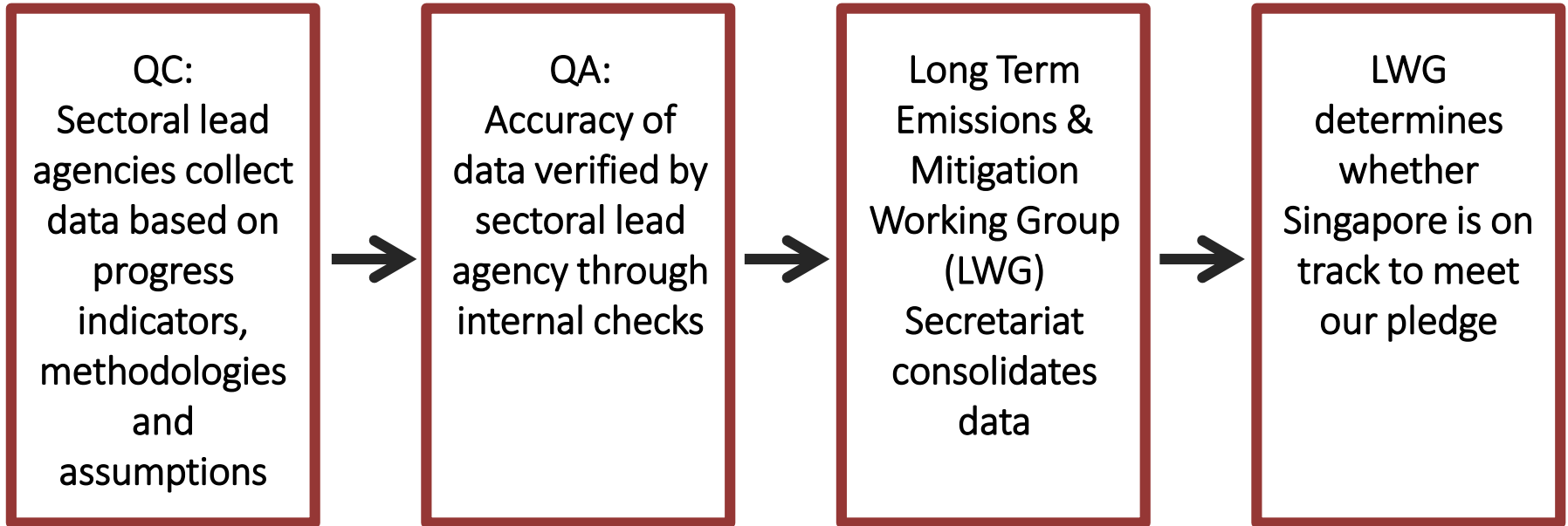
Industry

Examples of other policies:

- Energy Conservation Act
- Energy Efficiency National Partnership
- Singapore Certified Energy Manager



Domestic MRV of Mitigation Actions



QC – Quality Control
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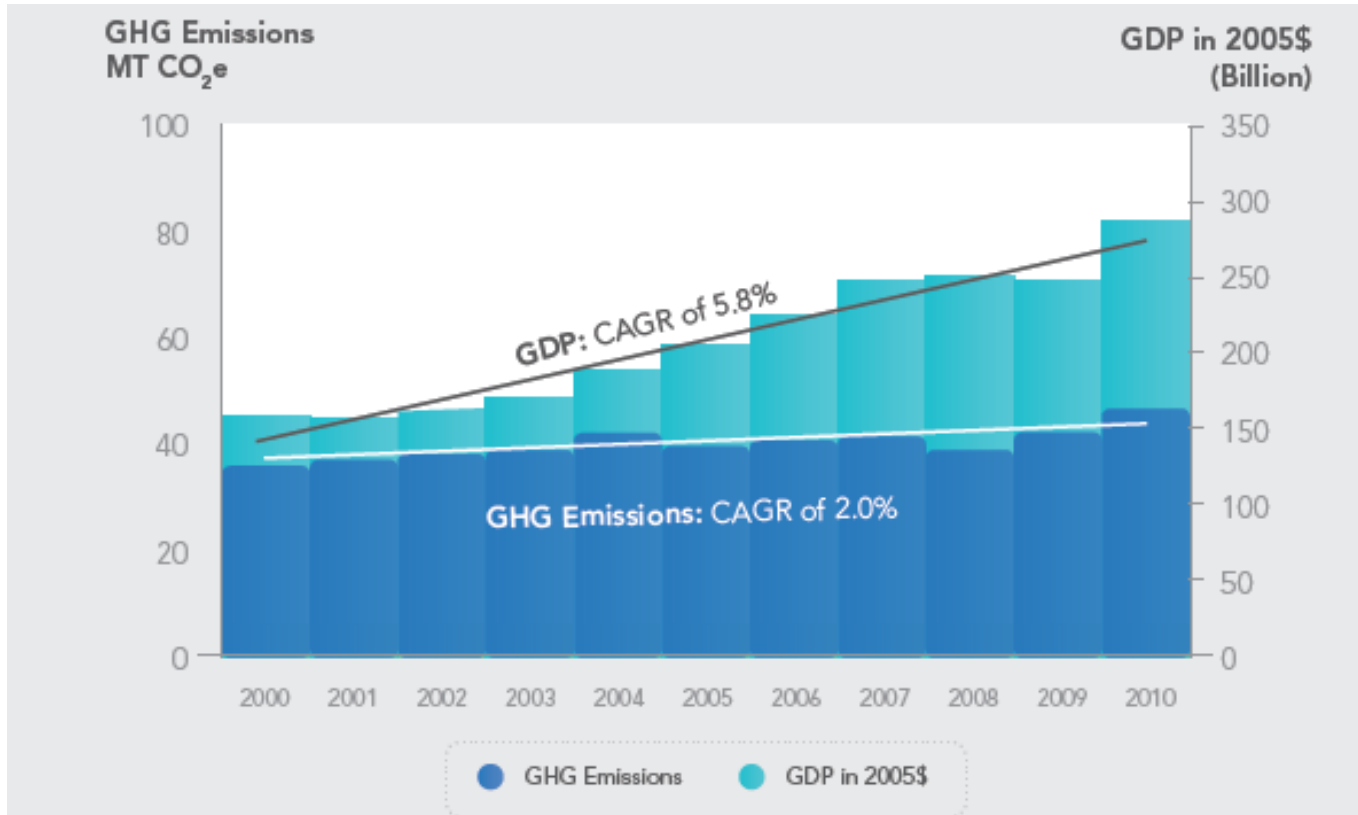
Mitigation Measures

Sector	2020 Goal (CO ₂ eq)	Methodologies and assumptions	Results Achieved (2012)
Power generation	4 MT	<p><u>Fuel Switch</u>: Abatement estimated based on amount of fuel oil displaced by cleaner natural gas</p> <p><u>Solar</u>: Abatement estimated based on amount of Combined Cycle Gas Turbines (CCGT)-generated electricity displaced by solar</p>	2.50 MT
Industry	1.15 MT	<p><u>Cogeneration</u>: Abatement estimated based on technical estimates and information provided by companies</p> <p><u>Co-funding</u>: Abatement assumed to be 1% above BAU levels for 3 years for 90% of manufacturing sector. Abatement from GREET and tax incentives audited by specialists</p>	0.51 MT
Waste and water	0.15 MT	<p><u>Sludge Incineration</u>: Abatement calculated from total amount of sludge incinerated. Assumptions from IPCC methodology “Tool to determine the methane emission avoided from disposal of waste at a solid waste disposal site”</p> <p><u>Recycling</u>: Abatement calculated using amount of waste disposed, the proportion of waste incinerated over waste disposed at landfill, and recycling rates</p>	0.06 MT

Mitigation Measures

Sector	2020 Goal (CO ₂ eq)	Methodologies and assumptions	Results Achieved (2012)
Buildings	1.21 MT	<u>Green Mark (GM)</u> : Abatement calculated by the difference between emission values for BAU and emission values for 2020 with legislation in place requiring building owners to achieve minimum GM standards	0.15 MT
Transport	1.16 MT	<u>Public transport</u> : Abatement calculated as the difference between emissions from BAU and emissions from actual travel demand <u>Fuel Efficiency</u> – Abatement calculated based on increased quantity of cars purchased in each lower-carbon band compared to historical rates and average emission reduction between CEVS-bands	0.20 MT
Households	0.71-1.07 MT	<u>Energy Efficiency</u> : Abatement calculated by comparing actual sales data of household appliances by tick-rating efficiency, against the projected sales data in the BAU scenario	0.05 MT

Time Series of GHG (2000-2010)



Singapore's GHG emissions (2010): 46,831.68 gigagram CO₂e

Enhancing Capacities

- Land Use Change and Forestry
- Emissions data monitoring and analysis (EDMA) system



Joint Australia-Singapore Regional Capacity-building Workshop on International Consultation and Analysis (ICA), 28-29 Apr 2016



- Co-organising of technical cooperation programmes

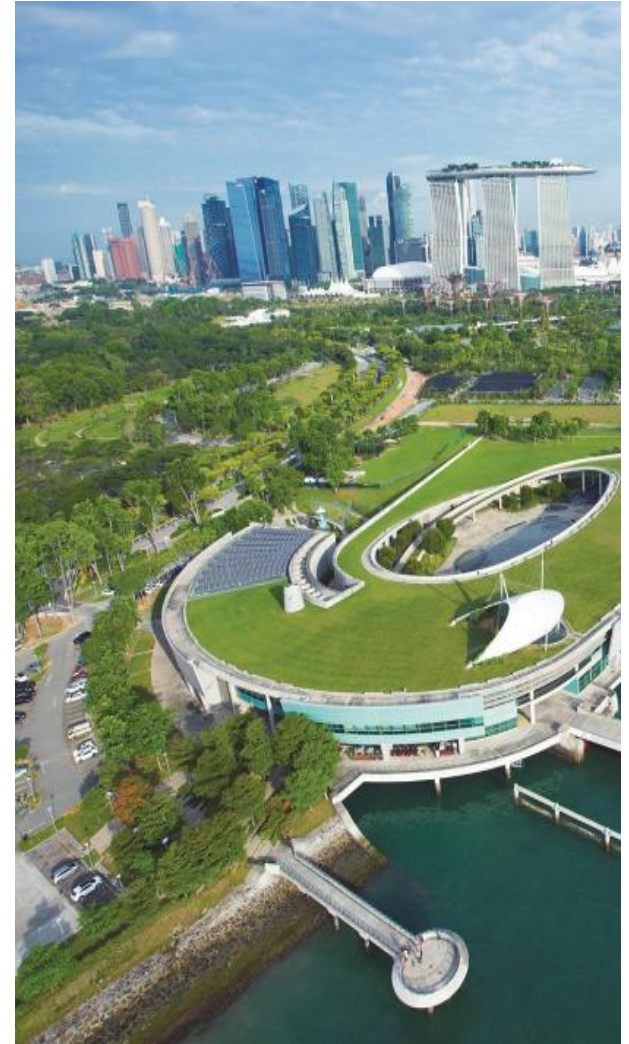
Singapore – A Green City

- Singapore's geographical realities and historical economic development are significant determinants of our emissions profile
- Singapore remains committed to stabilising our long term emissions
 - Invested significantly in energy-related R&D over the years
 - Test-bed for innovative sustainability solutions for cities
 - Submitted post-2020 pledge



Singapore – A Green City

- Early commitment to environmental sustainability has helped us become a Green City
 - Asia's greenest metropolis - 2011 Siemens/ Economist Intelligence Unit (EIU) Asian Green City Index
 - 2nd - 2011-2012 World Economic Forum's Sustainable Competitiveness Index
 - Best 20 low Emissions Intensity – International Energy Agency's CO2 Emissions from Fuel Combustion 2015

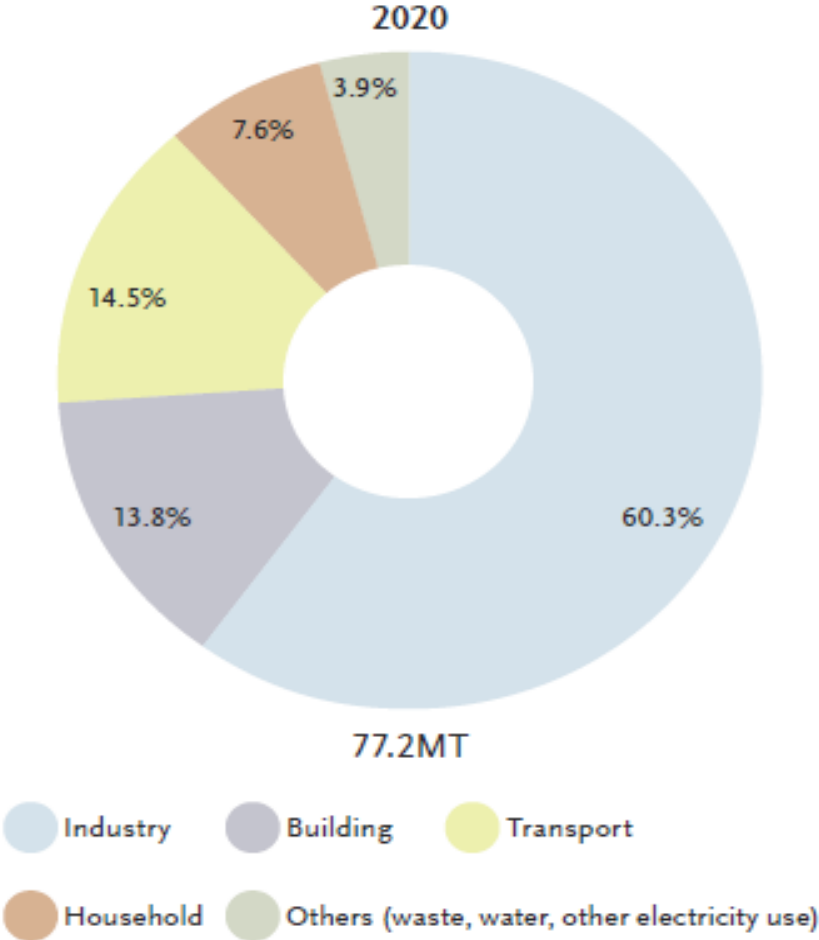


THANK YOU



Backup Slides

Singapore's 2020 BAU Emissions



Enhancing Resilience and Adapting to Impacts of Climate Change



Coastal Protection



Public Health & Food Security



Biodiversity & Greenery



Water Resources & Drainage



Network Infrastructure



Building, Structure & Infrastructure

Harnessing Green Growth Opportunities

CleanTech Park



Green business park in the tropics

Intelligent Energy System (IES) Pilot



Develop and test new smart grid technologies and solutions

Punggol Eco-Town



Sustainable public housing solutions

Pulau Ubin Micro-Grid



Off-grid energy solutions and applications

Test Beds in Singapore

Zero Energy Building



To test-bed green building technologies

Electric Vehicle Test Bed



Trials of electric vehicles and charging solutions

Solar PV Systems



Building capability for solar on public housing

Technical Cooperation with Developing Countries

- To date, over **10,700 officials** have benefitted from climate change and sustainable development programmes.
 - Sustainable Development and Climate Change (SDCC) Programme under the SCP
 - Agencies conduct capacity building courses
 - Centre for Climate Research Singapore (CCRS)
 - Technical Cooperation Package for SIDS



BCA and UNEP established the BCA Centre for Sustainable Buildings (2011)



Regional Workshop on Scaling up Climate Finance in the Asia Pacific (April 2013)