

Singapore's Fifth Biennial Update Report

27 June 2023

Presented at: 20th Workshop on Greenhouse Gas Inventories in Asia (WGIA20)

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Agenda

1. Background
2. Institutional arrangement
3. Greenhouse Gas (GHG) inventory

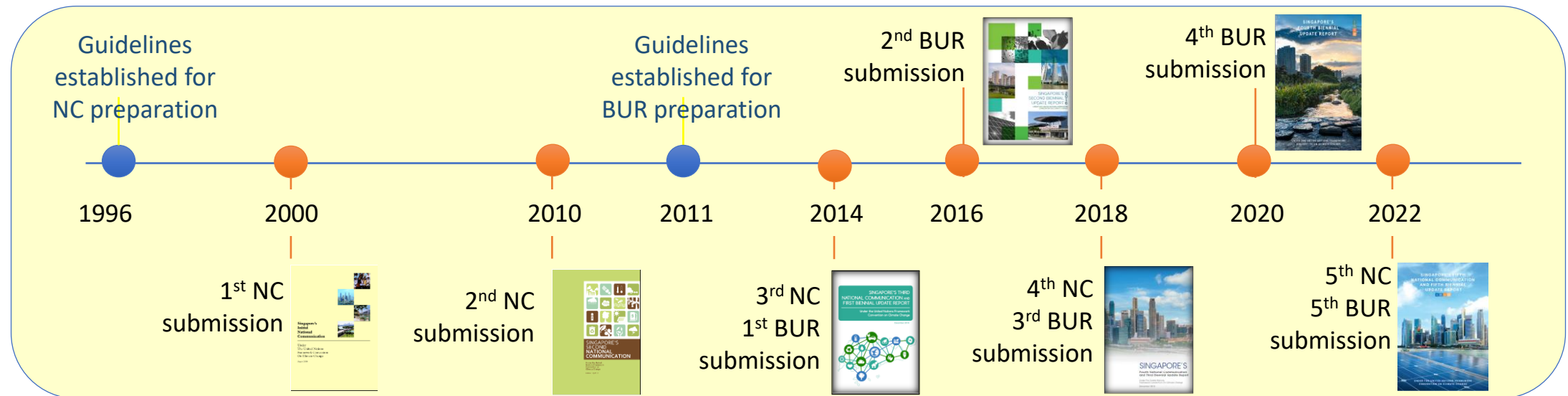
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Background

National Communications and Biennial Update Reports

1. National Communications (NC) and Biennial Update Report (BUR)

- As a Party to the United Nations Framework Convention on Climate Change (UNFCCC), Singapore is committed to submitting NC and BUR to the UNFCCC
 - NC once 4 years since 2000, 5th NC submitted in 2022
 - BUR once every 2 years since 2014, 5th BUR submitted in 2022



National Communications and Biennial Update Reports

1. Under current UNFCCC reporting guidelines, non-Annex I Parties (NAIP) are required to use the Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for estimation and reporting of National Greenhouse Gas Inventories.
2. In preparation for possible transition to 2006 IPCC Guidelines, Singapore carried out the preparatory work by building capacity.
3. Emissions were estimated using 2006 IPCC Guidelines in the 4th Biennial Update Report (published in 2020) – earlier BURs using a mix of Rev 1996 & 2006 IPCC Guidelines

Carried out an staff-level assessment on the switch to 2006 IPCC-GLs for 2014 data



2016

Completed the transition fully to 2006 IPCC Guidelines, Fifth Assessment Report (AR5) GWP



2020

BTR submission by 31 Dec 2024



2024

Built technical knowledge of GHG inventory compilers through technical workshops related to 2006 IPCC-GLs



2015

Initiated work to transit to 2006 IPCC Guidelines for other years



2018

Initiated work to prepare for BTR submission

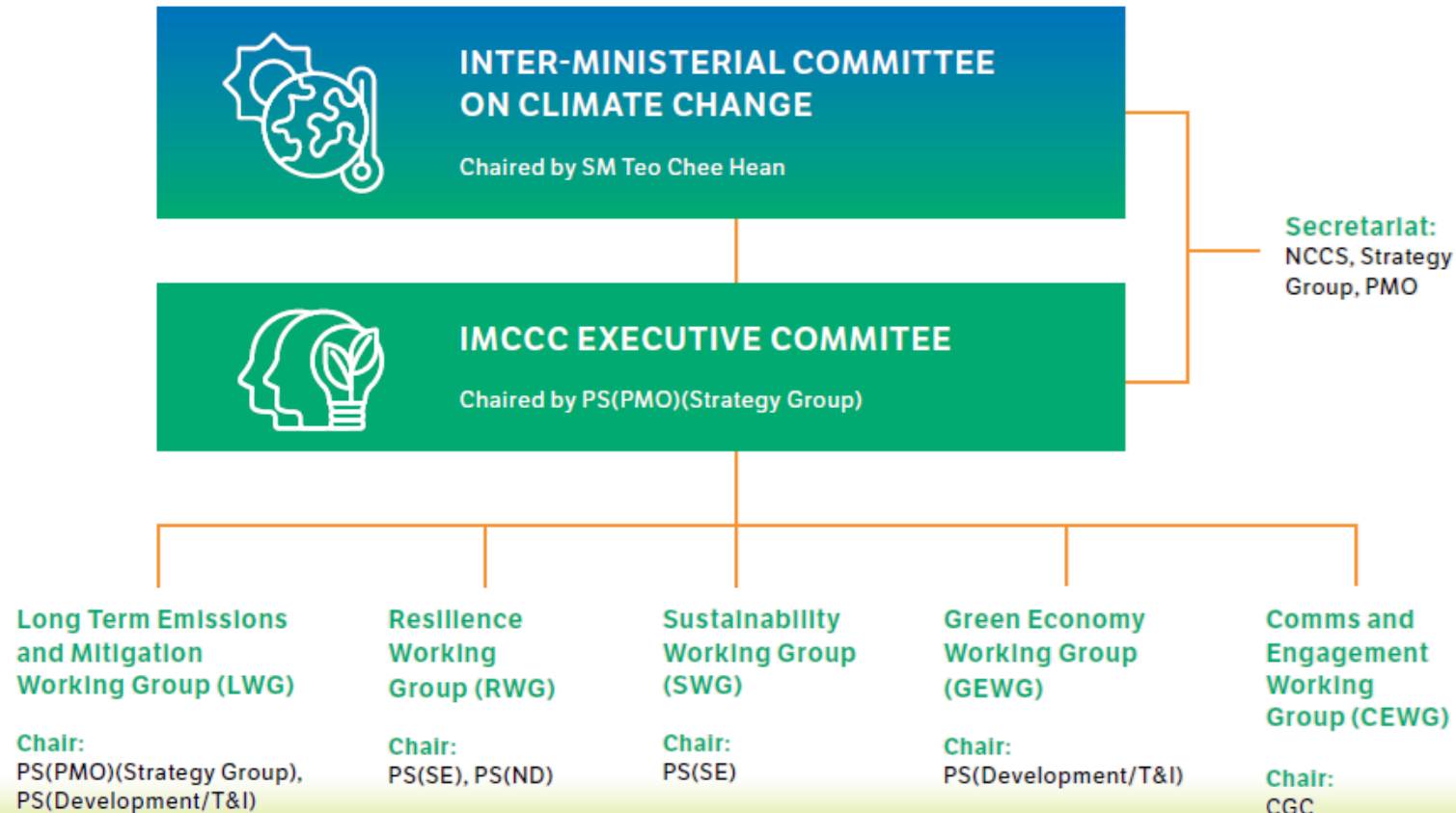


2023

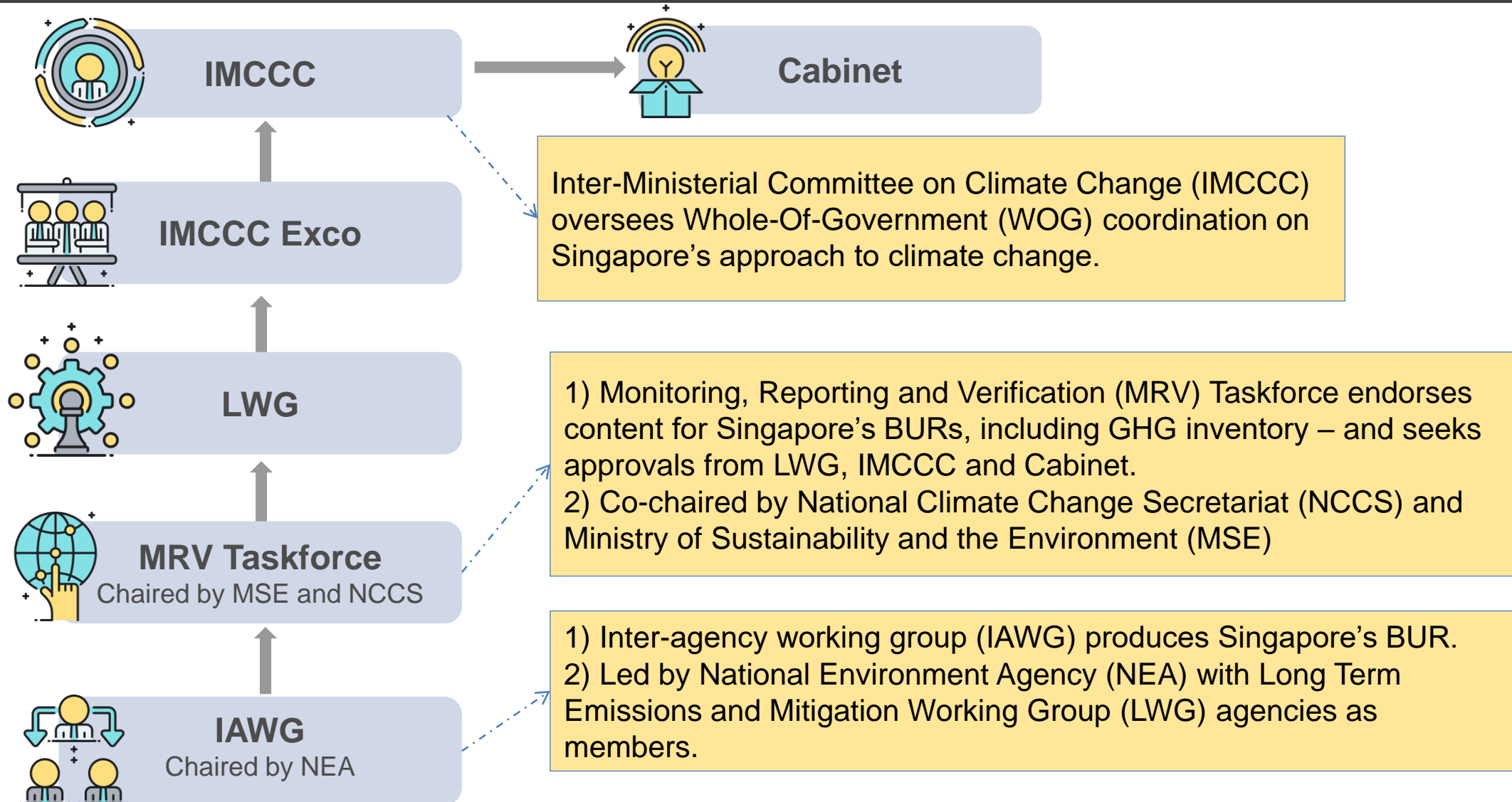
2 Institutional Arrangements

Institutional Arrangements

1. 2007: IMCCC oversees the WOG coordination on climate change policies to ensure that Singapore is prepared to address climate change
2. 2010: NCCS established to ensure effective coordination of Singapore's domestic and international policies, plans, and actions on climate change



Inter-agency Coordination on BUR Preparation

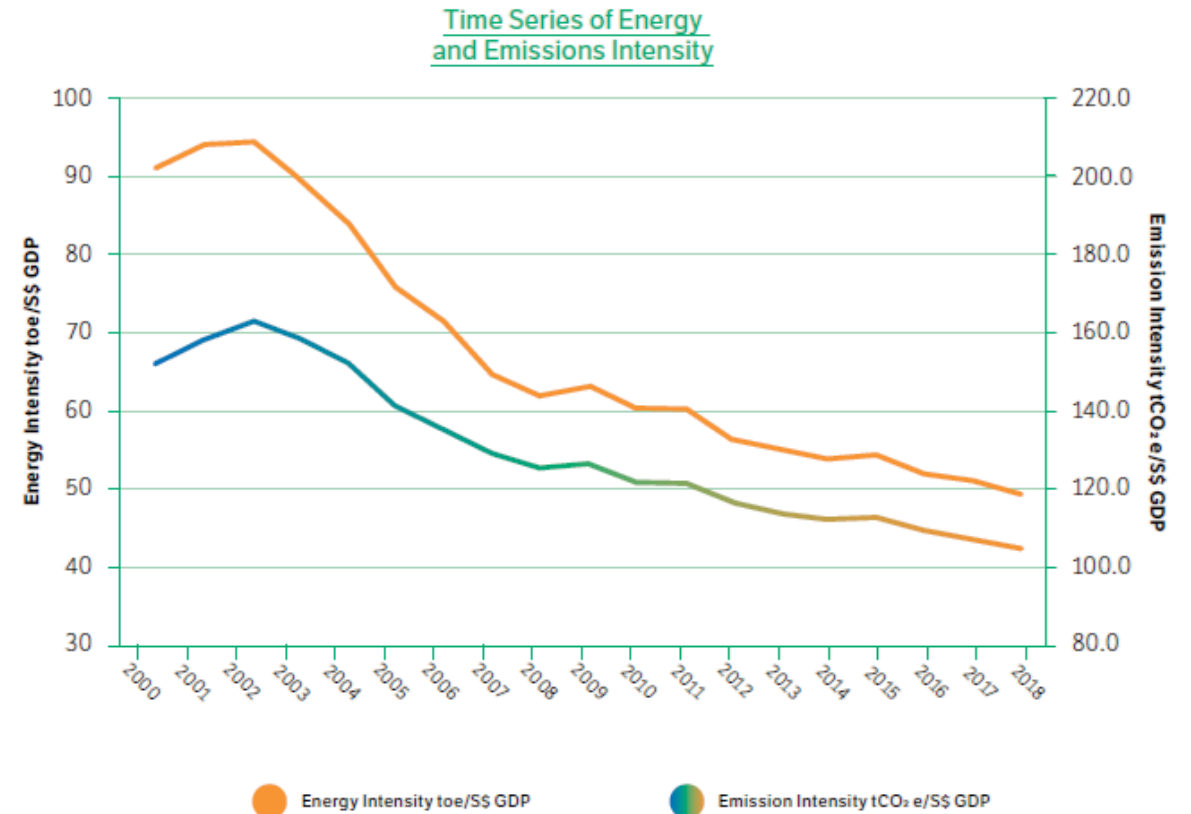
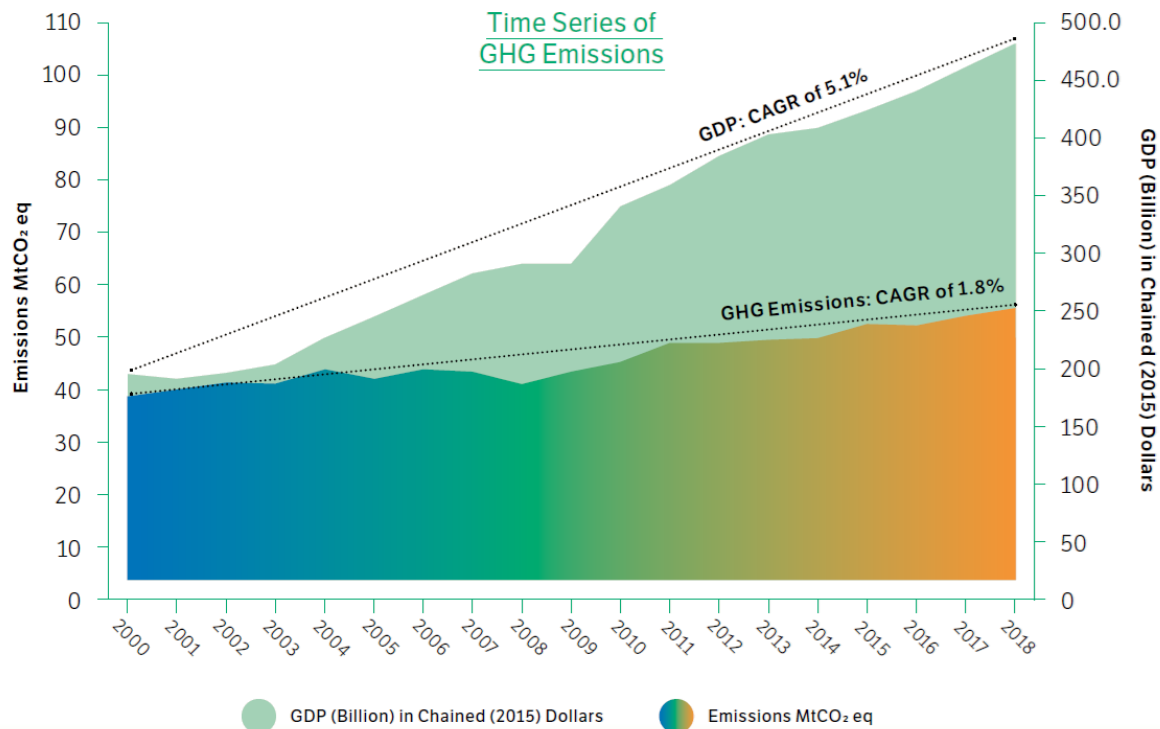


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Greenhouse Gas (GHG) inventory

Times Series of GHG emissions in Singapore

1. Singapore's GHG emissions for 2018 totaled 53,312.68 GgCO₂ eq.
2. From 2000 to 2018, Singapore's economy grew at a compounded annual growth rate (CAGR) of 5.1%.
3. In the same period, Singapore's GHG emissions grew at a slower rate with a CAGR of 1.8%, and an increase of 36.7% (14,326 GgCO₂ equivalent) from 2000 to 2018.



Level Assessment

- 11 out of 15 categories listed are from fuel combustion activities.
- Main contributor to Singapore's 2018 GHG inventory is CO₂ emissions from the combustion of natural gas (32.2%) for electricity and heat generation.

IPCC Category Code	IPCC Category	Fuel Type	Greenhouse Gas	Emissions (GgCO ₂ eq)	Percentage Contribution	Cumulative Total of Column E
1A1	Fuel Combustion Activities – Energy Industries	Natural Gas	CO ₂	17,190.68	32.2%	32.2%
1A2	Fuel Combustion Activities – Manufacturing Industries and Construction	Refinery Gas	CO ₂	10,719.60	20.1%	52.4%
1A2	Fuel Combustion Activities – Manufacturing Industries and Construction	Natural Gas	CO ₂	5,700.78	10.7%	63.0%
1A3b	Fuel Combustion Activities – Transportation – Road Transportation	Diesel	CO ₂	4,658.29	8.7%	71.8%
1A3b	Fuel Combustion Activities – Transportation – Road Transportation	Motor Gasoline	CO ₂	2,413.58	4.5%	76.3%
1A2	Fuel Combustion Activities – Manufacturing Industries and Construction	Fuel Oil	CO ₂	2,099.94	3.9%	80.2%
1A1	Fuel Combustion Activities – Energy Industries	Solid Waste ⁴³	CO ₂	1,830.72	3.4%	83.7%
2E	Industrial processes and Product Use – Electronics Industry		PFCs	1,437.92	2.7%	86.4%
1B2	Fugitive Emissions from Fuels	Oil and Natural Gas	CO ₂	1,245.91	2.3%	88.7%
1A1	Fuel Combustion Activities – Energy Industries	Coal	CO ₂	1,168.05	2.2%	90.9%
1A2	Fuel Combustion Activities – Manufacturing Industries and Construction	Petroleum Coke ⁴⁴	CO ₂	616.18	1.2%	92.1%
1A2	Fuel Combustion Activities – Manufacturing Industries and Construction	Diesel	CO ₂	479.88	0.9%	93.0%
1A2	Fuel Combustion Activities – Manufacturing Industries and Construction	Light Fuel Oil	CO ₂	440.54	0.8%	93.8%
2E	Industrial processes and Product Use – Electronics Industry		NF ₃	381.25	0.7%	94.5%
2F	Industrial Processes and Product Use – Product Uses as Substitutes for Ozone Depleting Substances		HFCs	375.63	0.7%	95.2%

Trend Assessment

13 categories identified where fuel oil combustion activities shown a significant decrease (40.2%) while natural gas fuel combustion activities reflect an increase (23.2%) over the period from year 2000 to 2018.

IPCC Category Code	IPCC Category	Fuel Type	Greenhouse Gas	Year 2000 Emissions (GgCO ₂ eq)	Year 2018 Emissions (GgCO ₂ eq)	Trend Assessment	Percentage Contribution to Trend	Cumulative Total of Column G
1A1	Fuel Combustion Activities – Energy Industries	Fuel Oil	CO ₂	16,965.21	2.41	0.59	40.2%	40.2%
1A1	Fuel Combustion Activities – Energy Industries	Natural Gas	CO ₂	2,766.79	17,190.68	0.34	23.2%	63.4%
1A2	Fuel Combustion Activities – Manufacturing Industries & Construction	Natural Gas	CO ₂	NO	5,700.78	0.15	9.9%	73.3%
1A2	Fuel Combustion Activities – Manufacturing Industries & Construction	Refinery Gas	CO ₂	4,781.20	10,719.60	0.11	7.2%	80.5%
1A2	Fuel Combustion Activities – Manufacturing Industries & Construction	Fuel Oil	CO ₂	4,007.03	2,099.94	0.09	5.9%	86.4%

Recalculations

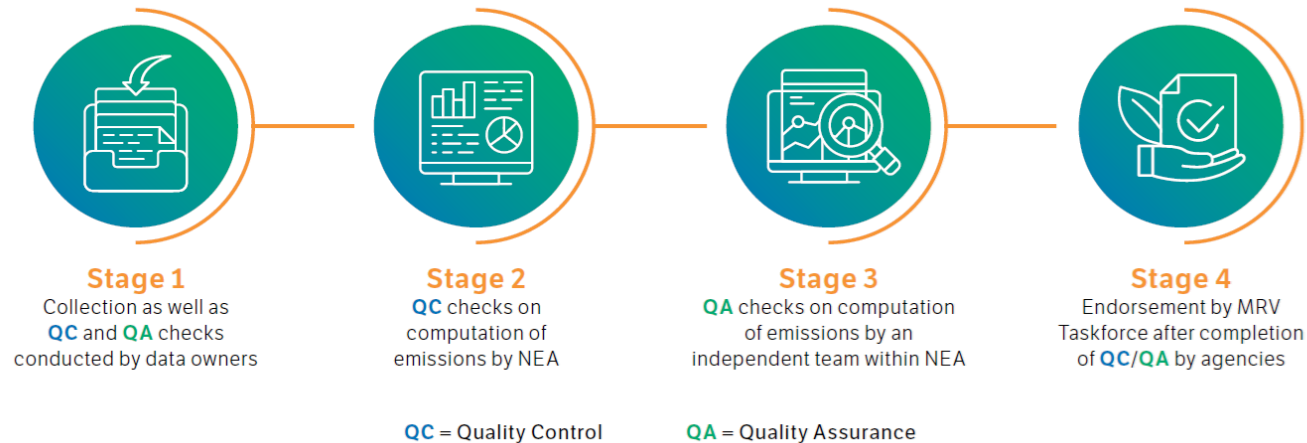
1. Recalculations were done due to:

- Inclusion of emissions from agriculture sector
- Updates to LULUCF sector
- Updates on activity data under energy sector

S/N	Net National Emissions	Before/After Recalculations	1994	2000	2010	2012	2014	2016
			(GgCO ₂ eq)					
1	Net National Emissions (reported in 4th BUR)	Before	28,115.53	38,952.34	46,142.83	47,909.83	49,943.35	50,702.71
2	Net National Emissions (reported in 5th NC and 5th BUR)	After	28,151.94	38,986.99	46,165.75	47,931.91	49,973.25	51,531.18
% Difference between Rows 1 and 2			0.13%	0.09%	0.05%	0.05%	0.06%	1.63%

Preparation of Greenhouse Gas (GHG) Inventory

1. The preparation of the national GHG inventory is a multi-agency effort led by the National Environment Agency (NEA).
2. An overview of the four-stage GHG inventory preparation process is shown below.



3. Data required for the national GHG inventory is collected/compiled through legislation and surveys administered by the various government agencies (data owners).

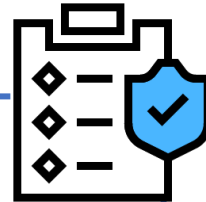
SOURCES OF DATA FOR GHG INVENTORY

IPCC Sector	Type of GHG	Data Owner	
1 — ENERGY		93.5%	
1A - Fuel Combustion Activities			
1A1 Energy Industries	CO ₂ , CH ₄ , N ₂ O	Energy Market Authority National Environment Agency PUB, Singapore's National Water Agency	
1A2 Manufacturing Industries and Construction		Energy Market Authority National Environment Agency	
1A3 Transport		Energy Market Authority National Environment Agency Maritime and Port Authority of Singapore	
1A4a Commercial/ Institutional		Department of Statistics Energy Market Authority	
1A4b Residential			
1B - Fugitive Emissions from Fuels			
1B2 Oil and Natural Gas	CO ₂ , CH ₄ , N ₂ O	National Environment Agency	
2 — INDUSTRIAL PROCESSES AND PRODUCT USE		National Environment Agency	
3 — AGRICULTURE		Singapore Food Agency	
3 — LAND USE, LAND-USE CHANGE AND FORESTRY		National Parks Board	
4 — WASTE			
4A - Solid Waste Disposal			
4A - Solid Waste Disposal		CH ₄	PUB, Singapore's National Water Agency
4C - Incineration and Open Burning of Waste			
Clinical Waste Incineration	CO ₂ , CH ₄ , N ₂ O	National Environment Agency	
Hazardous Waste Incineration			
4D - Wastewater Treatment and Discharge		N ₂ O	PUB, Singapore's National Water Agency Food and Agriculture Organization of the United Nations (FAO)

Quality Control (QC) and Quality Assurance (QA) Process

Greenhouse Gas Inventory Preparation Process

QC involves



- Analyse and verify of data trends for potential unit/conversion errors & for consistency
- Check on transcript errors in data input and reference
- Include new emissions streams.
- Streamline and aligned data sources.

QA involves



- Verification of data by an independent team within each agency which is not involved in the data collection and compilation process.

International Consultation and Analysis (ICA)

1. BUR is subject to review under UNFCCC process - International Consultation and Analysis (ICA)
 - Main objective is to ensure proper reporting of the BUR
 - Step 1: Team of reviewers from UNFCCC (or Technical Experts (TTE)) conducts the review (termed as 'Technical Analysis') and provides a summary report (or 'Technical Analysis Summary Report (TASR)') at the end of review.
 - Step 2: Countries participate in a workshop (termed as 'Facilitative Sharing of Views (FSV)') to exchange views of the submitted BUR.



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