

Preparing GHG inventory under the ETF: Drawing experience from 1st TER

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Outline

1. Background

- Reporting of NC/BTR
 - Institutional arrangements
 - Inventory preparation process
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- Enhancement of GHG inventory preparation following TER of BTR1
 - TER in May 2025
 - Key areas of improvements for future BTR

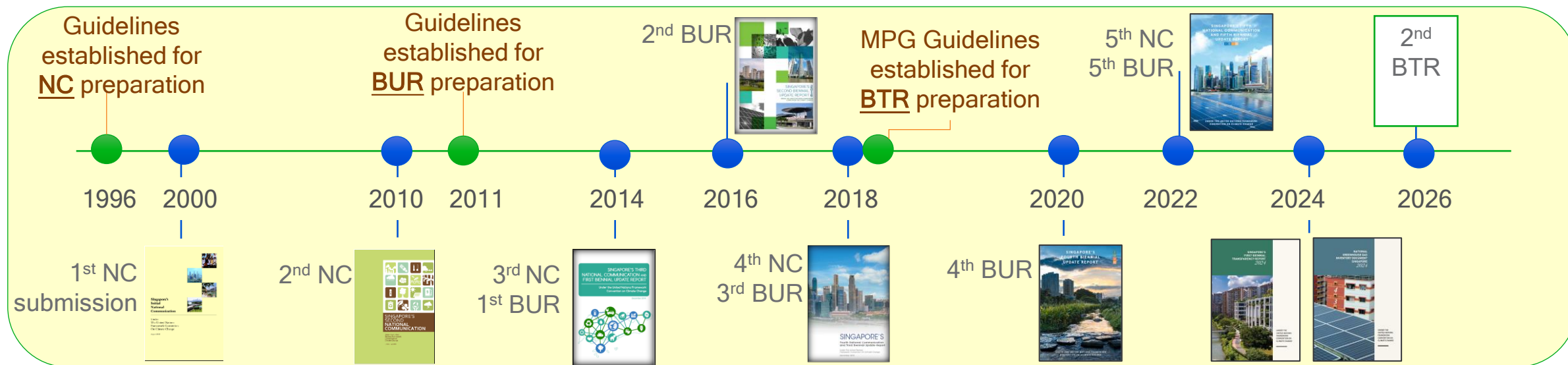
1 Background



Reporting of Greenhouse Gas (GHG) Emissions

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

- As a Party to the United Nations Framework Convention on Climate Change (UNFCCC)¹, Singapore is committed to submit NC and BUR to the UNFCCC
 - NC once every 4 years since 2000, 5th NC submitted in 2022
 - BUR once every 2 years since 2014, 5th BUR submitted in 2022

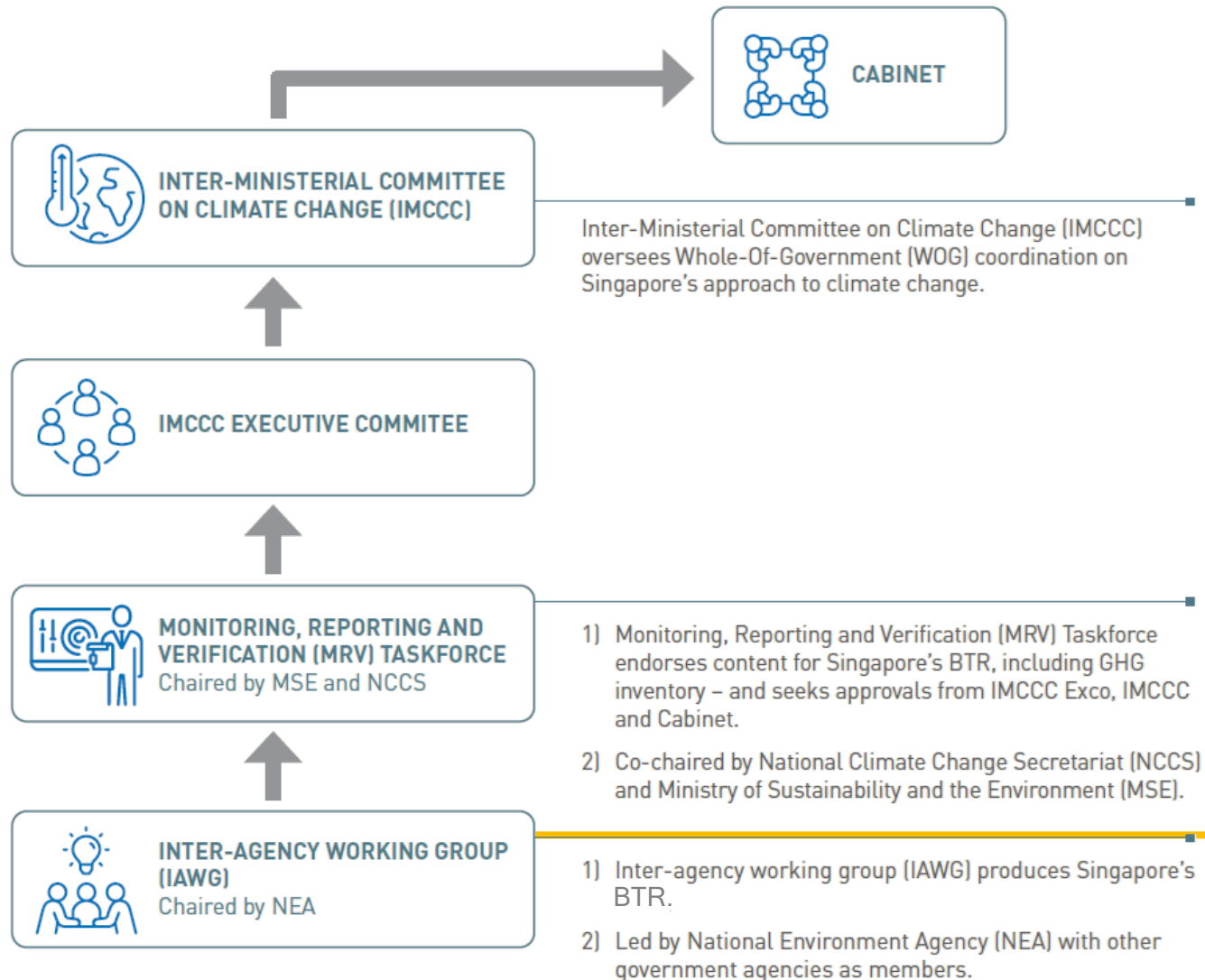


2. Under the Paris Agreement, the Biennial Transparency Report (BTR) will supersede the reporting of BUR under the Convention

- BTR once every 2 years, with the 1st submission submitted on 11 Nov 2024 and BTR2 to be submitted by end of 2026.

¹UNFCCC is the United Nations body that supports global response to climate change and it is a parent treaty to the 2015 Paris Agreement.

Inter-agency Coordination on BTR Preparation



Inventory Preparation Process



Inventory Preparation Process

IPCC Sector	Type of GHG	Data Owner
1 - ENERGY		
1A - Fuel Combustion Activities		
1.A.1. Energy industries	CO ₂ , CH ₄ , N ₂ O	Energy Market Authority National Environment Agency PUB, Singapore's National Water Agency
1.A.2 Manufacturing industries and construction		National Environment Agency Energy Market Authority
1.A.3 Transport		Civil Aviation Authority of Singapore National Environment Agency Energy Market Authority Maritime and Port Authority of Singapore
1.A.4 Other sectors		Energy Market Authority Department of Statistics
1.A.5 Other (Not specified elsewhere)		Ministry of Defence
1B - Oil, natural gas and other emissions from energy production	CO ₂ , CH ₄ , N ₂ O	National Environment Agency
2 - INDUSTRIAL PROCESSES AND PRODUCT USE		
2.B. Chemical industry	CO ₂ , CH ₄ , N ₂ O	National Environment Agency
2.C. Metal industry	CO ₂ , CH ₄	National Environment Agency
2.D. Non-energy products from fuels and solvent use	CO ₂ , CH ₄ , N ₂ O	National Environment Agency
2.E. Electronics industry	CO ₂ , N ₂ O, CH ₄ , HFCs, PFCs, SF ₆ , NF ₃	National Environment Agency
2.F. Product uses as substitutes for ODS		
2.F.1. Refrigeration and air conditioning	HFCs	National Environment Agency Department of Statistics Land Transport Authority
2.F.2. Foam blowing agents	HFCs	National Environment Agency
2.F.3. Fire protection	HFCs	National Environment Agency Singapore Civil Defence Force
2.F.4. Aerosols	HFCs	National Environment Agency Health Sciences Authority
2.F.5. Solvents	HFCs	National Environment Agency
2.G. Other product manufacture and use	SF ₆	National Environment Agency
2.H. Other	CO ₂ , CH ₄ , N ₂ O	National Environment Agency

3 - AGRICULTURE	CO ₂ , CH ₄ , N ₂ O	Singapore Food Agency
4 - LAND USE, LAND-USE CHANGE AND FORESTRY	CO ₂ , N ₂ O	National Parks Board
5 - WASTE		
5.A. Solid waste disposal	CH ₄	PUB, Singapore's National Water Agency
5.C. Incineration and open burning of waste	CO ₂ , CH ₄ , N ₂ O	National Environment Agency
5.D. Wastewater treatment and discharge	CH ₄ , N ₂ O	PUB, Singapore's National Water Agency



2 Enhancement to Singapore's GHG inventory

Technical Expert Review in Singapore (5-9 May 2025)



Technical Expert Review in Singapore (5-9 May 2025)



Key areas of improvement identified at TER

Key areas of improvement

Provide further details such as **clear information** on agency designated as Singapore's national entity or national focal point etc. in the NID.

Improvements to be made

We noted that key terms from the MPGs such as “national entity or national focal point”, should be incorporated into the narrative of the report to ensure that it clearly meets all reporting requirements set out in the MPGs.

Extract from MPG

B. National circumstances and institutional arrangements

18. Each Party should implement and maintain national inventory arrangements, including institutional, legal and procedural arrangements for the continued estimation, compilation and timely reporting of national inventory reports in accordance with these MPGs. National inventory arrangements can vary by Party depending on their national circumstances and preferences, and change over time.

19. Each Party shall report on the following functions related to inventory planning, preparation and management:

- (a) Its **national entity or national focal point** with overall responsibility for the national inventory;
- (b) Its inventory preparation process, including division of specific responsibilities of institutions participating in the inventory preparation to ensure that sufficient activity data collection, choice and development of methods, emission factors and other parameters are in accordance with the IPCC guidelines referred to in paragraph 20 below and these MPGs;
- (c) Its archiving of all information for the reported time series, including all disaggregated emission factors and activity data, all documentation about generating and aggregating data, including quality assurance/quality control (QA/QC), review results and planned inventory improvements;
- (d) Its processes for the **official consideration and approval of the inventory**.

Extract from TERR

The TERT recommends that Singapore include in the NID more detailed information on (1) **the national inventory arrangements, including on which agency has been designated as Singapore's national entity or national focal point responsible for the inventory**; (2) the inventory preparation and management process, including on how decisions are made regarding choice of estimation methods and changes to EFs for each sector; and (3) **the entity responsible for submitting the approved inventory to the UNFCCC as part of the official consideration and approval of the inventory**. The TERT also recommends that Singapore report in the NID, in addition to the information on the data management functions covered in the NID (section 1.2.3), that the archiving system includes archiving of QA/QC documentation, review results and planned inventory improvements.

Extract from NID

1.2.1. National Entity or National Focal Point

The Inter-Ministerial Committee on Climate Change (IMCCC) oversees the Whole-Of-Government (WOG) coordination on climate change policies to ensure that Singapore is prepared to address climate change. Established in 2007, the IMCCC is chaired by Mr Teo Chee Hean, Senior Minister and Coordinating Minister for National Security, and includes the Ministers from the following Ministries: Sustainability and the Environment, Finance, Foreign Affairs, National Development, Trade and Industry as well as Transport.

To ensure the effective coordination of Singapore's domestic and international policies, plans and actions on climate change, the National Climate Change Secretariat (NCCS) was established as a dedicated unit in July 2010 under the Prime Minister's Office (PMO). NCCS is part of the Strategy Group which supports the Prime Minister and his Cabinet to establish priorities and strengthen strategic alignment across the Government. The positioning of NCCS underscores the importance that Singapore places on climate change.

The preparation of the national GHG inventory is a multi-agency effort led by the NEA, which also chairs the inter-agency working group (IAWG) that produces the BTR, NC and NID. The IAWG submits the finalised BTR and NID to the MRV Taskforce (MRV-TF) Co-Chairs for approval. MRV-TF would then seek approval from the IMCCC Executive Committee before tabling at the Cabinet as shown in Figure 4 below. The approved report would then be submitted to the UNFCCC Secretariat.

Key areas of improvement identified at TER

Key areas of improvement

Improvements to be made

Correct use of notation keys

We noted the distinction in the use of the notation keys "not occurring" (NO) and "not applicable" (NA). **“NO”** is used for *categories/processes that do not occur within a party* while **“NA”** is used for *activities under a category that do occur but do not result in emissions/removals of a specific gas*.

Where information is confidential, the notation key "included elsewhere" (IE) was used. However, at the TER, we noted that "confidential" (C) must be used together with "IE".

Extract from MPG

5. Assessment of completeness

30. Each Party should indicate the sources and sinks (categories, pools and gases) that are not considered in the national inventory report but for which estimation methods are included in the IPCC guidelines referred to in paragraph 20 above and explain the reasons for such exclusion.
31. Each Party shall use notation keys where numerical data are not available when completing common reporting tables, indicating the reasons why emissions from sources and removals by sinks and associated data for specific sectors, categories and subcategories or gases are not reported. These notation keys include:
- (a) “NO” (not occurring) for categories or processes, including recovery, under a particular source or sink category that **do not occur within a Party**;
 - (b) “NE” (not estimated) for activity data and/or emissions by sources and removals by sinks of GHGs that have not been estimated but for which a corresponding activity may occur within a Party;
 - (c) “NA” (not applicable) for activities under a given source/sink category that **do occur within the Party but do not result in emissions or removals of a specific gas**;

Extract from CRT

2022
SGP-CRT-2024-V0.3
Singapore

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY									
Fuel combustion activities - sectoral approach									
(Sheet 3 of 4)									
Back to Index									
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS			
	Consumption		CO ₂ ⁽²⁾	CH ₄	N ₂ O	CO ₂ ^(2,3)	CH ₄	N ₂ O	
	(TJ)	NCV/GCV ⁽⁵⁾	(t/TJ)	(kg/TJ)		(kt)			
Diesel oil	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Liquefied petroleum gases (LPG)	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Other liquid fuels (please specify) ⁽⁷⁾	NO	NCV				NO	NO	NO	NO
NA	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Gaseous fuels ⁽⁶⁾	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass ⁽²⁾	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Other fossil fuels (please specify) ⁽⁷⁾	NO	NCV				NO	NO	NO	NO
NA	NO	NCV	NO	NO	NO	NO	NO	NO	NO
1.A.3.c. Railways	NO	NCV,NA				NO	NO	NO	NO
Liquid fuels	NO	NA	NO	NO	NO	NO	NO	NO	NO
Solid fuels	NO	NA	NO	NO	NO	NO	NO	NO	NO
Gaseous fuels ⁽⁶⁾	NO	NA	NO	NO	NO	NO	NO	NO	NO
Biomass ⁽²⁾	NO	NA	NO	NO	NO	NO	NO	NO	NO
Other fossil fuels (please specify) ⁽⁷⁾	NO	NCV				NO	NO	NO	NO
NA	NO	NCV	NO	NO	NO	NO	NO	NO	NO

Table1.A(a)s3Table1.A(a)s4Table1.A(b)Table1.A(c)Table1.A(d)Table1.B.1

Key areas of improvement identified at TER

Key areas of improvement

Include explanation for not using higher-tier methodology for key categories (recommended) and to use tier-level methodology for key categories recommended in 2006 IPCC Guidelines (encouraged).

Improvements to be made

Most of the key categories fall under the energy sector, where we will be working with various stakeholders – including agencies and companies – to obtain the relevant information needed to develop country-specific factors and move to Tier 2.

IPCC Code	IPCC Category	Greenhouse Gas	Emissions (Gg CO ₂ eq)	Percentage Contribution	Cumulative Total
1.A.1.	Fuel combustion - Energy Industries - Gaseous Fuels	CO ₂	17,995	30.64%	30.64%
1.A.2.	Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO ₂	12,695	21.61%	52.25%
1.A.3.b.	Road Transportation	CO ₂	6,426	10.94%	63.19%
1.A.2.	Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO ₂	6,129	10.43%	73.62%
2.F.1.	Refrigeration and air-conditioning	HFCs	3,973	6.76%	80.39%
2.E.	Electronics Industry	PFCs	2,519	4.29%	84.67%
1.A.1.	Fuel combustion - Energy Industries - Liquid Fuels	CO ₂	1,732	2.95%	87.62%
1.A.1.	Fuel combustion - Energy Industries - Other Fossil Fuels	CO ₂	1,609	2.74%	90.36%
2.B.10.	Other (Total chemical production)	CO ₂	815	1.39%	91.75%
2.E.	Electronics Industry	NF ₃	645	1.10%	92.85%
1.B.2.c.	Fugitive Emissions from Fuels - Venting and flaring	CO ₂	565	0.96%	93.81%
2.B.8.	Petrochemical and Carbon Black Production	CO ₂	473	0.81%	94.61%
1.A.3.d.	Domestic Navigation - Liquid Fuels	CO ₂	431	0.73%	95.35%

Key areas of improvement identified at TER

Key areas of improvement

Improvements to be made

Reporting of subcategories that are **not estimated** (“NE”) such as 1.B.2.b.iv transmission and storage and 1.B.2.b.v distribution, 2.G.3.a medical applications



Energy sector
Singapore continually works to report subcategories that are currently not estimated. One such subcategory from the energy sector is 1.B.2.b.iv (transmission and storage of natural gas) and 1.B.2.b.v (distribution of natural gas) under CRT 1.B.2, where we work closely with the SP Group/Energy Market Authority to estimate and report fugitive CO2 and CH4 emissions for these subcategories.

++++++
Most of the back-casting work for subcategories that are currently "NE" requires reference to relevant literature and surrogate data, potentially using *natural gas consumption data* for estimating fugitive emissions under 1.B.2.b.iv (transmission and storage of natural gas) and 1.B.2.b.v (distribution of natural gas).

Key areas of improvement identified at TER

Key areas of improvement	Improvements to be made
Reporting of subcategories that are not estimated (“NE”) such as 1.B.2.b.iv transmission and storage and 1.B.2.b.v distribution, 2.G.3.a medical applications	<u>IPPU sector</u> For the IPPU sector, we are working towards estimating and reporting N2O emissions from medical applications by <u>engaging various stakeholders</u>, including gas suppliers and the Centre for Sustainable Medicine (CoSM) at the National University of Singapore (NUS Medicine), in partnership with the Ministry of Health, to obtain data for recent years and to back-project emissions to 1990. +++++ Most of the back-casting work for subcategories that are currently "NE" requires reference to <u>relevant literature and surrogate data</u>, potentially using <i>annual data on surgeries, total live births, accident and emergency (A&E) cases, and emergency ambulance calls</i> for 2.G.3.a (medical applications).



Key areas of improvement identified at TER

Key areas of improvement

Reporting of subcategories that are **not estimated** ("NE") such as 5.A.1 Managed waste disposal sites, 5.B Biological treatment of solid waste



Improvements to be made

5.A.1 Managed waste disposal sites

As Singapore's Lorong Halus landfill closed in 1999, we are working with the waste department and reviewing relevant literature to estimate emissions from the closed landfill between 1990 and 2002, with the aim of back-projecting its historical methane emissions.

Should CH₄ emissions remain low – that is, below 0.05 per cent of the national total GHG emissions – and given that no further waste has been deposited at Lorong Halus landfill since its closure, the notation key "NE" will be applied for CH₄ emissions from 2003 onwards.

5.B Biological treatment of solid waste

To estimate CH₄ and N₂O emissions from community composting, we are collaborating with the waste department to produce estimates from 2000 onwards. As composting activities prior to 2000 were expected to be smaller in scale, the notation key "NE" will be applied for both CH₄ and N₂O emissions from 1990 to 1999 if the emissions in 2000 is below 0.05 per cent of the national total GHG emissions.

Composting from animal manure on livestock farms has been reported under the Agriculture sector.

Thank you!

www.nea.gov.sg

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