جابتن ڤردان منتري
PRIME MINISTER'S OFFICE
BRUNEI DARUSSALAM

قجابت ڤراوبهن اقليم نكارا بروني دارالسلام
BRUNEI CLIMATE CHANGE OFFICE

# 22nd Workshop on Greenhouse Gas Inventories Asia (WGIA22)

[15th to 18th July 2025, Cambodia]

***PRESENTATION***

*Brunei Darussalam's GHG Inventory under the First BTR: Emissions Profile, Methodologies and Challenges in Implementation*

# Agenda

01 COUNTRY OVERVIEW

02 GOVERNANCE STRUCTURE

03 CLIMATE CHANGE TARGETS AND INTERNATIONAL COMMITMENTS

04 OVERVIEW OF BRUNEI'S GHG INVENTORY

05 CHALLENGES AND LIMITATIONS


BURMA
VIETNAM
LAOS
THAILAND
CAMBODIA
PHILIPPINES
BRUNEI
MALAYSIA
SINGAPORE
INDONESIA
EAST TIMOR

# BRUNEI DARUSSALAM
# 'THE ABODE OF PEACE"

**Population**
**455,500**

**Land Area**
**5,765 KM2**

**GDP: US$21 Billion (2023)**
**Derived from Oil & Gas: 52.1%**
**Government Services: 10.5%**
**Downstream: 21.0%**
**Others: 16.4%**

**Main Industries**
**Petroleum, petroleum refining, liquefied natural gas, construction, agriculture, aquaculture, transportation**

**Language: Malay, English, Chinese**

**Climate: tropical; hot, humid, rainy**

# Climate Change Governance In Brunei Darussalam

## BRUNEI DARUSSALAM NATIONAL COUNCIL ON CLIMATE CHANGE

CO-CHAIR
YB Dato Seri Setia Dr. Awang Haji Mohd Amin Liew bin Abdullah
Minister at the Prime Minister's Office and
Minister of Finance and Economy II

CO-CHAIR
YB Dato Seri Setia Awang Haji Muhammad Juanda
bin Haji Abdul Rashid
Minister of Development

MEMBER
YB Dato Seri Setia Dr. Haji Abdul Manaf
bin Haji Metussin
Minister of Primary Resources and
Tourism

MEMBER
YB Pengiran Dato Seri Setia Shamhary
bin Pengiran Dato Paduka Haji Mustapha
Minister of Transport and
Infocommunications

MEMBER
YM Haji Mohammad Azmi bin Haji
Mohd Hanifah
Deputy Minister (Energy)
at the Prime Minister's Office

MEMBER
YM Dato Seri Paduka Awang Haji
Khairuddin bin Haji Abdul Hamid
Deputy Minister of Finance and Economy
(Economy)

## EXECUTIVE COMMITTEE ON CLIMATE CHANGE

Secretariat: Brunei Climate Change Office (BCCO)

### INDUSTRIAL EMISSIONS WORKING GROUP

Secretariat
Energy Transition
Division, Dept of Energy,
PMO

Chairperson: TSUT ENERGY

### ELECTRIC VEHICLE WORKING GROUP

Secretariat
Land Transport Department, MTIC
Energy Transition Division, Dept of
Energy, PMO

Chairpersons: TSUT MTIC, TSUT ENERGY

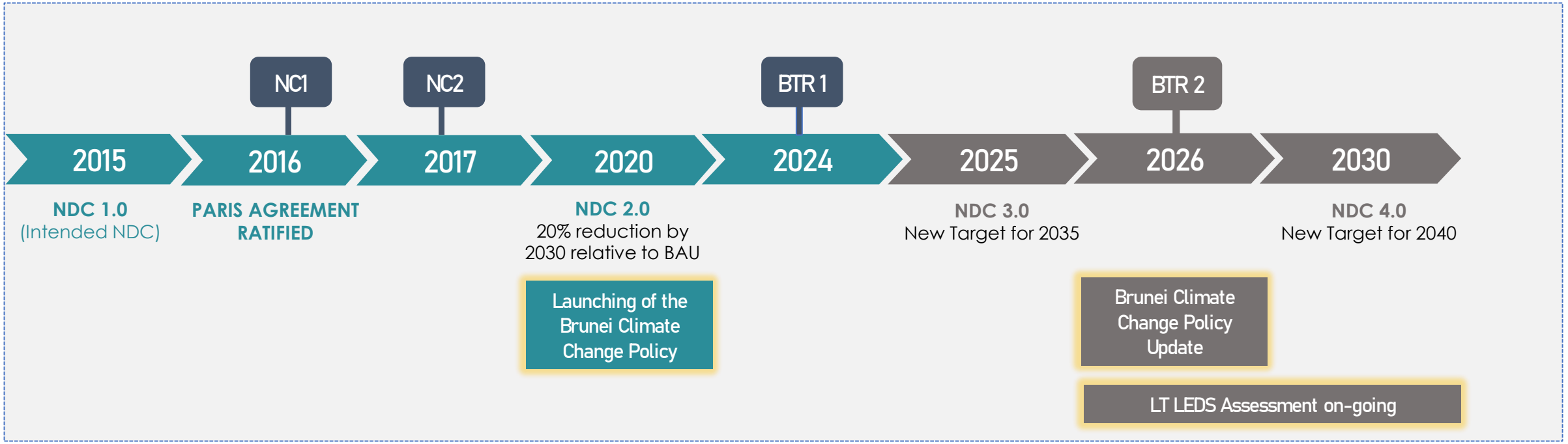
### ADAPTATION & RESILIENCE WORKING GROUP

Secretariat
Brunei Climate Change
Secretariat

Chairpersons: TSUT MOHA and TSUT MOD

# International Commitments

Brunei Darussalam remains firmly committed to addressing climate change through enhanced transparency, ambitious climate action, and sustained international cooperation, in line with its national priorities and the goals of the Paris Agreement.




LT LEDS - Long-Term Low Emission Development Strategies

- Brunei is currently assessing its current national circumstances to develop targets that are **realistic, evidence-based, and aligned with national priorities.**

- Brunei expected to submit its updated NDC by **Q3 2025** for inclusion in the global synthesis report.

# National Strategies Towards a Low Carbon Pathway

## NATIONALLY DETERMINED CONTRIBUTION (NDC)

- **Submitted Dec 2020**
- **Legally binding under the Paris Agreement**
- **Reduction of GHG emissions by 20% by 2030 relative to BAU levels**

## BRUNEI NATIONAL CLIMATE CHANGE POLICY (BNCCP)

- **National document launched in June 2020**

GHG Emissions Reduction Targets

2024

20%

2030

Towards Net Zero

2050

Indirect Impact

Direct impact

### ADAPTATION

Strengthen Adaptation and Resilience

### ENABLING STRATEGIES

Increase climate awareness & education

Improve GHG inventory

Introduce carbon pricing

### SIX MITIGATION STRATEGIES

Reduce GHG emissions from industry.

Increase Brunei's forest cover.

Increase sales of electric vehicles.

Increase the share of RE in the energy mix.

Reduce GHG emissions from power generation.

Reduce waste emissions

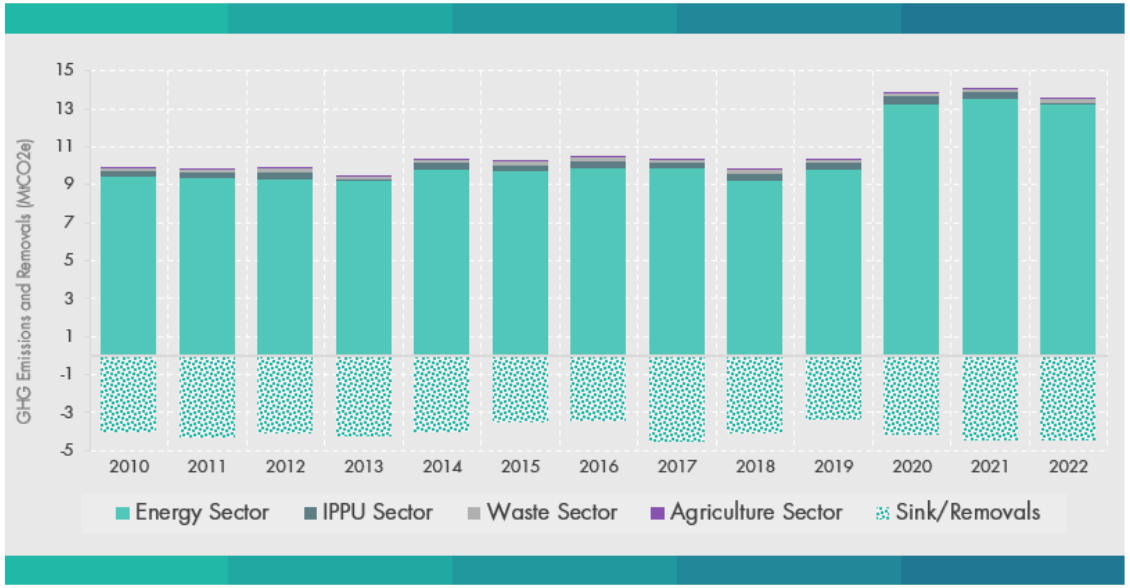
# Overview of GHG Emissions and Removals (2022), By Sector And By Type

As a predominantly oil and gas country, energy sector remains the largest emitting sector, accounting for **more than 90%** of the total emissions.

## Type of GHG

- **93.8%** Carbon Dioxide ($CO_2$)
- **5.7%** Methane ($CH_4$)
- **0.4%** Nitrous Oxide ($N_2O$)

## Emissions 2010 – 2022 (As per BTR 1)

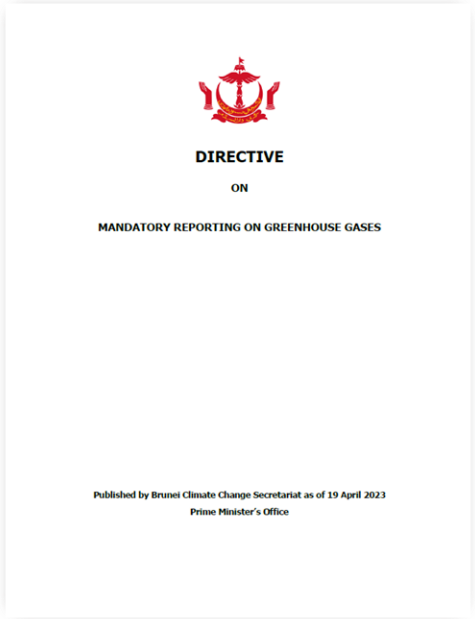



## GHG Emissions by Sector

| Industrial Sector (Power Generation & Own Use) | Public Utilities Power Generation | Venting and Flaring | Land Transportation | Non-specified Industries | Waste | Industrial Processes | Residential | Agriculture |
|---|---|---|---|---|---|---|---|---|
| 55% | 22% | 8.2% | 8.9% | 2.9% | 1.5% | 1.0% | 0.6% | 0.3% |

# Mandatory Reporting Directive (MRD) on Greenhouse Gas

## BRUNEI GHG REPORTING SYSTEM



DIRECTIVE

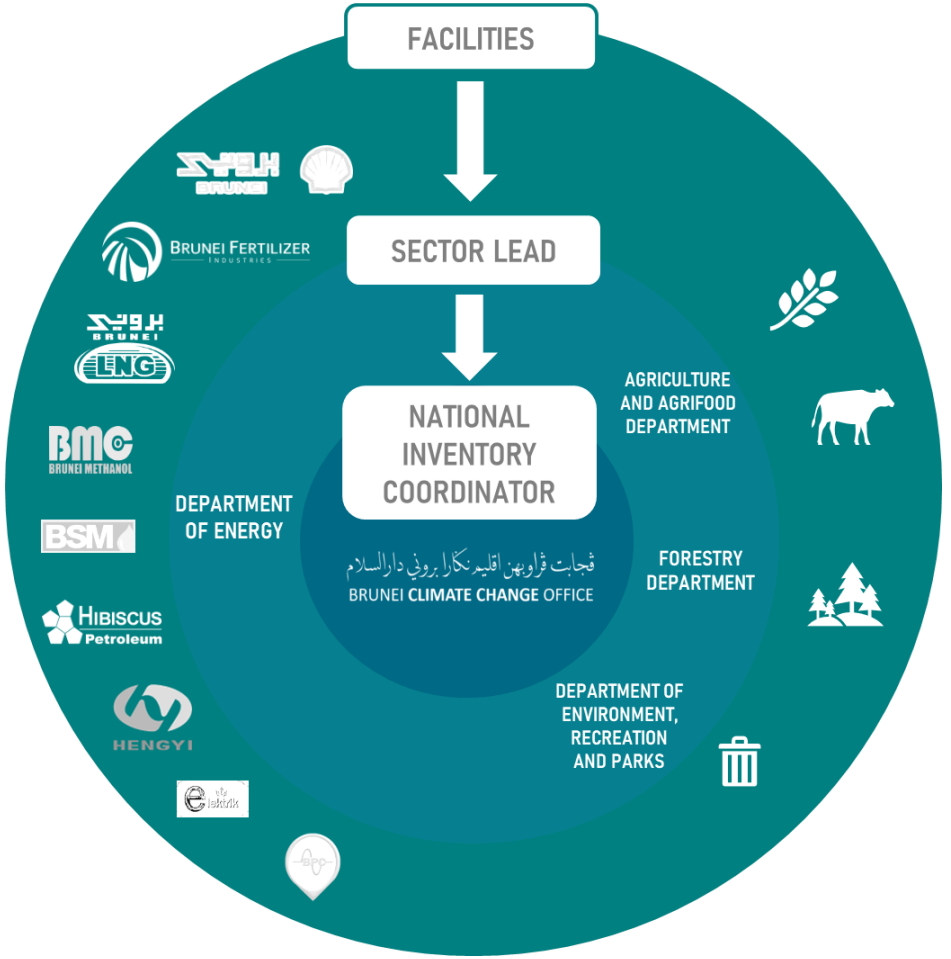
ON

MANDATORY REPORTING ON GREENHOUSE GASES

Published by Brunei Climate Change Secretariat as of 19 April 2023
Prime Minister's Office

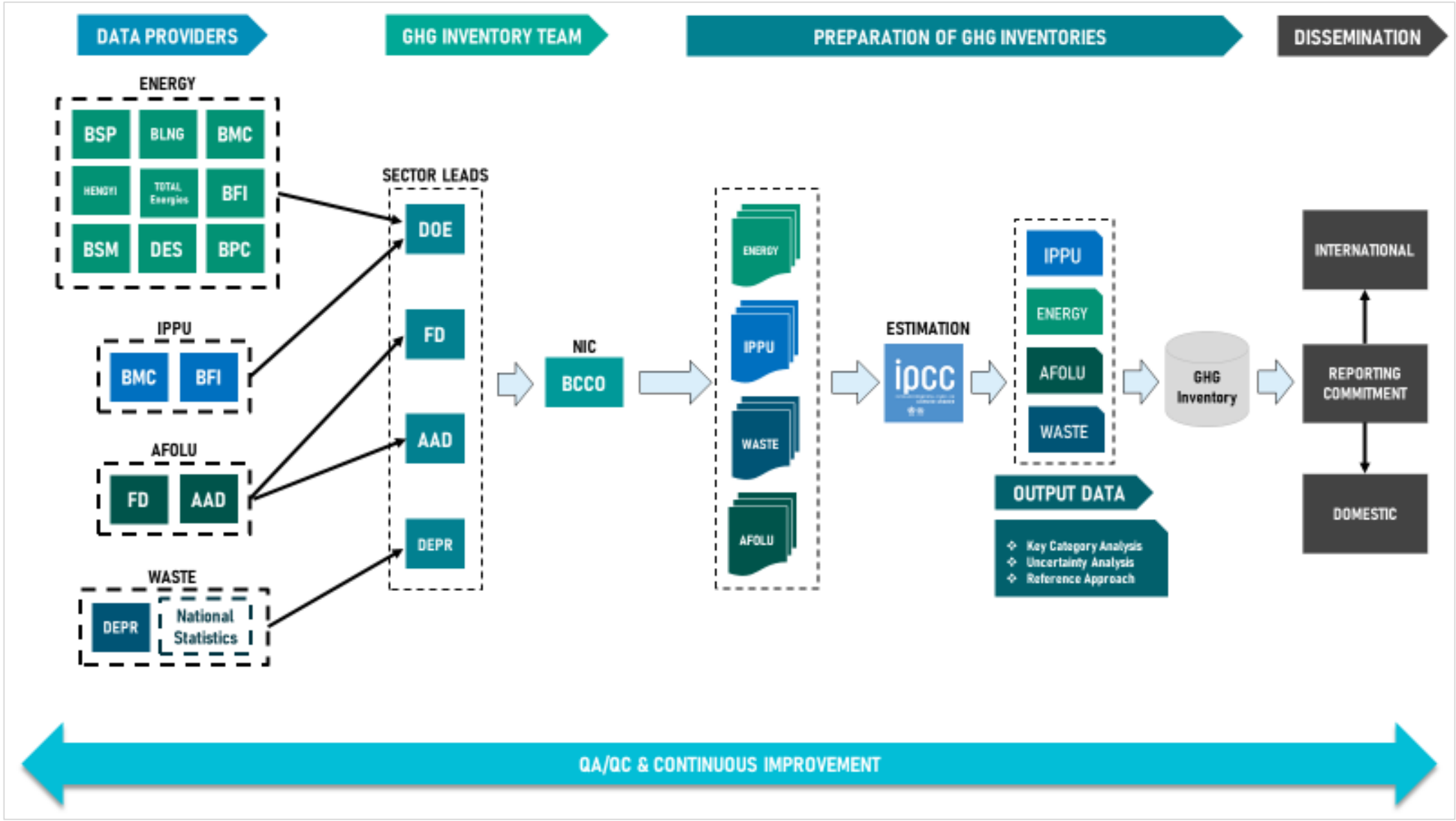
MRD introduced in April 2023

## STRUCTURE



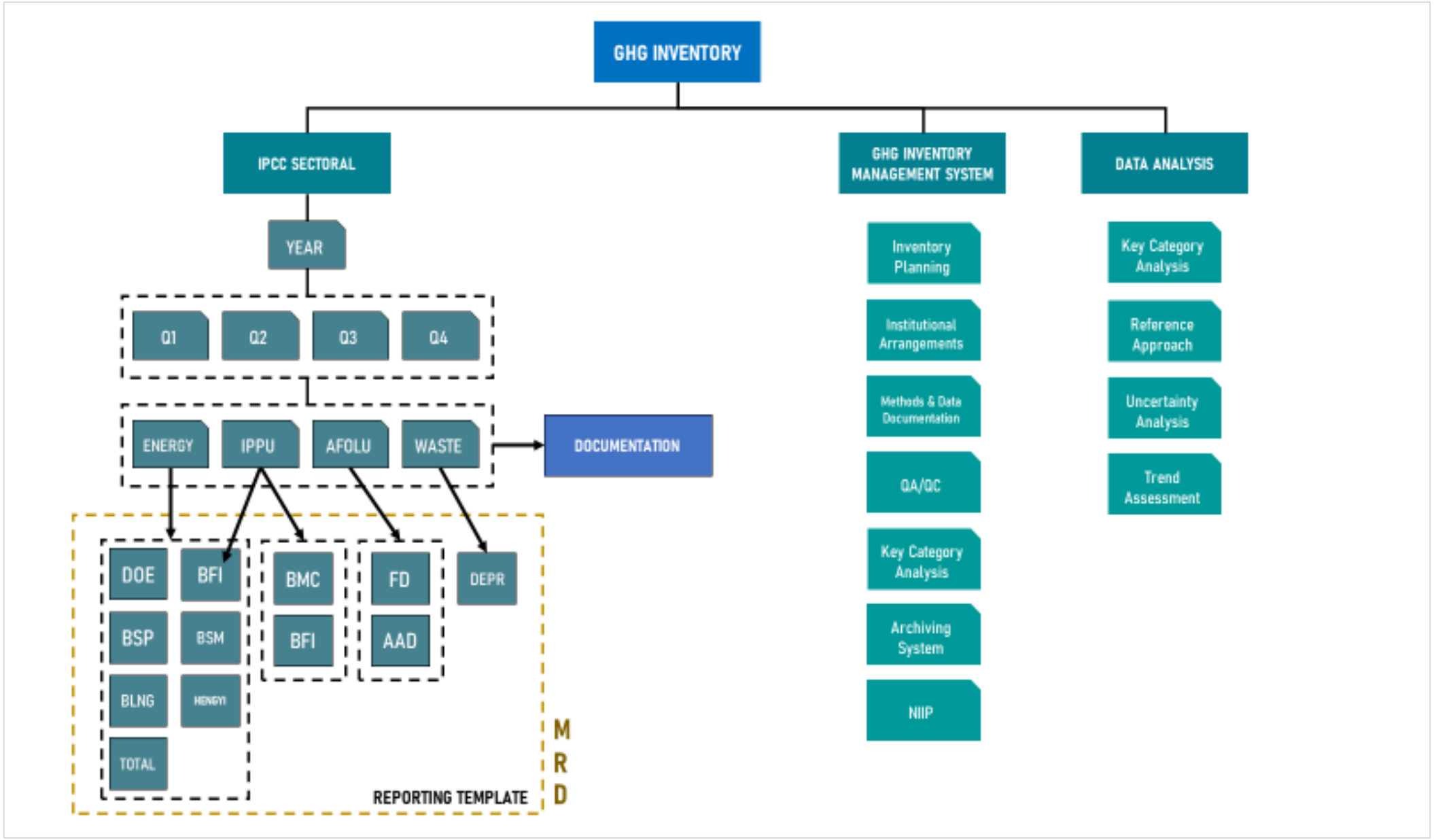
# Inventory Management System

Brunei Darussalam's Data Flow and Inventory Preparation Process



# Inventory Management System

Brunei Darussalam's Archiving System



# Methodologies and Data Sources

*The inventory was prepared in accordance with the requirements of the **UNFCCC** using the **Intergovernmental Panel On Climate Change (IPCC) Guidelines**, supplemented by the **2019 IPCC Refinement** and utilizes the **associated IPCC software.***

| IPCC Code | Emission sources/removal categories | $CO_2$ | | $CH_4$ | | $N_2O$ | |
|---|---|---|---|---|---|---|---|
| | | Method | EF | Method | EF | Method | EF |
| 1.A | Energy | T1, T3 | D, PS | T1, T3 | D, PS | T1, T3 | D, PS |
| 1.A.1.a. i | Electricity Generation | T1 | D | T1 | D | T1 | D |
| 1.A.1.a. ii | Combined Heat and Power Generation (CHP) | T1 | D | T1 | D | T1 | D |
| 1.A.2.m | Non-Specified Industry | T1 | D | T1 | D | T1 | D |
| 1.A.3.a. ii | Domestic Aviation | T1 | D | T1 | D | T1 | D |
| 1.A.3.b. i | Cars | T1 | D | T1 | D | T1 | D |
| 1.A.4.b | Residential | T1 | D | T1 | D | T1 | D |
| 1.A.1.b | Petroleum Refining | T3 | PS | T3 | PS | T3 | PS |
| 1.A.1.c. ii | Other Energy Industries | T3 | PS | T3 | PS | T3 | PS |
| 1.A.2.c | Chemicals | T3 | PS | T3 | PS | T3 | PS |
| 1.B.2.a | Oil | T3 | PS | T3 | PS | T3 | PS |
| 1.B.2.b | Natural Gas | T3 | PS | T3 | PS | T3 | PS |
| 2B | Industrial Processes & Product Use | T1, T3 | D, PS | - | - | - | - |
| 2.B.8.a | Methanol | T1, T3 | D, PS | - | - | - | - |

**Tier 1** applied to most sectors, except in cases where available national data allowed the adoption of higher tier.

**Tier 3** approaches are implemented for **Fuel Combustion in Petroleum Refining and Other Energy Industries, Fugitive Emissions.**

**Hybrid (Tier 1 and 3)** approach applied to **IPPU sector**.

# Methodologies and Data Sources

| IPCC Code | Emission sources/removal categories | $CO_2$ | | $CH_4$ | | $N_2O$ | |
|---|---|---|---|---|---|---|---|
| | | Method | EF | Method | EF | Method | EF |
| 3A | Agriculture | T1 | D | T1 | D | T1 | D |
| 3.A.1.a.ii | Other Cattle | - | - | T1 | D | T1 | D |
| 3.A.1.b | Buffalo | - | - | T1 | D | T1 | D |
| 3.A.1.d | Goats | - | - | T1 | D | T1 | D |
| 3.A.2.a.ii | Other Cattle | - | - | T1 | D | T1 | D |
| 3.A.2.b | Buffalo | - | - | T1 | D | T1 | D |
| 3.A.2.d | Goats | - | - | T1 | D | T1 | D |
| 3.A.2.i | Poultry | - | - | T1 | D | T1 | D |
| 3.C.3 | Urea Application | T1 | D | - | - | - | - |
| 3.C.4 | Direct $N_2O$ Emissions from Managed Soils | - | - | - | - | T1 | D |
| 3.C.5 | Indirect $N_2O$ Emissions from Managed Soils | - | - | - | - | T1 | D |
| 3.C.6 | Indirect $N_2O$ Emissions from Manure Management | - | - | - | - | T1 | D |
| 3.C.7 | Rice Cultivation | - | - | T1 | D | - | - |
| 3B | Land-Use, Land-Use Change and Forestry (LULUCF) | T1, T3 | D, CS | T1 | D | T1 | D |
| 3.B.1.a | Forest Land Remaining Forest Land | T1, T3 | D, CS | - | - | - | - |
| 3.C.3 | Cropland Remaining Cropland | T1 | D | T1 | D | T1 | D |
| 3.C.4 | Settlements Remaining Settlements | T1 | D | T1 | D | T1 | D |
| 4A | Waste | - | - | T1, T2 | D | T1 | D |
| 4.A.1 | Managed Waste Disposal Sites | - | - | T2 | D | - | - |
| 4.D.1 | Domestic Wastewater Treatment and Discharge | - | - | T1 | D | T1 | D |
| 4.D.2 | Industrial Wastewater Treatment and Discharge | - | - | T1 | D | T1 | D |

**Tier 2** approach applied in calculating **waste disposal** combines **default parameters alongside reliable country-specific activity data** for both current and historical waste disposal at Solid Waste Disposal Sites.

**Tier 1** approach applied to the **Agriculture sector.**

**Global Warming Potential (GWP) values from Fifth Assessment Report:**

| Greenhouse Gas | Global Warming Potential (AR5) |
|---|---|
| Carbon Dioxide ($CO_2$) | 1 |
| Methane ($CH_4$) | 28 |
| Nitrous Oxide ($N_2O$) | 265 |

# Quality Assurance and Quality Control (QA/QC)

*Brunei is in the midst of formulating a QA/QC plan that emphasizes the principles of **TACCC** in accordance with the **2006 IPCC Guidelines**. These procedures primarily focus on verifying activity data and emission factors, as well as archiving of reference materials.*

## Quality Control conducted at 3 levels of the Inventory Process:

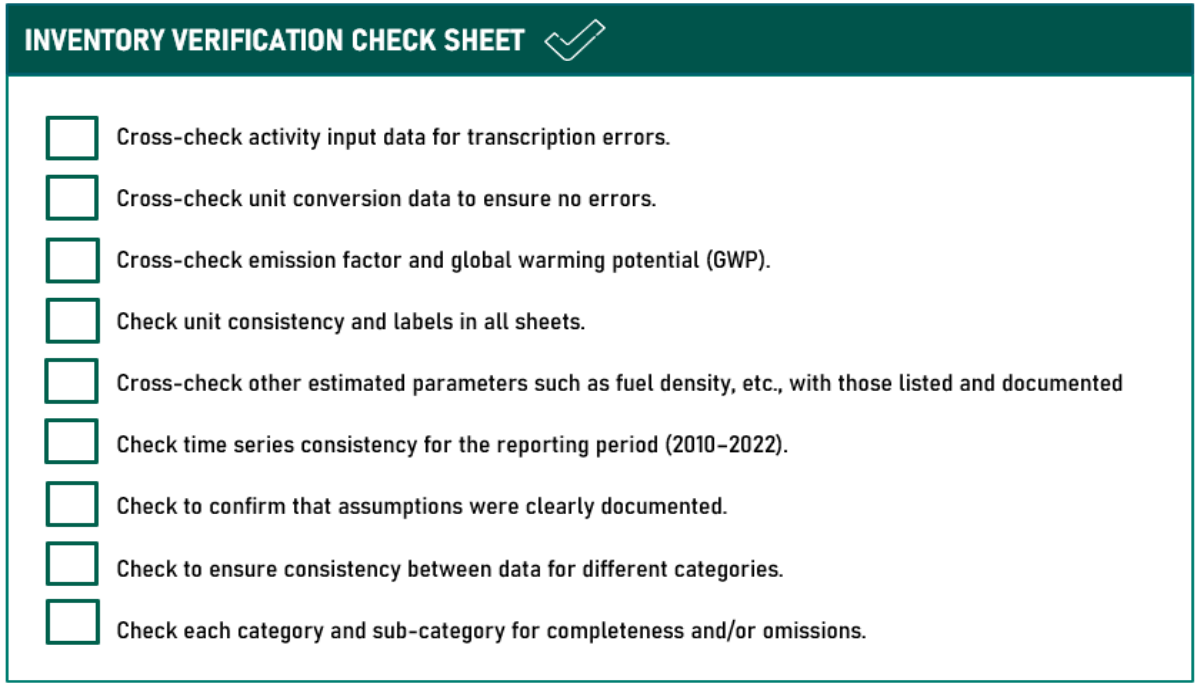
- Pre-inventory preparation
- Inventory preparation
- Post inventory preparation

## Quality Assurance

- GHG Inventory report was submitted to a third-party verifier, highlighting information gaps and levels of uncertainties.
- QA workshop conducted by the UNFCCC Secretariat and FAO

## PaSTI-JAIF Project

- Capacity building workshop and consultation which analyzed all collected data and preliminary results.




*Source: Brunei Darussalam First Biennial Transparency Report*

# General Uncertainty Assessment

- **IPCC Tier 1 method** used to estimate uncertainty, based on error propagation across sectors
- Due to data limitations, Brunei applies **default (maximum range) uncertainty values for both activity data and emission factors** (as per 2006 IPCC Guidelines)
- Committed to improvements through **development of country-specific data and refined methodologies**

## Approach 1 Uncertainty Analysis Result (2022)

| 2022 GHG Inventory | Uncertainty of Total Inventory (%) | | Uncertainty in Trend (%) | |
|---|---|---|---|---|
| | ( - ) | ( + ) | ( - ) | ( + ) |
| Total Inventory including LULUCF | 23.67 | 23.67 | 179.18 | 179.18 |
| Total Inventory excluding LULUCF | 6.71 | 6.71 | 72.77 | 72.77 |

*Source: Brunei Darussalam First Biennial Transparency Report*

# Flexibility Applied

*Brunei demonstrates flexibility in its GHG inventory tailored to its capacities.*

- Brunei focuses on delivering quality data from **2010 onwards**. This aligns with the flexibility for developing country Parties under **Article 4** of the Paris Agreement.

- Brunei exercises **flexibility in completeness**. E.g., Certain categories **unreported** due to data unavailability or capacity, **the use of 'NE', 'NO', 'IE' notations**.

# Key Categories

*Brunei conducts Key Category Analysis (KCA) for 2022 through a level assessment using Approach 1 with the IPCC software, for all inventory categories, including and excluding the LULUCF sector. More detailed information is described in Annex II.*

| CRT Category code | IPCC Category | GHG | 2022 Estimate ($MtCO_2e$) | Individual Contribution | Cumulative Contribution |
|---|---|---|---|---|---|
| 1.A.1 | Energy Industries - Gaseous Fuels | $CO_2$ | 5,374.09 | 28.95% | 28.95% |
| 3.B.1.a | Forest land Remaining Forest land | $CO_2$ | 5,302.74 | 28.57% | 57.52% |
| 1.A.1 | Energy Industries - Solid Fuels | $CO_2$ | 2,515.74 | 13.55% | 71.07% |
| 1.A.1 | Energy Industries - Liquid Fuels | $CO_2$ | 2,098.97 | 11.31% | 82.38% |
| 1.A.3.b | Road Transportation - Liquid Fuels | $CO_2$ | 1,176.01 | 6.34% | 88.71% |
| 1.A.2 | Manufacturing Industries & Construction - Liquid Fuels | $CO_2$ | 402.18 | 2.17% | 90.88% |
| 1.B.2.b | Fugitive Emissions - Natural Gas | $CO_2$ | 301.90 | 1.63% | 92.51% |
| 1.B.2.a | Fugitive Emissions - Oil | $CH_4$ | 287.29 | 1.55% | 94.06% |
| 1.A.2 | Manufacturing Industries & Construction - Gaseous Fuels | $CO_2$ | 264.72 | 1.43% | 95.48% |

**Including LULUCF sector**, there are **9 key categories** in the level assessment: 8 of these from the energy sector, followed by 1 from AFOLU sector.

# Current GHG Inventory Gaps

| Sectors | Sub Categories | Challenges and Limitations |
|---|---|---|
| **Energy** | **1.A.2.c** | Inconsistency across time periods when estimating emissions due to application of different methodologies i.e. Tier 1 for the period of 2010-2021 and Tier 3 for 2022. |
| | **1.B.2** | flaring from processing, production, storage, and distribution, as accounted for by Hengyi Industries, were calculated based on the difference between input and output of material (mass balance check). |
| **IPPU** | **2.A** | Not estimated due to limited data |
| | **2.B** | Inconsistency across time periods due to application of different methodologies |
| | **2.F** | Not estimated |
| **AFOLU** | **-** | Emission factors for this sector used Tier 1 |
| | **-** | Absence of robust QA/QC processes to verify data for agricultural emissions |
| | **3.A.2** | Challenges in tracking and categorization manure management |
| | **3.C.2 & 3.C.3** | Methodological issues in calculating emissions, including whether to base it on the production of fertiliser batches or when they are used. |
| | **3.B** | Insufficient data to estimate emissions and removals from land use change |
| **Waste** | **4.A** | Only includes waste collection and disposal data obtained from the 3 operating landfills. Other waste disposal entities are not considered. |
| | **4.D.2** | Industries beyond fish processing, meat and poultry and petroleum refineries have not been considered.<br><br>Chosen waste treatment method for calculating emissions requires reassessment, as its presence in the country is unknown. |

# CHALLENGES AND LIMITATIONS

## Data Gaps

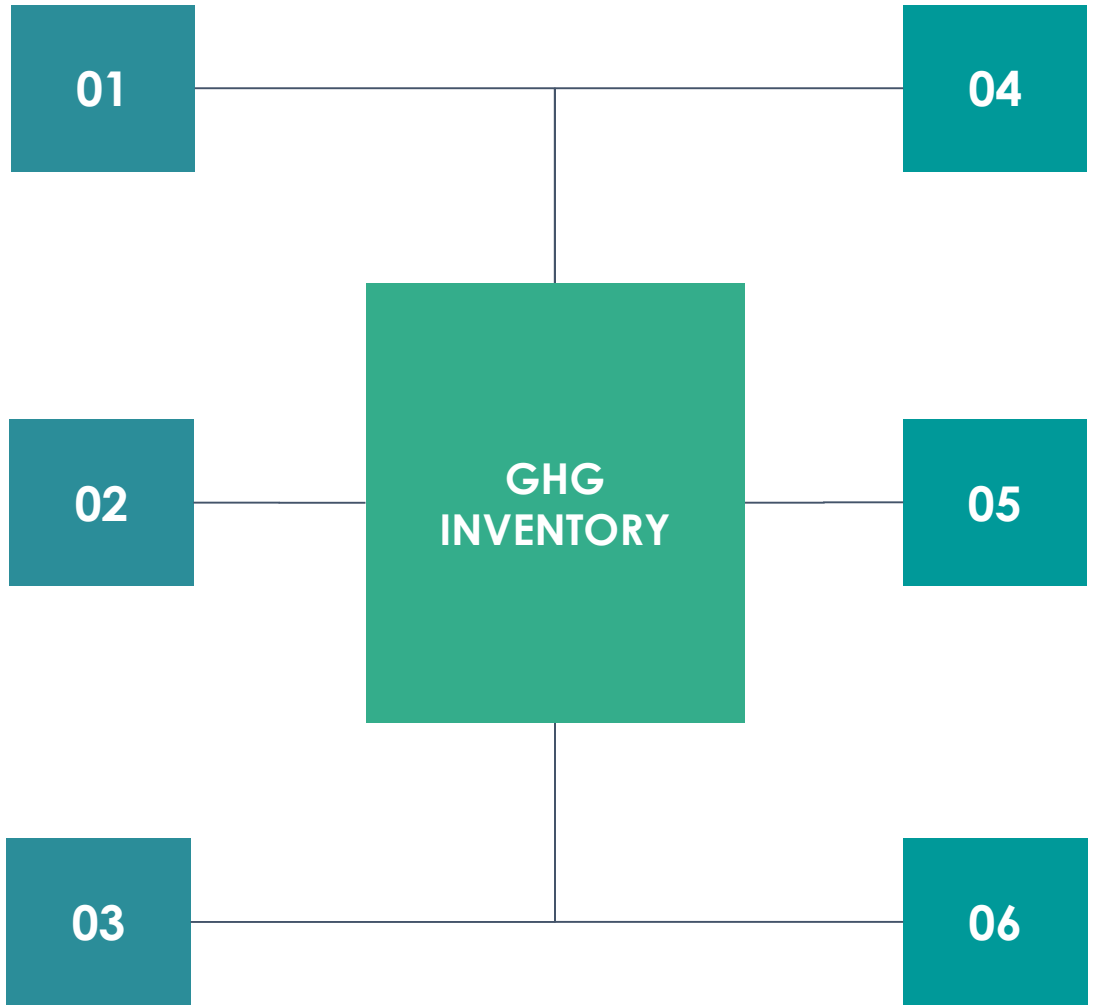
- Incomplete inventory due to incomplete or outdated activity data. Particularly on AFOLU (Land Use Changes & Forestry) & IPPU sector.
- Most categories rely primarily on Tier 1 methodologies, affecting accuracy.

## Data Availability & Quality Issues

- Difficulty accessing and processing data
- Unavailable datasets, poor formats, scattered across agencies, no sense of ownership
- Heavy reliance on default IPCC EF due to lack country-specific emissions factor

## Institutional and Clearance Delays

- Inter-agency endorsement and clearance processes were lengthy
- Requires active push from senior management to move forward




## GHG Forecasting

- Lack of technical capacity, limited access to forecasting tools, incomplete historical data, and uncertainty in key assumptions collectively hinder the development of reliable and policy-relevant GHG emission forecasts.

## Capacity Constraints

- Small team with limited technical skills and institutional resources

## Technical Tools and Reporting Systems

- Lack of familiarity with tools and guidelines (CRT, MPGs)
- Reporting tools require disaggregated, sector-specific data that was often unavailable
- National systems are still under development, tools still evolving
- Lack of examples or precedents

# GENERAL SUPPORT REQUIRED

SUPPORT REQUIRED

## GHG FORECASTING

- Capacity Building
- Sector-specific modelling tools for LT emissions forecasting and policy impact assessment
- Scenario development and macroeconomic impact assessment

## NATIONAL INVENTORY

- Development of country-specific emission factors and higher-tier methodologies (Tier 2/3) especially for Power, a key category.
- Address inventory gaps for AFOLU and IPPU.
- Estimation of F-gases from Product Uses



## COST QUANTIFICATION

- Cost-benefit analysis (CBA) adapted to the national context to enable consistent, evidence-based evaluation of mitigation and adaptation actions.
- Tools and models for economic valuation of adaptation co-benefits, avoided damages, and long-term mitigation returns.

## POLICY

- Assistance in updating and implementing climate-related policies, sectoral strategies, and regulatory frameworks.

# قجابت قراوبهن اقليم نكارا بروني دارالسلام

# BRUNEI **CLIMATE CHANGE** OFFICE


www.ClimateChange.gov.bn

bcco@jpm.gov.bn

bcco.bn

2381144 | 2381177

Prime Minister's Office,
Jalan Perdana Menteri
Bandar Seri Begawan BB3913
Negara Brunei Darussalam.