The Second Philippines-Japan Environment Week
Side Event: Partnership to Strengthen Transparency for co-Innovation (PaSTI)
Promoting Quality Corporate-Level GHG Measurement and Reporting
January 13, 2025

The Philippines' Commitments on GHG Reporting and Tracking of NDC Progress with Demonstration on GHG Calculation

Rolando O. Abad Jr.
Climate Change Service
Department of Environment and Natural Resources
Republic of the Philippines

Outline:

- ❑Philippine GHG Reporting Framework
- ❑NDC Policies and Measures of the Waste and IPPU Sectors
- ❑Experience in Accounting Waste and IPPU GHG Emissions
- ❑Proposed IPPU and Waste Sector Reporting Template
- ❑Challenges, Needs and Way Forward

NATIONAL INSTITUTIONAL ARRANGEMENTS (Executive Order 174 series of 2014)

Climate Change Commission

Department of Environment & Natural Resources

Department of Energy

Department of Transportation

Department of Agriculture & Philippine Statistics Authority

Waste, IPPU, FOLU

Energy

Transport

Agriculture

CCC as Overall lead

- Provide direction and guidance
- Develop archiving reporting monitoring and evaluating GHGI
- Provide continuous capacity building

Lead Agencies:

- Conduct and monitor sector specific GHG inventory
- Report GHGI to CCC based on agreed reporting scheme

Philippine Statistics Authority

- assist in data collection and analysis

local government units

academe

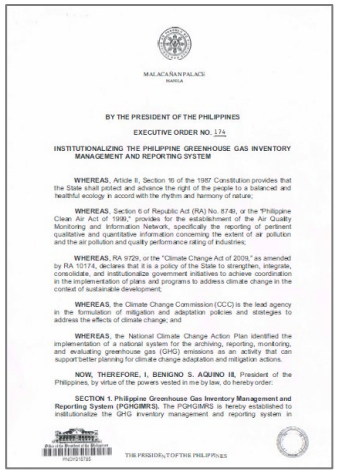
private sector

public institutions

- participate, complement, and assist in the implementation of the PGHGIMRS

Support Institutions

Legal Bases



MALACAÑANG PALACE
MANILA

BY THE PRESIDENT OF THE PHILIPPINES

EXECUTIVE ORDER NO. 174

INSTITUTIONALIZING THE PHILIPPINE GREENHOUSE GAS INVENTORY MANAGEMENT AND REPORTING SYSTEM

WHEREAS, Article II, Section 16 of the 1987 Constitution provides that the State shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature;

WHEREAS, Section 6 of Republic Act (RA) No. 8749, or the "Philippine Clean Air Act of 1999," provides for the establishment of the Air Quality Monitoring and Information Network, specifically the reporting of pertinent qualitative and quantitative information concerning the extent of air pollution and the air pollution and quality performance rating of industries;

WHEREAS, RA 9729, or the "Climate Change Act of 2009," as amended by RA 10174, declares that it is a policy of the State to strengthen, integrate, consolidate, and institutionalize government initiatives to achieve coordination in the implementation of plans and programs to address climate change in the context of sustainable development;

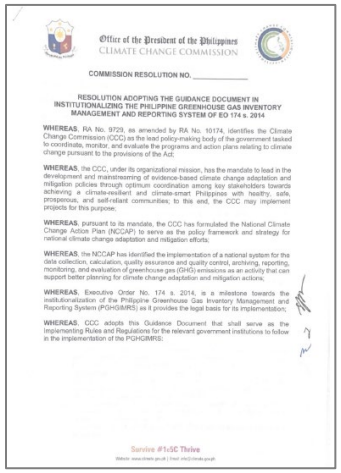
WHEREAS, the Climate Change Commission (CCC) is the lead agency in the formulation of mitigation and adaptation policies and strategies to address the effects of climate change; and

WHEREAS, the National Climate Change Action Plan identified the implementation of a national system for the archiving, reporting, monitoring, and evaluating greenhouse gas (GHG) emissions as an activity that can support better planning for climate change adaptation and mitigation actions.

NOW, THEREFORE, I, BENIGNO S. AQUINO III, President of the Philippines, by virtue of the powers vested in me by law, do hereby order:

SECTION 1. Philippine Greenhouse Gas Inventory Management and Reporting System (PGHGIMRS). The PGHGIMRS is hereby established to institutionalize the GHG inventory management and reporting system in

THE PRESIDENT OF THE PHILIPPINES



Office of the President of the Philippines
CLIMATE CHANGE COMMISSION

COMMISSION RESOLUTION NO. _____

RESOLUTION ADOPTING THE GUIDANCE DOCUMENT IN INSTITUTIONALIZING THE PHILIPPINE GREENHOUSE GAS INVENTORY MANAGEMENT AND REPORTING SYSTEM OF EO 174 s. 2014

WHEREAS, RA No. 9729, as amended by RA No. 10174, identifies the Climate Change Commission (CCC) as the lead policy-making body of the government tasked to coordinate, monitor, and evaluate the programs and action plans relating to climate change pursuant to the provisions of the Act;

WHEREAS, the CCC, under its organizational mission, has the mandate to lead in the development and mainstreaming of evidence-based climate change adaptation and mitigation policies through optimum coordination among key stakeholders towards achieving a climate-resilient and climate-smart Philippines with healthy, safe, prosperous, and self-reliant communities; to this end, the CCC may implement projects for this purpose;

WHEREAS, pursuant to its mandate, the CCC has formulated the National Climate Change Action Plan (NCCAP) to serve as the policy framework and strategy for national climate change adaptation and mitigation efforts;

WHEREAS, the NCCAP has identified the implementation of a national system for the data collection, calculation, quality assurance and quality control, archiving, reporting, monitoring, and evaluation of greenhouse gas (GHG) emissions as an activity that can support better planning for climate change adaptation and mitigation actions;

WHEREAS, Executive Order No. 174 s. 2014, is a milestone towards the institutionalization of the Philippine Greenhouse Gas Inventory Management and Reporting System (PGHGIMRS) as it provides the legal basis for its implementation;

WHEREAS, CCC adopts this Guidance Document that shall serve as the Implementing Rules and Regulations for the relevant government institutions to follow in the implementation of the PGHGIMRS;

Service #1:5C Thrive

EO 174 Guidance Document

- **Climate Change Act as Amended** mandates the CCC to formulate strategies to reduce GHG emissions
- **Executive Order No. 174, s.2014**: institutionalizes the GHG inventory management and reporting system in relevant government agencies to enable the country to transition towards a climate-resilient pathway for sustainable development, and ensuring appropriations for sectoral PGHGIMRS implementation
- **CCC Resolution 2018: Guidance Document** to aid agencies in preparing and submitting GHGI

Capacity Building Initiatives to Institutionalize the National GHG Inventory to Key National Government Agencies

Post-issuance of EO-174

Greenhouse Gas Emissions Profile

- Philippines emits an average of 1.98 metric tons of carbon dioxide equivalent (CO2e) per capita in 2020, or considerably below the global average of four metric tons per capita and contributes less than 1% of global emissions

GHGI Year	1994	2000	2010	2015	2020
Methodology	1996 IPCC	1996 IPCCf	2006 IPCC	2006 IPCC	2006 IPCC
GWP	SAR	SAR	AR4	AR5	AR5
Sector GHG Emissions (MtCO2e)					
Energy	50.038	69.667	77.279	106.143	129.286
Industry/IPPU	10.603	8.610	8.363	15.297	16.772
Agriculture	33.130	37.003	43.152	52.704	54.080
FOLU/LULUCF	−0.126	−105.111	−37.007	35.668	−25.935
Waste	7.094	11.559	15.559	23.176	30.122
Total (without FOLU)	**100.864**	**126.879**	**144.352**	**197.319**	**230.260**
Total (with FOLU)	**100.738**	**21.767**	**107.345**	**232.988**	**204.325**

Source: Climate Change Commission; Figures converted by DENR from gigagrams of CO2 equivalent (GgCO2e) to million metric tons of CO2e (MtCO2e).

Greenhouse Gas Emissions Trends

- **Energy Sector:** top two emission sources are the transport and energy

- **Agriculture Sector:** top emission source is rice cultivation, followed by domestic livestock

  ➢*Domestic livestock emissions come from enteric fermentation and manure management*

- **Waste Sector:** top source of emission is wastewater treatment and discharge, dominantly from domestic wastewater treatment and discharge, followed by solid waste disposal

- **IPPU Sector:** top emission sources are the cement industry and refrigeration and air-conditioning (RAC) industry

ETF vis-a vis existing MRV REPORTING THEMES

Biennial Transparency Reports

- National greenhouse gas inventory
- Progress made in implementing and achieving national determined contributions under Article 4
- Climate change impacts and adaptation under Article 7 (as appropriate)
- Financial, technology transfer and capacity-building support needed and received under Articles 9, 10, 11

Article 13 of the Paris Agreement; decision 18/CMA.1

National Communications

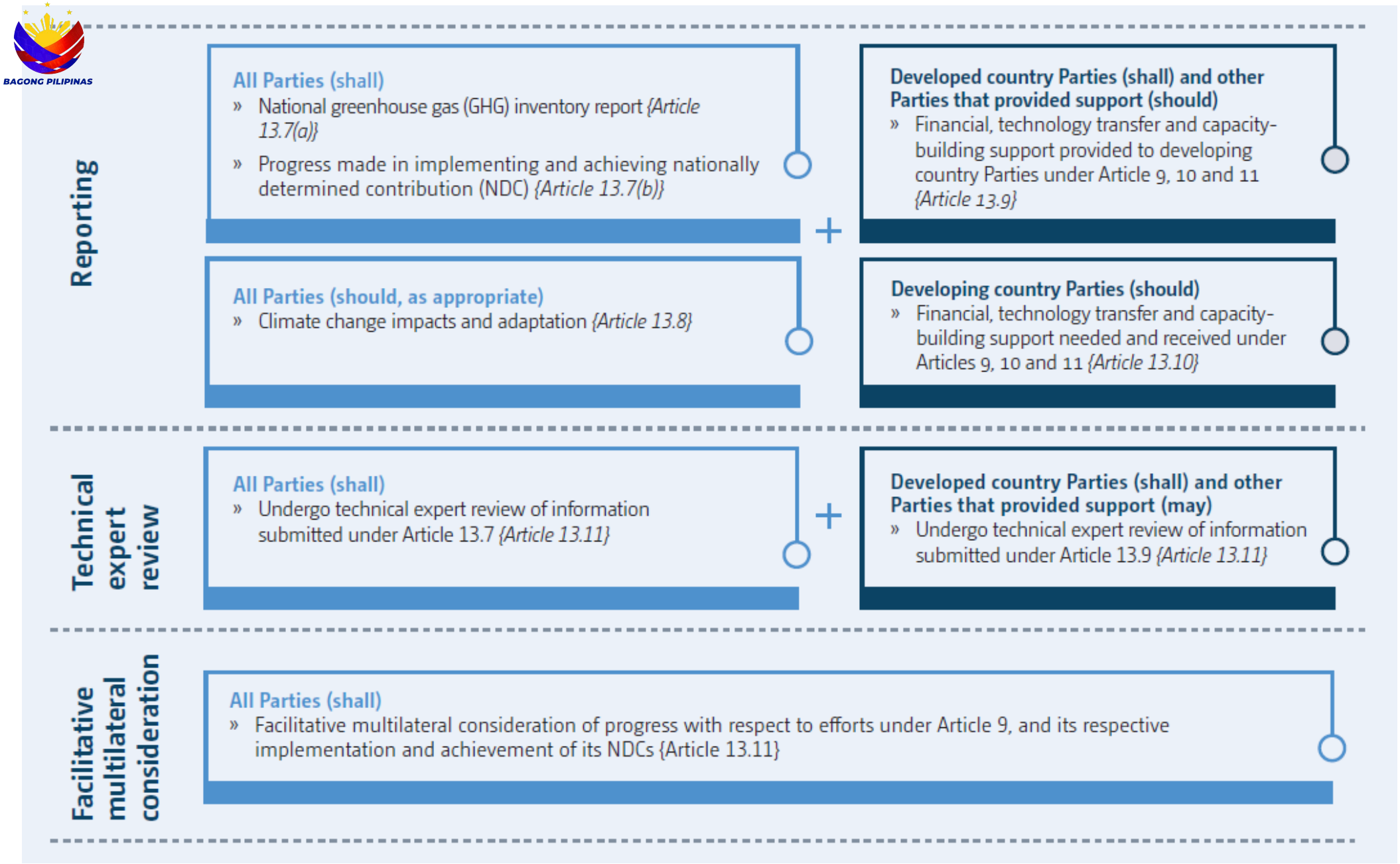
- National greenhouse gas inventory
- Programmes containing measures to facilitate adaptation to climate change
- Programmes containing measures to mitigate climate change
- Transfer of technology
- Research and systematic observation
- Education, training and public awareness
- Capacity-building
- Information and networking
- Constraints and gaps, and related financial, technical and capacity-building needs

Article 4.1 and 12.1 of the Convention; Decision 17/CP.8

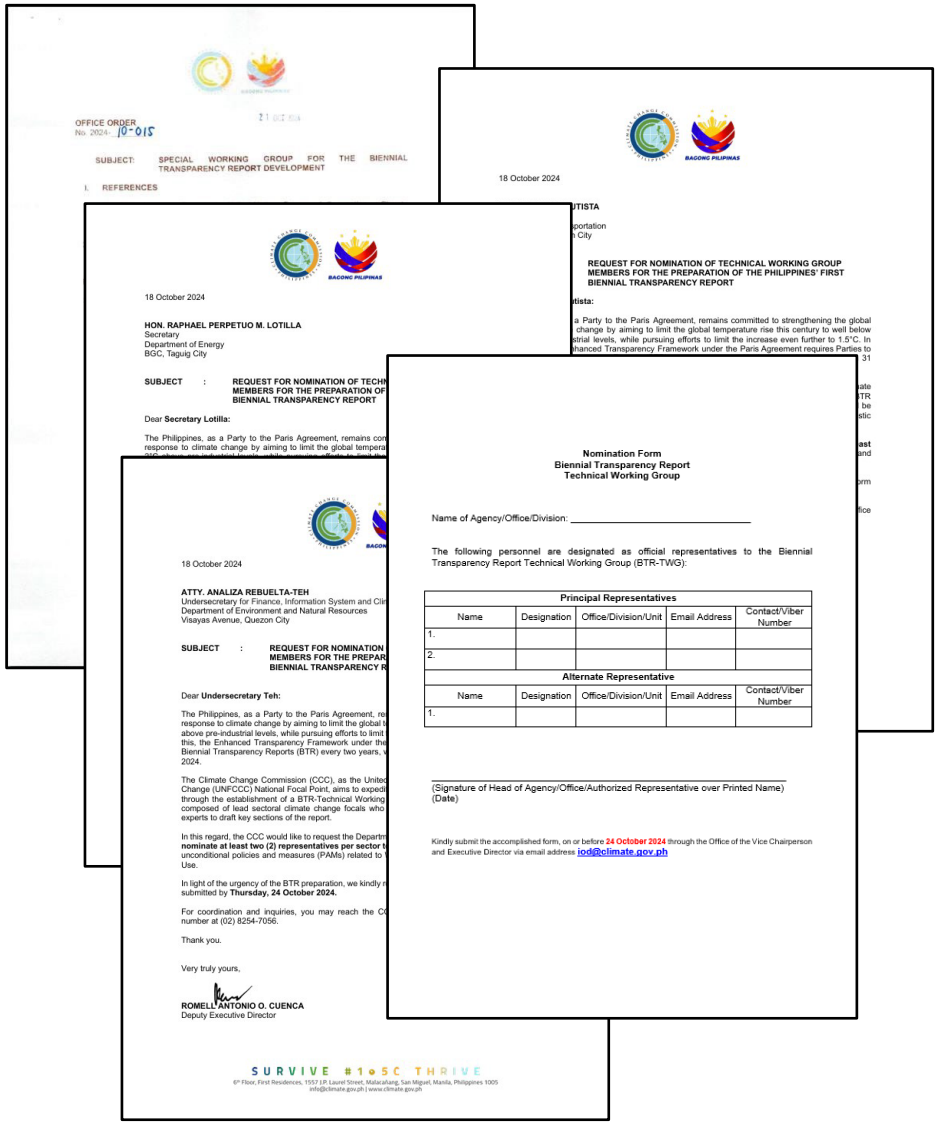
Biennial Update Reports

- National greenhouse gas inventory
- Mitigation actions and their effects
- Finance, technology and capacity-building needs

Cancun Agreements (1/CP.16); Durban Outcomes (2/CP.17)


Reporting
All Parties (shall)
» National greenhouse gas (GHG) inventory report {Article 13.7(a)}
» Progress made in implementing and achieving nationally determined contribution (NDC) {Article 13.7(b)}
+
Developed country Parties (shall) and other Parties that provided support (should)
» Financial, technology transfer and capacity-building support provided to developing country Parties under Article 9, 10 and 11 {Article 13.9}
All Parties (should, as appropriate)
» Climate change impacts and adaptation {Article 13.8}
Developing country Parties (should)
» Financial, technology transfer and capacity-building support needed and received under Articles 9, 10 and 11 {Article 13.10}
Technical expert review
All Parties (shall)
» Undergo technical expert review of information submitted under Article 13.7 {Article 13.11}
+
Developed country Parties (shall) and other Parties that provided support (may)
» Undergo technical expert review of information submitted under Article 13.9 {Article 13.11}
Facilitative multilateral consideration
All Parties (shall)
» Facilitative multilateral consideration of progress with respect to efforts under Article 9, and its respective implementation and achievement of its NDCs {Article 13.11}

BTR Technical Working Group



OFFICE ORDER
No. 2024-10-015

SUBJECT: SPECIAL WORKING GROUP FOR THE BIENNIAL TRANSPARENCY REPORT DEVELOPMENT

I. REFERENCES

18 October 2024

HON. RAPHAEL PERPETUO M. LOTILLA
Secretary
Department of Energy
BGC, Taguig City

SUBJECT : REQUEST FOR NOMINATION OF TECHNICAL WORKING GROUP MEMBERS FOR THE PREPARATION OF THE PHILIPPINES' FIRST BIENNIAL TRANSPARENCY REPORT

Dear **Secretary Lotilla:**

The Philippines, as a Party to the Paris Agreement, remains committed to strengthening the global response to climate change by aiming to limit the global temperature rise this century to well below 2°C above pre-industrial levels, while pursuing efforts to limit the increase even further to 1.5°C. In this, the Enhanced Transparency Framework under the Paris Agreement requires Parties to submit their Biennial Transparency Reports (BTR) every two years, with the first BTR due by December 2024.

The Climate Change Commission (CCC), as the United Nations Framework Convention on Climate Change (UNFCCC) National Focal Point, aims to expedite the preparation of the BTR through the establishment of a BTR-Technical Working Group (BTR-TWG) composed of lead sectoral climate change focals who will serve as technical experts to draft key sections of the report.

In this regard, the CCC would like to request the Department of Energy to **nominate at least two (2) representatives per sector** to participate in the BTR-TWG. Use.

In light of the urgency of the BTR preparation, we kindly request that the nominations be submitted by **Thursday, 24 October 2024.**

For coordination and inquiries, you may reach the CCC Secretariat at telephone number at (02) 8254-7056.

Thank you.

Very truly yours,

ROMELL ANTONIO O. CUENCA
Deputy Executive Director

18 October 2024

ATTY. ANALIZA REBUELTA-TEH
Undersecretary for Finance, Information System and Climate Change
Department of Environment and Natural Resources
Visayas Avenue, Quezon City

SUBJECT : REQUEST FOR NOMINATION OF TECHNICAL WORKING GROUP MEMBERS FOR THE PREPARATION OF THE PHILIPPINES' FIRST BIENNIAL TRANSPARENCY REPORT

Dear **Undersecretary Teh:**

The Philippines, as a Party to the Paris Agreement, remains committed to strengthening the global response to climate change by aiming to limit the global temperature rise this century to well below 2°C above pre-industrial levels, while pursuing efforts to limit the increase even further to 1.5°C. In this, the Enhanced Transparency Framework under the Paris Agreement requires Parties to submit their Biennial Transparency Reports (BTR) every two years, with the first BTR due by December 2024.

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In this regard, the CCC would like to request the Department of Energy to **nominate at least two (2) representatives per sector** to participate in the BTR-TWG. These representatives should be knowledgeable on the unconditional policies and measures (PAMs) related to Energy and Energy

In light of the urgency of the BTR preparation, we kindly request that the nominations be submitted by **Thursday, 24 October 2024.**

For coordination and inquiries, you may reach the CCC Secretariat at telephone number at (02) 8254-7056.

Thank you.

Very truly yours,

ROMELL ANTONIO O. CUENCA
Deputy Executive Director

SURVIVE #1o5C THRIVE

18 October 2024

REQUEST FOR NOMINATION OF TECHNICAL WORKING GROUP MEMBERS FOR THE PREPARATION OF THE PHILIPPINES' FIRST BIENNIAL TRANSPARENCY REPORT

Nomination Form
Biennial Transparency Report
Technical Working Group

Name of Agency/Office/Division: _____

The following personnel are designated as official representatives to the Biennial Transparency Report Technical Working Group (BTR-TWG):

Principal Representatives				
Name	Designation	Office/Division/Unit	Email Address	Contact/Viber Number
1.				
2.				
Alternate Representative				
Name	Designation	Office/Division/Unit	Email Address	Contact/Viber Number
1.				

_____
(Signature of Head of Agency/Office/Authorized Representative over Printed Name)
(Date)

Kindly submit the accomplished form, on or before 24 October 2024 through the Office of the Vice Chairperson and Executive Director via email address lod@climate.gov.ph

- As a contingent measure, the CCC established an interagency Technical Working Group to develop the Philippines' BTR.
- On 19 October, the CCC requested an official nomination from NGAs and invited local climate change experts to join the TWG.
- BTR-TWG convened last 30 October 2024 in an organizational meeting to discuss the work plan for the BTR development
- The CCC created an internal Special Working Group to efficiently allocate and manage the preparation of the individual chapters of the BTR.

Areas of Improvement

- Greenhouse Gas Inventory
  1. Capacity-Building activity for the Agriculture Sector (PSA, DA, and CCC)
  2. Emission Factor for recalculation (Agriculture Sector)
  3. Improve coordination for data collection (cross-cutting)
  4. Ongoing study for Livestock Tier 2 emission estimation (Agriculture)
  5. Capacity-building activity for the Transportation Sector (DOTr and CCC, [or DOE])
  6. Improve data collection for open burning, fossil liquid waste, incineration, thermal treatment, slaughterhouses (solid waste sector)
  7. Formulate appropriate policy instruments to partner with DOH for hospital and clinical hazardous wastes (solid waste)
  8. Improve characterization and matching of categories for hospital and clinical hazardous wastes (solid waste)
  9. Establish a rendering facility for slaughterhouses' waste (solid waste)
  10. Integrate into the existing reporting system of concerned DENR agencies (hazardous solid waste)
  11. Improve LGU adoption of updated WACS guidelines (solid waste)
  12. Develop studies for industrial wastewater for improved parameters on wastewater generation and influent COD per industry type
  13. Capacity-building for data collection (wastewater)
  14. Improve the validation process for domestic wastewater
  15. Improve coordination with the Private Sector in reporting GHG emissions (IPPU)
  16. Establish a partnership with DOE's database on the Philippine Energy Labelling Program for RAC sector (IPPU)
  17. Clarification with expert on iron and steel furnace in the Philippines (IPPU)
  18. Support for readiness of Energy sector on using Tier 2 approach (energy) – training and activity data
  19. EF from biomass energy use liquid fuel (energy)
  20. Improve capacity on data generation for EBT – energy consumption (energy)
  21. Identification of facilities considered for energy generation or autoproducer (energy)

Areas of Improvement

- Tracking NDC Implementation Progress
  1. Provision of guidelines and template for tracking NDC progress, harmonized with data collection for GHG inventory (cross-cutting)
  2. Formulate policies to submit information necessary for reporting updates on NDC and GHG Inventory from implementing agencies e.g., NGAs, private sector (cross-cutting)
  3. Extend CCET to private sector (cross-cutting)
  4. Establish incentive system for private sector and LGU on NDC implementation (not necessary monetary)
  5. Capacity-building for mitigation and economic assessment and analysis (per project/PAM) (cross-cutting)
  6. Integrate specific provision for regular reporting for data collection to DOTr (transport sector)
  7. Updating of Philippine Green Employment Model (just transition)
  8. Support to identify social cost (cost of transition) (just transition)
  9. Toolkit (for technology and capacity-building) for just transition for entity-level (just transition)
  10. Increase allocation of resources for implementing and monitoring NDC (workforce and funding) (cross-cutting)
  11. Clarity and guidance on NDC to be achieved through Article 6 and carbon markets

IPPU and Waste Sector PAMs

IPPU Sector **Mitigation PAMs**

- Substitute clinker with supplementary cementitious materials (SCMs) in cement production
- Shift to low Global Warming Potential refrigerants in Refrigeration and Air-Conditioning industry
- Establish dedicated and efficient destruction facility for Ozone-Depleting Substances and Hydrofluorocarbons (HFCs)
- Promote the use of alternative fuel and raw materials in cement co-processing
- Install waste heat recovery facilities in cement plants
- Increase use of cullet in glass production

TOTAL EMISSION REDUCTIONS

INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

59

million tonnes CO_2e

Waste Sector Mitigation PAMs

- Increase methane capture, utilization, and flaring at sanitary landfills
- Reduce methane and other gas emissions from landfills through composting of organic wastes and use of eco-efficient soil cover to lay on top of waste
- Expand septage and sewerage treatment facilities in highly urbanized cities (HUCs) and other cities outside Manila Bay
- Promote industrial wastewater systems/technologies that consider the capture and utilization of biogas in an anaerobic system

TOTAL EMISSION REDUCTIONS

WASTE SECTOR

66

million tonnes CO_2e

Waste and IPPU Sector Mitigation Target

- The mitigation target for IPPU and Waste in 2025 is **1,297,524** tonnes carbon dioxide equivalent (tCO_2e) of which **830,690 tCO_2e** is from the Waste sector and **466,834 tCO_2e** is from industrial processes & product use (IPPU) , thru the ff:
- * For waste sector, composting, methane recovery in sanitary landfill for energy, anaerobic digestion of municipal solid waste with methane recovery and the expansion of wastewater treatment facilities within Manila Bay Area.

*IPPU and Waste Sector's Mitigation Target in Tonnes Carbon Dioxide Equivalent (tCO_2e)						
Sector	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Waste	757,840	799,680	830,690	885,057	1,043,535	1,078,354
IPPU	327,624	393,307	466,834	541,803	619,205	706,755
Total	1,085,463	1,192,987	1,297,524	1,426,861	1,662,739	1,785,109
*as reflected in the PDP 2023-2028						

For the industry sector, the PAMs include: Substitution of Clinker in Cement Production, Shift to Low GWP Refrigerants in the Refrigeration and Air-conditioning (RAC) Industry and Increase Use of Cullet in Glass Production.

Experience in Accounting GHG Emissions in the IPPU and Waste Sector

Methodological Tiers

GHG = AD x EF x GWP

- **Activity Data:** General
- **Emission Factor:** (National statistics and IPCC default emission factors)
- **GWP: Published GWP**

Tier 1

GHG = AD x EF x GWP

- **Activity Data:** Specific (Types)
- **Emission Factor:** (National statistics and country-specific emission factors, partly plant-level data)
- **GWP: Published GWP**

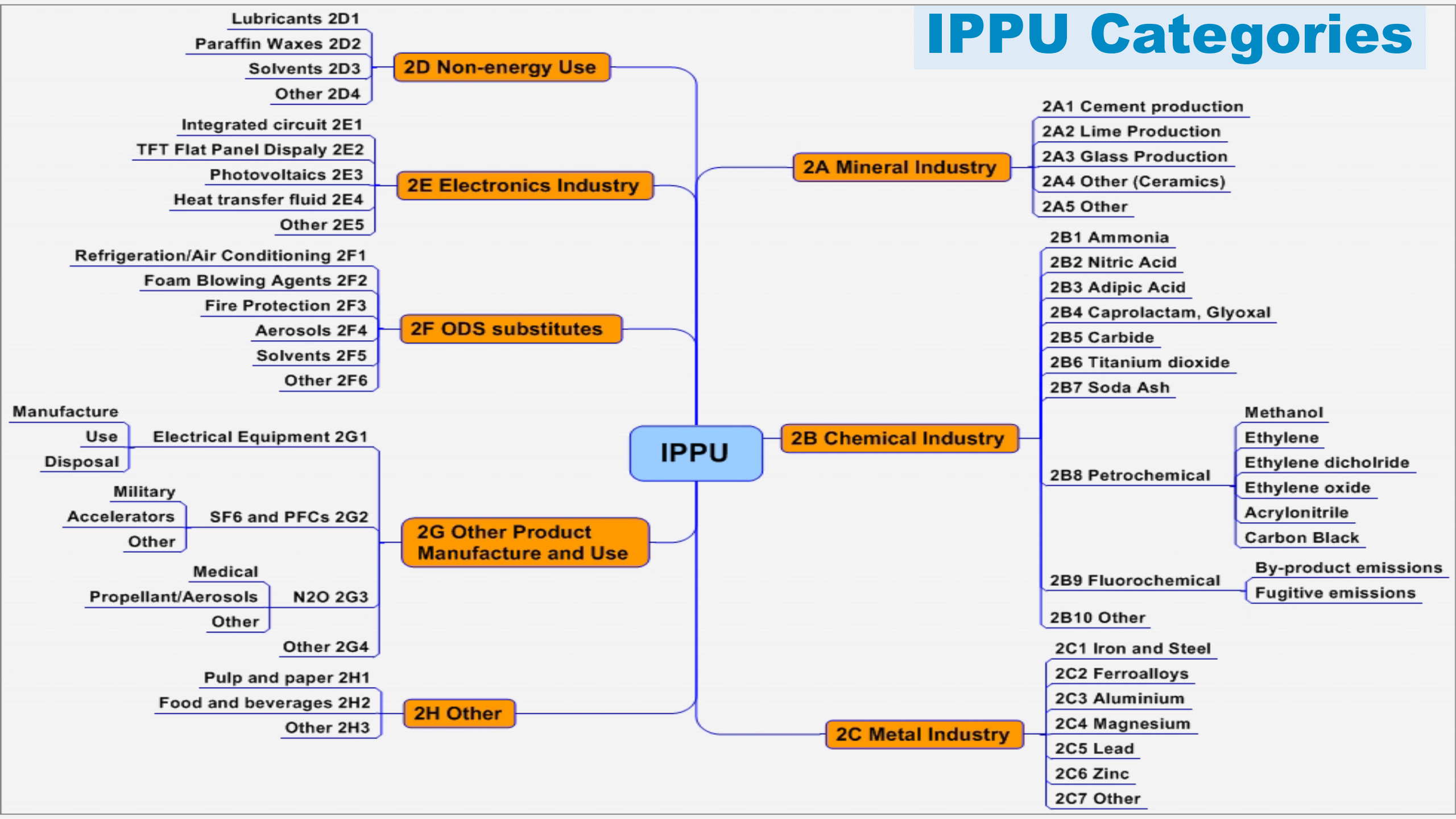
Tier 2

GHG = AD x EF x GWP

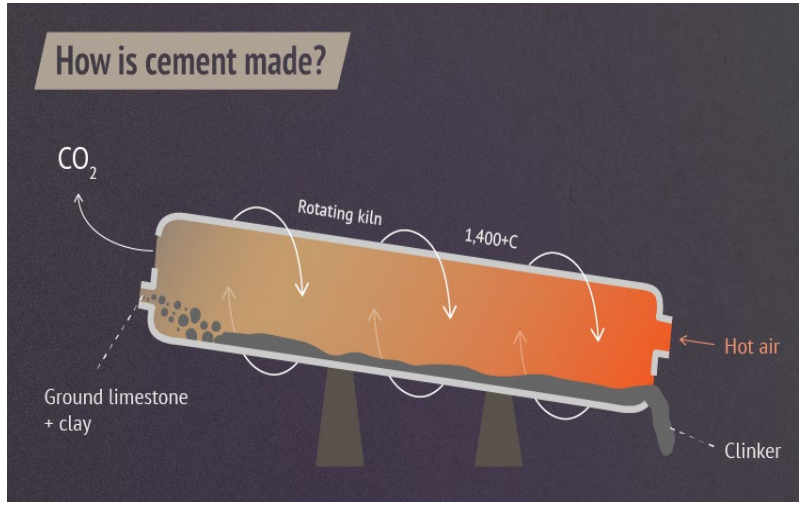
- **Activity Data:** Disaggregated/Per component
- **Emission Factor:** Plant-level Data
- **GWP: Published GWP**

Tier 3

IPPU Categories

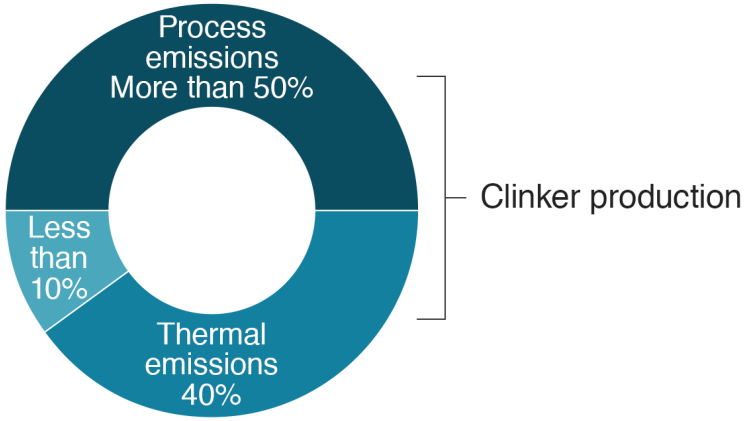


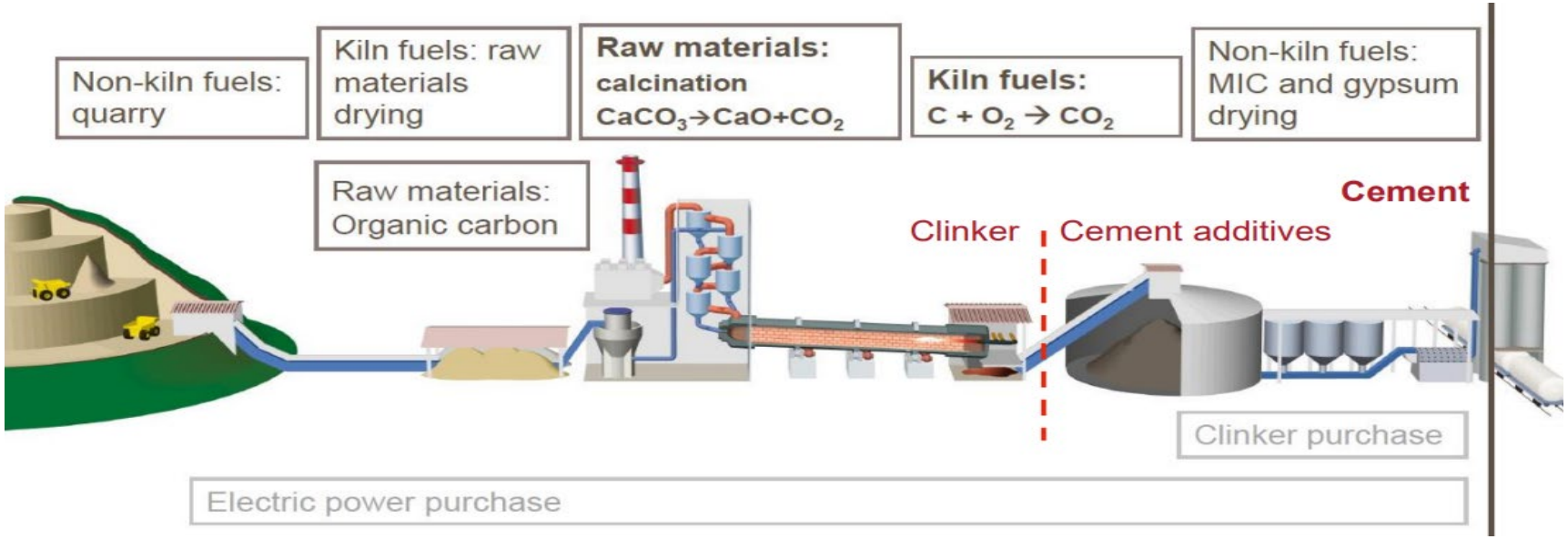
Sources of CO_2 Emissions in Cement Production Process



The production of "clinker" accounts for most of the CO2 emissions of cement production

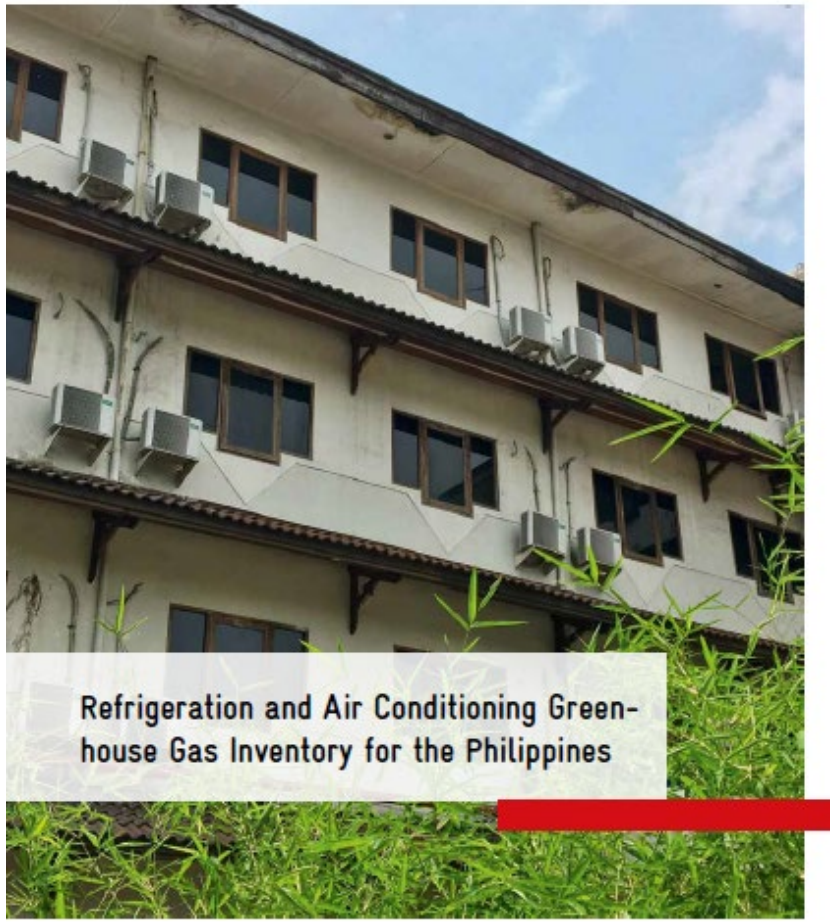
- Quarrying & transport
- Grinding & preparation of raw materials
- Cooling, grinding, mixing





RAC Sector GHG Inventory 2019

- The Refrigeration and Air Conditioning Greenhouse Gas Inventory was completed and published in August 2019
- Completed through the efforts of staff from the **Climate Change Division and Philippine Ozone Desk** of the Environmental Management Bureau of the Department of Environment and Natural Resources
- Endorsed to the Climate Change Commission as inputs to **Nationally Determined Contribution (NDC)** projections
- Energy efficiency gains in the shift towards natural refrigerants were also calculated contributing to mitigation in the energy sector



Primary Data Collection


- Primary data collection from Top UAC and Dom Ref Manufacturers and Distributors for the Philippines with enforcement support from the DENR EMB Regional Offices
- DIS surveys were completed by manufacturers, though partial data

RAC Subsectors covered by the GHG Inventory

1. Stationary Air Conditioning

- Self-Contained ACs (Window type)
- Split-type ACs (Ductless)
- Ducted Splits
- Multi-splits, VRF, VRV

2. Mobile Air Conditioning

- Cars, Buses and Trucks

3. Domestic Refrigeration

4. Transport Refrigeration

- Trailers, Vans and Trucks

Relatively robust from government databases (DOE-PELP, LTO MVIS, NMIS)

4. Commercial Refrigeration
   - Stand alone units
   - Condensing units
   - Centralized systems in supermarkets

5. Industrial Refrigeration
   - Process chillers
   - Condensing units
   - Stand-alone units

6. AC Chillers

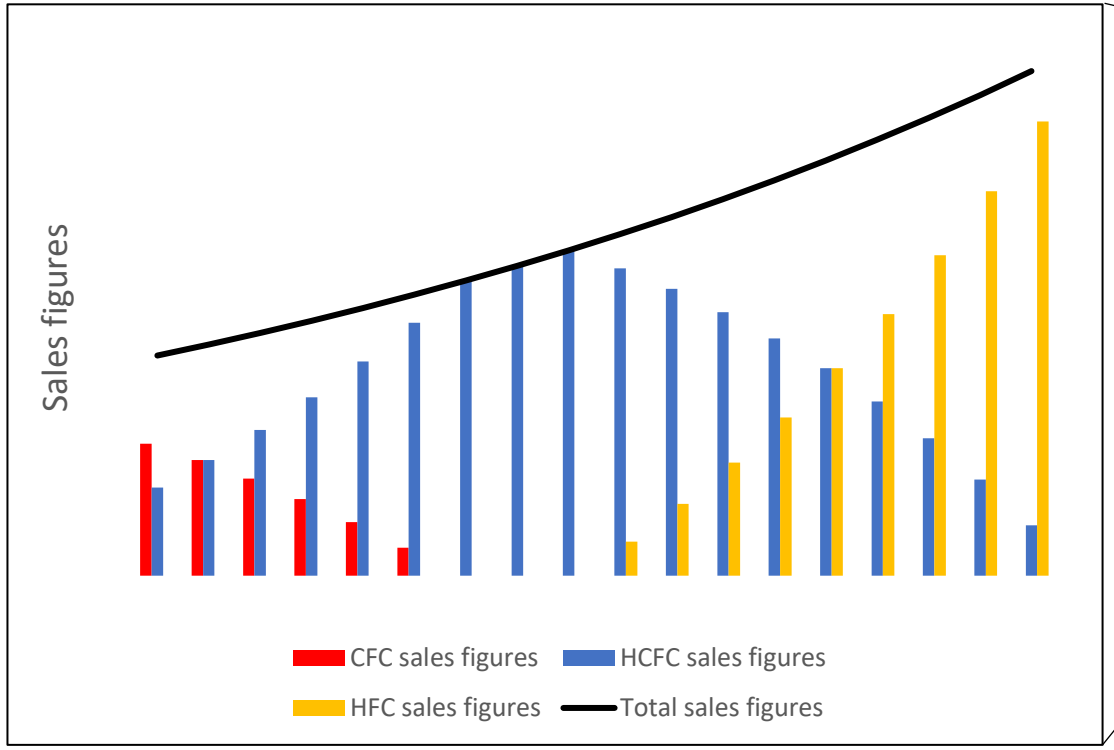
Statistical and Proxy data was utilized for emissions best estimates but data gaps

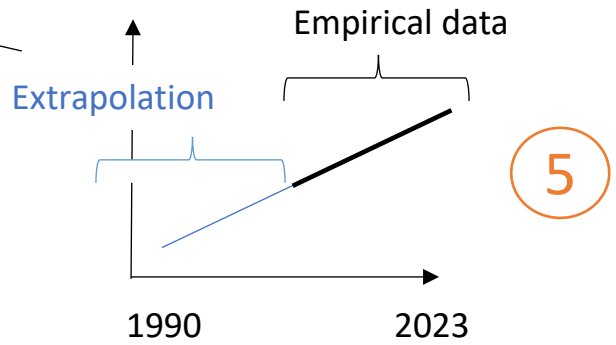
Understanding the calculation process

Consultancy services provided by HEAT GmbH

- Key parameters
  - Stock (number of equipment units in use)
  - Share of refrigerant (e.g. 40% of equipment stock contains R22 and 60% R410A)
- Stock can be derived from sales data or directly estimated
- Develop sales/stock time series
- Derive substance amounts available for management from equipment reaching its end-of-life using refrigerant charge/blowing agent content and recovery factor

1 Production + 2 Import - 3 Export = 4 Sales figures





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Sum up sales figures over life time of equipment to get stock figures

7

Stock figures × Initial charge/ blowing agent content

6

ODS/HFC bank

Processing the data

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500

Stock = $\sum_{i=2009}^{2023}$ Sales figures = 12.000 units

ODS/HFC banks = Stock * initial charge
= 12.000 units * 1 kg = 12.000 kg

ODS/HFC potentially available for management = Sales figures$_{i=2009}$ * initial charge
= 100 units* 1 kg = 100 kg

ODS/HFC effectively available for management = ODS potentially available for management * recovery rate
= 100 kg * 5% = 5 kg

Projection of banks

Year	2023	2024	2025	2030	2035	2040	2045	2050	
Sales	1500	1500*(1+g)	$1500*(1+g)^2$	$1500*(1+g)^7$	$1500*(1+g)^{12}$	$1500*(1+g)^{17}$	$1500*(1+g)^{22}$	$1500*(1+g)^{27}$	Estimate sales figures based on estimated annual growth g
Refrigerant share e.g. 410A in split ACs	80%	65%	50%	5%	0%	0%	0%	0%	Estimate share based on trends and KIP

Apply linear interpolation to estimate annual data points, apply suitable equipment lifetime as developed in step 4

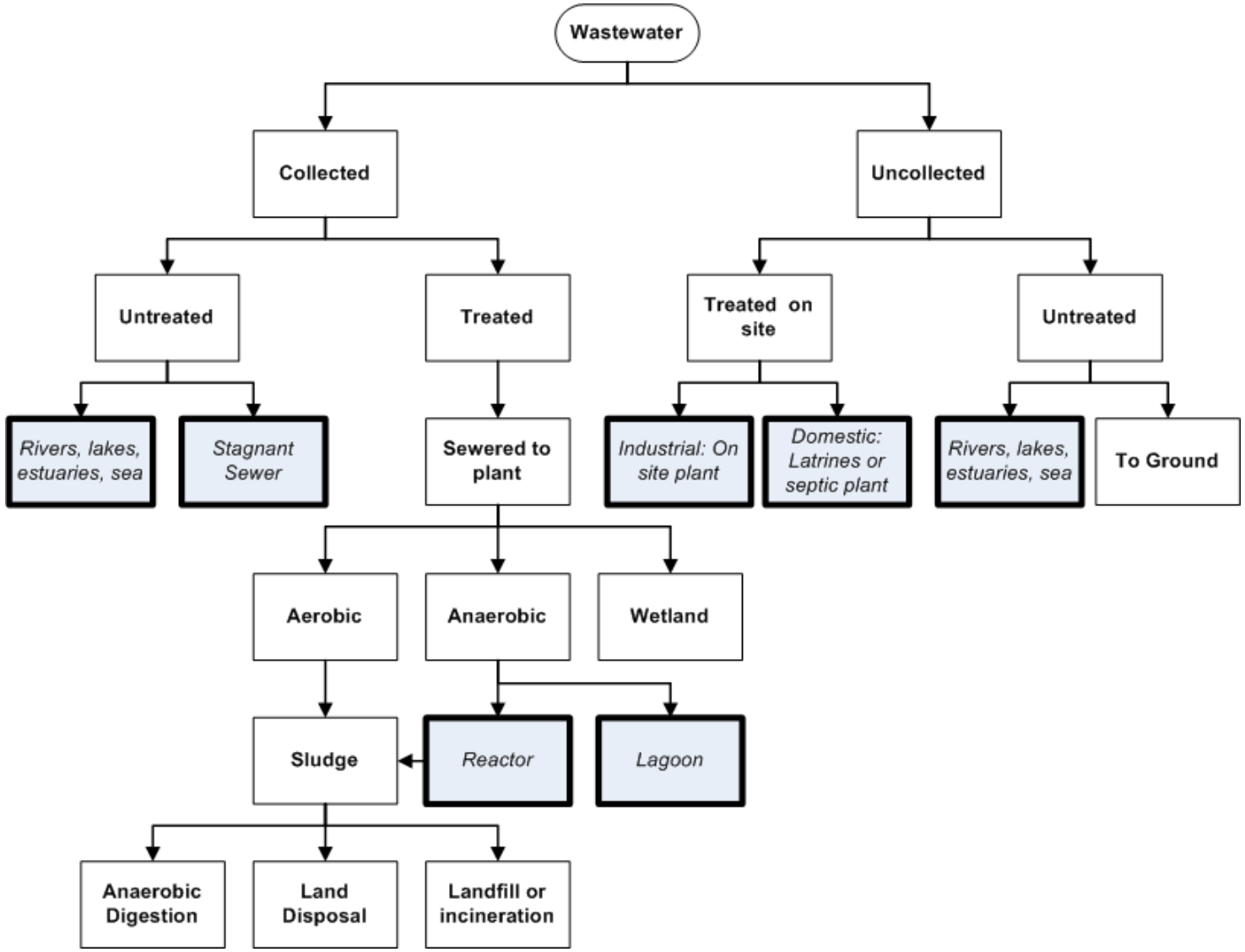
Stock = e.g. in 2030 $\sum_{i=2030-LT}^{2030}$ Sales figures

ODS/HFC banks = Stock * initial charge

ODS/HFC potentially available for management = Sales figures$_{\text{i=projection year-LT}}$ * initial charge

ODS/HFC effectively available for management = ODS potentially available for management * recovery rate

Wastewater Treatment Systems and Discharge Pathways



Industrial Wastewater: CH_4 Emissions

- Industrial wastewater may be treated on-site or released into domestic sewer systems
- The CH_4 emissions from industrial wastewater treatment (on-site):

$$CH_4 Emissions = \sum_i \left[\left(TOW_i - S_i \right) \bullet EF_i - R_i \right]$$

CH_4 Emissions : CH_4 emissions in inventory year, kg CH_4/yr

TOW_i : total organically degradable material in wastewater from industry i in inventory year, kg COD/yr

i : industrial sector

S_i : organic component removed as sludge in inventory year, kg COD/yr

EF_i : emission factor for industry *i, kg CH_4/kg COD* for treatment/discharge pathway or systems. If more than one treatment practice is used in an industry this factor would need to be a weighted average.

R_i : amount of CH_4 recovered in inventory year, kg CH_4/yr

Industrial Wastewater: CH_4 Emissions

- Activity data is the amount of organically degradable material in the wastewater (TOW):

$$TOW_i = P_i \bullet W_i \bullet COD_i$$

TOW_i : total organically degradable material in wastewater for industry *i, kg COD/yr*

i : industrial sector

P_i : total industrial product for industrial sector *i, t/yr*

W_i : wastewater generated, m^3/t product

COD_i : chemical oxygen demand (industrial degradable organic component in wastewater), kg COD/m^3

TABLE 6.9
EXAMPLES OF INDUSTRIAL WASTEWATER DATA

Industry Type	Wastewater Generation W (m^3/ton)	Range for W (m^3/ton)	COD (kg/m^3)	COD Range (kg/m^3)
Alcohol Refining	24	16 – 32	11	5 – 22
Beer & Malt	6.3	5.0 – 9.0	2.9	2 – 7
Coffee	NA	NA –	9	3 – 15
Dairy Products	7	3 – 10	2.7	1.5 – 5.2
Fish Processing	NA	8 – 18	2.5	
Meat & Poultry	13	8 – 18	4.1	2 – 7
Organic Chemicals	67	0 – 400	3	0.8 – 5
Petroleum Refineries	0.6	0.3 – 1.2	1.0	0.4 – 1.6
Plastics & Resins	0.6	0.3 – 1.2	3.7	0.8 – 5
Pulp & Paper (combined)	162	85 – 240	9	1 – 15
Soap & Detergents	NA	1.0 – 5.0	NA	0.5 – 1.2
Starch Production	9	4 – 18	10	1.5 – 42
Sugar Refining	NA	4 – 18	3.2	1 – 6
Vegetable Oils	3.1	1.0 – 5.0	NA	0.5 – 1.2
Vegetables, Fruits & Juices	20	7 – 35	5.0	2 – 10
Wine & Vinegar	23	11 – 46	1.5	0.7 – 3.0

Notes: NA = Not Available.
Source: Doorn *et al.* (1997).

Industrial Wastewater: CH_4 Emissions

- Emission factor for each treatment/discharge pathway/systems

$$EF_j = B_0 \bullet MCF_j$$

EF_j : emission factor, kg CH_4 / kg COD

j : each treatment/discharge pathway or system

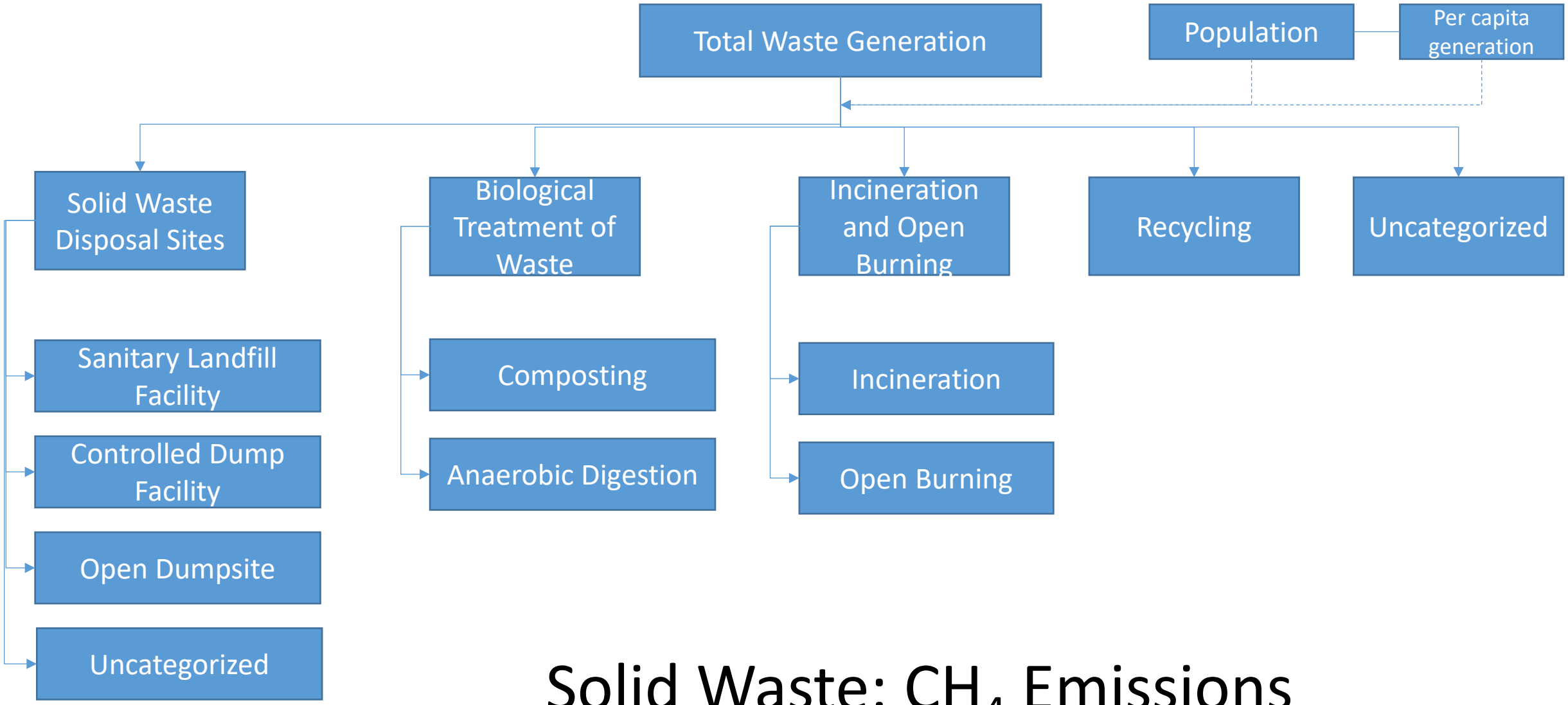
B_o : maximum CH_4 producing capacity, kg CH_4/kg COD

MCF_j : CH_4 correction factor (fraction)

TABLE 6.8
DEFAULT MCF VALUES FOR INDUSTRIAL WASTEWATER

Type of treatment and discharge pathway or system	Comments	MCF [1]	Range
Untreated			
Sea, river and lake discharge	Rivers with high organics loadings may turn anaerobic, however this is not considered here.	0.1	0 – 0.2
Treated			
Aerobic treatment plant	Must be well managed. Some CH_4 can be emitted from settling basins and other pockets.	0	0 – 0.1
Aerobic treatment plant	Not well managed. Overloaded	0.3	0.2 – 0.4
Anaerobic digester for sludge	CH_4 recovery not considered here	0.8	0.8 – 1.0
Anaerobic reactor (e.g., UASB, Fixed Film Reactor)	CH_4 recovery not considered here	0.8	0.8 – 1.0
Anaerobic shallow lagoon	Depth less than 2 metres, use expert judgment	0.2	0 – 0.3
Anaerobic deep lagoon	Depth more than 2 metres	0.8	0.8 – 1.0

[1] Based on expert judgment by lead authors of this section



Solid Waste: CH_4 Emissions

LOCAL GOVERNMENT UNIT-SOLID WASTE MANAGEMENT
SELF-COMPLIANCE MONITORING AND AUDITING REPORT
(LGU-SWM-SCMAR)

CITY/MUNICIPALITY OF _____,
PROVINCE OF _____
REGION _____

(_____Semi-Annual, CY 2016)

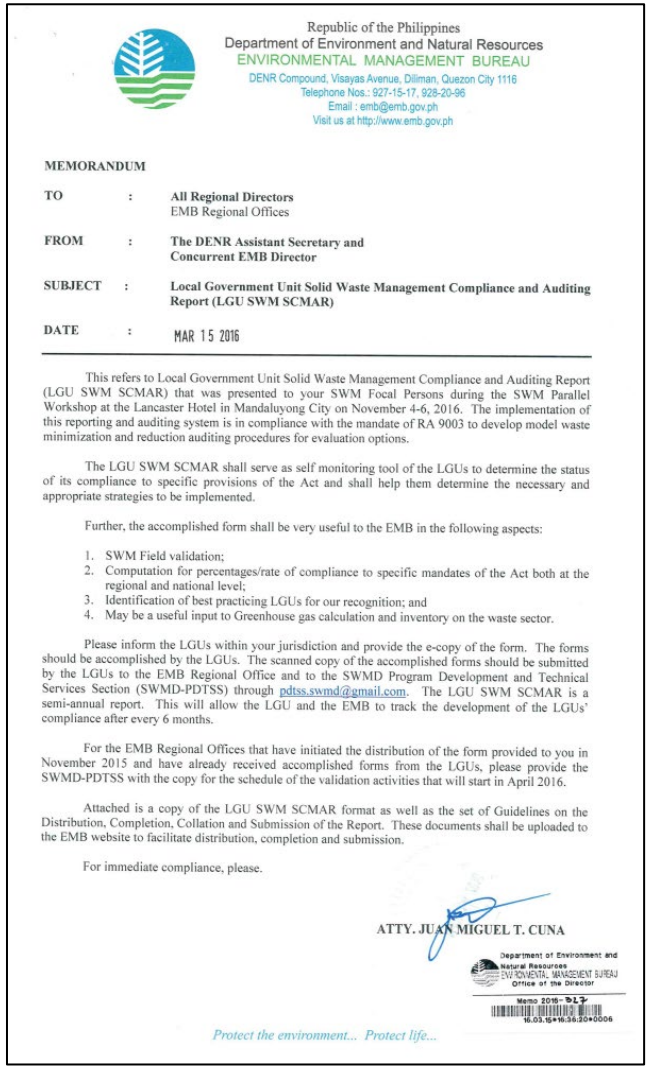
Instructions:

1. This form is to be filled-out and duly signed by the assigned C/MENRO or In-charge SWM for the LGU, and be certified as true and correct by the City or Municipal Mayor or designated alternate.
2. Please supply the information being required.
3. For items with options, put a check mark (✓) on the appropriate box or line; otherwise, provide the value or explanation required.
4. The LGU-SWM SCMAR shall be submitted to the EMB Regional Office through official email address and to the EMB SWMD-Program Development and Technical Services Section through pdtss.swmd@gmail.com
5. The EMB Regional Office is to ensure that all items in this form are satisfactorily filled out.
6. To be submitted every **second week of July** and **second week of January.**

SCMAR

SCMAR Background

- Issued on March 15, 2016
- It was developed in compliance with the mandate of RA 9003 to develop waste minimization and reduction auditing procedures for evaluation process.
- For LGU
  - Self-monitoring tool to determine the status of its compliance to specific provisions of the RA 9003 and help them determine the necessary and appropriate strategies to be implemented.
- For EMB
  - SWM Field validation;
  - Computation for percentage/rate of compliance to specific mandates of the Act both at the regional and national level;
  - Identification of best practicing LGUs for our recognition; and
  - May be a useful input to Greenhouse gas calculations and inventory on the waste sector.



Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Telephone Nos.: 927-15-17, 928-20-96
Email : emb@emb.gov.ph
Visit us at http://www.emb.gov.ph

MEMORANDUM

TO : **All Regional Directors**
EMB Regional Offices

FROM : **The DENR Assistant Secretary and Concurrent EMB Director**

SUBJECT : **Local Government Unit Solid Waste Management Compliance and Auditing Report (LGU SWM SCMAR)**

DATE : MAR 15 2016

This refers to Local Government Unit Solid Waste Management Compliance and Auditing Report (LGU SWM SCMAR) that was presented to your SWM Focal Persons during the SWM Parallel Workshop at the Lancaster Hotel in Mandaluyong City on November 4-6, 2016. The implementation of this reporting and auditing system is in compliance with the mandate of RA 9003 to develop model waste minimization and reduction auditing procedures for evaluation options.

The LGU SWM SCMAR shall serve as self monitoring tool of the LGUs to determine the status of its compliance to specific provisions of the Act and shall help them determine the necessary and appropriate strategies to be implemented.

Further, the accomplished form shall be very useful to the EMB in the following aspects:

1. SWM Field validation;
2. Computation for percentages/rate of compliance to specific mandates of the Act both at the regional and national level;
3. Identification of best practicing LGUs for our recognition; and
4. May be a useful input to Greenhouse gas calculation and inventory on the waste sector.

Please inform the LGUs within your jurisdiction and provide the e-copy of the form. The forms should be accomplished by the LGUs. The scanned copy of the accomplished forms should be submitted by the LGUs to the EMB Regional Office and to the SWMD Program Development and Technical Services Section (SWMD-PDTSS) through pdtss.swmd@gmail.com. The LGU SWM SCMAR is a semi-annual report. This will allow the LGU and the EMB to track the development of the LGUs' compliance after every 6 months.

For the EMB Regional Offices that have initiated the distribution of the form provided to you in November 2015 and have already received accomplished forms from the LGUs, please provide the SWMD-PDTSS with the copy for the schedule of the validation activities that will start in April 2016.

Attached is a copy of the LGU SWM SCMAR format as well as the set of Guidelines on the Distribution, Completion, Collation and Submission of the Report. These documents shall be uploaded to the EMB website to facilitate distribution, completion and submission.

For immediate compliance, please.

ATTY. JUAN MIGUEL T. CUNA

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
Office of the Director

Memo 2016-013

Protect the environment... Protect life...

Enhancement of SCMAR

Through series of workshop and meeting together with the **Department of Interior and Local Government (DILG)** and **Metro Manila Development Authority (MMDA)** and **Climate Change Service of DENR**, as well as the members of the **National Solid Waste Management Commission (NSWMC)**, the LGU-SWM-SMAR was ehanced to respond with the needs of common and harmonized data for the agencies.

SUBMISSION OF SCMAR

The modified LGU-SWM-SCMAR form will serve as the annual monitoring system and shall be accomplished/prepared by the LGU's Environment and Natural Resources Officer (ENRO) or Equivalent Solid Waste Management Officer to be certified by the Local Chief Executive.

LGU shall submit the accomplished form on an annual basis. SCMAR forms covering activities for the year shall be submitted by the end of 1st quarter (March 31) of following assessment year.

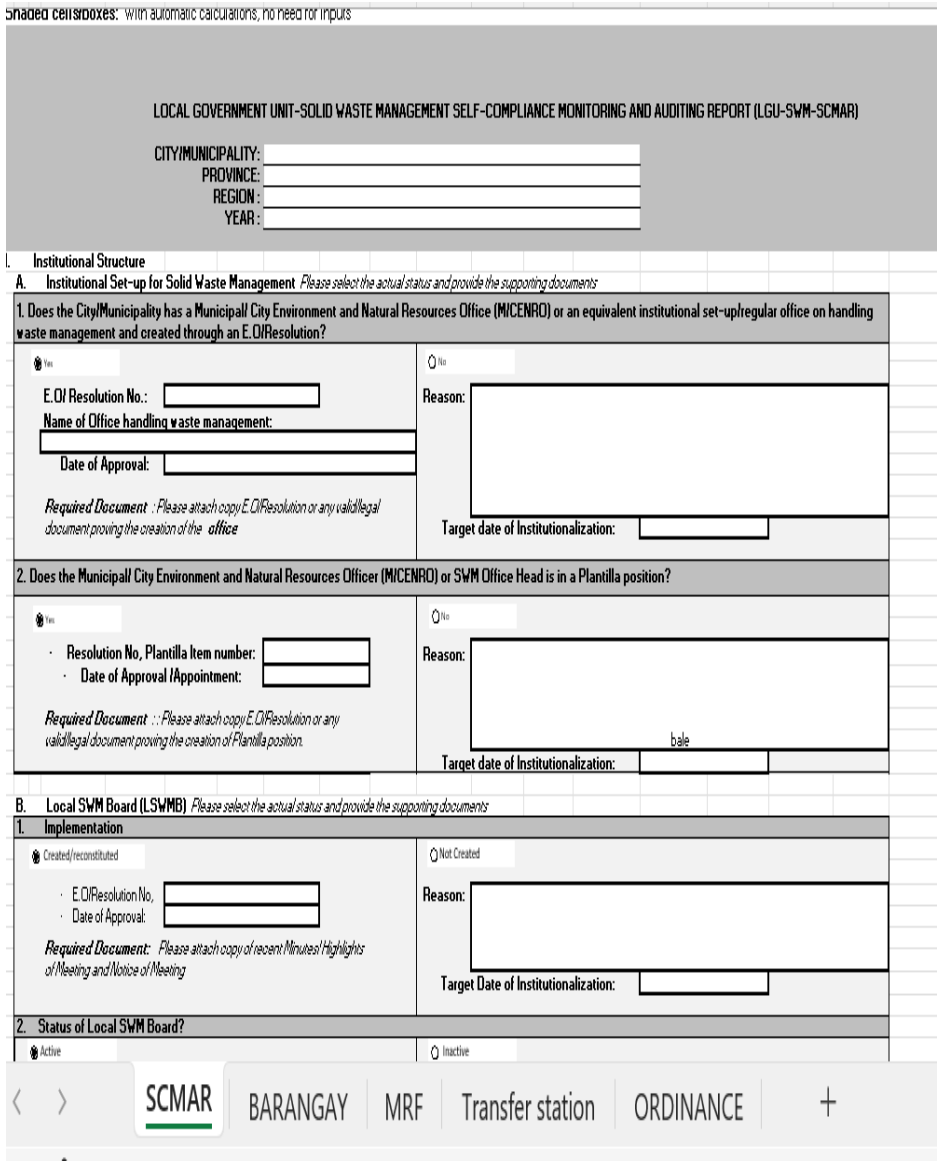
Example: For year 2023 assessment report, the deadline of submission will be on March 31, 2024.

The submission* of SCMAR may done through:

- Printed or hard copies - Submission of the required number of (completed and signed) copies to the EMB RO concerned.
- Electronic submission - E-mail the accomplished report to the EMB RO concerned.
- Online submission **– waiting for the program to complete.**

The EMB RO shall complete the procedural, technical and/or substantive review of the submitted accomplished SCMAR forms within fifteen (15) working days. Absence of actions/communication from the EMB RO concerned within the prescribed period shall be deemed as acceptance of the SCMAR submitted. The EMB RO shall consolidate the forms for submission to EMB CO.

Excel Form



Shaded cells/boxes: With automatic calculations, no need for inputs

LOCAL GOVERNMENT UNIT-SOLID WASTE MANAGEMENT SELF-COMPLIANCE MONITORING AND AUDITING REPORT (LGU-SWM-SCMAR)

CITY/MUNICIPALITY:
PROVINCE:
REGION :
YEAR :

I. Institutional Structure

A. Institutional Set-up for Solid Waste Management *Please select the actual status and provide the supporting documents*

1. Does the City/Municipality has a Municipal/ City Environment and Natural Resources Office (M/CENRO) or an equivalent institutional set-up/regular office on handling waste management and created through an E.O/Resolution?

Yes
E.O/ Resolution No.:
Name of Office handling waste management:
Date of Approval:
Required Document : Please attach copy E.O/Resolution or any valid/legal document proving the creation of the office

No
Reason:
Target date of Institutionalization:

2. Does the Municipal/ City Environment and Natural Resources Officer (M/CENRO) or SWM Office Head is in a Plantilla position?

Yes
- Resolution No, Plantilla Item number:
- Date of Approval /Appointment:

Required Document : : Please attach copy E.O/Resolution or any valid/legal document proving the creation of Plantilla position.

No
Reason:
bale
Target date of Institutionalization:

B. Local SWM Board (LSWMB) *Please select the actual status and provide the supporting documents*

1. Implementation

Created/reconstituted
- E.O/Resolution No,
- Date of Approval:

Required Document: Please attach copy of recent Minutes/ Highlights of Meeting and Notice of Meeting

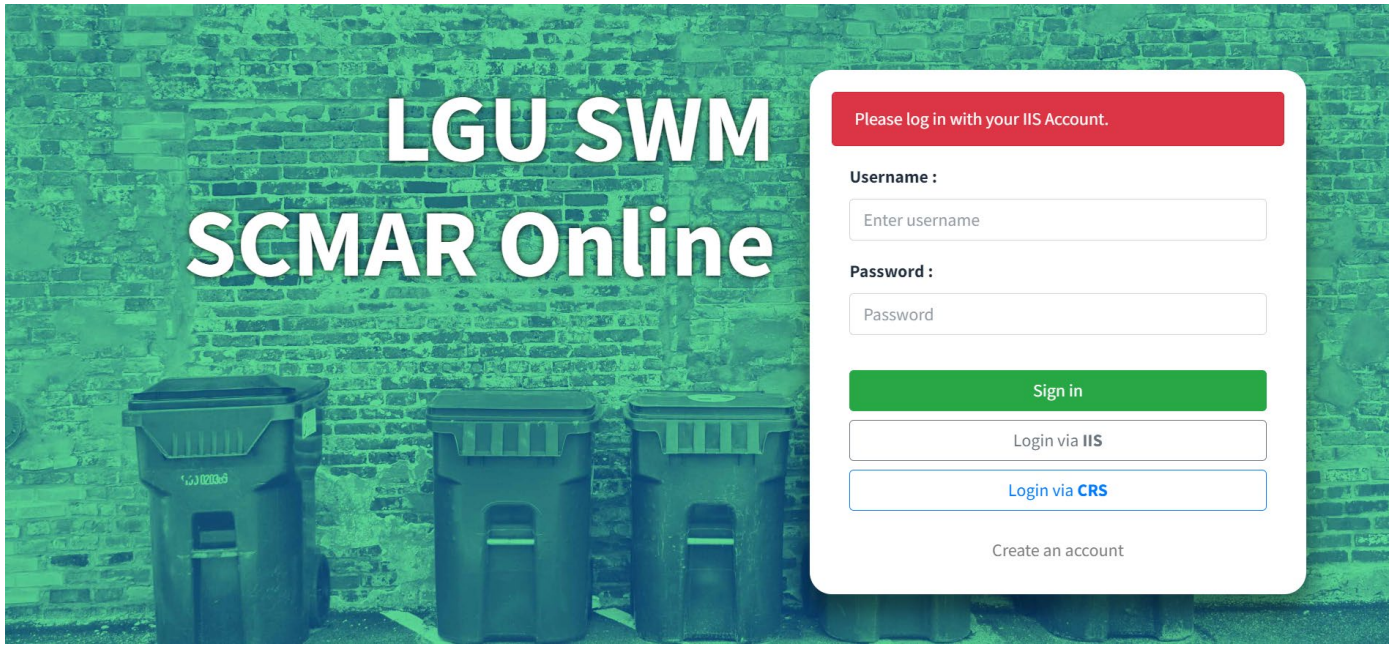
Not Created
Reason:
Target Date of Institutionalization:

2. Status of Local SWM Board?

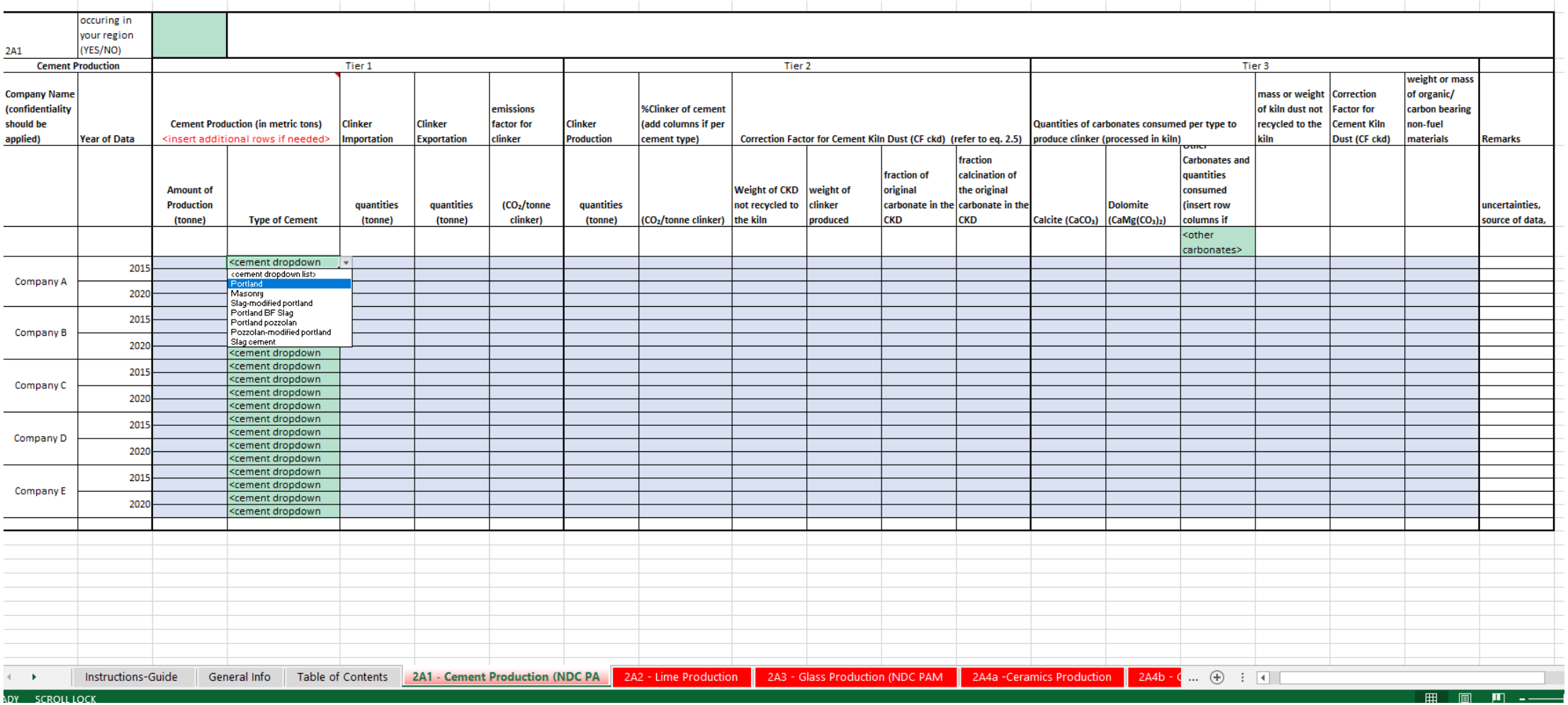
Active
Inactive

SCMAR | BARANGAY | MRF | Transfer station | ORDINANCE | +

Online System



IPPU Data Collection Matrix (Excel)



2A1	occuring in your region (YES/NO)																				
Cement Production		Tier 1					Tier 2							Tier 3							
Company Name (confidentiality should be applied)	Year of Data	Cement Production (in metric tons) <insert additional rows if needed>		Clinker Importation	Clinker Exportation	emissions factor for clinker	Clinker Production	%Clinker of cement (add columns if per cement type)	Correction Factor for Cement Kiln Dust (CF ckd) (refer to eq. 2.5)				Quantities of carbonates consumed per type to produce clinker (processed in kiln)			mass or weight of kiln dust not recycled to the kiln	Correction Factor for Cement Kiln Dust (CF ckd)	weight or mass of organic/ carbon bearing non-fuel materials	Remarks
		Amount of Production (tonne)	Type of Cement	quantities (tonne)	quantities (tonne)	(CO_2/tonne clinker)	quantities (tonne)	(CO_2/tonne clinker)	Weight of CKD not recycled to the kiln	weight of clinker produced	fraction of original carbonate in the CKD	fraction calcination of the original carbonate in the CKD	Calcite ($CaCO_3$)	Dolomite ($CaMg(CO_3)_2$)	Other Carbonates and quantities consumed (insert row columns if <other carbonates>				uncertainties, source of data,
Company A	2015		<cement dropdown																		
	2020																				
Company B	2015																				
	2020		<cement dropdown																		
Company C	2015		<cement dropdown																		
	2020		<cement dropdown																		
Company D	2015		<cement dropdown																		
	2020		<cement dropdown																		
Company E	2015		<cement dropdown																		
	2020		<cement dropdown																		

Wastewater Data Collection Matrix

Region:	Population	
No. of cities/municipalities:	2015	2020
Urban population		
Rural population		

Complete Name of Water Concessionaire/Water Utility with Wastewater Treatment Facility/System 1	
Cities/Municipalities Covered by the Water Utility	
Is the Water Concessionaire/Utility managed by LGU? (Yes or No)	
Is industrial wastewater also discharged in domestic sewers? (Yes, No or N/A)	
Type of Wastewater Treatment (Sewerage or Septage?)	
Specific wastewater treatment technology used [Centralized, aerobic treatment plant (Specify if well-managed or not well managed or overloaded);Anaerobic digester for sludge; Anaerobic reactor; Anaerobic lagoon (Specify if shallow (Depth less than 2 meters) or deep (Depth more than 2 meters), Septic System. If other, please specify]	
Is the Water Concessionaire/Utility managed by LGU? (Yes or No)	
Is industrial wastewater also discharged in domestic sewers? (Yes, No or N/A)	
Details of Contact Person (Complete Name, Position, Email Address and Telephone Number)	

2006 IPCC GL Data Requirements	2015	2020
Total population of the Cities/Municipalities Covered by the Water Utility/Facility		
Population served by the wastewater treatment facility		
Wastewater treated (cu.m/year)		
Total organic loading in wastewater (kg BOD/year)		
Per capita organic loading (kg BOD/capita/year)		
Sludge removed (kg BOD/year)		
Influent BOD (mg/L)		
Effluent BOD (mg/L)		
Amount of Methane Recovered/Flared (kg methane/year)		

	2015	2020

Solidwaste Data Collection Matrix

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	19
Population																																								
Per capita waste generation (metric tons/year)																																							
% by weight of generated municipal solid waste going to Solid Waste																																							
waste delivered to different types of SWDS																																							
- un-managed shallow																																							
- un-managed deep																																							
- managed shallow																																							
- managed deep																																							
- uncategorized																																							
Amount of industrial solid waste generation (metric tons/year)																																							
% by weight of generated industrial solid waste going to SWDS																																							
waste delivered to different types of SWDS																																							
- un-managed shallow																																							
- un-managed deep																																							
- managed shallow																																							
- managed deep																																							
- uncategorized																																							
Composition of waste entering disposal sites, %																																							
- Kitchen waste																																							
- Garden waste																																							
- Agricultural waste																																							
- Livestock waste																																							
- Paper																																							
- Plastics																																							
- Glass																																							
- Metal																																							
- Residual waste																																							
- Hazardous waste																																							
- Healthcare waste																																							
- Bulky waste																																							
Methane recovery at SWDS																																							
Oxidation factor (status of soil or eco-efficient soil cover)																																							

... | Types | **4a Solid Waste Disposal Aggre** | 4b Biological Treatment | 4c1 Incineration | 4c2 Open Bu ...

Composting Facility 2	2015	2020
Amount (tons) waste composted		
Fractions of waste composted		
- Kitchen waste		
- Garden waste		
- Agricultural waste		
- Livestock waste		
- Paper		
- Residual waste		
Other waste composted (e.g. healthcare waste)		

Incineration Facility 1	2015	2020
Amount (tons) waste incinerated		
Fractions of waste incinerated		
- Kitchen waste		
- Garden waste		
- Agricultural waste		
- Livestock waste		
- Paper		
- Plastics		
- Glass		
- Metal		
- Residual waste		
Other waste incinerated		
- Liquid fossil		
- Healthcare		
- Hazardous		

Proposed IPPU and Waste Sector GHG Reporting Template

Draft Template for GHG Accounting and Reporting

Table of Contents

1.A Cement Production

Disclosure Template and Equation

			A	B	C
No.	Type of Cement Produced	Cement Production per Type (tonnes)	Clinker Production (tonnes)	Emission Factor (tonne CO_2/ tonne clinker) (tonne)	CO_2 Emissions (tonne CO_2)
					C = A*B
1					
2					

Guidance for Filling-up the Template and Calculating Emission

1. Indicate the type of cement produced (i.e. Ordinary Portland Cement- Type 1, Blended Cement - Type 1P (Portland-Pozzolan), Type 1L (Portland-Limestone), Type 1T (Ternary Blend) or Masonry Cement – Type M, N, S, if other please specify;
2. In the third column, input the annual cement production for the reporting year in tonnes per type of cement;
3. Provide the clinker production in tonnes per type of cement in the fourth column;
4. In the fifth column, provide plant-specific EF if available, otherwise use the IPCC default value of 0.52 tonne CO_2/tonne clinker;
5. In column 6, input the calculated CO_2 emissions which is the product of clinker production data (A) multiplied with the emission factor (B).

1.B Lime Production

Disclosure Template and Equation

			A	B	C
No.	Name of Plant and Location	Type of Lime Produced	Mass of Lime Produced (tonnes)	Emission Factor (tonne CO_2/ tonne lime) (tonne)	CO_2 Emissions (tonne CO_2)
					C = A*B
1					
2					

Guidance for Filling-up the Template and Calculating Emission

1. Provide the name of the plant and location in the first column;
2. In the second column, indicate the type of lime produced (i.e. High calcium lime, dolomitic lime, hydraulic lime);
3. In the third column, input the annual lime production for the reporting year in tonnes per type of lime;
4. In the fourth column, provide plant-specific EF if available, otherwise use the IPCC default value in tonne CO_2/tonne lime (high calcium=0.75, dolomitic=0.77, hydraulic=0.59);
5. In column 5, input the calculated CO_2 emissions which is the product of lime production data (A) multiplied with the emission factor (B).

1.C Glass Production

Disclosure Template and Equation

			A	B	C	D
No.	Name of Plant and Location	Type of Glass Produced	Total Glass Production (tonne)	Emission Factor (tonne CO_2/ tonne glass)	Average Annual Cullet Ratio (fraction)	CO_2 Emissions (tonne CO_2)
						D = A * B * (1 - C)
1						
2						
3						

Type of Glass and their Emission Factor

Glass Type	Emission Factor (tonne CO_2/ tonne glass)
Float	0.21
Container	0.21
Fiberglass (E-glass)	0.19
Fiberglass (Insulation)	0.25
Speciality (TV Panel)	0.18
Speciality (TV Funnel)	0.13
Speciality (Tableware)	0.10
Speciality (Lab/Pharma)	0.03

Guidance for Filling-up the Template and Calculating Emission

1. Provide the name of the plant and specific location in the first column;
2. In the second column, indicate the type of glass produced (refer to the table above);
3. In the third column, input the annual glass production for the reporting year in tonnes per type;
4. In the fourth column, provide plant-specific EF if available, otherwise use the IPCC default value;
5. In column 5, input the fraction (in decimal) of the average cullet (recycled glass) ratio.
6. In column 6, input the calculated CO_2 emissions which is the product of glass production data (A) multiplied with the emission factor (B) and multiplied with (1 minus C or the cullet ratio).

1.D Other Process Use of Carbonates

Disclosure Template and Equation

				A	B	C
No.	Name of Plant and Location	Type of Use	Type of Carbonate Consumed	Mass of Carbonate Consumed (tonnes)	Emission Factor (tonne CO_2/ tonne carbonate) (tonne)	CO_2 Emissions (tonne CO_2)
						C = A*B
1						
2						

Type of Carbonate and their Emission Factor

Carbonate Type	Emission Factor (tonne CO_2/ tonne carbonate)
Calcite	0.43971
Magnesite	0.52197
Dolomite	0.47732
Siderite	0.37987
Ankerite	0.44197
Rhodochrosite	0.38286
Sodium carbonate	0.41492

Guidance for Filling-up the Template and Calculating Emission

1. Provide the name of the plant and specific location in the first column;
2. In the second column, indicate the type of use of carbonates (ceramics, other use of soda ash, non-metallurgical magnesia production, if others-please specify);
3. In the third column, input the type of carbonate consumed;
4. In the fourth column, input the mass of carbonate consumed for the reporting in tonnes;
5. In the fifth column, input the IPCC default emission factor for the specific type of carbonate based on the table above;
6. In column 6, input the calculated CO_2 emissions which is the product of carbonate consumption data (A) multiplied with the emission factor (B).

2.A Ammonia Production

Disclosure Template and Equation

	A	B	C	D
Name of Plant and Location	Amount of Ammonia Produced (tonne)	Fuel Requirement for Ammonia Production (GJ/tonne ammonia produced)	Carbon Content of Fuel (kg C/GJ)	Carbon Oxidation Factor of Fuel (fraction)

E	F	G	H	I
CO_2 Generated ($kg\ CO_2$)	Amount of Urea Produced (kg)	CO_2 Recovered for Urea Production ($kg\ CO_2$)	CO_2 Emissions ($kg\ CO_2$)	CO_2 Emissions ($t\ CO_2$)
$E = (A * B * C * D) * 44/12$		$G = F * 44/60$	$H = E - G$	$I = H/10^3$

Guidance for Filling-up the Template and Calculating Emission

1. Provide the name of the plant and specific location in the first column;
2. In column A, provide the amount of ammonia produced in tonnes;
3. In column B, input the average fuel requirement in GJ per tonne of ammonia produced;
4. In column C, input the default carbon content factor of the fuel;
5. In column D, input the default carbon oxidation factor of the fuel in fraction;
6. In column E, input the calculated kg CO_2 emissions which is the product column A*B*C*D and the conversion factor of carbon to CO_2 that is 44/12;
7. In column F, provide the amount of Urea produced in kilograms;
8. In column G, input the calculated CO_2 recovered for Urea production which is a production of the amount of Urea produced (F) multiplied by 44/60, that is the stoichiometric ratio of CO2 to urea.
9. In column H, input the CO_2 emissions which is the difference of the CO_2 generated (E) and CO_2 recovered (G);
10. In column I, divide the CO_2 emissions (H) with 1000 to covert kg to tonnes.

3.A Iron and Steel Production

Disclosure Template and Equation

Type of Steelmaking Method, etc	A Amount of Steel or Iron Production (tonne crude steel produced, pig iron, DRI, sinter or pellet)	B Emission Factor (IPCC Default) (tonne CO_2/tonne production)	C CO_2 Emissions (tonne CO_2)
			C = A * B
Basic Oxygen Furnace		1.46	
Electric Arc Furnace		0.08	
Open Hearth Furnace		1.72	
Pig Iron Production (not converted into steel)		1.35	
Direct Reduced Iron (DRI) Production		0.7	
Sinter Production		0.2	
Pellet Production		0.03	
TOTAL			

Guide for Filling-up the Template and Calculating Emission:

1. Identify the production processes in your facility, i.e., Pig Iron Production, Steel Production (BOF), or Steel Production (EAF).
2. Collect the annual production volumes for each process in metric tons. This information can typically be obtained from your facility's production records or management reports.
3. For Tier 1 reporting, use the provided IPCC default emission factors. For Tier 2 reporting, use country or plant-specific emission factors.
4. Calculate emissions (CO2e) by multiplying the production volume by the corresponding emission factor for each process.

Challenges/Needs on GHG Reporting

- Lack of data and information for accurate GHG estimation and mitigation analysis.
- Lack of understanding on the cost and benefits on use of wastewater treatment technologies with methane recovery.
- A feasibility study is needed to look at the viability of utilizing the appropriate methane recovery technology in industries discharging high-COD wastewater.
- Technology demonstration may also be needed.
- Institutionalization of GHG reporting and tracking of mitigation implementation.

Way Forward

- Pilot testing of the draft GHG reporting template
- Harmonized government policies and guidelines and alignment of the private sector
- Conduct of training and capacity building activities
- Establishment of an incentive mechanism on GHG accounting and reporting

Thank you