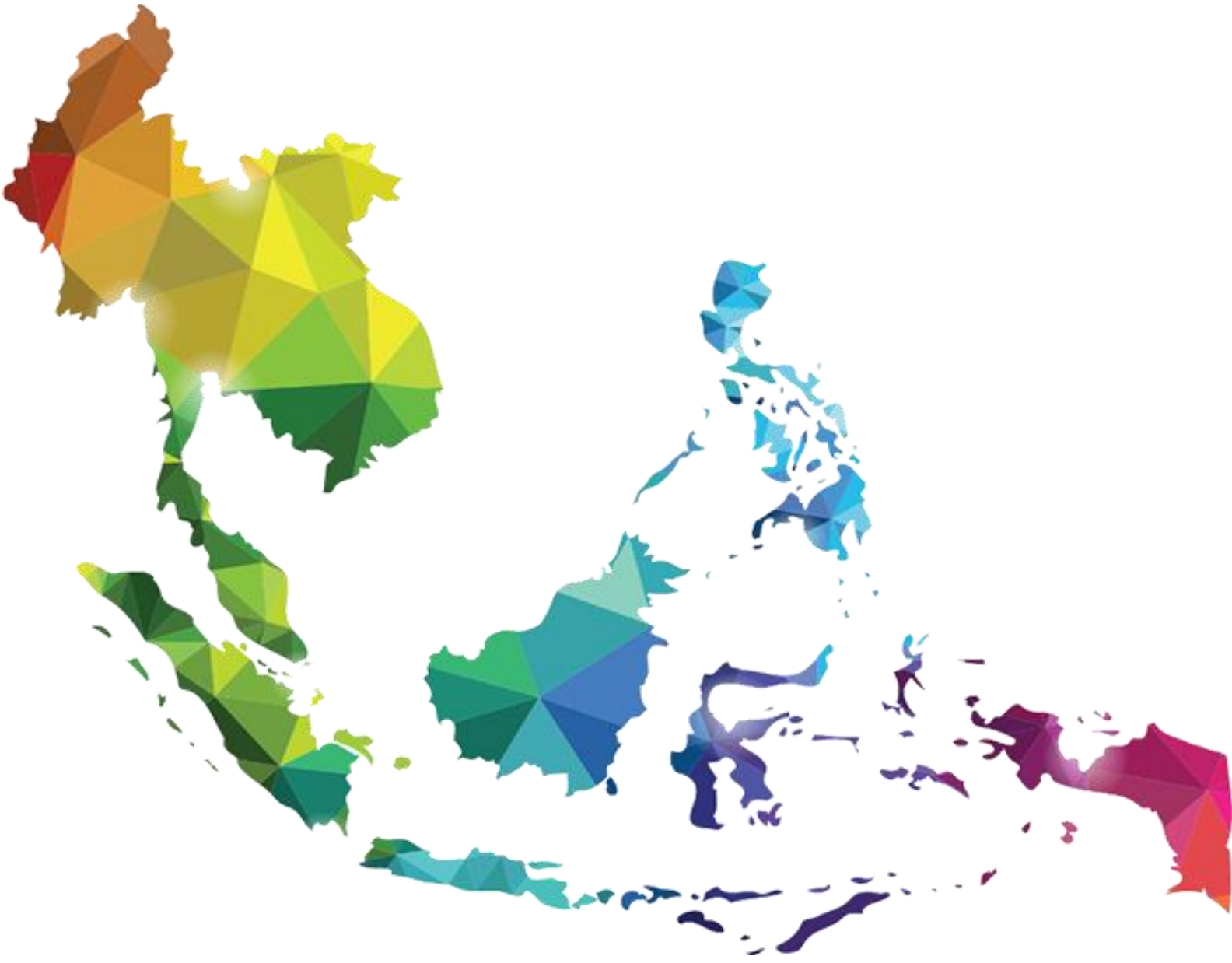
Road Map for Designing Facility Level GHG M&R Guideline for ASEAN Region



Road Map for Designing Facility Level GHG M&R guideline for ASEAN region

Association for Southeast Asian Nations

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Partnership to Strengthen Transparency for co-Innovations

Partnership to Strengthen Transparency for co- Innovation - PaSTI- JAIF

Implemented by Overseas Environmental Cooperation Center (OECC)

Development and implementation of facility level Monitoring and Reporting systems for Greenhouse Gas (GHG) emissions in ASEAN Member States (AMS)

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Acknowledgement

Establishment of a robust measurement, reporting and verification (MRV) approach to account for GHG emissions is vital in order: a.) to meet the international reporting requirements under Article 6 of the Paris agreement; b) to build mutual trust and confidence; c.) to promote effective implementation; and d.) to enhance the transparency. However, ASEAN Member States (AMS) were found to be at different levels from non-existent to fully implement on development of facility level MRVs.

Therefore, to be in line with the spirit of Article 6 of the Paris Agreement, AMS is willing to develop and implement robust MRV approaches to account for facility-level GHG emissions. This project addresses the urgent need of the AMS to develop measurement and reporting (M&R) guideline/approaches by focusing on the engagement at facility level.

With this background, Climate Smart Initiatives (Pvt) Ltd (ClimateSI) entered into a contract with Overseas Environmental Cooperation Center (OECC), Japan on 26th September 2019, to provide technical assistance for the development of a road map for a regional facility level M&R guideline. This contract was signed between OECC and ClimateSI with the support from PaSTI-JAIF.

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Climate Smart Initiatives (Pvt) Ltd.

Glossary of Terms

Measure or monitor (M)[1]	Data and information on emissions, mitigation actions, and support. This may entail direct physical measurement of GHG emissions, estimating emissions or emissions reductions utilizing activity data and emission factors, calculating changes relevant to sustainable development, and collecting information about support for climate change mitigation
Report (R)[1]	By compiling this information in inventories and other standardized formats to make it accessible to a range of users and facilitate public disclosure of information
Verify (V)[1]	By periodically subjecting the reported information to some form of review or analysis or independent assessment to establish completeness and reliability. Verification helps to ensure accuracy and conformance with any established procedures, and can provide meaningful feedback for future improvement
Facility level MRV[1]	Involves assessing total GHG emissions and removals from all sources within a single facility (e.g., power plant, factory, or waste disposal site), as opposed to an entire organization, to produce a facility-level inventory
Direct emissions[2]	GHG emissions from GHG sources owned or controlled by the organization

[1]https://www.wri.org/publication/mrv-101-understanding-measurement-reporting-and-verification-climate-change-mitigation
[2] ISO 14064-1, 2018

Indirect emissions[2]	GHG emissions that are consequences of an organization's operations and activities, but that arise from GHG sources that are not owned or controlled by the organization. These emissions occur generally in the upstream and/or downstream of supply chain
Energy Industry[3]	In energy industries, fossil fuels are both raw materials for the conversion processes, and sources of energy to run these processes. The energy industry comprises three kinds of activities: 1 Primary fuel production (e.g. coal mining and oil and gas extraction); 2 Conversion to secondary or tertiary fossil fuels (e.g. crude oil to petroleum products in refineries, coal to coke and coke oven gas in coke ovens); 3 Conversion to non-fossil energy vectors (e.g. from fossil fuel into electricity and/or heat) Emissions from combustion during production and conversion processes are counted under energy industries.
IPPU[4]	Covers greenhouse gas emissions occurring from industrial processes, from the use of greenhouse gases in products, and from non-energy uses of fossil fuel carbon. (IPCC, 2006b)

[3]https://www.ipcc nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

[4] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_1_Ch1_Introduction.pdf

Summary

This report provides a road map to develop a facility level GHG Measurement and Reporting (M&R) Guideline for the ASEAN Member States. Process of developing the M&R guideline consists four main sections: Sector prioritization, Planning, Designing an M&R guideline; and Piloting.

Country visits were conducted with the aim of identifying the GHG Measuring and Reporting status of the AMS. As a result of the discussions held with respective ministries, private sector entities, national and sector experts data were collected on the GHG emissions of the country. Further, detailed discussions were held to understand the M&R process followed for preparing the national communications. Moreover, discussions were directed to understand the country experience on M&R. As such, details on existing and proposed M&R systems, availability of legal mandates and the country preference on a sector/sub sector to establish a facility level M&R system were collected. Gathered data were processed using the Analytic Hierarchy Process (AHP) method. As per the results, Energy Industry, which is a sub sector of the Energy sector, will be prioritized for developing the M&R system. Chapter 2 of this report summarizes the prioritization process while detailed analysis is given in the *sector & sub sector prioritization* report.

Major barrier to harmonize the available M&R systems within the respective countries and also in the ASEAN region is that, facilities are in different level in understanding on the particular subject. Further, status of experience on M&R systems range from non-existing to implementation of online M&R systems. To bridge this gap, it is important to define the facility and agree on the scope and Greenhouse Gases to be covered at the very beginning of the project. Chapter 3 of this report details the road map to achieve this target.

Designing of the M&R system will be discussed under two main sub sectors which are Measuring and Reporting.

It is important to agree on a methodology to measure the GHG emissions of a facility, so that results are comparable with similar facilities within the country and the region. Currently facilities of the respective countries follow different methodologies. As such, this section provides a pathway to agree on common methodology to be used for the

proposed M&R system. Once methodology is selected, emission sources to be considered and parameters to be measured will be decided. The emission sources and respective parameters attributed to each facility will be discussed in accordance with the selected methodology. Quality of the activity data and also the emission factor will define the quality of the results generated. Therefore, depending on the tier that stakeholders decide to use for the M&R system, they need to either develop or adopt a set of emission factors. The process to follow, to achieve this target is also discussed under the Chapter 04 of this report.

Quality of the data that received for the National Communication will be improved as one of the major outcomes of this M&R system. Therefore, it is essential to establish a proper Data Management System (DMS). Development of a comprehensive DMS, indicating What, Who, How and When to be measured and reported, will be discussed under this chapter. Detailing the reporting, this section will discuss on how to agree on a reporting structure by taking into account all the available standards, and practices of the respective countries.

Study includes ten different countries which are at different levels in terms of knowledge, financial ability, etc. Therefore, testing the guideline to understand the level of practicality of the document is important to achieve the objective of this project. Final chapter of this document will draw the road map on how to test the guideline in selected countries.

Each chapter consists five sections namely, methodology, stakeholder engagement, timeline and outcome for the ease of reference.

1 Introduction

In December 2015, the Paris Agreement introduced harmonized greenhouse gas (GHG) measurement, reporting and verification (MRV) provisions for climate change mitigation, with the objective of improving the transparency of mitigation actions conducted by member countries (UNFCC, 2015). MRVs are intended to improve the efficiency of implementing Nationally Determined Contributions (NDCs), which describe the countries' mitigation goals and policies.

Measurement is needed: a) to identify emission trends; b) determine where to focus GHG reduction efforts; c) track mitigation-related support; d) assess whether mitigation actions planned under NDCs or otherwise are proving effective; e) evaluate the impact of support received; and f) monitor progress achieved in reducing emissions.

Reporting and verification are important for ensuring transparency, good governance, accountability, credibility of results, and for building confidence that resources are being utilized effectively.

There are three type of MRVs: a) MRV of GHG emissions; b) MRV of mitigation actions; and c) MRV of support (WRI, 2016).

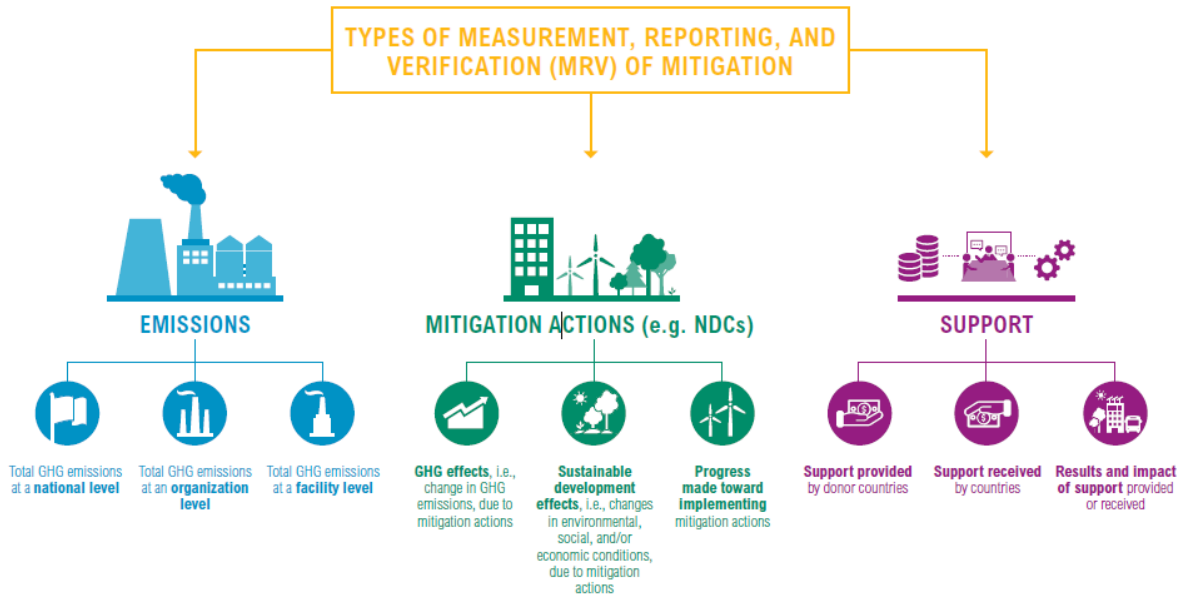


Figure 1 Mitigation related MRV types

Source: World Resource Institute, 2016

MRV of GHG emissions

This MRV is conducted at national, organizational, and/or facility level to understand an entity's emission profile and report it in the form of an emissions inventory.

MRV of mitigation actions

This is to assess the GHG effects and sustainable development (non-GHG) effects of mitigation activities, as well as to monitor the progress of their implementation. This type of MRV focuses on estimating the change in GHG emissions or other non-GHG variables such as achievement of SDGs, through actions (e.g., policies and projects).

MRV of support

This MRV is intended to track the provision and receipt of climate support, monitor results achieved, and assess the impact (e.g., climate finance, technology transfer, and capacity building).

Main Objective

Many countries have engaged in MRV to serve a variety of domestic and international purposes. This study will support ASEAN Member States (AMS) to design a road map in order to develop facility level GHG M&R guideline for the selected sectors in AMS.

Benefits of a regional Facility Level M&R Guideline

- Enhance the comparability and transparency of GHG M&R at facility level
- Improve the data management system of the National Communication
- Serve as an enabler for establishment of a regional carbon market
- Enable to identify the high GHG emitters of the region

2 Selection of priority sectors

The aim of this section is to prioritize main sectors and sub sectors to develop a facility level M&R guideline. One of the Multi Criteria Decision Making methods, Analytic Hierarchy Process (AHP), is applied for prioritizing and selecting sectors listed under sub section 2.1. Sub Sector prioritization is described under section 2.2.

2.1 Identification of priority sectors

Prioritized sectors will be selected from Energy, Agriculture, Waste and IPPU sectors which make a significant contribution to national GHG emissions in AMS. As shown in Table 2-1, five criteria were selected based on the GHG emissions of the sectors and the experiences on GHG M&R systems in the countries.

Table 2-1: Prioritization criteria for sectors

No.	Criteria	Marks	Weight
1	Sectors which cover more than 20% of country 's total GHG emissions	20	14%
2	Country's preferred sector/sectors indicated during country visit	20	37%
3	Sectors which have any legal mandate to implement a M&R system	20	8%
4	Sectors with existing M&R system	20	27%
5	Sectors for which M&R system is under consideration	20	15%
	Total	**100**	**100%**

Following steps were followed for the prioritization of sectors:

Step 1 - Assign weights for selected criteria using Analytic Hierarchy Process (AHP) and weights are calculated according to the potential impact of the criteria in the development of facility-level M&R system

Step 2 - Assign 20 marks for each criterion

Step 3 – Apply the criteria for each sector

Step 4 - Consider the highest scored sectors as the prioritized sectors

Table 2-2: Summary table of sector prioritization

No.	Criteria	Marks	Weight value	Energy	Agriculture	Waste	IPPU
1	Sectors which cover more than 20% of country 's total GHG emissions	20	14%	12.90	7.10	0	0
2	Country's preferred sector/sectors indicated during country visit	20	37%	10.6	-	0.4	9.0
3	Sectors which have any legal mandate to implement a M&R system	20	8%	8	-	-	12
4	Sectors with existing M&R system	20	27%	10	-	-	10
5	Sectors for which M&R system is under consideration	20	15%	10	-	-	10
	Total			**52 %**	**5 %**	**1 %**	**42 %**

Energy sector has the highest priority to develop a facility level M&R guideline given the fact that it has the highest score based on the AHP assessment (52%), which is followed by IPPU (42%).

2.2 Identification of priority sub-sectors

Prioritized sub-sectors will be selected from prioritized sectors (Energy and IPPU) under sub chapter 2.1. As shown in Table 2-3, five criteria were selected based on the GHG emissions of the sectors and the experiences on GHG M&R systems in the countries.

Table 2-3: Prioritization criteria for subsectors

No.	Criteria	Marks	Weight
1	Sub sector emission percentages from total country emission	20	25%
2	Country's preferred subsectors indicated during country visit	20	25%

3	Sub sectors which have any legal mandate to implement a M&R	20	25%
4	Sub Sectors with existing M&R system	20	15%
5	Sub-sectors for which M&R system is under consideration	20	10%
	Total	**100**	**100%**

Step 1 - Assign weights for selected criteria using Analytic Hierarchy Process (AHP).

Step 2 - Assign 20 marks for each criterion

Step 3 – Apply the criteria for each sector

Step 4 - Consider the highest scored sectors as the prioritized sectors

Energy industry[5] has the highest priority to develop a facility level M&R guideline given the fact that it has the highest score based on the AHP assessment (24.4%), which is followed by Mineral products (cement, 17.4%) and manufacturing industry (16.6%).

Please refer sector and sub sector prioritization report for more details.

[5] Only considered the conversion of fossil fuel in to non-fossil energy vectors (from fossil fuel into electricity)

Table 2-4: Summary of sub-sector prioritization

No.	Criteria	Marks	Weight value	Energy					IPPU			
				Fuel combustion				Fugitive fuel emissions	Mineral products	Chemical industry	Metal production	Other
				Energy Industries[5]	Manufacturing industries and construction	Transport	Other sectors					
1	Sub sector emission percentages from total country emission	20	25%	7.69	3.69	4.23	1.50	1.50	1.05	0.16	0.09	0.08
2	Country's preferred subsectors indicated during country visit	20	25%	8.52	2.16	1.48	-	1.14	5.68	-	1.02	-
3	Sub sectors which have any legal mandate to implement a M&R	20	25%	2.50	5.00	-	2.50	-	2.50	2.50	2.50	2.50
4	Sub Sectors with existing M&R system	20	15%	2.86	2.86	-	1.43	-	4.29	2.86	2.86	2.86
5	Sub-sectors for which M&R system is under consideration	20	10%	1.82	1.82	3.64	1.82	1.82	1.82	1.82	3.64	1.82
	Total	**100**		**27%**	**14%**	**8%**	**5%**	**4%**	**19%**	**6%**	**9%**	**6%**

3 Planning

3.1 Define the facility

Methodology:

- Take a stock of definitions for "facility" in the context of the quantification of GHG emissions.
- Define the 'facility' of the selected sector using the available definitions and the requirements of the AMS.
- Agree on a definition with the AMS

Box 1, gives a sample stock of definitions for the term "facility" which are given by different MRV systems, International standards and organizations.

Box 1: Sample stock of definitions for the term "facility"

GHG standard or programme	Definition of facility
Carbon Tax in Singapore[6]	A business facility is a single site at which any business activity is carried out. In this Act, "business activity" means any activity or series of activities (including ancillary activities) that involves the emission of greenhouse gas; and that forms a single undertaking or enterprise, having regard to any circumstances prescribed.
Greenhouse Gas Reporting Program under EPA in USA[7]	Physical property, plant, building, structure, source, or stationary equipment, on contiguous or adjacent properties; in actual physical contact or separated solely by public roadway or other public right of way; and under common ownership or common control

[6] https://sso.agc.gov.sg/Acts-Supp/23-2018/Published/20180601?DocDate=20180601
[7] https://www.epa.gov/sites/production/files/2015-07/documents/part-98-training-complete.pdf

National Greenhouse and Energy Reporting in Australia[8]	A facility is an activity, or a series of activities (including ancillary activities) that: - involve the production of greenhouse gas emissions, the production of energy or the consumption of energy, and - form a single undertaking or enterprise and meet the requirements of the regulations.
ISO 14064-1:2018	Single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process
The Greenhouse Gas Reporting Program in Canada[9]	Facility means an integrated facility, a pipeline transportation system, or an offshore installation. • Integrated Facility: All buildings, equipment, structures, on-site transportation machinery and stationary items that are located on a single site, on multiple sites or between multiple sites that are owned or operated by the same person or persons and that function as a single integrated site. Integrated facility excludes public roads. • Pipeline transportation system: All pipelines that are owned or operated by the same person within a province or territory that transport/ distribute CO_2 or processed natural gas and their associated installations, including meter sets and storage installations but excluding straddle plants or other processing installations. • Offshore installation: An offshore drilling unit, production platform or ship, or sub-sea installation that is attached or anchored to the continental shelf of Canada in connection with the exploitation of oil or natural gas.
World Resource Institute[10]	involves assessing total GHG emissions and removals from all sources within a single facility (e.g., power plant, factory, or waste disposal site), as opposed to an entire organization, to produce a facility-level inventory.

[8] http://www.cleanenergyregulator.gov.au/NGER/Reporting-cycle/Assess-your-obligations/Facilities-and-operational-control

[9] http://publications.gc.ca/collections/collection_2019/eccc/En81-29-2018-eng.pdf

[10] Source-WRI: https://www.transparency-partnership.net/sites/default/files/mrv_101_0.pdf

Stakeholder Engagement:

- Step 1: The proposed definition for "facility" will be shared via e-mails with AMS focal points to get their endorsement.
- Step 2: If all AMS focal points endorsed it without any concerns, then the proposed definition will be used in the development of a facility level GHG M&R guideline for ASEAN. In case, some AMS focal points do not respond within 2 weeks of the circulation of the e-mail, it will be considered that the AMS focal points do not have any objection to the proposed definition.
- Step 3: In case, AMS focal points have some concerns, those concerns will be discussed multilaterally or bilaterally, and then agree on a mutually agreeable definition. Once agreed, it will be circulated among AMS focal points again for approval. Then, step 2 will be followed again.
- Step 4: In the case of inability to agree on one definition, multilateral stakeholder consultations will be held with all AMS focal points to reach a final agreement on the definition.
- During this process, AMS focal points will be reached via e-mail, telephones, in-person meetings, workshops, etc. as appropriate.

Time line:

- Within a period of 4 weeks upon beginning of the project. Please see the work plan for more details (Annex I).

Outcome:

- A common definition for the "Facility" with the approval of all AMS

3.2 Scope of GHG emissions

Methodology:

- Take a stock on the scope of national communications (NCs), biennial update reports (BURs), biennial transparency reports (BTRs) submitted by AMS to the UNFCCC.
- Assess the scope of emissions measured by each selected facility.
- List down the uses and users of the M&R guideline from each AMS
- Agree on the scope of GHG emissions that a facility needs to consider: i.e Direct emissions only, Indirect emissions only, both direct and indirect emissions

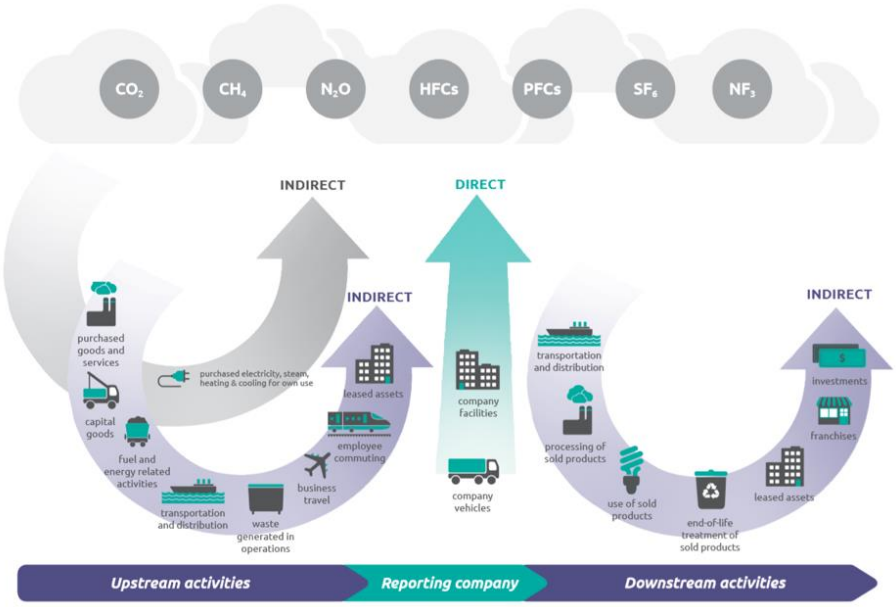


Figure 2 Direct and indirect emission sources

Stakeholder Engagement

- It is important to engage all the government and private sector stakeholders such as state sector members from Ministry of Energy, Ministry of Environment, Ministry of Industries, experts from industries/private companies, members from PaSTI-JAIF, and project consultants in deciding the scope of the GHG emissions.
- This can be achieved through stakeholder consultation workshops, in-country investigations, conference calls with all focal points of the AMS, through emails etc.

Time Line: Within 6 weeks. Please see the work plan for more details (Annex I).

Outcome: Identified scope for the quantification of emissions for the sector.

3.3 GHGs covered

Methodology:

- Check for the GHGs covered under the national GHG inventory of each AMS for the selected sector

Box 2: A list of GHGs

Carbon dioxide (CO_2)

Methane (CH_4)

Nitrous Oxide (N_2O)

Hydrofluorocarbons (HFCs)

Perfluorocarbons (PFCs)

Sulphur hexafluoride (SF_6)

Nitrogen trifluoride (NF_3)

- Agree on a common set of GHGs to be quantified and reported

Stakeholder Engagement

- It is important to get all the government and private sector stakeholders such as state sector members from Ministry of Energy, Ministry of Environment, Ministry of Industries, experts from industries/ private companies, MRV experts, UNFCCC focal points, members from PaSTI JAIF, project consultants in deciding the GHGs to be covered.
- There can be differences of the GHGs covered between national GHG Inventory and facility level GHG measurements in each AMS. Thus, there should be an agreement between all AMS on the GHGs to be covered under the proposed M&R guideline.
- This can be done through stakeholder consultation workshops, in-country investigations, conference calls with all focal points of the AMS and emails etc.

Time Line: Within 6 weeks. Please see the work plan for more details (Annex I).

Outcome: Common agreement on GHGs that would be covered under the M&R system

4 Design GHG Measurement and Reporting (M&R) system

4.1 Measurement of Facility Level GHG Emissions

4.1.1 Selecting Methodologies for emissions quantification

Methodology:

- Take a stock of the methodologies which the facilities and AMS are familiar with
- Compare the internationally available methodologies such as IPCC, GHG protocol, CDM, JICA, etc. to quantify the attributed GHG emissions of the facilities (Annex 4)
- Select and agree on the most appropriate methodology to quantify facility level GHG emissions

Stakeholder Engagement:

- Government and Private sector stakeholders such as state sector members from Ministry of Energy, Ministry of Environment, Ministry of Industries, MRV experts, sector experts from industries/ private companies, members from PaSTI-JAIF, and project consultants should be engaged in selecting the methodology.
- Input from the state sector organizations who involved in preparing National GHG Inventory and the facility level MRVs is important.
- This can be done either in the stakeholder consultation workshop, In-country investigations, through conference calls with all focal points of the AMS or through emails etc.

Time line: Within 2 weeks upon the completion of planning stage. Please see the work plan for more details (Annex I).

Outcome: A methodology to quantify the GHG emissions of facilities of the selected sector.

4.1.2 Sources of emissions

Methodology:

- Identify emission sources in each type of facility
- List the emission sources that are considered for the preparation of National Communication and existing facility level GHG assessment.
- Prioritize the emission sources that need to be reported, based on the scope (direct, indirect), emission intensity, data availability, requirement of the country, etc.
- Based on the gathered data, prepare a list of emission sources attributed to each type of facility
- Communicate the list of emission sources among the stakeholders and agree on them

Box 3: Example of emission source at diesel power plant

Sector: Energy
Sub sector: Energy Industry
Facility type: Diesel power plant
Emission sources (Direct): Generators

Stakeholder engagement:

- Government and Private sector stakeholders such as State sector members from Ministry of Environment, Ministry of Energy, Ministry of Industries, national experts, sector experts from industries/private companies, Members from PaSTI-JAIF, and project consultants should be engaged in deciding the emission sources for the sector.
- This can be done through in plant investigations upon the agreement of AMS and facility, stakeholder consultation workshops, conference calls, etc.

Time line: Within period of 14 weeks upon the selection of a methodology. Please see the work plan for more details (Annex I).

Outcome: Agreed list of emission sources for each type of facility

4.1.3 Parameter identification

Methodology:

- List down the parameters that are required to be measured from each source according to the selected methodology
- Consolidate the data collection templates prepared by the government entities/ private sector to collect data for those parameters
- If data collection templates are available, adopt them with minimal changes
- If data collection templates are not available, prepare data collection templates in accordance with the selected methodology
- Select most appropriate parameters to be measured, considering the factors such as availability of data, access to the data, and accuracy of the data.
  - Option 1:
    - Prepare data collection templates indicating all sort of data that need to be collected. Provide different approaches to collect the data.
    - Distribute them among the potential reporting entities.
    - Collect feedback on availability and feasibility of reporting those data. (i.e five parameters out of ten) and also the preferred approach of collecting them.
  - Option 2: If the option 1 helps to collect less 50% of the required data, different data collection approach need to be considered (i.e regional default data)
- Agree on the parameters to be used in the M&R guideline
- Prepare procedures, including all the data collection templates required for a type of facility.
- Prepare a protocol, including the monitoring plan, monitoring methodology, parameter and procedure and the organization structure with the M&R specific responsibilities and agree on them.

Stakeholder Engagement:

- Government and Private sector stakeholders such as State sector members from Ministry of Environment, Ministry of Energy, Ministry of Industries, national experts, sector experts from industries/private companies, Members from PaSTI-

JAIF, and project consultants should be engaged in deciding the emission sources for the sector.

- Opinions of the MRV experts, sector experts and officers participated in the preparation of National Communication are very important.
- This can be done either in the stakeholder consultation workshop, In-country investigations, through conference calls with all focal points of the AMS or through emails etc.

Time Line: Within 14 weeks upon the selection of a methodology. Please see the work plan for more details (Annex I).

Outcomes:

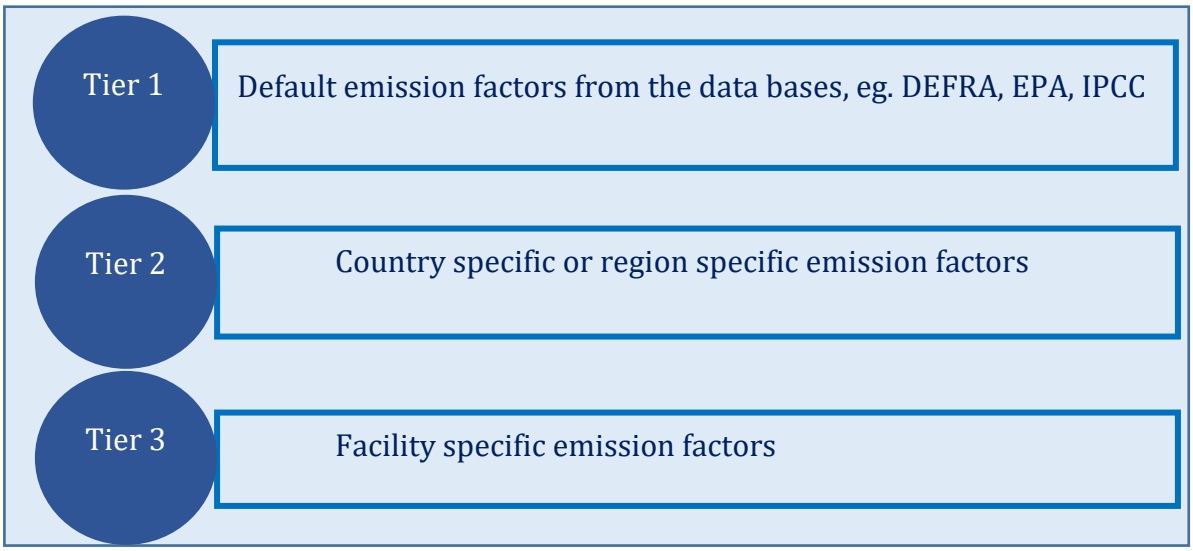
- Set of parameters that are required to be measured from each type of facility
- Procedures /Data collection template for each type of facility
- Protocol

4.1.4 Emission factors

Methodology:

- Prepare a list of data bases available (regional/global) on emission factors
- Identify the sources of the emission factors used for the preparation of National Communication and existing GHG MRV system.
- Identify the sources of the emission factors use by the respective facilities
- Develop a tier system indicating the different approaches that can be used to quantify the emissions

Box 4: Illustration of possible tier system



- Prioritize and agree on a tier system to be used
    - Option 1: Prepare a set of emission factors based on facility level data
    - Option 2: Prepare/adopt emission factors for the region
    - Option 3: Agree on a common data base (IPCC, DEFRA, etc.) and modify the data set only including the factors relevant to the selected sector

Stakeholder Engagement:

- Government and Private sector stakeholders such as state sector members from Ministry of Environment, Ministry of Energy, Ministry of Industries, national experts, sector experts from industries/private companies, members from PaSTI-JAIF, and project consultants should be engaged in deciding the emission sources of the facilities.
- Opinions of the MRV experts, sector experts and officers participated in the preparation of National Communication are very important. Especially from the countries which use country specific or facility specific emission factors for the measurements.
- This can be done either in the stakeholder consultation workshop, In-country investigations, through conference calls or e-mails with all focal points of the AMS.

Time line: Within period of 8 weeks upon the completion of planning stage. Please see the work plan for more details (Annex I).

Outcomes: Agreed source/set of emission factors

4.2 Reporting

In the process of reporting, GHG emissions data shall report from facilities to the common M&R platform. Reporting shall be complete, consistent, accurate, relevant, transparent and planned in accordance with the previously agreed reporting guidelines.

Methodology:

4.2.1 Data Management System

- Take a stock of the data management systems of the existing MRVs such as National Communications, BURs, NAMA, Facility level carbon footprints
- Adopt existing data management systems with minimum changes and agree on them with the stakeholders

  Box 5 provides the components that shall include in the proposed data management system

4.2.2 Structure of the report

- Take a stock of the available standards for the reporting (i.e. ISO 14064, GHG protocol, etc.)
- Assess the reporting structure of the national communications (UNFCCC guidelines)
- Develop a reporting structure by integrating the component of the available reports, standards and the requirements of the AMS
- Agree on the developed reporting structure

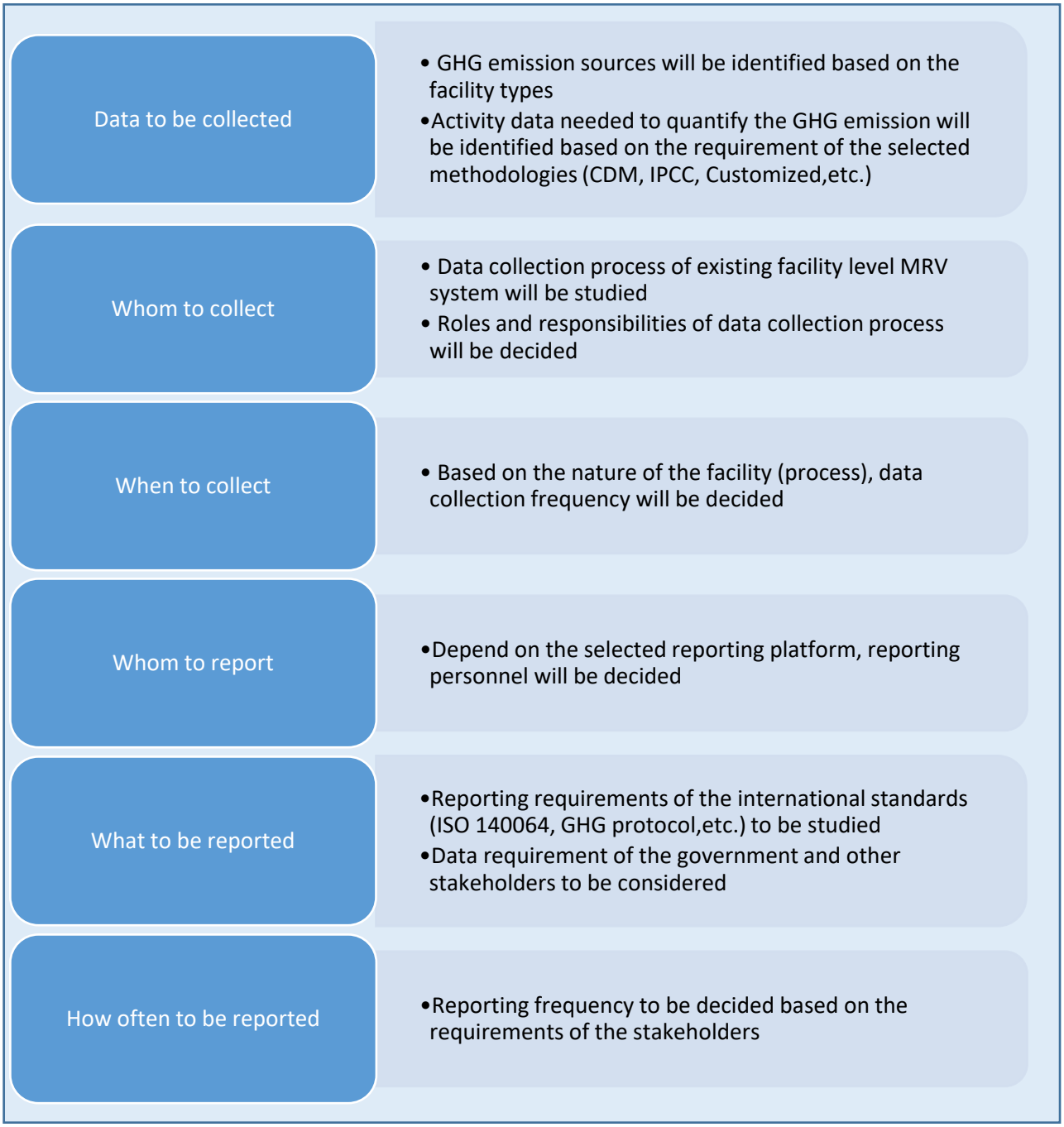
Box 6 provides the structure of the report according to the ISO 14064

4.2.3 Data sharing agreement

- Take a stock of the available data sharing/transfer agreements of CDM, JCM, VERRA, GCF, Gold standard, etc.
- Take a stock of nationally available data sharing/transfer agreements
- Assess the available agreements
- Recommend an agreement from the stock to adopt for the M&R system[11]

[11] Development of new data sharing agreement is not within the scope of this project

Box 5: Components of the data management system



Box 6: Example for reporting structure

GHG report according to the following chapters ISO 14064

Chapter 1: General description of the organization goals and inventory objectives.

This chapter includes the description of the reporting organization, persons responsible, purpose of the report, intended users, dissemination policy, reporting period and frequency of reporting, data and information included in the report (list of GHGs taken into account and explained), and statements by the organization about verification.

Chapter 2: Organizational boundaries.

This chapter includes the description and explanation of boundaries and consolidation methodologies.

Chapter 3: Reporting boundaries.

This chapter includes the description and explanation of emissions categories that are considered.

Chapter 4: Quantified GHG inventory of emissions and removals.

This chapter includes the quantified data results by emission category, description of methodologies and activity data used, references and/or explanation and/or documentation of emission and removal factors, uncertainties and accuracy impacts on results (disaggregated by category), and description of planned actions for reducing uncertainty for the future inventory.

Stakeholder engagement

- Government and Private sector stakeholders such as state sector members from Ministry of Environment, Ministry of Energy, Ministry of Industries, national experts, sector experts from industries/private companies, members from PaSTI-JAIF and project consultants should be engaged in deciding the structure of the report, developing data management system and selecting a data sharing agreement
- It is important to take the input from all the potential reporters, users of the M&R guideline as well as stakeholders involved in preparing NCs, BURs, and facility level GHG measurements when deciding the structure of the report, developing data management system and selecting a data sharing agreement
- Above can be either done through stakeholder consultation meetings, in-country visits, bilateral meetings with potential reporters and government officers

Timeline

- Within period of 8 weeks upon the completion of measurement stage. Please see the work plan for more details (Annex I).

Outcomes

- Data management system
- Structure/Content of the report
- Institutional arrangement
- Data sharing agreement

5 Testing the M&R guideline

Methodology

- Considering the interest and other criteria, few AMS will be prioritized to test the guideline.
- Identify local MRV experts to assist the process of piloting M&R guideline.
- Identify facilities which volunteer to implement the guideline from AMS.

Box 7

Selected facilities need to include the companies which have experience on M&R and also the companies which do not have proper M&R in place.

- Conduct a capacity building workshop to all the stakeholders
- Collect necessary information to apply the guideline
- Update the M&R guideline based on the lesson learnt

Stakeholder engagement

- Government and Private sector stakeholders such as state sector members from Ministry of Environment, Ministry of Energy, Ministry of Industries, national experts, sector experts from industries or private companies, members from PaSTI-JAIF, and project consultants should be engaged in designing the pilot phase.
- Stakeholder consultation meeting will be held to the officers of the volunteered facilities, local experts, sector experts, representatives of the ministries to build the capacities on MRV.
- Once the pilot project is conducted, evaluation meetings will be held to identify the opportunities for improvements and challenges faced during the implementation.
- A validation workshop will be held to get the endorsement for the revised M&R guideline.

Timeline

- Within 12 weeks of the development of measurement and reporting guideline Please see the work plan for more details (Annex I).

Outcomes

Finalized facility level M&R guideline for AMS for a prioritized sector, which include M&R framework, procedures, data management systems and protocol.

Annex 1: work plan

Task Name/Months	1	2	3	4	5	6	7	8	9	10	11
1. Sector prioritization											
- Prioritize a sector											
- Prioritize a sub sector											
2. Planning											
- Define the facility											
- Scope of emissions & GHG covered											
3. Design GHG M&R system – Measurement											
- Selecting Methodology for emission quantification											
- *Identification of emission sources*											
- *Identification of parameters*											
- *Identification of emission factors*											
4. Design GHG M&R system – Reporting											
- *Select a data sharing agreement*											
- *Design data management system*											
- *Prepare reporting structure*											
5. **Testing the M&R guideline**											
- *Identify potential private sector and local experts*											
- *Stakeholder consultation meetings*											
- *Revise the report*											
- *Provide technical training*											
- *Finalizing the report*											

Annex 2: National emission reduction targets

GHG emission reduction targets in NDC and non-NDC have been explored in this subsection to see how the proposed common facility level GHG M&R guideline. Most of ASEAN member states (AMS) have set GHG reduction targets to be achieved by 2030. Further, the cumulative GHG reduction targets were also explored to assess the overall impact by measuring and reporting using the common facility level M&R guideline.

Country	Target type	Energy sector Target
Brunei	NDC	Reduce total energy consumption by 63% by 2035 compared to a Business-AsUsual (BAU) scenario; and to increase the share of renewables so that 10% of the total power generation is sourced from renewable energy by 2035
	Non-NDC	APEC economies, including Brunei Brunei Darussalam Energy White Paper 9 Darussalam, have set an ambitious regional goal of a 45 percent energy intensity reduction by 2035 versus a 2005 baseline[12]
Cambodia	NDC	Reduction of 1,800 Gg CO2eq and (16%) in the year 2030 compared to the baseline (baseline emissions of 11,600 Gg CO2eq)
	Non-NDC[13]	In 2017, a National Policy, Strategy, and Action Plan, by 2035, the MME will commit to (i) reducing national energy consumption by 20% compared to business-as-usual projections; and (ii) reducing national carbon dioxide emissions to 3 million tons annually, or 28.5 cumulative million tons from 2017 to 2035, relative to the business-as-usual scenario.
Indonesia	NDC	Emission reduction as a percentage to BAU for Conditional Mitigation Scenario is 11% while the Unconditional Mitigation Scenario target is setted as 14% (BAU(2030):1669 Mton CO2e)

[12] http://www.des.gov.bn/SiteCollectionDocuments/Energy%20White%20Paper%202014(1).pdf
[13] https://www.adb.org/sites/default/files/institutional-document/479941/cambodia-energy-assessment-road-map.pdf

	Non-NDC[14]	Indonesia plans to increase the share of new and renewable energy in the primary energy mix to 31% by 2050
Laos	NDC	• According to the Mitigation Action of The Renewable Energy Strategy (2011) the anticipated emission reduction is 1,468,000 ktCO2e by 2025 compared to the Base year:2011 • According to the mitigation Action of Expansion in the use of large-scale hydroelectricity the anticipated emission reduction is 16,284 ktCO2 per annum, once the target is reached in 2020 compared to the base year 2015 • According to the mitigation Action Rural electrification program the anticipated emission reduction is 63 ktCO2 per year compared to the Base year 2010[15]
	Non-NDC	• Renewable Energy Development Strategy seeks to increase the share of renewable energy within total energy consumption to 30% by 2025[16]
Malaysia	NDC	Targets for 40% emission reduction within the period of 2021-2030 compared to the base year 2005
	Non-NDC	2080 MW in renewable energy installed capacity by 2020[17]
Myanmar	NDC	• Mitigation Action: Renewable energy - Hydroelectric power. Target: reach 9.4 GW by 2030 • Mitigation Action: Renewable energy – Rural electrification Target:As a final result of the overall action, 6 million people in rural areas will have access to electricity generated by a variety of sources, at least 30 %

[14] https://www.climate-transparency.org/wp-content/uploads/2019/01/BROWN-TO-GREEN_2018_Indonesia_FINAL.pdf

[15] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Lao%20People%27s%20Democratic%20Republic%20First/Lao%20PDR%20First%20NDC.pdf

[16] https://www.greenclimate.fund/documents/20182/1688867/Lao_People_s_Democratic_Republic_Country_Programme.pdf/9362f3bd-dde9-309c-0bc0-439ff64b62ba

[17] http://policy.thinkbluedata.com/sites/default/files/National%20Green%20Technology%20Policy%202009.pdf

		of which will be sourced from renewables such as of mini-hydro, biomass, solar, wind and solar mini-grid technologies. • 20% electricity savings potential by 2030 from improved energy efficiency in industries
	Non-NDC	The Ministry of Electricity and Energy (MOEE) is drafting a renewable energy law by aiming to generate 8 percent of the country's electricity through renewable sources by 2021. The target is for 12 percent of all electricity generated in Myanmar to be renewable by 2025. [18]
Philippine	NDC	Double renewable energy capacity to 9000 MW by 2022 against a 2010 baseline
	Non-NDC[19]	2008 Renewable Energy Action Plan, the 2010 National Renewable Energy Program (NREP) aimed to triple by 2030 the renewable capacity in geothermal, hydro, biomass, wind, solar, and ocean power.
Singapore	NDC	To peak emissions at 65 $MtCO_{2e}$ by 2030. Beyond 2030, to halve emissions to 33 $MtCO_{2e}$ 2050.
	Non-NDC	Aims to achieve industrial EE improvement rates of 1-2% per year[20]
Thailand	NDC	20% share of power generation from renewable energy by 2036; 30% share of renewable energy in end use energy by 2036; -30% energy intensity (compared to 2010) by 2036
	Non-NDC[21]	• EEP2015 was expected to reduce energy intensity by 30% in 2036 compared with 2010 level. The EEP2015 was projected to conserve 51,700 ktoe by 2030 • The target of the AEDP2015 is to increase the portion of renewable power generation from 8% in 2014 to 20% of the total power requirement in 2036. This accounts for

[18] https://www.export.gov/article?id=Burma-Energy
[19] https://www.adb.org/sites/default/files/publication/389806/pathways-low-carbon-devt-philippines.pdf
[20] https://www.mewr.gov.sg/docs/default-source/default-document-library/a5finalmerw.pdf
[21] file:///C:/Users/Acer/Downloads/2020-5331-1-PB.pdf

		19,684.4 MW. The target aligns with the PDP2015 which stated that the electricity generation from RE will be 15-20% by 2036
Vietnam	NDC	Viet Nam's BAU scenario for GHG emissions was developed based on the assumption of economic growth in the absence of climate change policies. The BAU starts from 2010 (the latest year of the national GHG inventory) and includes the energy, agriculture, wasteand LULUCF sectors. • **GHG emissions in 2010:** 246.8 million tCO2e • **Projections for 2020 and 2030** (not included industrial processes): 2020: 474.1 million tCO2e and 2030: 787.4 million tCO2e
	Non-NDC[22]	• The VNEEP had the objective to promote energy conservation and a target to reduce energy use by 3%-5% in the 2006-2010 period and 5%-8% in the 2011-2015 period against baseline • The World Bank's low carbon development path (LCDP) published in 2016 estimates that energy efficiency in the household and industry sectors can reduce emissions by 10% compared to baseline, at an average negative marginal abatement cost. Electricity savings in industry and households could reach almost 64 billion kWh with measures up to the cost of US$10/tCO2 • The Renewable Energy Strategy up to 2030 objective to reduce emissions from energy by 25% by 2030 compared to BAU.

[22] https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2017-10-26_climate-change_25-2017_country-report-vietnam.pdf

Annex 3: Comparison of internationally accepted methodologies

Name of the guideline	Latest available version Year	Source category	Methodological approaches				Activity data				Emission factors		Uncertainty
			Tier 1	Tier 2	Tier 3	Other	Source	Availability of default conversion factors		Other approaches	Availability of default values	other	
								NCV	Density				
IPCC	2006	Energy	Default emission factors	Country specific emission Factors	Facility level emission factors	N/A	International Energy Agency (IEA) United Nations(UN)	yes Default NCV values to convert from units of 10^3 tonnes to units of terajoules are in are based on a statistical analysis of three data sources **Annual greenhouse gas inventory submissions of Annex I Parties: UNFCCC Annex-1 countries* **Emission Factor Database* **IEA data based*		N/A	Default carbon content in kg per 1 GJ		Activity data uncertainty Emission factor uncertainty

GHG protocol	2005	stationary combustion This guideline doesnot include greenhouse gas emissions from transport-related combustion of fuels				There are two basic approaches for estimating direct (Scope 1) CO2 emissions from stationary combustion: 1) direct measurement of the mass of CO2 in the exhaust gas and (CEM system is required to measure the CO2 emits thus that this is expensive 2) the calculation of CO2 emissions based on proxy (i.e., activity) data.This is the suggested approach in this guideline since this is less expensive	On-site Meteri ng Purcha sed or deliver ed records of the mass or volume of fuel eneteri ng facility fuel expend iture data	Default values are not given tocalculate NCV		Fuel samp heating ar consumed Oxidation of carbon form default val	For defualt emission factor IPCC is recommended.		General guidance on quality management for corporate greenhouse gas inventories is provided in Chapter 7 of the Revised Edition of the GHG Protocol Corporate Standard. In addition to this general guidance provides some specific quality management procedures which should be considered in calculating emissions from stationary combustion (see the section Quality management and uncertainty in the referance:https: //ghgprotocol.org/sites/default/files/Stationary_Combustion_Guidance_final_1.pdf)

ISO 14064-1	2018	Direct emissions	When site specific data is not available	Use when the site specific data is not availabl e but contry specif factors are availabl e	When site specific data is availab le to calculat e the emissio n factors		Site specific data National or regiona l Averag es	IPCC methodology is used	Default emission factors from IPCC		Sources of uncertainty can include: a) parameter (or calculation factors) uncertainty, e.g. emission factors, activity data; b) scenario uncertainty, e.g. use stage scenario or end-of-life stage scenario; c) model uncertainty

Annex 4: Content of the report according to the ISO 140064

a) Description of the reporting organization
b) Person or entity responsible for the report
c) Reporting period covered
d) Documentation of organizational boundaries
e) Documentation of reporting boundaries, including criteria determined by the organization to define significant emissions;
f) Direct GHG emissions, quantified separately for CO2, CH4, N2O, NF3, SF6 and other appropriate GHG groups (HFCs, PFCs, etc.) in tonnes of CO2e
g) Description of how biogenic CO2 emissions and removals are treated in the GHG inventory and relevant biogenic CO2 emissions and removals quantified separately in tonnes of CO2e
h) If quantified, direct GHG removals, in tonnes of CO2e
i) Explanation of the exclusion of any significant GHG sources or sinks from the quantification
j) Quantified indirect GHG emissions separated by category in tonnes of CO2e
k) The historical base year selected and the base-year GHG inventory
l) Explanation of any change to the base year or other historical GHG data or categorization and any recalculation of the base year or other historical GHG inventory, and documentation of any limitations to comparability resulting from such recalculation
m) Reference to, or description of, quantification approaches, including reasons for their selection
n) Explanation of any change to quantification approaches previously used
o) Reference to, or documentation of, GHG emission or removal factors used
p) Description of the impact of uncertainties on the accuracy of the GHG emissions and removals data per category
q) Uncertainty assessment description and results
r) The GWP values used in the calculation, as well as their source

Annex 5: Criteria to be added for the mandatory M&R system

Current study propose a road map to develop a voluntary M&R system. If AMS are interested to upgrade the system in to mandato

ry state over the time, following steps may follow apart from the steps given for the voluntary system.

Define applicability Criteria

Define threshold

Methodology:

- List the options that can be used to determine the threshold.
    - Option 1: Assess the cumulative regional GHG emissions of the selected sector and list the facility level emissions from highest to lowest. Then identify the highest GHG emitting facilities which covers the 80% of the sectorial emissions and select the emission of the lowest emitter from the highest emitters list as the threshold.
    - Option 2: Assess threshold under similar facility level M & R systems and then recommend one of those thresholds which is more appropriate for the climate change context of ASEAN region.
    - Eg: 25,000 tonnes per annum (American, Australian, Singapore)
- Propose a threshold and share with AMS focal points
- Agree on the suitable threshold for each AMS

Stakeholder Engagement:

- Government and Private sector stakeholders such as state sector members from Ministry of Energy, Ministry of Environment, Ministry of Industries etc, and Experts from industries or private companies, Members from PaSTI and project consultants should be engage in deciding the threshold for the entities who should report in each AMS

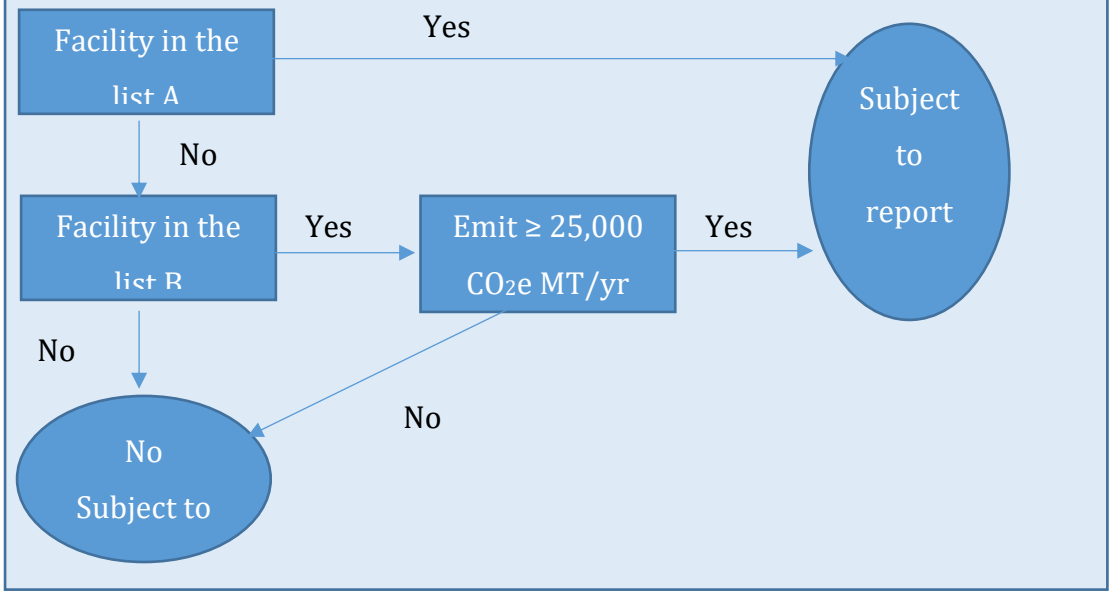
- This can be done either in the stakeholder consultation workshop, In-country investigations, through conference calls with all focal points of the AMS or through emails etc. Eg: 25,000 tonnes per annum (American, Australian, Singapore)

Eligible facilities

- Develop a methodology to identify the applicable facilities
    - Option 1: Categarize facilities of the selected sector in to two groups based on their energy/emission intensity. Define conditions for each categories in regards of reporting
    - Option 2: Select facilities need to be reported based on the requirements of the country
- Share the proposed methodologies with the focal points of the AMS
- Agree on a methodology to select the eligible facilities

Box 2 illustrates a methodology that can be used to select the facilities

Box 2



Annex 6: List of interviewees during the country missions

Brunei

Name	Position	Institution
Aammine Alias	Head of Planning	Petroleum Authority
Adina	Head of Environmental Affairs	Brunei LNG
Alinayati	Environmental Affairs Advisor	Brunei LNG
Farah	Planning officer	Petroleum Authority
Heather Ptak	Head of Environment	Brunei Shell Petroleum (BSP)
Jaafar Bakar	Acting Managing Director BLNG	Brunei LNG
Marlina	Project Officer	Department of Electrical Services (DES)
Menno Gierman	Head of Technology Services	Brunei LNG
Najeebah	Special Duties Officer, Transport Policy Division	Ministry of Transport and InfoCommunications
Nur Syamimi	Port Officer	Ministry of Transport and InfoCommunications
Nurul Hani	Focal officer for MRV for Department of Civil Aviation (DCA)	Ministry of Transport and InfoCommunications
Nurul Izni		Ministry of Transport and InfoCommunications
Nurun Nawawi	Environmental Advisor	Brunei Shell Petroleum (BSP)
Robin Yong	Superintendant Engineer	Department of Electrical Services (DES)
Scott Bilton	Technical Manager	Brunei LNG
Shirley Sikun	Head of Energy Transition	Brunei Shell Petroleum (BSP)
Sofi Hasni Sharbini	HSSE Executive for Environment	Hengyi

Cambodia

Name	Position	Institution
Dr. Mao Hak		Ministry of Environment
H.E. Chim Pheaktra	Under Secretary of State	Ministry of Industry and Handicraft
Heng Eang	Deputy Director General	Ministry of Industry and Handicraft
Leang Sophal	Head of GHG Inventory and Mitigation Office	National Council for Sustainable Development, Ministry of Environment
Ouch Many	Director	Ministry of Industry and Handicraft
Sok Chea	Deputy Director	Ministry of Industry and Handicraft

Lao – PDR

Name	Position	Institution
Bounthee Saythongvanh	Deputy Director	Greenhouse Gas Inventory & Mitigation Division, Department of Climate Change MONRE
Haruthai		Hongsa power
Khatthaneth Sensathith	Officer, Division of Climate Change Management Promotion	Department of Climate Change
Vaiyakone Sysavath	Director Environmental & Chemical Division	Department of Industry & Handcraft,Ministry of Industry Commerce
Vithounlabandid Thoummabout	Director of Environmental Engineering Division	Department of Energy Policy & Planning

Malaysia

Name	Position	Institution
Ahmad Farid Bin Mohammed	Under secretary	Ministry of Energy, Science, Technology, Environment and Climate Change
Aida Bt Anuwi	Executive, Climate Change Planning	Petoliam National BERHAD
Aimi Hazwanie binti Nordin	Executive	Malaysia Energy Information Hub
Esther Lew	Principal Assistant Secretary	Ministry of Energy, Science, Technology, Environment and Climate Change
Himala Velusamy	Industrial Ecology Manager	TASEK Corporation BERHAD
Huzairin Biniti Mohd Radzi	Head of Sustainability	Tenaga National Berhad
Marhaini Binti Mat	Principle Assistant Secretary	Ministry of Energy, Science, Technology, Environment and Climate Change,Environmental Management and Climate Change Division
Muhammad Ridzwan Ali	Senior assistant secretary	Ministry of Energy, Science, Technology, Environment and Climate Change,Environmental Management and Climate Change Division
Norizal Khushairi Mohomad Zamri	National Project Manager	Sustainable Energy Development Authority (SEDA) Malaysia
Olivia Newton Chin	Head of Department	Daikin Malaysia SDN.BHD.
Sazalina Binti Zakaria	Meng.	TNB Research Sdn,Bhd.
Thirupathi Rao	Head, Climate Change	Petoliam National BERHAD
Wan Haslina Wan Hussin	Manager	Federation of Malaysian Manufacturers
Wang Tze Wee	Senior Assistant Director	Perbadanan Putrajaya

Myanmar

Name	Position	Institution
Daw Phyu Phyu Khin	Deputy Director	Department of Electric Power Planning, Ministry of Electricity and Energy
Daw Su Mon Aung	Deputy Staff Officer	Department of Power Transmission and System Control, Ministry of Electricity and Energy
Daw Su Myat Mon	Assistant Director	Department of Power Transmission and System Control, Ministry of Electricity and Energy
Daw Thi Thi Soe Min	Assistant Director	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
Daw Thin Thuzar Win	Deputy Director	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
Dr. Aaron Russell	GGGI country representative to Myanmar	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
Dr. San Win	Deputy Director	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
Dr. Way Phyo Aung	Deputy Director General	Nay Pyi Taw City Development Committee
U Aung Ko Win	Staff Officer	Department of Power Transmission and System Control, Ministry of Electricity and Energy
U Aung Kyaw Htoo	Director	Department of Power Transmission and System Control, Ministry of Electricity and Energy
U Aung Phyo Min	Assistant Director	Directorate of Industrial Collaboration, Ministry of Planning, Finance and Industry
U Aung Thu Han	Assistant Director	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation

U Aye Ko Ko	Deputy Director General	Nay Pyi Taw City Development Committee
U Aye Myint	Member of Committee	Nay Pyi Taw City Development Committee
U Khin Maung Sein	Deputy Director General	Directorate of Industrial Collaboration, Ministry of Planning, Finance and Industry
U Kyaw Moe Aung	Project Coordinator, Myanmar Second National Communication	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
U Kyaw Myo Lin	Assistant Director	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
U Kyaw San Tun	Director	Nay Pyi Taw City Development Committee
U Kyaw Soe Win	Staff Officer	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation
U Myat Zaw	Director	Directorate of Industrial Collaboration, Ministry of Planning, Finance and Industry
U Myo Aung	Permanent Secretary	Nay Pyi Taw City Development Committee
U Myo Myint Thein	Assistant Director	Nay Pyi Taw City Development Committee
U Pauk Kyaing Sahm	Assistant Director	Department of Power Transmission and System Control, Ministry of Electricity and Energy
U Soe Han	Deputy Director General	Nay Pyi Taw City Development Committee
U Than Htike Aung	Deputy Director General	Nay Pyi Taw City Development Committee
U Win Htay	Director	Nay Pyi Taw City Development Committee

The Philippines

Name	Position	Organization
Albert A. Magalang	Head of Climate Change Office, EMB-Dept of Environment and Natural Resources	EMB-Dept. of Environment and Natural Resources
Paulo M. Gooco	Air quality specialist	Energy Development Corporation
Sandee G. Recabar	Planning Officer, Implementation Oversight Division, Climate Change Commission	Climate Change Commission

Singapore

Name	Position	Organization
Rohaya Saharom	Deputy Director, Climate Change Programme Department, National Environment Agency	National Environment Agency
Roxanne Tan	Assistant Manager	National Environment Agency
Tony Ng Swee Heng,	Senior Assistant Director, Climate Change Programme Department,National Environment Agency	National Environment Agency

Thailand

Name	Position	Organization
Natthanit Asavapusitkul	Director	Management Coordination Division, Climate Change, ONEP
Chatchawan Genarkarn	Environmental official, Thailand's UNFCCC National Focal Point,	Climate Change Management and Coordination Division, ONEP
Jens Radschinski	Team Lead	UNFCCC RCC
João Aleluia	Programme Officer	UNFCCC RCC
Saudamini Bagai	Programme Officer	UNFCCC RCC
Seetala Chantes	Environmental official	Climate Change Database and Knowledge Section, ONEP

Vietnam

Name	Position	Organization
Akihiko HAGA	Third Secretary	Embassy of Japan in Vietnam
Daisuke OKABE	Minister	Embassy of Japan
Dr. Luong Quang Huy	Head, Division of GHG emission reduction and ozone layer protection	Department of Climate Change, MONRE
Hong Van Tam	Deputy Chief of Climate Change and Green Growth Office	MOIT
Jun ICHIHARA	Chief Adviser/climate Mitigation policy P.E.Jp	Project support the Planning and Implementation of NAMAs in MRV manner (SPI NAMA)
Kazumasa Nagamori	Office of Market Mechanisms, and Office of Director for International Strategy on Climate Change,Climate Change Division, Global Environment Bureau	Ministry of Environment Japan
Pham Nam Hung	Officer, Division of GHG Mitigation and Ozone Layer Protection, Department of Climate Change	Ministry of Natural Resources and Environment
Phan Thi Ha	Officer, Division of Science Technology and International Cooperation, Department of Climate Change	Ministry of Natural Resources and Environment
Tang The Cuong	Director General	Department of Climate Change, MONRE
Yasuhiro (Yasu) KASUYA	Senior Project Formulation Advisor	Japan International Cooperation Agency Vietnam Office