Guidance for Operating Measurement & Reporting of Greenhouse Gas Pilot Projects in ASEAN Member States

(With reference to the developed ASEAN Guidelines on Facility-level GHG Measurement and Reporting)

March 2023

Partnership to Strengthen Transparency for co-Innovations

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Table of content

Acronyms

AD	Activity Data
AHP	Analytic Hierarchy Process
AMS	ASEAN Member States
CDM	Clean Development Mechanism
CH_4	Methane
CO_2	Carbon dioxide
EF	Emission Factor
ESG	Environmental, Social and Governance
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HFC	Hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
JCM	Joint Crediting Mechanism
M&R	Measurement & Reporting
MRV	Measurement, Reporting and Verification
NDC	Nationally Determined Contribution
NF_3	Nitrous Trifluoride
OECC	Overseas Environmental Cooperation Center
PDCA	Plan-Do-Check-Act
PFCs	Perfluorocarbons
SF_6	Sulfur hexafluoride
ToR	Terms of reference
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

1.1 Background

Under the first phase of the PaSTI-JAIF project, the uptake of Measurement and Reporting (M&R) for preparing GHG inventories was analyzed on three dimensions: i) At national level; ii) At sectoral and policy levels; and iii) At the facility/installation level. The survey showed that ASEAN Member States (AMS) were at different stages of development and levels of readiness for implementing M&R systems at the facility/installation level, ranging from non-existent to fully implemented. In particular, many AMS have a strong willingness to engage the private sector in climate change mitigation while some AMS are interested to develop domestic GHG M&R systems targeting the private sector with the aim of sharing relevant knowledge and experiences.

As some countries have not yet started to fully develop their GHG M&R systems, there is a need to know the steps to be taken while developing GHG M&R systems. This Guideline sets out the components to be included; and the steps to be followed by administrative officials in AMS when establishing a national mandatory, or voluntary GHG M&R system[1].

1.2 Objectives of the facility-level GHG reporting system

The main objective of the facility-level GHG reporting system is to provide transparency on GHG emissions at individual GHG emitting facilities and corporates, and to facilitate the emitters to reduce the GHG emissions caused by their economic activities. The system can be introduced either by the government or as a program by a group of corporates.

1.3 Outputs of the facility-level reporting system

[1] Please note that the Guideline is not binding on the current system in any AMS or the GHG M&R system to be established in the future, and those are left to the discretion of each country.

For the private sector

- The facility-level GHG reporting system will provide a Plan-Do-Check-Act (PDCA) cycle for GHG emitters at facility level to understand and revisit their own emissions, with a view to reducing GHGs.
- Meet requirements in the supply chain by their business partners, increasing competitiveness and in some cases, obtaining better access to Environmental, Social, and Governance (ESG) investments[2].
- The private sector will benefit from reduced compliance and law enforcement risks, which positively impacts the medium- and long-term commercial and business performance of participating companies. For example, companies starting GHG M&R voluntarily could be among the first to respond once a country's government decides to introduce mandatory reporting system and/or carbon pricing in the future. In addition, it may be easier to obtain financing for their own efforts to reduce GHG emissions.

For governments

- The facility-level GHG reporting system will provide access to bottom-up data directly reported by facilities.
- It will help the governments to develop more effective policies and measures targeting specific groups of GHG emitters (Once the data are verified)

The facility-level GHG reporting system can provide a foundation for extended interventions, including introducing, and linking with other indicated activities such as carbon pricing, disclosure, stock exchange, etc.

[2] In some stock markets, sustainability index criteria are introduced, requiring disclosure of corporates' GHG emission amount. This can be a variation of facility-level GHG reporting, which is closely linked with ESG investments.

2 Purpose of the guidance

The guidance for the pilot project provides step for operating a pilot GHG reporting system as a demonstration. It is expected that those in charge of GHG M&R will be able to use the Guideline in order to establish a facility level M&R system for GHG emissions, and finally be able to implement such a system. In addition, the private sector will also get an opportunity to learn the basics of GHG M&R systems as well as potentially create opportunities for the private sector to be involved in the development of national M&R systems.

Guidance for pilot project ("the guidance") includes: a) potential opportunities to conduct a pilot project; and b) main characteristics, the activities, schedule, and deliverables of a Pilot Project. In addition, the guidance also discusses resource requirements, interfaces, and dependencies with other groups, risks, and risk mitigation.

The pilot project will allow the implementing agency to: collect feedback from the AMS on the application of the facility level GHG measurement and reporting guideline, and improve it to meet the requirements of facility/installation level GHG measurement and reporting of all AMS.

3 Analysis of the opportunity to conduct the pilot project

3.1 Objectives of the piloting

The objectives of piloting are to: a) test the guideline's readiness for national implementation, b) assess the time and resources allocation, c) measure success of implementing the guideline, d) give AMS a chance to practice the guideline, e) identify the issues when implementing the guideline and, f) improve the guidance based on the feedback.

3.2 Selection of the sectors

Previously, the "Roadmap for Designing Facility Level GHG M&R guideline for ASEAN region" developed by PaSTI in 2020 under phase 1 identified the following sectors in order of priority,

1. Energy industry
2. Mineral products (cement)
3. Manufacturing industry

In addition to that, the Building sector – energy consumption in hotels, commercial building, etc., which have a significant contribution to national GHG emissions in AMS can be considered for the piloting. An exercise was carried out with AMS to prioritize the sectors based on 11 criteria. Table 3 indicates top three potential sectors, out of the four sectors to be considered for piloting. Please refer the Annex 01 for the detailed assessment.

Table 1: Top three potential sectors to be considered for piloting

	1st Sector	**2nd Sector**	**3rd Sector**
ASEAN region	Cement	Energy industries	Waste

However, selection of different sectors may have both pros and cons which are described in the Table 4.

Table 2: Pros and cons of each potential sector

	Pros	Cons
Cement Sector		
Collection of Activity data	Data are frequently monitored in the countries where cement production takes place (Eg. Vietnam, Indonesia, Thailand, the Philippines, and Malaysia. Brunei Darussalam, Cambodia, Lao PDR and Myanmar)	Unavailability of cement production companies in Singapore. (Only cement distribution companies are available in Singapore)
Availability of Emission factors	Default emission factors (IPCC) and country specific emission factors are available in some countries (Eg. Thailand, Malaysia, and Indonesia).	-
Energy industries		
Collection of Activity data	Activity data is available for all countries.	There may be challenges to access to data in relation to the authority.
Availability of Emission factors	Default emission factors are available for energy sector.	
Waste Sector		
Collection of Activity data	Activity data for Solid waste disposal, biological treatment of solid waste, Incineration and open burning of waste, and waste treatment and discharge are available in some countries (Eg. Thailand, Vietnam, Malaysia, Indonesia, Cambodia, Singapore)	Only limited activity data are available in some countries (Eg. the Philippines, Myanmar, Lao PDR, and Brunei Darussalam). Collection of activity data for waste sector is significantly difficult.
Availability of Emission factors	Default emission factors (IPCC) and country specific emission factors are available in some countries (Thailand, Vietnam, Malaysia).	

3.3 Identifying facilities to volunteer

The list of facilities in the respective countries need to be identified for the recommended sectors through recommendations from the line ministries, sector specific business associations of the host country by desk review, stakeholder consultations and online questionnaires. Discussions need to be conducted with facilities to identify the willingness to pilot the M&R system.

3.4 Identifying local MRV experts

Local MRV experts are responsible for providing guidance and training to stakeholders on accurate data collection, data recording, data reporting, data analysis, and calculation of GHG emissions.

Key roles-

- Support the identification of sectors and potential facilities for piloting, by coordinating among relevant ministries, and the top management of facilities
- Establish extensive and effective communication with stakeholders
- Plan and conduct all coordination and consultation activities with governmental and, if appropriate non-governmental stakeholders
- Carry out and keep track of capacity-building efforts, both domestic (unilateral) as well as international
- Conduct an evaluation exercise to identify key lessons learned and areas for improvement
- Incorporate reporting from all line ministries and their regulatory bodies and keep an updated registry
- Establish guidelines for quality control of collected data, and develop and oversee the implementation of a quality control strategy for the entire M&R process; and
- Mediate between parties when concerns surface, for example, over a disagreement in terms of responsibilities or a potential conflict of interest.

A clear TOR improves the engagement of Local MRV experts. While the legal framework sets out expectations for data supply and knowledge-sharing, the TOR can establish tangible objectives and performance measures for experts to comply with. Therefore, Terms of Reference (TOR) will be developed to identify the local MRV experts from identified countries and sectors. Examples of items that can be included in the TOR are: objective of the expert's involvement; specific tasks and responsibilities; key deliverables and outcomes (and related performance measures); expected period of commitment; and names and contact details of key individuals/roles.

3.5 Characteristics of the M&R system

Characteristics of the M&R system need to be defined prior to implementing the pilot.

Methodology –

For the sake of simplicity in measurement, almost all M&R systems adopt the method "Activity Data (AD) × Emission Factor (EF)" to calculate emissions, as the first choice. Examples of information sources for reporting entities to fill activity data and other relevant information may be indicated as:

- Bills for purchasing fuels, energy commodities and relevant materials
- Stock changes of fuels and relevant materials between the initial and final days of the reporting period.
- Measuring equipment (e.g. air pollutant monitor, electricity meter, flowmeter)
- Records on waste disposal
- Other activity reports

Based on the objective of the measuring the GHG emission, facilities may select different type of guidance such as GHG protocol, ISO 14064, IPCC Guideline, etc.

Scope of measuring GHG emissions -

Scope of measuring GHG emissions must be defined, typically into project level, facility level, local and national level measurements. Emission inventories of facility, local or

national level, account for all emissions (and removals if appropriate) within the geographical boundary.

When accounting emissions within a given geographical boundary of the facility, emissions from the burning of fuels used by the facility within the given geographical boundary is a straightforward example. Such emissions are called direct emissions. The facility may also be responsible for some emissions, which occur outside the geographical boundary of the facility, such as electricity from national/sub national/regional grid. Those are called indirect emissions.

ISO14064 provides two categories for emissions: direct and indirect emissions, while Greenhouse Gas Protocol has three categories as scopes 1, 2 and 3 emissions. Scope 1 means emissions attributed to sources which are owned or controlled by the organization. According to the Greenhouse Gas Protocol, scope 1 emissions at company level can be summarized as follows:

- Generation of electricity, heat, or steam. These emissions result from the combustion of fuels in stationary sources, e.g., boilers, furnaces, turbines etc.
- Physical or chemical processing. Most of these emissions result from the manufacture or processing of chemicals and materials, e.g., manufacturing of cement, aluminum, adipic acid, ammonia, and waste processing.
- Transportation of materials, products, waste, and employees. These emissions result from the combustion of fuels in company owned/controlled mobile combustion sources (e.g., trucks, trains, ships, airplanes, buses, and cars)
- Fugitive emissions. These emissions result from intentional or unintentional releases, e.g., equipment leaks from joints, seals, packing, and gaskets; methane emissions from coal mines and venting; hydrofluorocarbon (HFC) emissions during the use of refrigeration and air conditioning equipment; and methane leakages from gas transport.

Scope 2 includes some indirect emissions. These are emissions associated with commodities called secondary energy such as electricity or heat used within the facility but the emissions from the production of the commodity occur outside the facility. Electricity generation-related emissions occur at power companies which are usually direct emitters. GHG emissions from secondary energy productions attributed to energy producers will be considered as scope 1 in National GHG inventories.

Scope 3 is also indirect emission even covering production, use, and disposal of products, passenger and freight transport conducted for the facility by third parties, disposal of waste outside facilities, and any other activities as far as relevant. For scopes 1 and 2, the facility managers can take measures to reduce the emissions by actions within the facility. For scope 3, addressing emissions is basically beyond the control of the facility managers, except for delegated activities by the facility.

GHGs covered-

Coverage of GHG emissions must be defined. carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are common GHGs. On the contrary, many facilities may not have perfluorocarbons (PFCs) and nitrous trifluoride (NF_3) emissions covered in the system. Hydrofluorocarbons (HFCs) may have been emitted in all facilities from all the sectors. Sulfur hexafluoride (SF_6) may also emit from different industrial activities.

Report structure-

The reporting structure is necessary for submission of GHG reports by the emitters. It should have an accurate but uncomplicated layout. Following generic elements may consider for the development of the report structure.

- Reporting boundaries

The organization shall establish its reporting boundaries, including the identification of direct and indirect GHG emissions and removals associated with the organization's operations. Grouping of GHG emissions or GHG removals reported within the boundary of facility is called as reporting boundary.

- Classification by gas

The format provides the kinds of GHGs that reporting facilities are required to report, including the provision of rule documents by GHG reporting systems. The basic reporting may require CO_2 only. However, to the extent possible, other gases, such as CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3 should be included. It is recommended to use GWP values given in the IPCC AR5 for all GHGs.

In the case of CO_2 emissions, it may be useful to differentiate energy derived CO_2 and non-energy derived CO_2. The former covers CO_2 emissions from energy consumption (direct combustion of fuels or electricity consumption from the grid), and the latter covers CO_2 emissions from chemical reactions in industrial processes, such as clinker production in the cement industries. Such differentiation can help identify emissions for reduction efforts.

- Emissions by scope

In general, the facility-level reporting should have scopes 1 and 2 as a basic format. Reporting of scope 3 emissions is useful for facilities to further provide information on their emissions for the purpose of meeting specific standards or carbon disclosure of corporate value. However, data collection and calculation would require more effort, and sometimes it is not easy for many facilities. In such cases, scope 3 can be optional.

If significant indirect emissions are excluded from the GHG emission quantification, explanation/ Justification shall be provided in facility level M&R system.

- Selection of Base year

A facility shall establish a historical base year for GHG emissions and removals for comparative purposes of the GHG M&R system. Base year emissions or removals may be quantified based on a specific period (e.g. a year or part of a year where seasonality is a feature of the organization's activity) or averaged from several periods (e.g. several years). If sufficient information on historical GHG emissions or removals is not available, the organization may use its first facility level GHG M&R period as the base year. The facility may change its base year subsequently, but shall justify any change.

- Uncertainties

Assumptions made in collecting activity data, and uncertainties in GHG emission calculations may be recorded separately. Description of planned actions for reducing uncertainty for the future years may be added to the respective section.

- Recalculation

If any change is made to the base year or other historical GHG data, recalculation of the base year or other historical year(s) may be needed to compare the results of subsequent year(s).

Data collection process

Data needs to be collected at facility level. The facilities may appoint at least one GHG Manager for data collation, preparation, and analysis of the GHG emissions. The duties and responsibilities of a GHG Manager may include, but are not limited to, the list below:

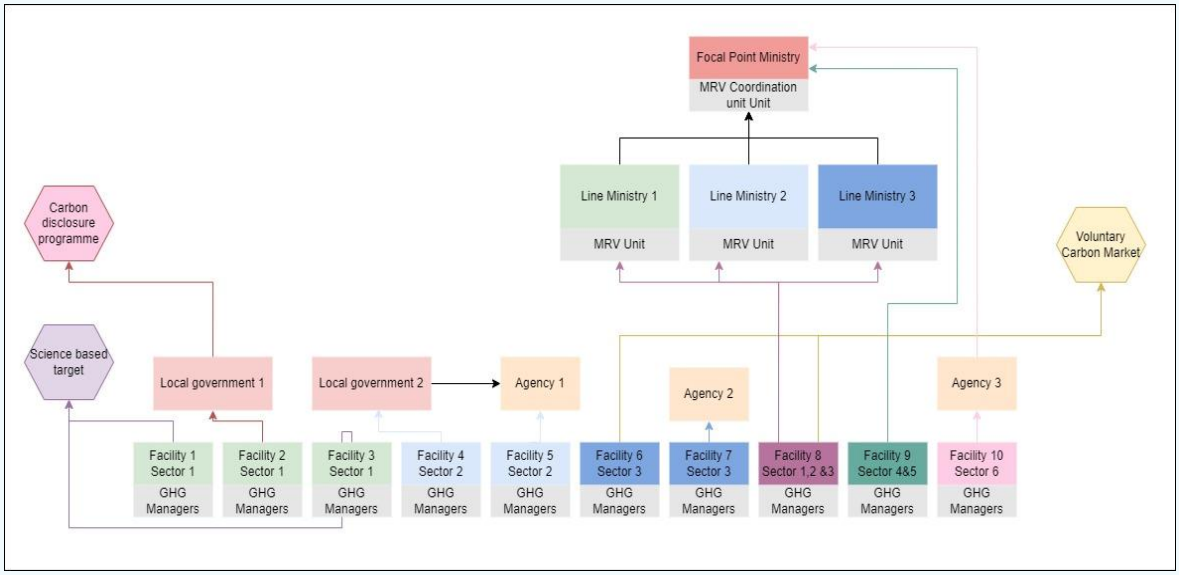
- Assess data collection for the required parameters that contribute to GHG emissions,
- Document measurement approaches,
- Monitor GHG emission sources and their operating parameters on a regular basis,
- Measure and report GHG emissions,
- Submit the emissions reports in accordance with the MRV requirements, and
- Ensure the emissions reports are, to the best of the knowledge of the GHG manager, complete and accurate.

Data to be collected under the reporting system should be transparent and are supposed to be publicly available or accessible in general. However, data providers might restrict access to information to prevent inappropriate use of the data, unauthorized commercial exploitation, or sensitivity to possible imperfections in the data. Clear explanation on the intended use of the data, and written agreement as to the level at which it will be made public, may help coordination of data collection.

Institutional arrangement

When introducing the institutional arrangement, it is necessary to consider what will be most suitable for the country and the respective sector. In many cases, the GHG reporting system is introduced by the Environment Ministry or Ministry in charge of climate change. In this case, the emitters' businesses may not necessarily be under their jurisdiction. For this reason, it is important to consider allocation of roles of line ministries (and in some cases local governments), for their effective engagement. This will allow smooth implementation of the systems.

Figure 1: prototype of the Institutional Arrangement for a facility level reporting system



Further details for institutional arrangement and key roles and responsibilities of each unit are provided in the "ASEAN Guidelines on Facility-level GHG Measurement and Reporting (Ver 2.0)".

3.6 Pilot options

All AMS will be provided with the opportunity to participate in the pilot project. It will be the decision of each AMS whether or not to participate in the pilot project. AMS that decides to participate can refer to Table 3 and the Annexes and the final decision will be made by the AMS. The minimum required preparations and system will be clearly stated.

AMS can work toward a more significant outcome by participating and testing the guideline's readiness for national implementation and identifying the issues when implementing the guideline.

4 Evaluation plan

This chapter suggests an evaluation process to the piloting. It provides criteria to measure the success, variable to be measured and mechanism to conduct the evaluation.

4.1 Success criteria

Pilots provide data and lessons for the expansion of sustainability initiatives. It is easier to widen a pilot than to jump into a national project all at once. Starting with a small number of pilots allows targeting the services and focus resources.

Followings criteria will allow to declare, at the end of the pilot, that the pilot project was a success:

- ✓ Piloting was completed within the budgeted cost and planned timeframe.
- ✓ Stakeholders are satisfied with the adoption of the guideline and have provided constructive feedback.
- ✓ prototypes, formats, and institutional models for a GHG reporting system are amended and validated using stakeholder feedback.
- ✓ All stakeholders understand the roadmap for the adoption of the guidelines and have provided feedback to improve same.
- ✓ Overall stakeholder capacity on the requirements, techniques and methodologies of M&R Systems is improved.

4.2 Variables to be measured

a. Which part(s) of the pilot go well? Which could be improved?
b. Identified Advantages and disadvantages in the M&R system
c. The strongest and weakest out of the pilot activities
d. Major difficulties in the pilot implementation
e. Any amendments or improvements to the pilot for future implementations
f. Available expertise and other useful human resources in AMS

g. Level of readiness for an M&R system among AMS
h. A better understanding of the institutional hierarchies, legal provisions and other factors which would influence the adoption of the M&R system in AMS

4.3 Mechanism for evaluation of the pilot

1. Stakeholder participation

   A pilot is successful when it achieves its objectives and meets or exceeds the expectations of the stakeholders. A stakeholder engagement plan will be prepared for evaluating the piloting of facility-level M&R system in the respective sector/s. It will be prepared by local M&R Experts for the respective countries in consultation with the OECC team.

Table 3: Outline for stakeholder engagement plan for evaluation

Country	Piloted sector	Involved Institutions	Responsible officer	Roles conducted during piloting	Stage of involve (Pre-piloting, piloting, post – piloting)	Way of evaluation (Workshop/ interview/online questionnaire

2. Processes, formats, responsibilities for obtaining the data needed

   A checklist will be used to collect the information needed to perform the evaluation and information will be collected from stakeholders identified in stakeholder engagement plan.

Table 4: A checklist for obtaining the data needed to perform the evaluation.

Country-

Piloted Sector-

☐	Availability and convenience of collecting activity data and emission factors for respective sector/s
☐	Ease of adopting the M&R guideline to the country
☐	Availability of expertise and other useful human resources in the respective country
☐	Issues in implementing the guideline, and proposals to address such issues
☐	Current national institutional and legal frameworks related to domestic M&R systems, and identify gaps including capacity needs
☐	Availability of financial resources for data collection, analysis and reporting
☐	The breakdown of the piloting costs
☐	Any amendments or improvements to the pilot for future implementations
☐	Other

An evaluation matrix is prepared based on the information recorded in the checklists.

Table 5: Evaluation Matrix

Criteria	Format	Score for piloted sector
1. Pre-piloting stage	1- Low 5- High	
1.1. Involvement of stakeholders to check the availability and accessibility of activity data	2- Low 5- High	
1.2. Involvement of sector expert to collect the emission factors	1- Low 5- High	
1.3. Availability of existing M&R system	1- Yes 0- No	
1.4. Availability of national institutional and legal frameworks related to domestic M&R	1- Yes 0- No	
2. Piloting stage	1-Low 5- High	
2.1 Availability of financial resources for data collection, analysis and reporting	1-Low 5- High	
2.2 Availability and accessibility of activity data	1- Low 5- High	
2.3 Availability of default emission factors	1 -Yes 0 - No	
2.4 Availability of country specific emission factors	1 – Yes 0 - No	
3. Post- piloting stage	1-Low 5- High	
3.1 Ease of adopting the M&R guideline to the country	1-Low 5- High	
3.2 Any amendments or improvements to the pilot for future implementations	0 – Yes 1 - No	
3.3 Readiness of the country to apply the M&R guideline	1-Low 5- High	

One or few analytical techniques will be incorporated to evaluate the collected information on piloting. They include: 1) statistical analyses, 2) non–statistical analyses, 3) projecting longer–term outcomes/impacts using direct results, 4) modelling, and 5) cost benefit and cost effectiveness analyses.

5 Project plan

5.1 Overview

Successful implementation of the pilot project and identification of required improvements to the guideline based on the requirements of the countries are crucial for achieving the targets of the M&R guidelines.

Through the implementation of the pilot project, it is expected to achieve the following

Identification of gaps and barriers

The ability of the guideline to meet the requirements of the different countries and gaps and improvements that need to be performed on the guideline can be identified.

Identification of the time frame

Piloting will provide the ground level experience of implementing the guideline from which countries may identify the overall time frame that will take to fully implement the guidance. Further, identified barriers and gaps to implement the guideline in different countries and different sectors may be used to develop a more accurate work plan to be issued with the final guideline.

Budget preparation

The pilot project will allow for verification of the identified resource requirement, budget allocation, etc. Further, the experience will allow stakeholders to manage resources more efficiently.

Define the scope of the MRV

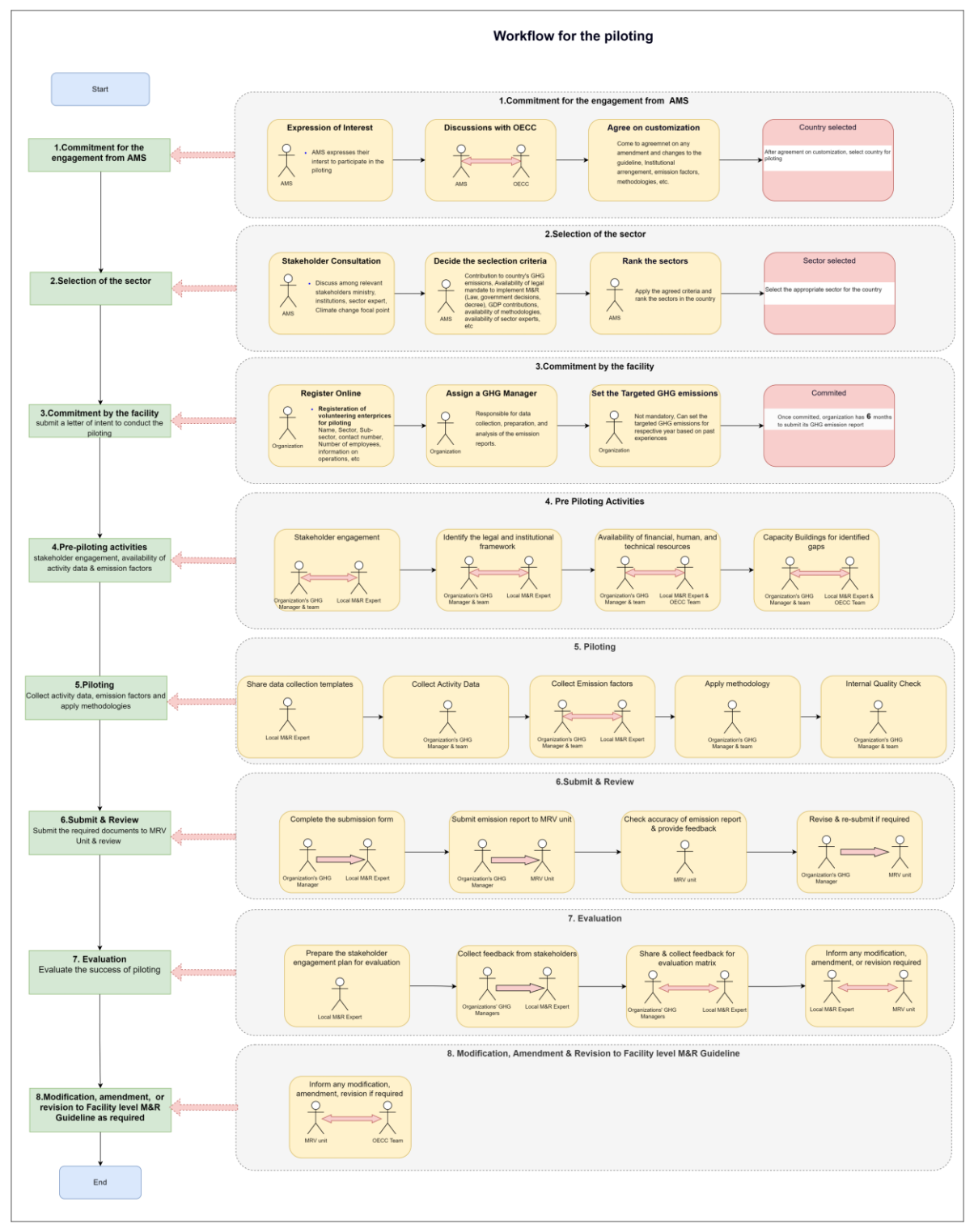
This will help everyone to understand the project's scope and contribute to its requirements. Further, this will allow to identify the preference of different countries on the characteristics of the MRVs. The outcome will support identifying the measures required to be taken to agree upon a common guideline for the region.

5.2 Workplan

The start date, responsible person(s), effort and artifacts of the implementation, evaluation, communication and dissemination, and monitoring phases will depend on the selected pilot option. Efforts on preparatory actions will also depend on the pilot option.

Task	Step	Start Date	Person responsible	Effort (Person-hour)	Artifacts
Preparatory actions	Select countries	TBD	OECC/AMS		N/A
	Select sector/s	TBD	OECC/AMS		N/A
	Identify volunteering facilities	TBD	OECC/AMS		N/A
	Identify local MRV experts	TBD	OECC/AMS		N/A
	Agree on the characteristic of the MRV to pilot	TBD	OECC/AMS		N/A
Implementation actions	Establish institutional arrangement and communicate roles and responsibilities				
	Disseminate the data required parameters				
	Conduct training sessions				
	Implement the guideline				
Evaluation	Collect feedback from the stakeholders on the guideline				
	Improve the guideline base on the feedback received				
Communication and dissemination actions	Disseminate the updated guideline				
Monitoring	Monitor the progress of implementing guideline in different countries				

5.3 Workflow for the piloting



5.4 Resources

Human, financial, and infrastructure requirements for different countries may vary based on their current status of readiness. Therefore, a needs assessment should be conducted to identify country-specific requirements.

Human resources

Facilities – Facilities should have adequate human resources that can be allocated to collect, record, review and report the required data and assess the GHG emissions.

- Collect data for the requisite parameters that contribute to GHG emissions
- Document measurement approaches
- Monitor GHG emission sources and their operating parameters regularly
- Measure and report GHG emissions
- Submit the emissions reports in accordance with the MRV requirements; and
- Ensure the emissions reports are, to the best of the knowledge of the GHG manager, complete and accurate

MRV unit – Institutions that are selected to establish the MRV units, need to have (minimum) adequate human resources to coordinate with facilities and the MRV coordination unit.

Other potential responsibilities

- Allocate responsibilities for all institutions, ensuring that there is a clear lead for each institution, and establish an institutional-level formal approval process
- Develop and monitor a time frame and schedule for preparing and submitting necessary data, including specific dates for the deliverables
- Report GHG emissions to the MRV coordination unit annually
- Appoint technical, data collection and QC teams

MRV coordination unit - The institution selected to establish the MRV coordination unit need to have (minimum) enough human resources with sufficient knowledge of MRV requirements, to compile the assessment reports received from different MRV units.

Additionally, following responsibilities need to be met by the coordination unit

- Provide technical and financial support
- Establish extensive and effective communication with stakeholders
- Plan and conduct all coordination and consultation activities with the governmental and, if appropriate non-governmental stakeholders
- Carry out and keep track of capacity-building efforts, both domestic (unilateral) as well as international
- Conduct an evaluation exercise to identify key lessons learned and areas for improvement
- Incorporate reporting from all line ministries and their regulatory bodies and keep an updated registry
- Establish guidelines for quality control of collected data and develop and oversee the implementation of a quality control strategy for the entire MRV process; and
- Mediate between parties when concerns surface, for example, over a disagreement in terms of responsibilities or a potential conflict of interest.

Infrastructure

Infrastructure such as office space, furniture, computers, etc. will be required to establish newly proposed units.

Finance

Hiring MRV experts, conducting training, establishing newly proposed units, and improvements to the guidance are the major components that need financing. The budget will depend on the selected scenario to pilot the guidance, selected sector, number of facilities, etc.

5.5 Dependencies

Proceedings and requirements of the piloting will be dependent on the piloting option selected in section 3.6.

5.6 Risks

Absence of volunteering facilities

Some countries may not have volunteering facilities for the selected sectors. In such a scenario it is proposed to reach out to facilities through government entities, associations etc.

Inadequate human resources

Volunteered facilities, respective ministries/local governments etc. may not have sufficient human resources to allocate for the tasks related to the MRV. Acquiring political support for the piloting will allow respective parties to gather/ hire required human resources.

Unavailability of required technical knowledge

Even institutes which have sufficient human resources may not have enough technical knowledge to carry out MRV-related activities. Comprehensive trainings have to be provided to the stakeholders on the guideline and implementation of the MRV system.

Unavailability of local technical experts for the selected sector

Some countries may not have required technical experts for the selected sector to implement the MRV system. Knowledge sharing through international experts and

sharing good practices among countries will be required to reduce the impact of this on the success of the pilot project.

Piloting the guideline for a sector which is not prioritized by a country

If it is decided to pilot the MRV system for one sector within the whole region, there is a risk that the selected sector is not a top priority sector for some countries. This will discourage the respective country to pilot the MRV guidance. Therefore, it is best to pilot the top priority sector of the country without selecting a common sector for the region.

Unavailability of sufficient funds

Although the pilot project will be implemented on the basis of funding from JAIF, countries might not have sufficient funds to expand the M&R activities. Funds may be acquired from international/ national governments, NGOs, etc. for such expansions.

Insufficient data

Volunteering facilities might not have sufficient data to calculate the attributed GHG emissions. Parameters that need to be measured need to be shared at the earliest with the stakeholders. Further, support may be needed to gather sector-specific defaults and data-sharing methods among the countries that may establish the M&R system.

Absence of structure

Some countries may not have a structured institutional arrangement to implement the M&R system. The absence of a proper institutional arrangement with defined roles and responsibilities will defer the successful implementation of the pilot project. Therefore, it is important to establish clear institutional arrangements at least to define minimum roles and responsibilities.

5.7 Opportunities for improvement

It is expected that the good practices and challenges identified in the pilot project will be shared and improved for further development of GHG reporting systems in AMS. For example, the pilot project highlighted Measurement and Reporting, as stated in the guidelines. However, many countries often consider MRV, including Verification, as an integrated package.

Verification helps to ensure accuracy, completeness, and conformance with established procedures, and can provide meaningful feedback for future improvement. An accredited independent third-party verifier can be involved for verification if desired.

6 References

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https://unfccc.int/sites/default/files/resource/Hand%20book_EN.pdf

Road Map for Designing Facility Level GHG M&R Guideline for ASEAN Region, 2020. PaSTI

https://mrv-info.sakura.ne.jp/publication/files/pdf_roadmap.pdf

Annex 01- Assessment on Sector prioritization for piloting

Four sectors, which have a significant contribution to national GHG emissions in AMS, were selected as listed below.

1. Energy industries
2. Cement sector – Mineral products
3. The building sector – Energy consumption in hotels, commercial buildings, etc
4. Waste sector

11 criteria were selected for prioritizing the sectors based on the

- GHG emissions of the sectors/ sub- sectors
- Country's preferred subsectors indicated in the questionnaire
- Sub sectors which have any legal mandate to implement an M&R
- Sub Sectors with existing M&R system/ M&R system under consideration
- Contribution to GDP
- Availability of NDC target
- Availability of sector expertise in the country
- Simplicity of methodology
- Ease of information disclosure
- Ease of sectoral cooperation
- Ease of reducing GHG emissions

Following steps were followed for the prioritization of sector/s:

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

Step 2 - Assign marks for each criterion

Step 3 – Apply the criteria for each sector

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

Table 6: Collected data for sector selection of countries

Criteria	Brunei Darussalam				Cambodia				Indonesia				Lao PDR				Malaysia				Myanmar				Philippines				Singapore				Thailand				Viet Nam			
	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries
GHG emission percentages from total country emissions	3.4	1.36	N/A	48	0.88	4.27	N/A	11.5	1.38	12	0.15	12	0.54	1.5	N/A	11.8	3	8.85	2.62	38.7	0.27	3.8	N/A	6.84	6.23	9.14	N/A	16.7	N/A	0.58	1.22	38.1	5.19	3.71	N/A	74.4	11.4	6.7	2.11	31.7
Country's preferred subsectors indicated in questionnaire	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1
Sectors which have any legal mandate to implement a M&R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0
Sectors with existing or planned (under consideration) M&R system	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	1	1	0	0	1	0	0	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0
Contribution to GDP	0	0	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Availability of NDC target	0	1	0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1
Availability of sector expertise in the country	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1
Simplicity of methodology	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	0	0	0	1	1	0	0	1	1	0	0	1
Ease of information disclosure	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	0	1	0	0	1	0	0	0	1	1	0	0
Ease of sectoral cooperation	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Ease of reducing GHG emissions	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	0	1	0	0	1	0	0	0	1	1	0	0

Note- Values will be updated once responses are received.

Table 7: Summary table for sector selection of countries

Criteria	Total Mark	Weighted Value	Brunei Darussalam				Cambodia				Indonesia				Lao PDR				Malaysia				Myanmar				Philippines				Singapore				Thailand				Viet Nam			
			Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries	Cement	Waste	Building	Energy industries
GHG emission percentages from total country emissions	10	10%	0.66	0.26	0.00	9.34	0.53	2.57	0.00	6.90	0.54	4.70	0.06	4.70	0.39	1.08	0.00	8.53	0.56	1.66	0.49	7.28	0.25	3.48	0.00	6.27	1.94	2.85	0.00	5.21	0.00	0.15	0.31	9.55	0.62	0.44	0.00	8.93	2.20	1.29	0.41	6.11
Country's preferred subsectors indicated in questionnaire	10	10%	3.33	3.33	0.00	3.33	3.33	3.33	0.00	3.33	3.33	3.33	0.00	3.33	3.33	3.33	0.00	3.33	2.50	2.50	2.50	2.50	3.33	3.33	0.00	3.33	3.33	3.33	0.00	3.33	3.33	0.00	3.33	3.33	3.33	3.33	0.00	3.33	2.50	2.50	2.50	2.50
Sectors which have any legal mandate to implement a M&R	10	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Sectors with existing or planned M&R system	5	5%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	2.50	2.50	0.00	0.00	5.00	0.00	0.00	0.00	2.50	2.50	0.00	0.00	2.50	0.00	0.00	2.50	1.67	1.67	0.00	1.67	5.00	0.00	0.00	0.00
Contribution to GDP	5	5%	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	1.25	1.25	1.25	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Availability of NDC target	10	10%	0.00	5.00	0.00	5.00	5.00	2.50	2.50	2.50	3.33	3.33	0.00	3.33	3.33	0.00	3.33	3.33	0.00	5.00	0.00	5.00	0.00	3.33	3.33	3.33	0.00	5.00	0.00	0.00	5.00	0.00	3.33	3.33	3.33	3.33	0.00	0.00	2.50	2.50	2.50	2.50
Availability of sector expertise in the country	10	10%	3.33	0.00	3.33	3.33	0.00	3.33	3.33	3.33	2.50	2.50	2.50	2.50	3.33	0.00	3.33	3.33	2.50	2.50	2.50	2.50	3.33	3.33	0.00	3.33	3.33	3.33	0.00	3.33	0.00	3.33	3.33	3.33	3.33	3.33	0.00	0.00	2.50	2.50	2.50	2.50
Simplicity of methodology	10	10%	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	5.00	0.00	0.00	5.00
Ease of information disclosure	10	10%	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00

Total	Ease of reducing GHG emissions	Ease of sectoral cooperation
100	5	15
100%	10%	10%
3.483	2.50	15.00
1.609	2.50	0.00
0.333	0.00	0.00
2.851	0.00	0.00
3.386	2.50	15.00
1.924	2.50	0.00
0.583	0.00	0.00
2.357	0.00	0.00
4.033	2.50	15.00
2.199	2.50	0.00
0.319	0.00	0.00
1.949	0.00	0.00
3.581	2.50	15.00
1.525	2.50	0.00
0.667	0.00	0.00
2.478	0.00	0.00
3.931	2.50	15.00
2.041	2.50	0.00
0.549	0.00	0.00
2.728	0.00	0.00
3.692	2.50	15.00
2.098	2.50	0.00
0.333	0.00	0.00
2.127	0.00	0.00
3.736	2.50	15.00
2.327	2.50	0.00
0.000	0.00	0.00
2.188	0.00	0.00
0.958	0.00	0.00
2.181	5.00	0.00
1.031	0.00	0.00
3.580	0.00	0.00
3.895	5.00	10.00
1.126	0.00	0.00
0	0.00	0.00
2.976	0.00	0.00
4.970	2.50	15.00
1.629	2.50	0.00
0.791	0.00	0.00
1.861	0.00	0.00

Marks were provided for different criteria to the selected sub sectors under the road map and by OECC. Based on the marks, sectors were prioritized for each country, summarized the response for each country. (Criteria can be changed based on the discussions).

Table 8: Prioritized sectors

Country	**1st Prioritized Sector**	**2nd Prioritized Sector**	**3rd Prioritized Sector**
Brunei Darussalam	Cement	Energy industries	Cement
Cambodia	Cement	Energy industries	Cement
Indonesia	Cement	Waste	Energy industries
Lao PDR	Cement	Energy industries	Waste
Malaysia	Cement	Energy industries	Waste
Myanmar	Cement	Energy industries	Waste
Philippines	Cement	Waste	Energy industries
Singapore	Energy industries	Waste	Building
Thailand	Cement	Energy industries	Waste
Viet Nam	Cement	Energy industries	Waste
ASEAN region	**Cement**	**Energy industries**	**Waste**

Annex 02- Assessment on prioritization of Pilot Options

The following are the options that can be considered.

1. One sector in the whole region
2. Different sectors in different countries (one country, one sector)
3. Different sectors in one country

Each option needs to be discussed (pros and cons) in detail considering each criterion with consultation of stakeholders in all ASEAN Member States.

Qualitative criteria will be considered for the piloting and expert judgement for option selection will be conducted through the stakeholder discussion.

- **Importance of the selected sector to the country**

The energy industry has been selected as the priority for 8 countries out of 10 and same is the second priority for the other two countries. Importance of the selected sector to the country has been selected based on contribution to the GDP, country preferred option, availability of existing MRV system, sectoral NDC targets, and emission contribution to country total GHG emissions.

Low importance – 1 Medium importance – 2 High importance - 3

- **Requirement of sector expertise**

Expertise for prioritized sector will be requested by publishing Terms of reference (TOR) to identify the local MRV experts from identified countries and sectors. Sector expertise will be required for methodology, scope selection, activity data, emission factor identification, etc.

Low Requirement – 3 Medium Requirement – 2 High Requirement - 1

- **Labor intensity**

Labor intensity is the relative proportion of labor (compared to capital) used in any given process. If different sectors will be selected in different countries for piloting, labor used for the piloting process is high.

Low intensity- 3 Medium intensity- 2 High intensity – 1

- **Requirement of stakeholder consultation**

Stakeholder Consultation will be required for testing, checking guideline readiness for national implementation, to practice the guideline and finally, identify the issues when implementing the guideline.

Low Requirement – 3 Medium Requirement – 2 High Requirement – 1

- **Financial requirements**

Financial requirements for conducting the piloting will be considered.

Low Requirement – 3 Medium Requirement – 2 High Requirement – 1

- **Time & Resource allocation for piloting**

Time and resource allocation for piloting will depend on the selected number of sectors for piloting.

Low allocation – 3 Medium allocation – 2 High allocation – 1

Table 9: Response for qualitative criteria

Selection criteria	One sector in whole region	Different sectors in different countries	Different sectors in one country
Importance of the selected sector to the country	2	3	3
Requirement of sector expertise	3	2	2
Low labor intensity	3	1	1
Requirement of stakeholder consultation	3	2	2
Financial requirements	3	2	2
Time and Resource allocation for piloting	3	2	1

Table 10: Summary table for option selection

Selection criteria	Marks	Weight value	One sector in whole region	Different sectors in different countries	Different sectors in one country
Importance of the selected sector to the country	20	25%	5	7.5	7.5
Requirement of sector expertise	20	20%	8.57	5.71	5.71
Low labor intensity	10	5%	6	2	2
Requirement of stakeholder consultation	20	25%	8.57	5.71	5.71
Financial requirements	20	20%	8.57	5.71	5.71
Time and Resource allocation for piloting	10	5%	5	3.33	1.66
Total	100	100%	**7.370**	**5.853**	**5.769**

Marks are provided by considering the selected qualitative criteria for the different options. Criteria may be added and edited based on discussions.

The recommended option - selected sector for the whole region