ACCELERATING INDUSTRIES' CLIMATE RESPONSE
SRI LANKA

MRV FRAMEWORK

Measurement, Reporting and Verification (MRV) Framework for Industrial Sector GHG Emissions and Mitigation Actions in Sri Lanka

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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Abbreviations

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business-as-usual
BTR	Biennial Transparency Report
CCS	Climate Change Secretariat
CEA	Central Environmental Authority
CRT	Common Reporting Table
CTF	Common Tabular Format
DCS	Department of Census and Statistics
DSA	Data Sharing Agreements
EF	Emission Factor
EPL	Environmental Protection License
ETF	Enhanced Transparency Framework
GHG	Greenhouse Gas
GWP	Global Warming Potential
IDB	Industrial Development Board
IMWG	GHG Inventory and Mitigation Working Group
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ISIC	International Standard Industrial Classification
LULUCF	Land Use, Land Use Change, and Forestry
MoI	Ministry of Industries
MOU	Memorandum of Understanding
MPG	Modalities, Procedures, and Guidelines
MRV	Monitoring, Reporting, and Verification
NCV	Net Calorific Value
NDC	Nationally Determined Contribution
NECCCMM	National Expert Committee on Climate Change Mitigation
NID	National Inventory Document
NSC	National Steering Committee
PAM	Policy and Measure
QA	Quality Assurance
QC	Quality Control
SLSEA	Sri Lanka Sustainable Energy Authority
UNFCCC	United Nations Framework Convention on Climate Change

Introduction

This document contains the final MRV Framework for the industry sector of Sri Lanka under the overall Accelerating Industries' Climate Response in Sri Lanka project.

This report is structured in the following sections:

SECTION A: INTERNATIONAL TRANSPARENCY FRAMEWORK

This section reviews the reporting and accounting requirements under the Paris Agreement, and how it influences developing country Parties in needing to develop MRV systems to meet these requirements.

SECTION B: CONTEXT OF THE INDUSTRY SECTOR MRV FRAMEWORK OF SRI LANKA

This section defines the general stages of MRV processes and sets the objective, scope and different components of Sri Lanka´s industry sector MRV Framework.

SECTION C: INSTITUTIONAL ARRANGEMENTS

This section provides a description of the key functions and associated roles and responsibilities within the Industry Sector MRV system in Sri Lanka.

SECTION D: MRV PROCEDURES

This section outlines the MRV cycle activities of Sri Lanka´s industry sector MRV detailing the relevant procedures, as well as providing manuals and guidance to be followed for developing the national greenhouse gas (GHG) inventory and for mitigation.

Section A. International Transparency Framework

The adoption of the Paris Agreement[1] under the United Nations Framework Convention on Climate Change (UNFCCC) in 2015 marked an important moment in the global effort to address climate change and with it brings enhanced and transparent reporting requirements of national GHG inventories, climate change mitigation and adaptation actions and of support. In this context, this section describes the reporting and accounting requirements under the Paris Agreement, and how it influences developing country Parties in needing to develop MRV systems to meet these requirements.

1. Reporting and Accounting under the Paris Agreement

The reporting requirements under the Enhanced Transparency Framework (ETF) of the Paris Agreement build upon the experiences with the monitoring, reporting, and verification (MRV) framework under the UNFCCC and its Kyoto Protocol and introduces new and enhanced reporting and review requirements, particularly for developing country Parties, while offering flexibility in meeting the ETF requirements to those developing country Parties that need it in light of their capacities.

As such, a core element of the Paris Agreement is to ensure transparency in climate reporting. Although neither the Paris Agreement nor subsequent decisions provide an explicit definition of transparency, it can be described as the reporting of information by a Party in its Biennial Transparency Report (BTR) and the assessment of that information through technical reviews and the communication of Nationally Determined Contributions (NDCs). Thus, the provision of clear and comprehensive data and information via the BTR and NDC ensures transparency under the ETF of the Paris Agreement.

The ETF of the Paris Agreement requires Parties to provide a substantial amount of information in their NDCs and BTRs. Each of these two main reporting elements touches upon different aspects of transparency, namely:

- The NDC defines the information necessary for clarity, transparency and understanding of their climate change commitments up to 2030, which constitutes the actions they will take to reduce their GHG emissions in order to reach the goals of the Paris Agreement.
- The BTR presents the information on tracking progress towards implementing and achieving their NDC, including emissions inventories disaggregating national GHG emissions by their sources, domestic actions for mitigating and adapting to climate change, and the status of financial, capacity-building, and technology support for mitigation and adaptation activities in the country.

The NDC and BTR together therefore provide a complete overview of the climate goals of a Party and if, how, and to what extent the Party is meeting these goals and satisfying the accounting framework requirements, i.e., whether a Party is making progress or has achieved its NDC commitments, relies on relevant and consistent information included in both the NDC and the BTR. The informational elements required to meet the framework of principles and requirements for accounting under the Paris Agreement, which are detailed in the modalities, principles, and guidelines (MPGs)[2] adopted in 2018, ensure that reports and the information included within them are transparent, accurate, complete, consistent, and comparable. An overview of these reporting elements and the followed principles is provided in the following figure.

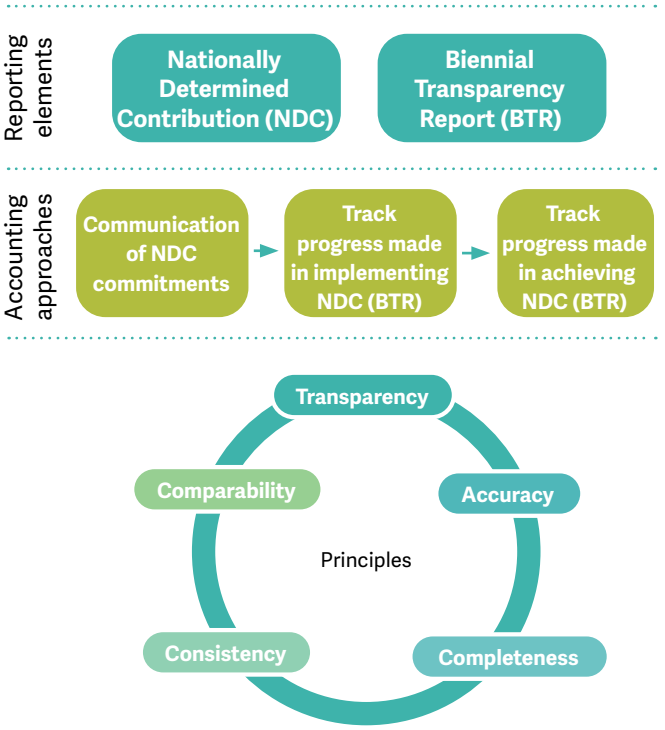


Figure 1. Reporting and accounting under the Paris Agreement.[3]

[1] Paris Agreement to the United Nations Framework Convention on Climate Change, December 12, 2015. Available at: Paris Agreement

[2] Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement. Available at: Decision 18/CMA.1

[3] Adapted by authors based on UNFCCC (2022), Reference Manual for the Enhanced Transparency Framework under the Paris Agreement. Available at: Reference Manual for the ETF

2. Institutional Arrangements for the ETF

Considering the reporting requirements of the ETF under the Paris Agreement compared to the previous requirements under the UNFCCC, developing countries need to develop appropriate institutional arrangements that enable them to fulfil these obligations. Existing institutional arrangements in countries can serve as a foundation on which can be built for the implementation of the ETF to ensure the arrangements are relevant and sustainable. This is an essential enabling factor for the successful implementation of the Paris Agreement requirements.

As such, several important elements need to be considered when establishing institutional arrangements within a national MRV framework that allow for a country to implement its climate change commitments, namely:

- **The organisations involved in implementation:** a range of entities is involved at national and/or sub-national level such as, among others, government agencies, industry organisations, educational institutions, and research organisations.
- **The need to establish a framework to support information collection or policy implementation and the type of arrangement feasible:** Formal agreements such as legislative decrees or memorandums of understanding can support the establishment of a sustainable process for collecting the necessary data.
- **The type of information management system that can be developed:** The submission of BTRs is every two years and NDCs are to be communicated every five years. As such, national information management systems that archive and display climate change information will allow a country to build on the work of previous submissions.

3. How MRV Frameworks Facilitate Adequate Reporting Under the ETF

Furthermore, the development of an MRV framework is an invaluable step a Party should engage in to ensure it can meet its reporting obligations under the ETF. MRV frameworks help to systematise the activities that must be undertaken to produce reports such as the BTR along with other reporting formats as stipulated in the MPGs. Ultimately, there are four dimensions of MRV under the ETF, whereby MRV Systems are developed for the four key areas that must be reported on – GHG Emissions, Mitigation, Adaptation, and Support. These are shown in the figure below. Note that the scope of this project covers only the GHG Emissions and Mitigation elements.

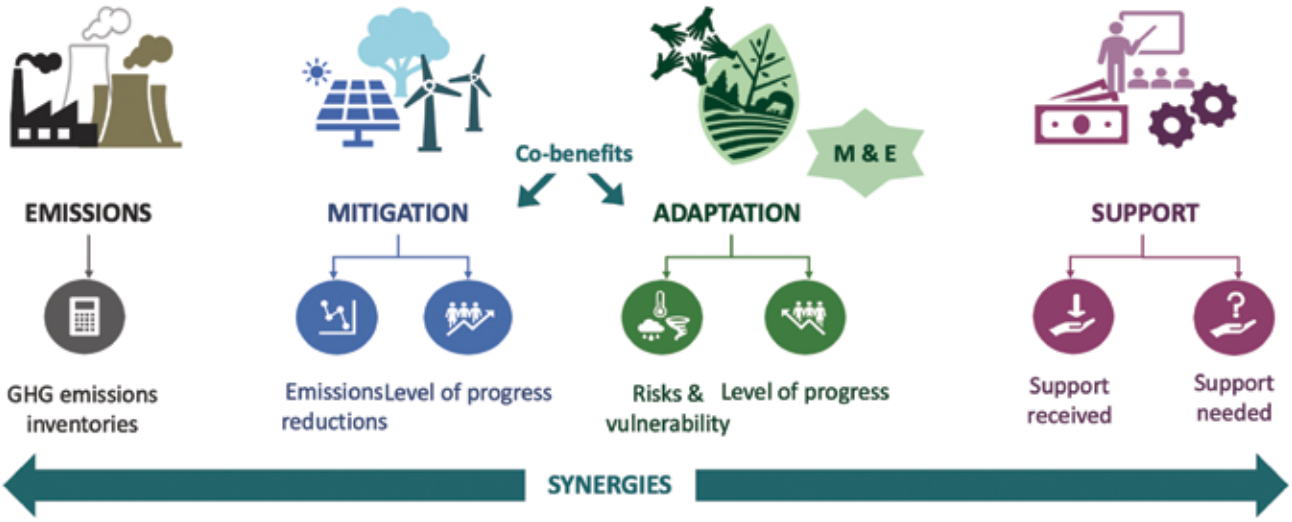


Figure 2. Dimensions of MRV Under the ETF

Within each of these four MRV Systems that make up the overarching MRV Framework are three core components – organisational mandates, information flows, and tools and systems. Pictured in the figure below, these components should rely on building upon what already exists in a country to leverage synergies, thereby easing the process of institutionalising climate reporting within the mandates and regular activities of the key MRV stakeholders. These three components are then deployed for the execution of the step-by-step manuals, hereby referred to as MRV protocols, that dictate the activities that must be carried out, by whom, and the timeframes that must be adhered to.

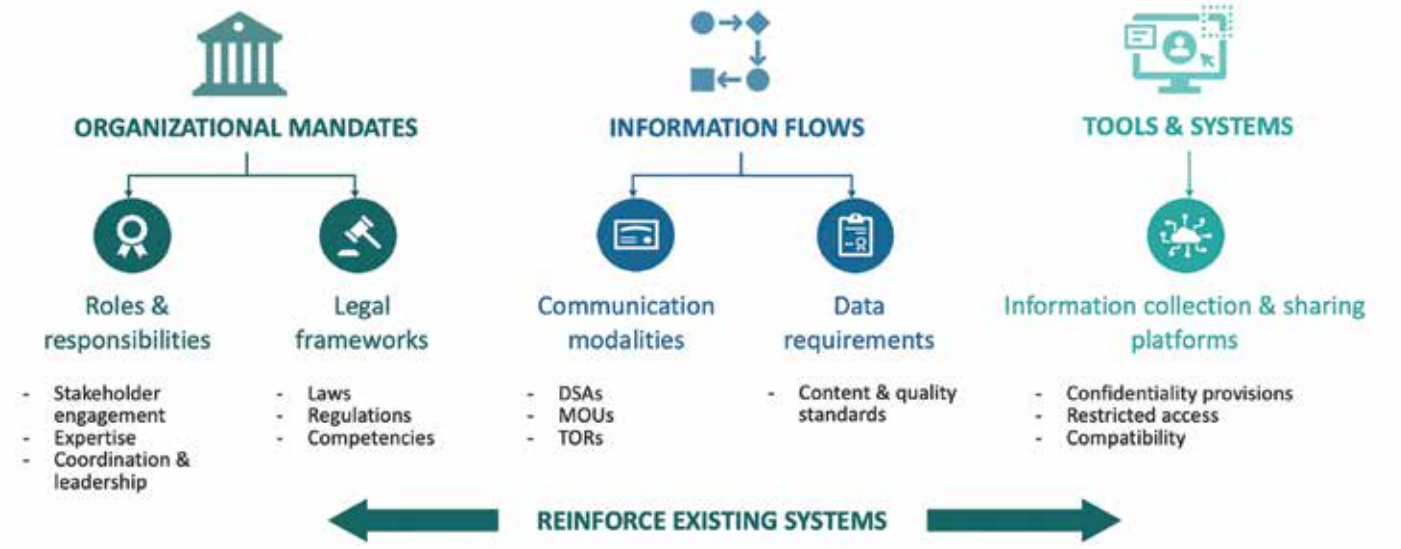


Figure 3. Core Components of MRV Systems.

Therefore, the MRV protocols establish a clear set of activities that must be completed according to a pre-determined schedule that enables reporting on a biennial basis, in line with the reporting requirements of the ETF. These sets of activities will clearly define the institutions and entities that must execute particular tasks, any information that must be shared between entities in order to execute a particular activity, and any tools, templates, and systems that should be used or completed in order to satisfy the requirements of the particular activity. Together, these activities that must be executed in order to elaborate reports that satisfy the reporting obligations make up what is referred to as an MRV cycle, which typically will be implemented on a continuous basis, with each cycle lasting for two years in line with the reporting timeframes under the ETF.

This systematisation of elaborating the reports that will be submitted to the UNFCCC ultimately facilitates a Party´s ability to meet its reporting obligations by providing a standardised and transparent approach for data collection, data estimation, and reporting, reinforced by a series of rigorous quality checks in line with international best practices. The clear delineation of roles and responsibilities, reinforced by legal frameworks and other communication modalities, ensure that all key MRV stakeholders have clearly delineated tasks, or protocols, to execute across the MRV cycle. Moreover, this standardised system enables the identification and implementation of actionable improvements that allow a Party to iteratively improve its reporting standards over time.

Section B. **Context of the Industry Sector MRV Framework of Sri Lanka**

This section introduces the general stages that are to be executed within an MRV System, collectively defined as an MRV Cycle, defines the specific objective and scope of the MRV framework of Sri Lanka´s industry sector and the different components of the MRV framework.

1. Stages of an MRV System

MRV Systems are designed to systematise and institutionalise climate reporting on a national level in such a manner that high-quality and timely reporting to the UNFCCC can be carried out sustainably while implementing improvements over time. A fundamental component of MRV Systems are the stages that must be executed, which clearly delineate, in chronological order, the tasks and protocols that must be completed to produce reports that satisfy a Party's reporting obligations under the ETF. These stages are collectively referred to as MRV cycles.

MRV Cycles consist of a biennial cycle composed of 7 stages as shown the following figure, based on the good practice guidelines as laid out by the "Handbook on Measurement, Reporting and Verification for Developing Country Parties".[4]



Figure 4.
Composition of the Seven Stages within MRV Cycles.

Plan

The first stage entails developing a line of approach for the temporal and managerial aspects of the entire MRV cycle. In view of the BTR and UNFCCC reporting cycles, a plan on how to accomplish the necessary steps of the MRV cycle is developed during this stage. To that end, first the information flows between data providers and key ministries must be consolidated and any lapses or missing mandates should be addressed via Data Sharing Agreements (DSA) or Memoranda of Understanding (MoU). An MRV cycle chronogram also should be prepared during the Planning stage, which delineates the timelines and deadlines for executing all stages of the cycle.

Collect

Concerning the raw data to be shared by data providers with designated lead ministries, the lead ministries will use forms and guides that detail data formats and complete them with the available information and request additional information and data from a previously identified list of data providers. Quality control checks of the information collected during the Collection stage will be performed during the data collection processes and any refinements to data agreed with the relevant data provider. The completed forms, together with documentary evidence, will then be used for conducting estimations during the Estimation stage.

Estimate

During the third stage, responsible entities will analyse the data collected to elaborate the estimations and prepare the reports, including the BTR sections for both the GHG inventory and the mitigation components and nay associated reporting tables that are to be completed in order to satisfy reporting obligations under the ETF. During this stage, sectoral lead ministries will also monitor the implementation progress of the policies and measures developed by Sri Lanka to achieve its NDC emissions reduction targets.

[4] Handbook on Measurement, Reporting, and Verification for Developing Country Parties

Verify

The fourth stage of the cycle is reserved for the Quality Assurance and Quality Control of various elements produced that contribute to the elaboration of reports and other formats required to be reported to the UNFCCC in satisfaction of obligations under the ETF. These quality assurance and quality control checks, in particular, must be performed on the estimated data, the reports developed on the industry sector GHG inventory and mitigation PAMs, and the overall MRV processes and protocols.

More specifically, quality control checks are to be performed on the data before estimations are conducted as well as on the estimates produced. Additionally, technical quality control checks will then be carried out by third-part experts on the estimations. This is then followed by a series of quality assurance procedures, which are conducted on all estimations produced and reports elaborated to ensure timely, transparent, accurate, consistent, comparable, and complete reporting. Finally, high-level political approval of all reporting documents will be carried out before these documents are submitted to the UNFCCC. In addition to these checks, the entity with responsibility for coordinating the MRV System will conduct quality control checks on all MRV processes and protocols. All of these checks will contribute to the identification of actionable improvement items, which is discussed below.

Improve

The fifth stage consists of improving the quality of the elaborated estimations and formats as well as the overall MRV process according to the recommendations arising from the verification stage. An improvement plan will be developed for communication flows, procedures and templates used during the MRV cycle. In practice, the improvements identified by the quality control and quality assurance checks should be classified as either requiring immediate correction or as medium-term improvements to be addressed in subsequent MRV cycles, thus two plans for cataloguing the improvements are developed. Similarly, the quality control processes elicit shortcomings during a MRV cycle which all are to be addressed within the same cycle. Quality control templates ensure the necessary documentation of these areas for improvement and measures taken to rectify them.

Report

Internal and external reports should be developed and made available to all stakeholders involved and the MRV cycle. The technical level of the reports should be adapted to the different audiences. It is important to note that the reporting to the UNFCCC requires the highest level of technical detail and formal elaboration following standardised formats and tables. For policymaking purposes, a comprehensive account of the progress and impacts of the implementation of mitigation policies and measures and information on the national inventory trajectory should be developed and disseminated to relevant entities and institutions. Moreover, the public in general should have access to progress information on national and sectoral emissions and on important mitigation actions and their contribution to NDC implementation, and thus the progress of the country on its international climate change obligations.

Archive

The transparency cycle concludes with archiving activities, in which all information pertaining to the current MRV reporting cycle is stored in a secure place with the aim to guarantee the credibility of results, facilitate data verification and prevent information loss. As such, all institutions are required to duly store all relevant documents and information. Additionally, a data archive coordinator should be appointed to oversee all archiving procedures and data access requests.

2. Scope and Objective

To operationalise the national climate change MRV framework in Sri Lanka, targeted transparency subsystems or modules need to be developed for the thematic scopes that it encompasses.

The **scope** of the MRV framework presented in this document includes the national GHG inventory and mitigation for the industry sector of the country.

The industry sector MRV framework seeks to enhance the monitoring, estimation, quality verification and reporting in the country in an integrated manner. When developing the MRV framework, the specific requirements, data needs and reporting specificities of the industry sector must be considered as they yield implications regarding the setup of institutional arrangements, data collection modalities and estimation protocols. Efforts are made to enable developments within the scope of the project to be adapted to key transparency design elements which fall outside of the project's scope.

In this context, the **overall objective** of the industry sector MRV framework of Sri Lanka is for the country to firstly be able to report an inventory report of anthropogenic emissions by sources and removals by sinks of GHG for the industry sector and secondly provide the information necessary to track progress made in implementing and achieving its NDC commitments for the industry sector.

These two thematic scopes are inherently linked because while GHG inventories do not constitute information to track NDC progress by definition, the information contained within national inventories is fundamental to tracking progress. Countries' NDC define absolute targets, a Business as Usual (BAU) target, intensity targets, or peaking targets, among others, to be achieved by 2030.

For instance, the Updated NDC of Sri Lanka defines a commitment to unconditionally reduce GHG emissions by 4% by 2030 compared to the BAU scenario and a conditional commitment to reduce GHG emissions by 10.5% by 2030 compared to the BAU scenario.[5]

Indicators to track progress made in implementing and achieving these targets within NDC's can constitute a percentage reduction of GHG emissions below a specified base year, base period, or baseline, or a percentage reduction of GHG intensity below the specified base year or base period. As such, information on the GHG emissions (tCO_2eq) in the base year or current year or trends of domestic emissions and removals of GHGs obtained through the GHG inventory is key to informing GHG-related indicators, which is core tracking progress information, and projections of emissions and removals. Annex I summarises examples of indicators for various types of goals in NDCs.

The following sections further define the **specific objectives** within the schematic scopes of the GHG inventory for the industry sector and mitigation related to the industry sector as part of the industry sector MRV framework of Sri Lanka.

GHG Inventory

Developing a GHG inventory for the industry sector in a sustainable fashion is essential for Sri Lanka as it delivers crucial insight into the emissions profile by industry sector, provides the fundament for any targeted mitigation efforts in industry, and presents the basis on which emission scenarios are developed for long-term projections. In addition, as previously stated, under the reporting requirements of the Paris Agreement, all countries shall report a national inventory report of GHG emissions and removals. The development of the GHG inventory for the industry sector thus enhances the wider national reporting systems and capacities.

To meet these requirements, the institutional architecture detailing clear responsibilities and protocols in Sri Lanka must be strengthened to ensure a timely compilation of necessary data from the industry and to allow for a precise estimation and subsequent reporting of the national GHG inventory.

In the context of the scope of the MRV framework of Sri Lanka, emissions from the industry sector in Sri Lanka that are to be estimated and reported in national GHG inventories include emissions from fuel use to produce electricity (1.A.1. Energy Industries), emissions from fuel use in the manufacturing industry (1.A.2. Manufacturing Industries), and emissions from the transformation of products and the use of products in the industry (2. Industrial Processes and Product Use). The following table summarises the incorporated industry sector emissions by category according to the 2006 IPCC Guidelines for National GHG Inventories and 2019 Refinement.

[5]Sri Lanka – Updated Nationally Determined Contribution to the United Nations Framework Convention on Climate Change (September 2021). Available at: Updated NDC of Sri Lanka

Table 1. Industry Sector Classification according to the 2006 IPCC Guidelines and 2019 Refinement.

Industry sector emissions in Sri Lanka			
IPCC categories			Emissions
1. Energy	1A1. Energy Industries		Emissions from fuel use to produce electricity
	1A2. Manufacturing Industries and Construction		Emissions from fuel use in the manufacturing industry
2. IPPU	2. Industrial Processes and Product use	**Industrial Processes** 2A. Mineral Industry 2B. Chemical Industry 2C. Metal Industry 2E. Electronics Industry[6] 2H. Other (Pulp and Paper and Food and beverages)	Emissions from the transformation of products and the use of products in the industry.
		Product Use 2D. Non-Energy Products from Fuels and Solvent Use 2F. Product Uses as Substitutes for Ozone Depleting Substances 2G. Other Product Manufacture and Use	

Note that under the international reporting requirements, it is necessary to account for and report on all GHG emissions for all sectors, thus Sri Lanka will have to report on emissions from the energy sector, including Transport, Commercial/Residential sector, fugitive emissions and carbon dioxide storage and transport not considered under the industry sector. Similarly, complete inventories contain a full account of all emissions from the IPPU (considered here), Agriculture, Forestry and Land-use categories (AFOLU) as well as from the Waste sector which are not part of the industry sector scope.

The **objective** of the industry sector MRV framework for the **GHG inventory** is for Sri Lanka to be able to sustainably estimate all anthropogenic emissions occurring in the industry sector in the country, which includes emissions from the energy producing and manufacturing industry (energy) and IPPU.

[6]In the latest national inventory, emissions from the categories 2B and 2E were not estimated due to lack of data, while 2C was not included due to marginal GHG emissions below 0.01 Gg. Information retrieved from the Third National Communication, 2022.

Mitigation

Climate change mitigation is key for decreasing the amount of emissions released into the atmosphere and in reducing the current concentration of carbon dioxide (CO2) by enhancing sinks. As such, national mitigation actions and their effects are crucial to achieve the climate change mitigation commitments set by a country and ultimately ensure the goals set within the global effort to address climate change are reached. They allow for- and support the assessment whether a country is on track in reaching its targets.

Under the reporting requirements of the Paris Agreement, all countries shall report information on mitigation policies and measures (PAMs), actions, and plans and information to track progress towards the implementation and achievement of a Party's NDC, with certain flexibility provisions provided for those developing country Parties that need flexibility in the light of their capacities. Sri Lanka submitted its updated NDC to the UNFCCC in September 2021, which incorporates mitigation targets and corresponding mitigation actions covering the following sectors: Electricity (Power), Transport Industry, Waste, Forestry, Agriculture[7]

These sectors are similar to the sectors as defined for the GHG inventory by the IPCC, yet they are not strictly split by emission category. To illustrate, transport and Electricity (power) both fall under the energy category and most activities envisioned in the Industry NDC actions would also relate to energy as the actions largely seek to reduce emissions accounted for in the energy category. As such, it is important to note that the scope for the industry sector MRV for mitigation covers only those policies and measures which produce emissions related to the energy industry (1A1), to the manufacturing industry (1A2) and to the IPPU (2) category as defined for the GHG inventory scope. Thus, for instance the transport policies and measures of the NDC, impacting on overall energy sector emissions due to fuel combustion in vehicles, are not considered in this industry sector MRV framework. Similarly, waste, forestry and agriculture are not a part of the industry sector scope.

As per its NDC Implementation Plan[8] published in 2023 Sri Lanka defines more specific and actionable targets to achieve its updated NDC. The Plan hence covers the same actions as in the updated NDC, but provides detail on the responsible institutions, the implementation time frame and Key Performance Indicators (KPI) to track their progress.

Moreover, institutional arrangements supporting the implementation are detailed in the plan and as such directly inform the MRV framework related to mitigation activities in the country.

The **objective** of the MRV framework for the industry sector in Sri Lanka related to **mitigation** is for the country to be able to sustainably track the progress in implementing and achieving the mitigation actions related to the industry sector outlined in its NDC Implementation Plan and subsequently track progress towards the achievement of its NDC commitments for the industry sector

[7]Sri Lanka – Updated Nationally Determined Contribution to the United Nations Framework Convention on Climate Change (September 2021). Available at: Updated NDC of Sri Lanka

[8]Sri Lanka Nationally Determined Contributions Implementation Plan (2021-2030) (July 2023), Available at: NDC Implementation Plan

3. Components

National MRV frameworks are comprised of several components that need to be designed and developed for each of the incorporated thematic scopes, namely:

- Formalisation of the **institutional arrangements** defining which institutions will be involved and their corresponding roles and responsibilities.
- Development of **protocols, formats, and methodologies** dictating the procedures to be followed for providing and compiling data that can subsequently be reported under the international reporting framework.
- Establishment of a **centralised information platform** compiling data flows and information obtained through the process ensuring availability in future estimation/reporting cycles.
- Implementation of **capacity-building mechanism** to train the stakeholders involved in the transparency system on their required roles and responsibilities.

In this MRV Framework, the institutional arrangements for the industry sector MRV system are developed and extensive protocols, formats and methodologies are provided. These components will be further described in subsequent sections as explained below.

Institutional Arrangements

Defining and formalising the roles and responsibilities of the stakeholders involved in the MRV framework for the industry sector of Sri Lanka is a key step and the backbone of any MRV framework. Stakeholders are mapped and their current capacities, procedures, and mandates analysed to identify and define the key stakeholders involved within each thematic scope. Subsequently, the necessary institutional arrangements are determined to ensure the sustainability of the system and its data and reporting flows. The institutional arrangements of the MRV framework for the industry sector of Sri Lanka are presented in Section C to this document.

Protocols, Formats, and Methodologies

Essential to the functioning of MRV frameworks is the provision of quality data to estimate and report information. Protocols and agreements need to be established dictating procedures to be followed for providing and compiling data. Such procedures should contain clear provisions for quality of the data and should ensure timely and complete data compilation for subsequent reporting. In addition, the methodologies required to be followed should be clearly defined to ensure consistency in the estimations and reporting of climate change information. The protocols, formats, and methodologies of the national industry sector MRV framework of Sri Lanka are presented in Section D to this document.

Centralised Information Platform

A centralised data and knowledge platform provides a central information repository and interface facilitating transparent sharing of progress and key data on climate action. As such, it further enhances the centralisation of climate change information while simultaneously improving public outreach.

As part of the national MRV framework for the industry sector of Sri Lanka, data, and estimations for the national GHG inventory and mitigation actions can be stored on this platform while making information on transparency activities in Sri Lanka available to national and international stakeholders such as:

- National government actors responsible for national policy development, planning and decision-making.
- Public, private and academia stakeholders tracking the implementation and progress of commitments and climate actions of Sri Lanka.
- The general public interested in learning about Sri Lanka's efforts on climate action.

This centralised information platform should be aligned with the institutional arrangements, the data-sharing templates and reporting formats, and protocols for data providers and methodologies incorporated in Section C and Section D of this document. Furthermore, the centralised platform will ensure an open-source database, data integrity, data consistency, data accessibility and proper security and storage, while avoiding data redundancy and preventing and signalling accidental data errors.
A range of recommendations for tool and IT use in relation to the centralised platform are provided in Deliverable 4: IT Platform Proposal. Further, a concise plan on upscaling the MRV system including the IT platform is found in Deliverable 9: Roadmap on upscaling the industry sector MRV system implementation.

• Capacity-building Mechanism

Capacity-building is an essential element of any transparency framework to expand the skills and knowledge of the relevant stakeholders. Ultimately, the goal is to ensure that all stakeholders have sufficient capacity to apply the defined institutional arrangements, procedures, formats, and methodologies. Capacity gaps thus mean that the existing capacity of a stakeholder is not in line with the required needs.

As is the case in many countries, stakeholder capacity is a main bottleneck for establishing and maintaining an effective MRV framework in Sri Lanka. Extensive training is required for key stakeholders reflecting their roles and responsibilities within the MRV framework for the industry sector. Such capacity-building should seek to build lasting capacities within institutions beyond capacitation of single individuals to ensure skills and knowledge on climate change transparency can eventually be passed on autonomously by the key institutions.

Capacity-building is provided throughout the adoption of the institutional framework defined in this document. The following table defines the four main capacity-building activities conducted as part of the overall training programme developed for the MRV framework for the industry sector of Sri Lanka.

In addition, Deliverable 8: Report on capacity building workshops developed contains a structured assessment of these four main training interventions conducted throughout the project and provides a detailed analysis of national stakeholder capacity against the key knowledge elements necessary for applying this MRV Framework

Table 2. Capacity-building Activities as part of the Capacity-building Programme for the MRV Framework for the Industry Sector of Sri Lanka.

Progress	Activity
✓	Provided training sessions on basic concepts of climate change, the Paris Agreement and its ETF and the related reporting requirements, MRV concepts for the GHG inventory and mitigation or NDC tracking, and estimation methodologies for industrial sector GHG emissions and the compilation of GHG inventories.
✓	Provided in country training sessions on the use of the MRV protocols. The details on this training are found in the Capacity-building Mission Report referring to the Consultation Mission conducted in March 2023.
✓	Piloting the proposed MRV protocol with key stakeholders. The detailed report of the Pilot Program is found in Deliverable 6: MRV Pilot Report
✓	Provided in country targeted training sessions on the key capacity-building areas based on the training needs assessment which can be retrieved in Deliverable 5 supporting the document at hand. The Mission Report for the Validation Mission conducted in November 2023 further includes a description and an assessment of this training.

Section C. **Institutional Arrangements**

1. Roles and Responsibilities by Function

Responsibilities should be assigned for each of the main functions of the MRV system, taking into account the national context to exploit the potential of existing governance structures and already defined institutional mandates and responsibilities in Sri Lanka. Specific national institutions and other entities are assigned to each of these core functions.

The seven core functions of the MRV system are:

a. Coordination and Reporting
b. Sectoral Data Collection
c. Data Provision
d. Data Estimation
e. Technical Quality Assurance and Quality Control (QA/QC)
f. Political Oversight and Validation
g. Archiving

This section introduces each of these core functions and presents the generally required activities, responsibilities, and the expected capacities for each of these functions. Following this, stakeholders will be designated to take on the responsibilities of each function for the MRV System of Sri Lanka based on their mandates, capabilities, and overall climate-relevant ambitions of the country.

Furthermore, Annex XVI provides several Terms of References (TORs) detailing, for each main institution, its role in the MRV system, specific responsibilities as well as meeting modalities.

1.1. General Activities and Expected Capacities

Coordination and Reporting

The coordination function of the MRV system is carried out by a central governmental institution with relevant mandates and policy application for climate change. The coordinator thus combines expertise and political weight to plan and oversee the climate MRV process for the country. In this capacity, the coordinator assumes responsibility for developing the reports to the UNFCCC and develops and implements improvement plans based on a thorough review process in order to continuously refine the MRV process in the country. The coordination function is the focal point within the MRV system, liaising with both the national stakeholders providing data, data estimation and quality assurance as well as with entities in the international climate transparency system, including the UNFCCC.

The activities and responsibilities of the Coordination and Reporting function include:

- Coordination role.
- Ensure the availability of financial and human resources needed for the functioning of the system, and for deploying them efficiently.
- Plan each MRV cycle.
- Convene stakeholders and chair working group and committee meetings.
- Define data needs for reporting sections in the BTR.
- Oversight and management of processes and data flows.
- Submission of integrated and final reports to the UNFCCC.
- Develop and implement improvement plans.
- National Focal Point during the UNFCCC review processes.

Expected capacities: Recognised and skilled national focal point working on climate change action, knowledgeable on climate change MR

Sectoral Data Collection

Sectoral data collection is a key function within the MRV system as the institutions tasked with executing these functions are the first focal point for raw data collection for climate data of one particular sector. As such, the function is covered by sectoral lead institutions representing the sectors required for the MRV system. Therefore, the choice of sectoral lead institutions depends firstly on the MRV component in question because the data required for the developing the national GHG inventory differs from the data needed for the mitigation MRV system. Once the system is determined, the function of the sectoral leads is to assume responsibility over data collection for one specific sector generating a particular set of climate change relevant data as a result of the particular activities that the sector engages in. For instance, for the GHG inventory, these data sectors are determined by the IPCC guidelines for reporting national GHG emissions. Hence sectoral leads for compiling raw data from each of the energy, industry, and product-use sectors have been defined under this project and will be additionally required for the agriculture, forestry, land-use, and waste sectors.

Alternatively, for the NDC Implementation, Sri Lanka's mitigation policies and measures are split by the electricity (power) sector and industry sector, which are both considered for the overall industry sector MRV framework. In order to enable an effective and recurrent data collection mechanism, potentially existing liaisons with data providers should be strengthened while new ones must be established where necessary. Such links may further be supported through regulatory motions or through other binding agreements such as Data Sharing Agreements (DSA) or Memoranda of Understanding (MoU).

Concerning the expected capacity of the sectoral lead institutions, key national institutions, which as per their mandates already hold relevant data for their sector, should be appointed. Furthermore, they must have sufficient capacity and political weight to lead the data collection from various sources, understand the data and be able to identify shortcomings, as well as to execute initial quality controls to ensure their suitability for estimation and for continuous data improvement. The sectoral leads thus liaise with the providers of additional sectoral data and pass on consolidated sectoral data to the institution carrying out deeper technical analysis for the MRV system.

The activities and responsibilities of the Sectoral Data Collection function include:

- One sectoral lead for each relevant sector.
- Participate in the planning and quality assurance meetings of the national verification body.
- Collaborate on data compilation with the coordinator who provides forms relating to data needs.
- Compile data available within each institution.
- Elaborate the list of required data providers and compile additional raw information from relevant data providers.
- Return the compiled data for all actions of their sector with metadata and additional evidence documents to the coordinator.

Expected capacities: In-depth knowledge of the relevant MRV subsystem and, in particular, of climate change data and policy of the sector led by the institution.

Data Provision

Data provision is the basis of any MRV system as required raw data for each sector is provided by the institutions responsible for this function. The raw data needed, similar to the sectoral data collection, is dependent on the MRV system and differs between the GHG inventory and mitigation. While the inventory development requires the provision of economic, and Intergovernmental Panel on Climate Change (IPCC) sectoral data relevant for estimating emissions, for mitigation, data on specific policies and measures with emission reduction potential is required. The data providers hence are those institutions that due to their organizational activities hold relevant data for the MRV system. The raw data is passed by the data providers to the sectoral ministries who, after conducting a first quality check, may request elaboration of the provisioned data.

The activities and responsibilities of Data Providers are to: Provide data in line with the compilation form requirements. Data include:

- Raw statistical data used for monitoring of progress: for instance, economic data, and IPCC sectoral data relevant for estimating emissions.
- Information generated for monitoring specific projects/policies, including specific indicators for monitoring policies and projects.
- Information generated on the GHG emission reduction potential of the projects if available at the level of data providers.

Expected capacities: Hold relevant data, such as data for sectoral emissions, or information on policies and measures implemented for mitigation.

Data Estimation

The data estimation function is carried out by a central institution in the national MRV system. The responsibilities of such institution revolve around the technical elaboration of the chapters of the BTR to be reported every two years and include the analysis of sectoral data provided by the lead ministries and the technical estimation of emission sources and sinks for the GHG inventory and emission reduction potential of mitigation actions. The data estimating institution hence works with the sectoral leads from which it receives aggregated sectoral data for further analysis and the coordinator and the verification body of the MRV system to whom it provides and presents the elaborated technical components of the BTR chapters and under whose guidance it operates. The data estimator moreover conducts targeted quality checks on the aggregated data and requests clarification from the sectoral lead and or other data providers if required. The capacities required for fulfilling this function hence are the technical skills and qualifications for adequate data estimation and elaboration of the chapters of the BTR. For that reason, familiarity with the international transparency requirements is needed. The data estimator does not need necessarily need to be a governmental body, but it is recommendable to appoint an institution with relevant knowledge and experience on national reporting on climate change in the country.

The activities and responsibilities of the Data Estimation function include:

- Ensure the availability of a technical team covering all sectors for data processing and aggregation, Quality Control (QC) activities, archiving and incorporating
- Analyse data and present the results of the analysis and the reports (BTR) to the entity carrying out the technical Quality Assurance (QA)/QC.

Expected capacities: Technical knowledge for elaborating the GHG inventory, estimating the effects of mitigation or policies and measures (statistics, IPCC guidelines, reporting requirements) and elaborating analyses and reports.

Technical QA/QC

Inter-agency Coordination and Technical Quality Control

To assure and enhance the quality of the estimated data, technical quality control (QC) checks must be implemented. These checks are conducted after data estimation and serve to identify errors or inconsistencies which either require immediate correction by the data estimating body or which are to enter the longer-term improvement plan for the MRV system which is developed by the coordinator. To that end, this function should be carried out by expert bodies. The body conducting the technical QC should have representation from the key institutions involved in the MRV System. Moreover, this body shall assume the role of an Inter-agency Coordination entity that supports the MRV processes.

The activities and responsibilities of the Technical QC function include: Support the development of the MRV process from the technical point of view.

- Support the coordinator in the managerial aspects of the MRV System and help set effective timelines and flow of activities.
- Undertake technical quality control activities for the GHG inventory and mitigation estimates.
- Propose improvements for the current (immediate action) and future MRV cycles (medium term recommendations).

Expected capacities: Good sectoral knowledge and capacity to technically review estimates and reports as well as capacity to develop targeted improvement plans. Further, good understanding of the MRV processes to support the implementation of an effective MRV cycle.

Expert Support and Quality Assurance

Quality assurance (QA) consists of an external third-party review which ensures overall quality of the estimations and reports. The responsible body should be staffed with inter-institutional experts which are not directly involved in the data collection, estimation, and reporting of the GHG inventory or mitigation components. Moreover, this body can provide additional support by complementing the skills and knowledge of the Inter-agency Coordination and Technical Quality Control body with external expertise.

The activities and responsibilities of the Technical QA function include:

- Undertake quality assurance activities on the reports from an externa viewpoint.
- Propose improvements for the current (immediate action) and future cycle (medium term recommendations).
- Provide expertise if requested to improve MRV processes.

Expected capacities: Good sectoral knowledge and capacity to follow the steps of technical monitoring of progress in order to develop improvement plans. This body shall not consist of actors directly involved in the main MRV activities to ensure independent third-party review.

Political Oversight and Validation

High-level political verification and support is important to legitimize the national MRV system. Therefore, a central and inter-institutional council must be appointed representing the main stakeholders with relevant operations and mandates for climate change policy in the country. This council is composed of political heavyweights mandated to oversee appropriate conduct in the MRV system and implementation of the international obligations. The core function of this body therefore is the high-level political validation of the technical reports developed for the BTR every two years. For that, it is assumed that validation by the council occurs once all data is technically validated.

The activities and responsibilities of the Political Oversight and Validation function include: Final validation of the information to be reported and use of the results for decision making.

Expected capacities: High level institution holding mandates for climate change transparency and decision-making.

Archiving

A robust archiving system is a crucial component of the MRV system as documentation and archiving of information will enhance the effectiveness and long-term sustainability of the transparency process. Archiving occurs throughout all stages in the MRV cycle, and all involved stakeholders should keep structured records of the data they manage to avoid data loss. Moreover, for the purpose of developing and refining specific methodologies and calculations on data aggregation and estimation as well as for ensuring continuous improvement and preventing data loss, a central archive coordinator shall be appointed from within the entity responsible for the Coordination function.

The activities and responsibilities of the Archiving function include: Storing of all relevant information of the MRV system by all stakeholders and maintenance of a central archive by an archive coordinator.

Expected capacities: Key focal point for monitoring and managing MRV-relevant data flows within each institution involved in the MRV system. Requirement to have access to an adequate IT infrastructure to securely maintain large and structured data bases.

1.2. Roles and Responsibilities by Function for Sri Lanka

In Sri Lanka, under the MRV framework for the industry sector and for each related subsystem, the Climate Change Secretariat (CCS) under the Ministry of Environment, in line with its mandate, assumes the role of the coordinating entity, while the GHG Inventory and Mitigation Working Group (IMWG) and the National Expert Committee for Climate Change Mitigation deliver technical quality control and assurance checks and verification. Moreover, the National Steering Committee provides final validation of the reports and political oversight to ensure the alignment of the MRV activities with national priorities. The sectoral ministries and data providers are determined for each of the MRV subsystems depending on the data management capacity and data availability in the institutions. The sectoral lead for the energy sector is the Sri Lanka Sustainable Energy Authority (SLSEA) and for the IPPU sector the Ministry of Industries (MoI).

It is important to note that institutions appointed in the MRV system are to continuously archive data handled by them to allow for gradual improvement of the process and to avoid data loss.

In the following sections, the roles and responsibilities by function are designated for the thematic areas, namely the national GHG inventory and for mitigation. For each identified institution, the respective ministry or other umbrella organisation under which the institution is placed is mentioned, if applicable.

Note in the MRV cycle chapters on data collection for the GHG inventory and mitigation, detailed matching processes are described, detailing the specific sectoral data needs linked to specific data providers. In Annex II, a more exhaustive list including additional data providers identified for each of the relevant IPCC categories for the inventory elaboration and for the tracking of mitigation PAMs in the industry sector is provided.

Moreover, Annex XVI presents detailed TOR for the key institutions responsible for coordination, data collection and provision, data estimation and inter-agency coordination as well as QA/QC and political oversight.

1.2.1. National GHG Inventory

In the following table, the roles and responsibilities for the Energy and IPPU Sectors of Sri Lanka's National GHG Inventory MRV System are provided. In this context, the choice of data providers and sectoral lead institutions is crucially shaped by the data needs and availabilities associated with the emissions categories of the energy and IPPU sectors. Regarding the other key functions, existing mandates have been analysed and confirmed with national stakeholders.

Overall, the roles and responsibilities have been continuously refined through extensive stakeholder consultation activities to ensure international reporting requirements and national priorities are aligned.

Note that the listed roles and responsibilities are subject to adjustment based on evolving international, national, and institutional circumstances, and should be assessed and, as necessary, refined for every inventory MRV cycle.

Table 3. National GHG Inventory MRV Roles and Responsibilities.

Core Function	Energy Sector Actors	IPPU Sector Actors
Coordination and Reporting	Climate Change Secretariat (CCS)	Climate Change Secretariat (CCS)
Sectoral Data Collection	Sri Lanka Sustainable Energy Authority Supported by the Central Environmental Authority - EPL	Ministry of Industries Supported by the Department of Census and Statistics – Annual Industry Survey
Data Provision	• Central Environmental Authority – EPL issuing system • Sri Lanka Sustainable Energy Authority (MoPE) • Sri Lanka Customs (MoF) • Department of Census and Statistics (MoF) • Ceylon Petroleum Corporation (MoPE) • Ceylon Electricity Board (MoPE) • Lanka Electric Company (MoPE) • Laugfs Gas • Litro Gas • Sinopec • Lanka Coal Company (MoPE) • Lanka IOC • Sri Lanka Tea Board	• Department of Census and Statistics (MoF) • Sri Lanka Customs (MoF) • Air Resources and National Ozone Unit (MoE) • Central Environmental Authority – EPL issuing system_ • Siam City Cement Corporation (Private Company) • Geological Survey and Mines Bureau • Ceylon Petroleum Corporation (MoPE) • Sinopec • Lanka IOC
Data Estimation/Compiler	Climate Change Secretariat (CCS)	Climate Change Secretariat (CCS)
Inter-agency Coordination and QC	GHG Inventory and Mitigation Working Group	GHG Inventory and Mitigation Working Group
Expert support and QA	National Experts Committee for Climate Change Mitigation (NECCCMM)	National Experts Committee for Climate Change Mitigation (NECCCMM)
Political Oversight and Validation	National Steering Committee (NSC)	National Steering Committee (NSC)
Archiving	Climate Change Secretariat (CCS) and all	Climate Change Secretariat (CCS) and all

1.2.2. Mitigation

In the following table, the roles and responsibilities for the Energy and IPPU Sectors of Sri Lanka's Mitigation MRV System are provided. These roles have been assigned based on existing mandates and are aligned with the responsibilities defined in Sri Lanka's NDC Implementation Plan. The NDC Implementation Plan envisions the establishment of sectoral Planning and Monitoring Committees (PMC) which are responsible for the implementation of the sectoral PAMs.

In the scope of this MRV Framework, this includes the PMC for the Electricity (Power) sector and the PMC for the Industry sector. These PMCs are chaired by the secretaries of the Ministry of Power and Energy (MoPE) and the Ministry of Industries respectively. However, for the operationalisation of the MRV system, the Sustainable Energy Authority (SLSEA) takes on formal responsibility for the Electricity (Power) Sector in close collaboration with the MoPE and is therefore considered the key entity for compiling data on electricity sector PAMs. These institutions are further planned to assume increasing responsibility with regard to the implementation, data collection and estimation of the sectoral PAMs.

As concerns the oversight and technical validation of the mitigation component, the NDC Implementation Plan foresees quality assurance to be carried out by the National Expert Committee on Climate Change Mitigation and central oversight to be provided by the National Steering Committee for the NDC. These arrangements are centrally integrated in his MRV Framework to ensure a streamlined NDC implementation and reporting process. As an addition to this, the MRV Framework establishes the GHG Inventory and Mitigation Working Group which is responsible for inter-agency coordination and quality control checks both for mitigation and the inventory components.

In addition, for each individual PAM, a lead entity responsible for the implementation of the PAM is identified and potential data providers are listed. As such, the institutional arrangements related to data provision, data collection, data estimation, as well as oversight and coordination centrally inform the development of the institutional arrangements for the mitigation component of the MRV Framework.

Nevertheless, the roles and responsibilities outlined in the NDC Implementation Plan have been confirmed through extensive stakeholder consultation activities to ensure the Mitigation MRV System's alignment.

Moreover, note that the listed roles and responsibilities are subject to adjustment based on evolving international, national, and institutional circumstances, and updates to the NDC and NDC Implementation Plan. Therefore, they should be assessed and, as necessary, refined at the onset of every mitigation MRV cycle.

Table 4. Mitigation Roles and Responsibilities.

Core Function	Electricity (Power) Sector Actors	Industry Sector Actors
Coordination and Reporting	Climate Change Secretariat (CCS)	Climate Change Secretariat (CCS)
Sectoral Data Collection & Monitoring of PAM progress & Data Provision	PMC Lead - Sri Lanka Sustainable Energy Authority • Sri Lanka Sustainable Energy Authority (MoPE) • Ministry of Power and Energy • Ceylon Electricity Board (MoPE) • Department of Census and Statistics (MoF) • Central Environmental Authority • Local Authorities • Ministry of Finance • Ministry of Environment • Sri Lanka Standards Institution • Urban Development Authority • Chambers and Industry Associations Academia • Mahaweli Authority of Sri Lanka • Land Custodians • Private Entities (Investors, Companies)	PMC Lead - Ministry of Industries • Sri Lanka Sustainable Energy Authority (MoPE) • Ministry of Power and Energy • Ceylon Electricity Board (MoPE) • Board of Investments • Ministry of Environment • Department of Census and Statistics (MoF) • Ministry of Finance • Central Environmental Authority • Siam City Cement Corporation • Chambers and Industry Association • Industrial Services Bureau • Industrial Development Board • Urban Development • Lanka Industrial Estates Ltd. • Waste Management Actors • Sustainable Consumption and Production (SCP) Providers • National Cleaner Production Centre • Industrial Technology Institute • Academia • National Enterprise Development Authority • Mahaweli Authority of Sri Lanka • Coconut Development Authority
Data Estimation/ Compiler	PMC Lead – SLSEA with CCS Support as needed during early MRV Cycles	PMC Lead – MoI with CCS Support as needed during early MRV Cycles
Inter-agency Coordination and QC	GHG Inventory and Mitigation Working Group (IMWG)	GHG Inventory and Mitigation Working Group (IMWG)
Expert support and QA	National Experts Committee for Climate Change Mitigation (NECCCMM)	National Experts Committee for Climate Change Mitigation (NECCCMM)
Political Oversight and Validation	National Steering Committee (NSC)	National Steering Committee (NSC)
Archiving	Climate Change Secretariat (CCS) and all Actors	Climate Change Secretariat (CCS) and all Actors

1.2.3. General Functions of the MRV Process

To provide a consolidated overview of the functions within an MRV system, the following diagram shows the general distribution of the key roles and functions in Sri Lanka. The diagram, to be read from left to right, shows the data flows between the different functions of the MRV System and the particular data-related activities each function is to execute. As can be seen from the data flow diagram, these activities have significant interdependencies and interlinkages.

Following this, comprehensive MRV procedures to be carried out by the designated institutions, are discussed in detail both for the GHG inventory and mitigation component of Sri Lanka´s Industry Sector MRV Framework.

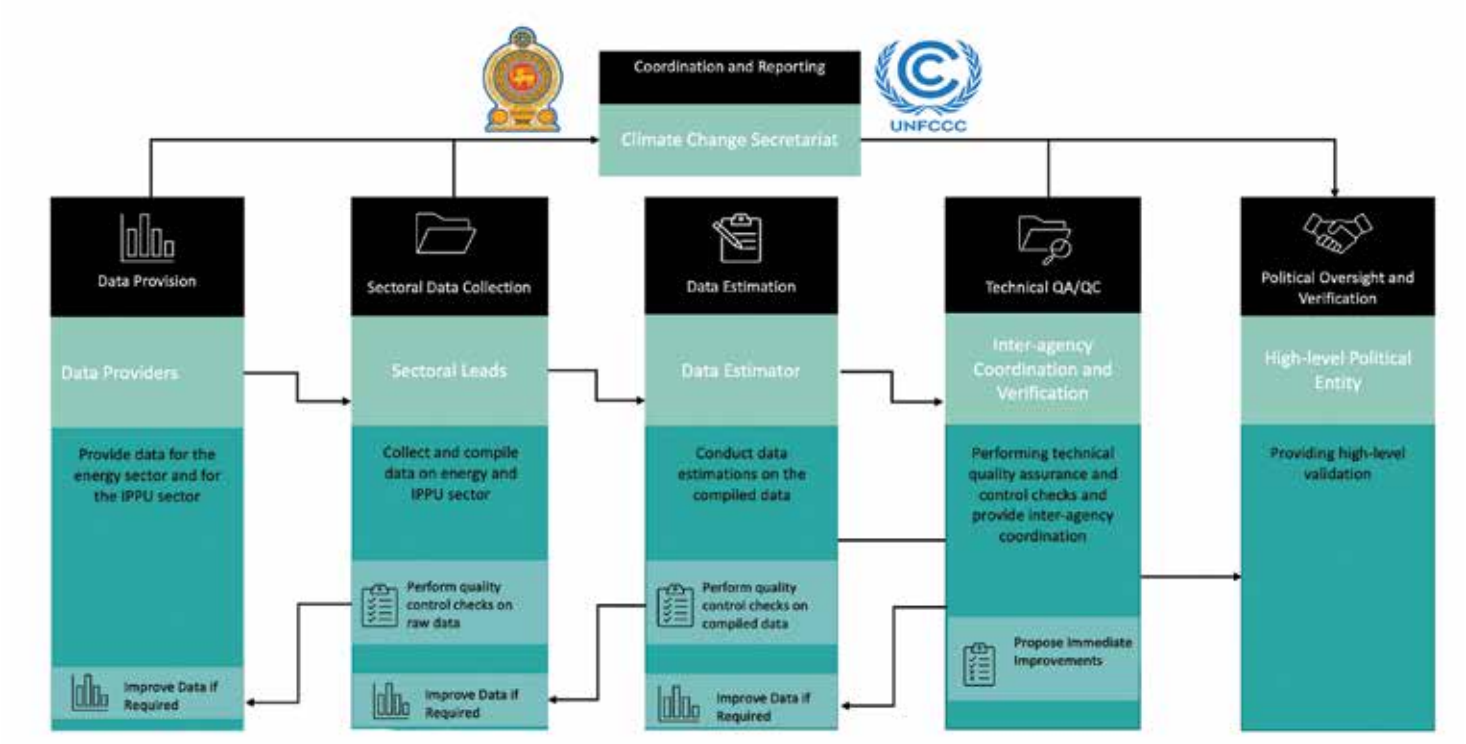


Figure 5. General Functions and Roles in the MRV Process.

Section D. **MRV Procedures**

This section delineates the procedures, technical guidance, templates, forms, outlines, and checklists to support the operationalisation of the industry sector MRV system for the GHG inventory and mitigation component in Sri Lanka.

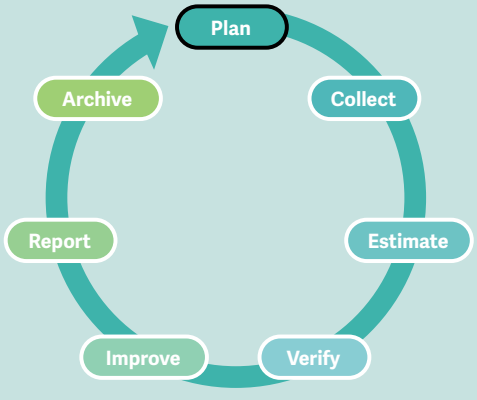
The procedures for both components are developed following the MRV cycle stages, as presented in Section B, and thus will have a similar structure:

GHG Inventory	Mitigation
Planning	Planning
Measuring including data collection and estimation	Measuring and monitoring including data collection and estimation
Verification	Verification
Reporting	Reporting
Relevant annexes containing data templates and formats	Relevant annexes containing data templates and formats

1. National GHG Inventory MRV Cycle

This section details the operational procedures to be followed for the regular elaboration of the industry sector GHG inventory.

1.1. Planning

<table>
<tr><th colspan="2">Summary</th></tr>
<tr><th>Main objective</th><th>Stage of MRV cycle</th></tr>
<tr><td>Plan the different activities of the MRV cycle, and the chronogram of activities within the cycle. The templates to be used within the MRV cycle will be defined and updated, if appropriate, and the priorities identified in the improvement plan of the previous cycle will be streamlined within the current cycle.</td><td>
</td></tr>
<tr><th>Responsible entities</th><th>Timeframe</th></tr>
<tr><td>Coordination
o Climate Change Secretariat (CCS)
• Inter-agency Coordination and QC
o GHG Inventory and Mitigation Working Group (IMWG)</td><td>Months 1-3; months 23-24</td></tr>
</table>

The planning phase is a critical aspect of the GHG inventory MRV cycle as the different activities of the cycle are planned out, detailing the chronogram of activities within the cycle. The main objective of this phase is to ensure that the GHG inventory is compiled in a robust and timely manner, and that the reporting obligations are fulfilled. The 2006 IPCC Guidelines and 2019 Refinement provide a framework for the planning phase, and it is essential that the CCS and the IMWG work together to ensure that the planning is carried out efficiently.

The planning phase commences with several managerial steps that are required to be conducted prior to following technical steps of the MRV cycle.

The **first step** of the planning phase is to define the industry sector GHG inventory objective which will support defining the GHG inventory's data and expertise needs, roles and responsibilities, scope (e.g., sectors, gases, geographies, time-series duration), and timeframes (e.g., schedule and updating frequency) for the inventory compilation, reporting, and review processes. Annex III to this document provides a template for defining the objectives of the GHG inventory.

An important element of the planning stage is to decide the target year or years for the inventory compilation. Data availability as well as NDC commitments will inform the selection of the target years. An important element to consider is the information needed for NDC tracking, in which a target year or years are likely to be defined. It is important to define the target years to allow a robust tracking of NDC commitments.

In addition, part of the first step of the planning phase is to identify the key categories for the GHG inventory in order for resources to be prioritised appropriately. Due to the relative share of these categories, more accurate estimation approaches, hence higher Tier levels should be aimed for, and thus more elaborate data needs to be compiled. Efforts and resources should therefore be focussed on these key categories.

The list of key categories can either be identified and obtained through a previously developed GHG inventory according to the methodologies defined in Volume 1, Chapter 4 of the 2006 IPCC Guidelines, or, in the case for countries where no previous GHG inventory exists, a preliminary assessment should be conducted during the planning phase based on local knowledge and expertise about large emission sources and inventories in countries with similar national circumstances or, by developing preliminary Tier 1 estimates to assist in identifying key categories. Please refer to Section 1.2 for more information on developing a key category analysis.

> **Key categories** are inventory categories which individually, or as a group of categories (for which a common method, emission factor and activity data are applied) are prioritised within the national inventory system because their estimates have a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level, the trend, or the level of uncertainty in emissions or removals. Whenever the term key category is used, it includes both source and sink categories.[9]

Furthermore, the first step of the planning phase also requires reviewing the improvement plan developed at the end of the MRV cycle under the previous GHG inventory to ensure the implementation of improvements over time. An improvement plan details the specific actions to address improvements, prioritises the improvements, and provides a plan how to implement them. It defines the priorities of organisational or technical nature which will need to be considered for the subsequent MRV cycle. This will help to ensure that the recommendations made in the previous GHG Inventory MRV cycle are addressed, and that any issues will be resolved and guide efforts to increase the transparency, consistency, comparability, completeness, and accuracy of future inventories. More information on the protocols to follow for developing an improvement plan are provided in Section 1.3.4 to this document.

The **second step** of the planning phase is to identify and update the list of stakeholders who will be involved in the industry sector GHG inventory process of Sri Lanka based on the outcomes of the first step of the planning phase. Although Section C to this document already identified the stakeholders that will participate in the MRV cycle for the industry sector GHG inventory of Sri Lanka, and the relevant roles and responsibilities of each stakeholder, this list needs to be regularly updated to ensure the sustainability of the process.

GHG inventories are updated on a regular basis which will lead to changing requirements for the institutional

[9]Volume 1, Chapter 4 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available at: Volume 1, Chapter 4 of 2019 Refinement

arrangements. As such, establishing sustainable national GHG inventory arrangements will help to continuously improve and regularly update national GHG inventories. This also includes the potential need to establish new or modified agreements or legal arrangements for data collection, archiving, reporting, and quality management to formalise the institutional arrangements for the industry sector GHG inventory of Sri Lanka compilation in the context of existing national statistical data collection systems.

Institutional arrangements include the interactions between organisations that are involved with the GHG inventory inputs, compilation processes, and outputs. [10]

The **third step** of the planning phase is to develop a chronogram or workplan of activities within the MRV cycle for the industry sector GHG inventory of Sri Lanka based on the outcomes of the first step of the planning phase. This chronogram or workplan should include all the activities that need to be carried out during the cycle, including the deadlines for each activity. The 2006 IPCC Guidelines provide a detailed description of the different activities that need to be carried out during the inventory transparency cycle.[11]

The CCS and the IMWG, responsible for Inter-agency Coordination and QC, should use these guidelines as a reference when developing the chronogram or workplan. This step can be facilitated by organising an inventory kick-off meeting with all sector experts, data providers, and data compilers identified through the second step of the planning phase.

The chronogram or workplan clarifies the schedule of steps for generating the GHG inventory outputs for the industry sector of Sri Lanka. It is important to note that the chronogram or workplan should be reviewed and, where necessary, updated or revised prior to the start of every new GHG inventory cycle. The following table proposes a general time frame for the seven stages of the industry sector MRV inventory cycle, through a 24-month period.

Table 5. Proposed Timeline of the GHG Inventory MRV Cycle.

MRV cycle steps	Specific activities	Months											
		1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
Plan	Analysis and update of stakeholders, key category analysis, selection of methods, definition of chronogram, streamlining of priorities in the IMWG.	■	■										■
Collect	Updates in templates, liaison with data providers, definition and update of MoU and data sharing agreements		■	■	■								
Estimate	Data processing, aggregation, and estimation following the 2006 IPCC Guidelines in line with the choice of method and activity data guided by the IPCC decision trees.				■	■	■	■	■				
Verify	Definition and update of the QA/QC plan and its implementation. Carrying out a range of QC checks for each main phase of the cycle and providing QA on the final estimates.	■	■	■	■	■	■	■	■	■	■	■	■
Improve	As a result of the implementation of QA/QC activities, errors will be identified and corrected before reporting.					■	■	■	■	■	■	■	
Report	Reporting in line with modalities, procedures, and guidelines (MPGs) and reporting procedures of the MRV system.										■	■	■
Archive	Archiving is a continuous activity occurring throughout the cycle to adequately store relevant information when it is generated.	■	■	■	■	■	■	■	■	■	■	■	■

[10]Volume 1, Chapter 1 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available at: Volume 1, Chapter 1 of 2019 Refinement

[11]Volume 1, Chapter 1 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available at: Volume 1, Chapter 1 of 2006 IPCC Guidelines

Determining specific deadlines for each step of the inventory cycle is at the discretion of the CCS. The deadlines can be established during the planning phase at the start of each reporting cycle, using the overall time frame provided in the document as a general reference. As such, the following table provides the template for defining the workplan for the industry sector GHG inventory MRV cycle.

Table 6. Template for defining the Industry Sector GHG Inventory MRV Cycle Workplan.

MRV Cycle Phase	GHG Inventory Activity	Milestone	Lead Actor/Stakeholder

The **fourth step** of the planning phase is to define the templates that will be used within the MRV cycle. These templates are designed in this project to ensure that the information reported is consistent, accurate and comparable. The templates should be designed in a user-friendly way, and they should be updated if appropriate. The CCS and the IMWG should also review the templates used in previous cycles to identify any areas where improvements may be required. The CCS and the IMWG furthermore establish a communication plan. This communication plan should outline the different communication channels that will be used to ensure that stakeholders are kept informed of the progress of the MRV cycle. The communication plan should also identify the frequency of communication and the information that will be communicated.

It is important to note that the planning phase is not a one-time event. The CCS and the IMWG should review the planning phase on a regular basis to ensure that it is up-to-date and that it is meeting the needs of the MRV cycle. The planning phase, linked with the overall procedural aspects, should be reviewed after the completion of each cycle to identify any areas where improvements on the planning aspects can be made.

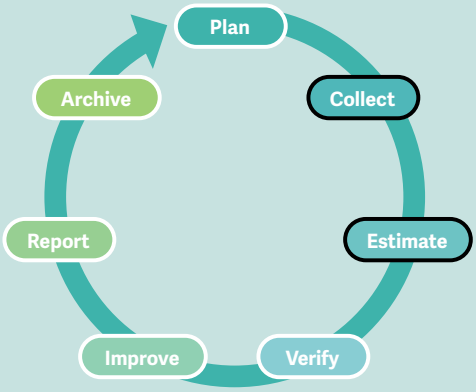
1.2. Measuring

Summary

Main objective

The "Measuring" stage of the MRV cycle for the national GHG inventory refers to the collection of data and estimation of industry sector GHG emissions within the country. The guiding principle for the measuring stage are to ensure the accuracy, completeness, comparability, transparency, and consistency of the estimates. Decision trees from 2006 IPCC Guidelines shall drive the data collection and the choice of method for the different IPCC categories within the industry sector MRV framework.

Stage of MRV cycle



Responsible entities

Coordination
- Climate Change Secretariat

- Sectoral Data Collection
  - Energy
    - Sri Lanka Sustainable Energy Authority
  - Industrial Processes and Product Use (IPPU):
    - Ministry of Industries
- Data Estimation
  - Climate Change Secretariat

Timeframe

Months 4 -16

The measuring phase is a crucial step in the MRV cycle of the industry sector GHG inventory, as it involves the collection of relevant data and the quantification of emissions and removals. According to the 2006 IPCC Guidelines, the measuring phase consists of three sub-steps:

1. **Data collection**
2. **Data processing**
3. **Data estimation or emissions calculation**

Throughout the measuring phase, it is important to ensure that the data collected, and the emissions calculated are in line with the decision trees provided by 2006 IPCC Guidelines by IPCC category of the industry sector MRV framework. The decision trees will guide the responsible entities in the choice of method, as well as in the collection of data and the application of the methodology.

1.2.1 Data Collection

The **first step** of the measuring phase relates to data collection, which is an essential and integral part of developing and updating GHG inventories. The following box defines the concept of data collection as presented in the 2006 IPCC Guidelines.

Box 1. Data Collection[12]

Data can be defined as factual information (e.g., measurements or statistics) used as a basis for reasoning, discussion, or calculation. Data collection is the activity of acquiring and compiling information from different sources. Formalised data collection activities should be established, adapted to countries' national circumstances, and reviewed periodically as a part of implementing good practice.

The CCS will conduct an initial screening of readily available data in Sri Lanka related to the defined industry sector GHG inventory objective in the planning phase and the related IPCC categories that are included. Based on this initial screening, the data collection templates will be drafted and developed by IPCC category to ease the data gathering.

These templates will be drafted by the CCS in close collaboration with the sectoral data collection entities, namely, the Sri Lanka Sustainable Energy Authority for Energy sector related data and the Ministry of Industries for IPPU sector related data. Note that the identification of data needs and the development of relevant templates should commence in the planning stage of the MRV cycle in order to streamline the data collection process.

An important element for data collection is the target year or years for the inventory compilation. Inventories are compiled in the form of time series, and, therefore, adding more than one year for data collection might be recommendable for several categories.

The templates will encompass all the IPCC categories of the GHG inventory required for the industry sector in Sri Lanka and will be specific to each emission source and the associated methodologies defined in 2006 IPCC Guidelines. The following sub-sections further define the specific data collection approach for the Energy and the IPPU sectors, including and the identification of the relevant IPCC categories within the industry sector GHG inventory and the explicit data collection templates for each of these categories.

Although the industry sector MRV framework of Sri Lanka defines the steps and templates for the data collection processes for the relevant IPCC categories considered in the MRV framework, it is important to acknowledge that for elaborating a complete national GHG inventory, it is required that all emissions sources and sinks occurring in Sri Lanka are estimated in line with their associated IPCC Sector and category, and relevant data needs to be identified. As such, the general approach to the defined protocols and formats for data collection defined in this document can be adapted and applied to other sectors in the future, with only the specific data collection templates requiring adjustments to reflect the specific needs of other IPCC sectors and categories.

Once the data collection templates have been developed by the CCS in collaboration with the Sri Lanka Sustainable Energy Authority and the Ministry of Industries as the sectoral leads, they are then shared with the relevant data providers to be completed according to the defined chronogram or workplan under the planning phase.

[12] 2006 IPCC Guidelines for National Greenhouse Gas Inventories – Volume 1: General Guidance and Reporting, Chapter 2: Approaches to Data Collection. Available at: Approaches to Data Collection

The data collection procedure is the most crucial step for any MRV system, as it determines the quality and completeness of the GHG inventory. Therefore, the following three aspects are of utmost importance:

1. Clear definition of data needs and associated templates facilitating compilation of the data.
2. Identification of adequate data sources.
3. Effective data collection procedures with strong mechanisms ensuring timely data provision and continuous data flows.

To address these key aspects, the data collection section for the GHG inventory is structured into three parts for each of the relevant categories, energy and IPPU. As such, first the data needs, data sources and data collection procedures for the energy sector are described and secondly, following the same structure, the IPPU sector data needs, sources and procedures are elaborated.

1.2.1.1. Energy Sector

Energy Sector Data Needs

As defined in Section B, in the context of the scope of the industry sector MRV framework of Sri Lanka, only the following Energy Sector emissions categories, as defined in the 2006 IPCC Guidelines, are included in this section: emissions from fuel use to produce electricity (1.A.1. Energy Industries), and emissions from fuel use in the manufacturing industry (1.A.2. Manufacturing Industries). The other categories within the Energy sector such as 1.A.3. Transport, 1.B. Fugitive emissions from fuels and 1.C. Carbon dioxide transport and storage are, therefore, not included. The following table provides an overview of the 2006 IPCC Guidelines emission sources within the Energy sector included in the MRV framework for the industry sector of Sri Lanka.

Table 7. Emission Sources included under the Energy Sector as part of the MRV Framework for the Industry Sector of Sri Lanka.

Sector/Category		GHG emissions
1. Energy		All GHG emissions arising from combustion and fugitive releases of fuels. Emissions from the non-energy uses of fuels are generally not included here but reported under Industrial Processes and Product Use (IPPU) sector.
2006 IPCC Guidelines categories included		
1.A. Fuel Combustion Activities	1.A1. Energy Industries	Emissions from the intentional oxidation of materials within an apparatus that is designed to raise heat and provide it either as heat or as mechanical work to a process or for use away from the apparatus.
	1.A.2. Manufacturing Industries and Construction	Emissions from combustion of fuels in industry. Also includes combustion for the generation of electricity and heat for own use in these industries.
2006 IPCC Guidelines categories not included		
1.A. Fuel Combustion Activities	1.A.3. Transport	Emissions from the combustion and evaporation of fuel for all transport activity (excluding military transport).
	1.A.4. Other Sectors	Emissions from combustion activities as described below, including combustion for the generation of electricity and heat for own use in these sectors.
	1.A.5. Other Sectors	All remaining emissions from fuel combustion that are not specified elsewhere. Include emissions from fuel delivered to the military in the country and delivered to the military of other countries that are not engaged in multilateral operations.
1.B. Fugitive emissions from fuels	All source categories for 1.B.	Includes all intentional and unintentional emissions from the extraction, processing, storage, and transport of fuel to the point of final use.
1.C. CO_2 Transport and Storage	All source categories for 1.C.	Carbon dioxide (CO_2) capture and storage (CCS) involves the capture of CO_2, its transport to a storage location and its long-term isolation from the atmosphere.

As such, considering this scope of the industry sector MRV framework for the GHG inventory of the Energy sector, the CCS, in close collaboration with the Sustainable Energy Authority, will need to develop the data collection templates for the emission categories 1.A.1 and 1.A.2. These templates should facilitate the collection of information for estimating the emissions from:

- 1.A.1. Energy industries: Comprises emissions from fuels combusted by the fuel extraction or energy-producing industries.
- 1.A.2. Manufacturing industries and construction: Emissions from combustion of fuels in industry. Also includes combustion for the generation of electricity and heat for own use in these industries.

Generally, emissions from fuel combustion activities are estimated on the basis of the quantities of fuel combusted and IPCC default emission factors. This is explained in more detail in Section 1.2.3 on Data Estimation. More accurate estimations rely on the quantities of fuel combusted but consider country-specific emission factors.

The main data requirements for the categories 1.A.1. and 1.A.2. are therefore the quantities of fuels combusted for each activity and the net calorific value (NCV) of the fuel type to attain the country specific emission factors. The NCV is the amount of heat released in an energy source when it undergoes complete combustion with oxygen, or in other words, how much energy a substance can generate during combustion in the form of heat. The accuracy of the estimations is reflected in the tier approach adopted, with the following table highlighting the data requirements for the different tier level approaches under the 2006 IPCC Guidelines and 2019 Refinement.

Table 8. Required Data for each Category and Fuel by Tier Approach.

	Tier 1	Tier 2	Tier 3
Data requirements	Data on the amount of fuel combusted in the source category. A default emission factor.	Data on the amount of fuel combusted in the source category. A country-specific emission factor for the source category and fuel for each gas.	Fuel type used Combustion technology Operating conditions Control technology Quality of maintenance Age of the equipment used to burn the fuel.

In summary, for each category within fuel combustion activities, data is required on the total fuel combusted, the specific unit in which it has been reported, and data on the NCV of each fuel type or on country specific emission factors.

The following paragraphs provide a more detailed description of the two IPCC categories within the Energy sector included in the MRV framework for the industry sector in Sri Lanka and the data requirements to conduct the GHG estimations for each category. In addition, Annex IV to this document provides a comprehensive overview of the energy sector data collection templates and formats.

Moreover, explanation and guidance on filling these templates is provided. The CCS, in close collaboration with the SLSEA, will need to consider these templates and may adapt them accordingly as required. Below, a summary of the data requirements is provided for reference, while Annex IV represents the full list of templates.

1.A.1. Energy Industries

This category combines the sum of emissions from main activity producers of electricity generation, combined heat and power generation, and heat plants. Main activity producers are enterprises whose primary activity is to supply electricity to the public and can be either in public or private ownership. Emissions from own on-site use of fuel is also included in this sector.

Data is therefore required on the consumption of fuel for these purposes and data on the NCV of each fuel type or on country specific emission factors.

It is important to point out that emissions from auto producers who, in support of its primary activity, are generating electricity and/or heat for their own use or for sale, but not for its main business, will be attributed to the industrial or commercial sector where they were generated and not under the electricity and heat production sector.

It is also important to consider data on energy from biomass. When energy is recovered from waste combustion, the associated GHG emissions are accounted for in the energy sector under stationary combustion.

1.A.2. Manufacturing Industries and Construction

In the manufacturing industries raw materials are converted into products, and in construction building materials are converted into buildings. Emissions in this sector include the combustion of fuels in the industry for the generation of electricity and heat for own use in these industries.

> Data is therefore required on the **consumption of fuel** for these purposes and data on the **NCV of each fuel type** or on **country specific emission factors**.

These emissions from each industry will be specified by sub-category corresponding to the International Standard Industrial Classification (ISIC)[13], with the largest fuel-consuming industrial ISIC categories being reported. The 2006 IPCC Guidelines suggest the following list of ISIC categories to be included in the GHG inventory:

- Iron and Steel
- Non-Ferrous Metals
- Chemicals
- Pulp, Paper and Print
- Food Processing, Beverages and Tobacco
- Non-Metallic Minerals
- Transport Equipment
- Machinery
- Mining (excluding fuels) and Quarrying
- Wood and Wood Products
- Construction
- Textile and Leather
- Non-Specified Industry

Note, for both 1.A.1. Energy Industries and 1.A.2. Manufacturing Industries and Construction, data is required on the NCV of each fuel type or on country specific emission factors, for which templates are provided in Annex IV.

Energy Sector Data Sources

Having defined the scope of the energy sector as well as the data templates, the sources for these data in Sri Lanka are to be defined. To do so, the data needs are matched to the data providers as identified in section C. on institutional arrangements and as can be seen in more detail in Annex II listing all data providers by type of data required.

In order to provide a clear overview of how the energy sector data needs of the industry sector link to the data providers, a table showing this matching exercise is added below.

Note that many of the institutions, namely the Sustainable Energy Authority, Ceylon Petroleum Corporation, Ceylon Electricity board, Lanka Electric Company and Lanka Coal all fall under the purview of the MoPE. Therefore, it is likely data is readily available within this Ministry which may facilitate overall data collection.

[13] International Standard Industrial Classification of All Economic Activities (ISIC)

Table 9. Energy Sector Data by Institution.

Data source/Data provider	Data types
Sustainable Energy Authority	• Fuel consumed by type of fuel and by activity (energy production, manufacturing, construction) through the Energy Balance. • Fuel characteristics (carbon content, calorific value).
Central Environmental Authority	• Fuel consumed by type of fuel and by activity (energy production, manufacturing, construction). • Fuel characteristics (carbon content, calorific value
Sri Lanka Customs	• Data on various fuel imports and exports (type of fuel and fuel characteristics)
Department of Census and Statistics	• Data on fuel use in numerous industries (type of fuel)
Ceylon Petroleum Corporation	• Fuel consumed for the refining of other fuel products (input quantity of crude oil and output of different fuels and quantities • Fuel characteristics (carbon content, calorific value)
Ceylon Electricity Board	• Fuel consumption for electricity generation (type of fuel and fuel characteristics) • Energy use in industries
Lanka Electric Company	• Fuel consumption for electricity generation (type of fuel and fuel characteristics) • Energy use in industries
Lanka Coal	• Fuel consumption of coal and characteristics of this coal for use in electricity generation and industry
Sinopec	• Fuel use of mainly petroleum products in the industry by sales data and characteristics of these fuels
Lanka IOC	• Fuel use of mainly petroleum products in the industry by sales data and characteristics of these fuels
Laugfs Gas & Litro Gas	• Fuel consumption of LPG and characteristics of this LPG for use in electricity generation and industry
Sri Lanka Tea Board	• Fuel consumption data by type of fuel of entities active in the tea industry

Energy Sector Data Collection Procedure

Supporting the data collection process, Data Sharing Agreements (DSA) are developed to ensure the continuous provision of data. Specifically, DSA are required between the individual data providers and the SLSEA as the sectoral lead and between the SLSEA and the CCS. Here it is to add that the SLSEA and many other of the key data providers operate under the MoPE, therefore a DSA between the MoPE and the CCS may be an effective shortcut to ensure data provision from these data institutions.

Extending on this, one key DSA shall be developed between the SLSEA or MoPE and the CCS detailing all data needs for the energy sector. Based on this and as required, individual DSA between single data providers and the SLSEA or MoPE may be established to cover the provision of specific data related either to category 1A1 Energy Industries or category 1A2 Manufacturing Industries and Construction that is available at the data provider institution in question.

Two institutions are considered cross-cutting due to the range of data they can potentially cover. These include the CEA, which, as per the EPL system, has great potential to obtain detailed data at a high level of disaggregation. To do so, however, the EPL system requires further fine-tuning and specifications. Additionally, Sri Lanka Customs may crucially support the data collection by providing reference data of total fuel exports and imports, likely disaggregated by importer or industry, as well as data on fuel characteristics.

Overall, it is to note that the procedures depicted below are embedded in the timelines and inventory steps, as defined in the planning stage. Related to the data collection, the procedures thus zoom in on the specific data needs, data sources and how these link to establish effective data flows that ensure adequate data collection.

The graph is organised by IPCC category, distinguishing between the data needs and data sources for categories 1A1 Energy Industries and 1A2 Manufacturing Industry and Construction, as well as cross-cutting data sources covering data providers holding relevant data for both categories. For each of the categories, the data types and sources are added vertically, and connecting lines show the flow of data from these sources to the SLSEA and from there to the CCS. Moreover, the links to the other institutions providing quality control and quality are provided. Orange boxes further indicate the DSA that are required to facilitate the data flows.

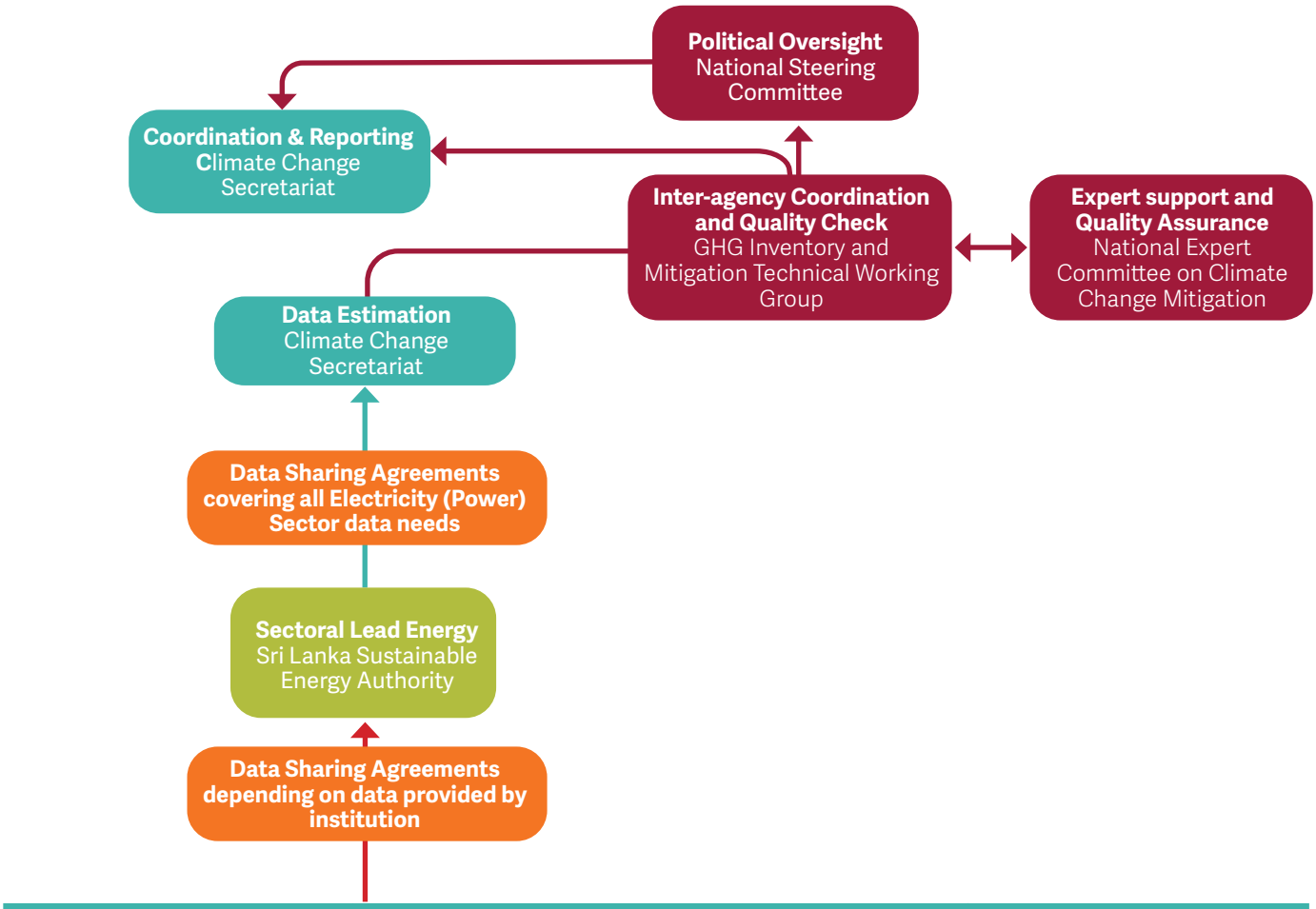


Figure 6. GHG Inventory Data Collection Flows for the Energy Sector

1.2.1.2. IPPU Sector

IPPU Sector Data Needs

The industry sector MRV framework of Sri Lanka includes all emissions from the transformation of products and the use of products in the industry sector, which corresponds to sector 2. Industrial Processes and Product Use (IPPU) of the 2006 IPCC Guidelines and 2019 Refinement. The following table provides an overview of the 2006 IPCC Guidelines emission sources within the IPPU sector included in the MRV framework for the industry sector of Sri Lanka.

Table 10. Emission Sources included under the IPPU Sector as Part of the MRV Framework for the Industry Sector of Sri Lanka.

Sector/Category	GHG emissions	
2. Industrial Processes and Product Use	All (GHG) emissions occurring from industrial processes, from the use of greenhouse gases in products, and from non-energy uses of fossil fuel carbon.	
2006 IPCC Guidelines categories included		
2. Industrial Processes and Product Use	2.A. Mineral Industry	Process-related carbon dioxide (CO_2) emissions resulting from the use of carbonate raw materials in the production and use of a variety of mineral industry products.
	2.B. Chemical Industry	Emissions that result from the production of various inorganic and organic chemicals.
	2.C. Metal Industry	Emissions that result from the production of metals.
	2.D. Non-Energy Products from Fuels and Solvent Use	Emissions from the first use of fossil fuels as a product for primary purposes other than i) combustion for energy purposes and ii) use as feedstock or reducing agent.
	2.E. Electronics Industry	Emissions from the use of fluorinated compounds (FCs) in electronics manufacturing processes for plasma etching intricate patterns, cleaning reactor chambers, and temperature control.
	2.F. Product Uses as Substitutes for Ozone Depleting Substances	Emissions from the use of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) serving as alternatives to ozone depleting substances (ODS).
	2.G. Other Product Manufacture and Use	Emissions of sulphur hexafluoride (SF_6) and perfluorocarbons (PFCs) from the manufacture and use of electrical equipment and a number of other products.
	2.H. Other (Pulp and Paper and Food and beverages)	Emissions from other industries not accounted for elsewhere in the sector.

As such, considering the scope of the industry sector MRV framework of Sri Lanka for the GHG inventory of the IPPU sector, the CCS, in close collaboration with the Ministry of Industries, will need to develop the data collection templates for all emission categories. More precisely, these templates should help obtain information for estimating the emissions for the following IPCC categories:

2.A. Mineral Industry:

This category includes all process related emissions resulting from the use of carbonate raw materials in the production and use of a variety of mineral industry products. The primary process resulting in the release of CO2 is the calcination of carbonate compounds, which is divided into the following categories in the 2006 IPPC Guidelines:

- Cement production
- Lime production
- Other process users of carbonates

The consumption of carbonates is the main data source for the mineral industry category and will provide information to estimate the emissions. Therefore, for each sub-category within the mineral industry, data is required on the consumption of the carbonate types in tonnes.

2.B. Chemical Industry:

This category covers all emissions resulting from the production of various inorganic and organic chemicals. These emissions occur during the production of various inorganic and organic chemicals, which have been divided into the following categories in the 2006 IPPC Guidelines:

- Ammonia production
- Nitric acid production
- Adipic acid production
- Caprolactam, glyoxal, and glyoxylic production
- Carbide production
- Titanium dioxide production
- Soda ash production
- Petrochemical and carbon black production
- Fluorochemical production

Emissions from the chemical industry are generally estimated on the basis of production data and default emission factors.

2.C. Metal Industry:

This category includes all emissions that result from the production of metals, which has been divided into the following categories in the 2006 IPPC Guidelines:

- Iron and steel, and metallurgical coke production
- Ferroalloy production
- Aluminium production
- Magnesium production
- Lead production
- Zinc production

Emissions from the metal industry are generally estimated on the basis of production data and default emission factors.

2.D. Non-Energy Products from Fuels and Solvent Use:

This category covers all emissions from the first use of fossil fuels as a product for primary purposes other than the combustion for energy purposes and the use as feedstock or reducing agent. Covered products are lubricants, paraffin waxes, bitumen/asphalt, and solvents, which occur in the following categories:

- Lubricant use
- Paraffin wax use
- Solvent use

Emissions from non-energy product from fuels and solvent use are generally estimated on the basis of the quantities of non-energy fuels used in terajoules (TJ) and default emission factors.

2.E. Electronics Industry:

This category includes all emissions from electronics manufacturing processes for the semiconductors, thin-film transistor flat panel display, and photovoltaic industry sectors. In the 2006 IPCC Guidelines, the electronics industry is subdivided into four categories:

- Integrated circuit of semiconductor
- TFT flat panel display
- Photovoltaics
- Heat transfer fluid

Emissions from the electronics industry are generally estimated on the basis of the activity data consisting of data on gas sales and use or the annual amount of electronics substrate processed (e.g., m2 of silicon processed for semiconductors) and default emission factors.

2.F. Product Uses as Substitutes for Ozone Depleting Substances:

This category includes all emissions from fluorinated substitutes for Ozone Depleting Substances (ODS). For example, HFCs are used as alternatives for ODS in various product applications. Current and expected application areas of HFCs and PFCs include:

- Refrigeration and air conditioning
- Foam blowing agents
- Fire suppression and explosion protection
- Aerosols
- Solvent cleaning
- Other applications

Emissions are generally estimated using the data on chemical sales by application, multiplying it with average emission factors by application. Therefore, data is required on the imports and exports of these substitutes by product and application.

2.G. Other Product Manufacture and Use:

This category includes all emissions from the manufacture and use of electrical equipment and other industrial, commercial, and consumer products that contain SF6 and PFCs. N2O emissions from anaesthetics, propellants and other product uses are also included. Emissions in the manufacture and use of products occur in the following categories:

- Electrical Equipment
- SF6 and PFCs from Other Product Uses
- N2O from Product Uses

Emissions from SF6 are generally estimated using the consumption data and the default emission factors. Therefore, data is required on the amount of SF6 imported and exported in tonnes. Emissions from N2O are generally estimated based on the quantity of N2O supplied.

2.H. Other:

This category includes emissions from the pulp and paper industry and the food and beverages industry. As there is no specific section on these categories provided in the 2006 IPCC Guidelines, the parameters have been based on the EMEP/EEA air pollutant emission inventory guidebook 2019.[14]

Emissions are generally estimated based on production data of the pulp and paper industry and the food and beverage industry and default emission factors.

Considering the diversity and large variety of emission sources and gases from industrial activities, the data collection step can provide difficulties. As such, unlike the for the relevant categories of the Energy sector, a specific data collection template should be developed for each category within the IPPU sector. Annex V to this document provides examples of data collection templates by category within the IPPU sector. The CCS in close collaboration with the Ministry of Industries will need to develop specific data collection templates for the emission each category based on the examples and data requirements.

[14] EMEP/EEA air pollutant emission inventory guidebook 2019

IPPU Sector Data Sources

In this section, the identified data needs are matched to identified data sources in order to draw a clear picture of where the data may be obtained. As evidenced by the table below, the DCS, through its Annual Industry Survey, is a key data source for IPPU related data and thus should be strongly engaged in the data collection process. Another important data source is Sri Lanka Customs as it centrally gathers information on national imports and exports of industrial products. These key data sources are supported by large industry players and other government institutions linked to industry data. Additionally, as a companion to the table below provided in Annex II, a full list covering the energy and IPPU categories for the inventory and mitigation is provided, displaying the data providers grouped by data needs.

Table 11. Industrial Processes and Product-use Sector Data by Institution.

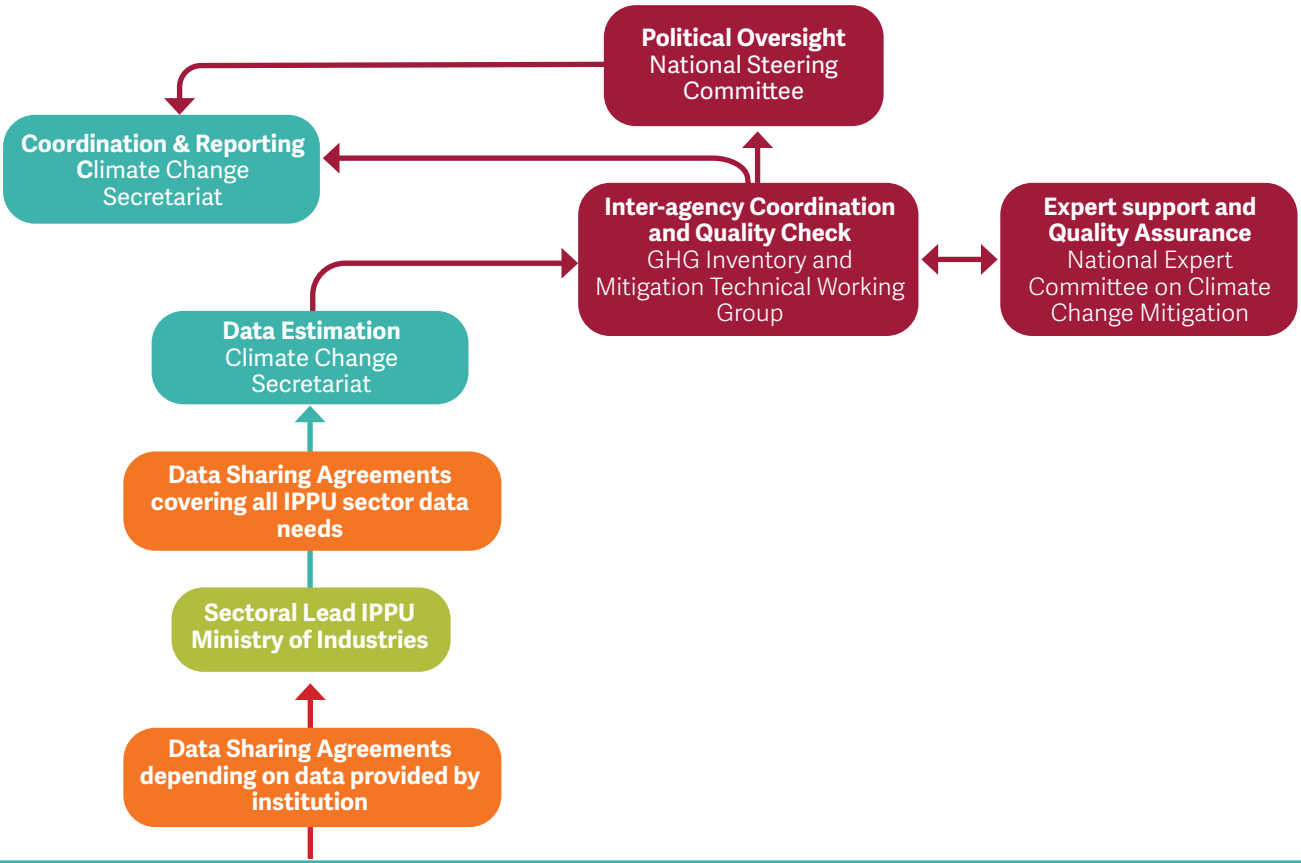
Data source/Data provider	Data types
Department of Census and Statistics	Data on a great range of IPPU relevant data through the Annual Industry Survey including: • Data on mineral production such as clinker, lime and glass as well as information on carbonate types and clinker composition of cement • Production data of the chemical industry on for example Ammonia or Nitric Acid (currently not occurring on scale) • Production data of the metal industry (currently only one steel rolling facility, not occurring on scale) • Production data of processing industries producing solvents, lubricants, waxes, paints, and other non-energy products based on fuel inputs • Production data of the electronics industry (currently no relevant emissions) • Data on the production (currently not occurring) and use/installation of refrigeration and air-conditioning as well as foam blowing devices • Production data of the food and beverage industry as well as pulp and paper
Sri Lanka Customs	• Data on imports and exports of mineral products and composition of the mineral products such as cement or lime • Data on imports and exports of solvents, lubricants and ink • Data on imports and exports of synthetic GHGs such as HFCs, for refrigeration, air-conditioning and foam blowing devices
Ministry of Environment - Ozone Unit	• Data on production (currently not occurring) import and export of HFCs and other synthetic GHGs and data on the use/installation of refrigeration, air-conditioning and foam blowing devices
Sustainable Energy Authority	• Comparative data on fuel uses for energy compared to non-energy purposes such as solvents, lubricants, and waxes
Siam City Cement	• Production data on cement and clinker and cement characteristics regarding carbonate input processes and clinker composition. Clinker imports.
Ceylon Petroleum Corporation & Sinopec, Lanka IOC	• Production data of processing industries producing solvents, lubricants, waxes ink and other non-energy products based on fuel inputs
Geological Surveys and Mines Bureau	• Production data on mineral products mined in the country

IPPU Sector Data Collection Procedure

Following the matching of the data needs with data sources, the data collection procedures are defined. As a first note, unlike in the data collection process for the energy sector led by the SLSEA, the sectoral lead for IPPU, the MoI, does not have strong data collection procedures in place the same way the SLSEA has. Nevertheless, the MoI retains its sectoral lead role organising the overall data collection process for which it will strongly cooperate with other entities, particularly with the CCS as the coordinator and the DCS as the key IPPU data provider.

In this context, a range of DSA are established to support effective data collection. The main DSA required are between the CCS and the MoI as well as between the DCS and the MoI. Additional DSA, specifying the type of industry sector data required, are needed between all relevant data providers and the MoI.

The IPPU sector data collection follows the overall MRV process laid out in this framework and the collection and submission of data shall occur in accordance with the established timelines and reporting cycles. As such, the following graph shows a snapshot of the specific data collection procedure as embedded in the wider MRV Framework. The graph is structured along the data needs and associated sources, splitting the latter into institutional and private sector data providers for industry sector data.



IPPU Data Providers	
Department of Census and Statistics - Annual Industry Survey, Sri Lanka Customs, Ministry of Environment - Ozone Unit, Sustainable Energy Authority, Central Environmental Authority - EPL issuing system, Geological Surveys and Mines Bureau	Siam City Cement, Ceylon Petroleum Corporation, Sinopec, Lanka IOC
Institutional data providers Categories of Industrial Processes and Product-use (IPPU) 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H	**Private sector data providers** Categories of Industrial Processes and Product-use (IPPU) 2A, 2D

Figure 7. GHG Inventory Data Collection Flows for the IPPU Sector.

1.2.2. Data Processing

The second step of the measuring stage relates to the collection of data once the data collection templates have been developed, conducting several quality checks on the collected data and consolidating the obtained data.

The sectoral data leads, namely the Sri Lanka Sustainable Energy Authority and the Ministry of Industries, will need to check the data while it is being collected considering several points:

- Is the data complete? Does it cover the entire territorial area of the inventory and/or the entire population of sources within the source category? Does the data represent collection for a complete calendar year?
- Does the data have associated measurement uncertainty information?
- What assumptions underlie the data? (E.g., is a survey representative? Is a census complete?).
- What measurement methods are used to obtain the data? Are they reliable?
- Are the time series of the data consistent? Does it include a complete time series?
- Has the collected data already undergone specific QA/QC procedures? Are these procedures documented?

If the sectoral data leads identify problems or issues with the data according to these points, they should approach the data providers and request that the issue be addressed. The DSA between the sectoral leads and data providers contain provisions to ensure collaboration on potential follow-up with data providers. However, if the data provider does not cohere to this request or is not in the position to fulfil it, other data sources are required to be consulted by the sectoral data leads. The figure on the following page provides an illustration of the steps and decisions that the sectoral data leads need to follow in the process of data processing.

Further information on the quality checks required to be conducted by sectoral data leads on the obtained data is provided in section 1.3. Verification of this document.

Following the quality check by the sectoral data leads, the data will be sent to the CCS. As previously mentioned, in the event that the sectoral data leads identify issues during the data collection process or in the collected data after the data collection process that cannot be resolved with the data provider, the data is required to be adapted for inventory use, which will be conducted by the CCS. These data gaps or inconsistencies need to be addressed by the sectoral data leads following certain approaches, namely:

- Filling gaps in periodic data: Gaps in the time series will exist when data are available at less than annual frequency. Time series data will need to be inferred to compile a complete annual estimate for all the years following the guidance provided in Volume 1, Chapter 5 of the 2006 IPCC Guidelines for National GHG Inventories.
- Time series revision: Using modelling techniques or assumptions to complete the most recent year of the estimates following the guidance provided in Volume 1, Chapter 5 of the 2006 IPCC Guidelines for National GHG Inventories.
- Incorporating improved data: When the data provided by the data providers is not of sufficient quality or not suitable for the GHG inventory compilation, new data sources need to be consulted or identified following the guidance provided in Volume 1, Chapter 5 of the 2006 IPCC Guidelines for National GHG Inventories.
- Compensating for deteriorating data: For datasets that have deteriorated over time other potential sources might need to be consulted or splicing techniques needs to be applied according to the guidance provided in Volume 1, Chapter 5 of the 2006 IPCC Guidelines for National GHG Inventories.
- Incomplete coverage: When data does not fully represent the entire country or not all sources within a category, the data will need to be combined with other data to calculate the national estimate. This can be achieved by using expert judgment or international data sets.

Further information on the quality checks required to be conducted by the CCS on the data is provided in section 1.3. Verification of this document.

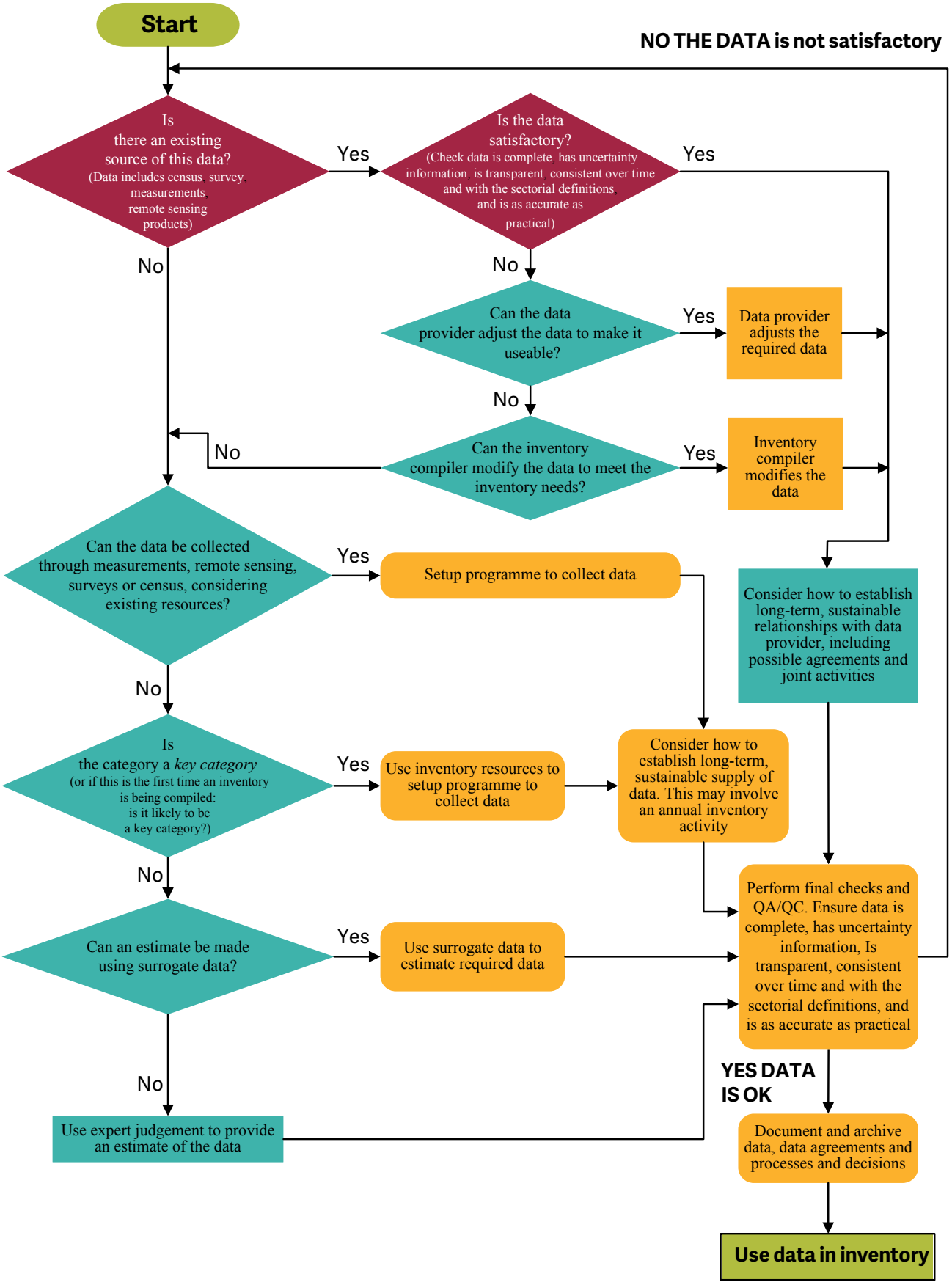


Figure 8. Data Collection Steps and Decisions.[15]

[15]2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories – Volume 1: General Guidance and Reporting, Chapter 2: Approaches to Data Collection. Available at: Approaches to Data Collection

1.2.3. Data Estimation

The decision trees for each of the categories of the inventory drive the choice of method, and in turn, data collection and estimation. The data collected shall be specific to the IPCC method selected, namely the Tier 1, Tier 2, or Tier 3 methodologies described for each of the IPCC categories. Once the data is collected and processed, the CCS will estimate the emissions of each of the applicable GHGs by category, following the methodologies and good practices provided by 2006 IPCC Guidelines and 2019 Refinement. The calculations can be made in Excel or also using the 2006 IPCC software[16]. In Annex XVII, guidance on using the IPCC software is included.

Estimation approaches available in 2006 IPCC Guidelines

2006 IPCC Guidelines provide differentiated methodologies for calculating the GHG emissions by IPCC category. These methodologies are organised in three tiers, generally defined as follows:

Tier 1.
Basic approach for calculating GHG emissions using default parameters and easily available activity data. 2006 IPCC Guidelines provide default emission factors for calculating Tier 1 emissions, allowing all countries to estimate the emissions. The compilation of activity data is not very demanding. The uncertainty of Tier 1 approaches is relatively high.

Tier 2. A national specific approach for calculating GHG emissions using nationally specific parameters and easily available data. Countries need to compile national emission factors and parameters to estimate Tier 2-level emissions. The uncertainty of Tier 2 approaches is lower than Tier 1, but higher than Tier 3.

Tier 3. A national specific approach for calculating GHG emissions using plant-level data and plant specific parameters or models. Countries need to collect comprehensive information on activity levels by facility, unit, and process to estimate Tier 3-level emissions.

Sri Lanka has decided to estimate all emissions of the inventory following a Tier 1 methodology[17], considering the national circumstances and available resources. Therefore, the current protocols are focused on the estimation of Tier 1 methodologies for the national inventory categories.

The estimates of emissions and removals – in its simplest form - correspond to a direct relation between an emission factor (emission rate by unit of activity) and the activity data which represents the corresponding level of activity. The activity data (AD) describes the annual magnitude of one activity. The emission factor (EF) is the amount of GHG emitted by a unit of activity. Default emission factors are provided by the 2006 IPCC Guidelines for the direct GHG emissions.

The basic equation for estimating the emissions of one category is the following:

$$Emissions_{c,g,t} = AD_{c,t} \cdot EF_{c,g,t}$$

Where:

$Emissions_{c,g,t}$ = *Emissions of category c,gas g and year t*

$AD_{c,t}$ = *Activity data of category c, year t*

$EF_{c,g,t}$ = *Emission factor of emissions of category c,gas g and year t*

In many cases, the units of the activity data available do not correspond to the units of the default (D) emission factor (EF) available or used. In these cases, the data need to be converted using conversion factors. In such cases, the equation is the following, though the conversion factor, will, of course, depend on the original units and target units:

$$Emissions_{c,g,t} = AD_{c,t} \cdot EF_{c,g,t} \cdot Conversion\ factor$$

As derived from the previous equations, GHG emissions are calculated by category and gas. Once the emissions by gas are calculated, they need to be converted into common units using Global Warming Potentials (GWP) for the purpose of comparability. The GWP to be used are those of the Fifth Assessment Report of the IPCC (AR5), provided in the following table.

[16] https://www.ipcc-nggip.iges.or.jp/software/index.html

[17] The CCS informed UNIDO that the methodology to be followed is Tier 1 for all inventory categories in the meeting held at the CCS premises on March 28th, 2023.

Table 12. AR5 Global Warming Potentials (GWP).

Gas	GWP
CO_2	1
CH_4	28
N_2O	265
HFC134a	1,300
HFC125	3,170
HFC143a	4,800
HFC32	677

At the time of writing this report, the selection of the AR5 GWP is recommended on the basis of the adopted decision under the MPGs for the Enhanced Transparency Framework established under the Paris Agreement, which states:

Article II-D: Decision 18/CMA.1 Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement

Each Party shall use the 100-year time-horizon global warming potential (GWP) values from the IPCC Fifth Assessment Report, or 100-year time-horizon GWP values from a subsequent IPCC assessment report as agreed upon by the CMA, to report aggregate emissions and removals of GHGs, expressed in CO2-eq.

1.3. Verification

Summary

Main objective	Stage of MRV cycle
Quality Assurance (QA) and Quality Control (QC) processes are an essential part of the inventory cycle. Quality control activities will be incorporated in all the steps of the cycle, from the collection of data to archiving. All key institutions will participate in QA/QC activities depending on their specific roles and responsibilities.	
Responsible entities	**Timeframe**
Coordination ○ Climate Change Secretariat • Sectoral Data Collection ○ Energy ⋆ Sri Lanka Sustainable Energy Authority - QC ○ Industrial Processes and Product Use (IPPU): ⋆ Ministry of Industries - QC • Data Estimation ○ Climate Change Secretariat - QC • Technical QA/QC O Energy ○ GHG Inventory and Mitigation Working Group – QC ○ National Expert Committee on Climate Change Mitigation - QA • Political Oversight and Validation ○ National Steering Committee (NSC) - QA	Months 1 – 24

The verification stage is a crucial component of the MRV cycle as it, in several steps, ensures accuracy and reliability of the national GHG inventory. The verification process involves the systematic and independent review of the inventory data, procedures, and assumptions to ensure that they comply with the established guidelines and quality requirements. The objective of this stage is thus to assess the overall quality of the inventory and to identify any inconsistencies, errors, or omissions that may affect the accuracy of the reported emissions.

To establish a robust QA/QC system for the national inventory, Sri Lanka can follow the guidelines and recommendations provided in the 2006 IPCC Guidelines, Volume 1, Chapter 6. This chapter defines the key principles and procedures for establishing a comprehensive and effective QA/QC system for the inventory. The following lines out the key elements of the verification process:

Elements of the verification process:

* QA/QC Plan
* QC checklists
* QA checklist
* QA/QC documentation template
* Improvement plan template for immediate action
* Improvement plan template for next MRV cycles
* Archiving procedures

Establishing a QA/QC plan:

The first step in implementing a QA/QC system is to develop a comprehensive plan that outlines the quality objectives, procedures, and responsibilities for each stage of the inventory cycle. The plan should also define the scope and frequency of quality control activities and establish performance indicators and targets to measure the effectiveness of the system. The plan should be reviewed and updated periodically to ensure that it remains relevant and effective.

Quality control activities:

Quality control activities are designed to prevent errors and ensure that the inventory procedures and methods are consistent with the established guidelines and standards. These activities include document review, data checks, and testing of assumptions and models. They should be carried out throughout the inventory cycle to ensure that the data is reliable and consistent. Quality control activities include category specific QC procedures, and general QC procedures.

Quality assurance activities:

Developed by third parties not involved in the inventory compilation, quality assurance activities assess the alignment of the inventory with the TACCC principles for inventory compilation.

Improvement Plan:

An improvement plan, including a template to follow for its elaboration, is developed to integrate any necessary improvements in subsequent MRV cycles. This includes structural non-urgent actions, as well as issues requiring immediate attention. Those requiring immediate attention should be addressed during that same cycle and, for this case, an immediate improvement plan template is developed.

Archiving:

All relevant information gathered, and any issues identified and improvements implemented or planned, should be continuously archived throughout the MRV cycle not only to avoid information losses, but also to gradually increase the data base for subsequent MRV cycles, and to facilitate the learning process.

1.3.1. Establishing the QA/QC Plan

The first step for verification is to set up a QA/QC system by developing a comprehensive plan that outlines the quality objectives, procedures, and responsibilities for each stage of the MRV cycle along with any tools that should be used for implementing the QA and QC activities such as checklists. The plan should also define the scope and frequency of quality control activities and establish performance indicators and targets to measure the effectiveness of the system. The plan should be reviewed by the IMWG and the CCS, and updated periodically to ensure that it remains relevant and effective.

The plan serves as a guide for all verification procedures along every step of the MRV cycle. The entity responsible for developing the QA/QC Plan is the CCS charged with coordination and oversight of the implementation of the MRV cycle.

The first step is to distribute the QA/QC Plan as well as the relevant checklists to the stakeholders. This should occur in a timely manner to ensure all relevant checks and documentation are understood and ready for use. To that end, the CCS should organize a meeting with all stakeholders to inform them of the timeline for QA/QC activities and to explain all relevant guides as well as discuss changes to the previous MRV cycles during the first meeting on planning of the MRV cycle.

Responsibilities

The following table lists the entities and their respective roles and responsibilities in the QA/QC process. Each role and corresponding activities are further explained in more detail in the respective sections on QC, QA, and Improvement Plan.

Table 13. Roles and Responsibilities for Verification Procedures.

Entities	Responsibilities
Climate Change Secretariat (Coordination)	• Develops the QA/QC Plan, distributes the checklists and templates and finalises them with the key stakeholders during the first planning meeting of the MRV cycle. • Performs the QC of the MRV procedures during the whole cycle and propose improvements for the next MRV cycle. • Acts as the focal point for inquiries and oversees implementation. • Develops, refines, and archives QC and QA documentation.
Sectoral leads	• Performs QC on the data collected from data providers.
Climate Change Secretariat (Data estimation)	• Conducts internal checks on the estimates.
GHG Inventory and Mitigation Working Group	• Conducts technical quality control checks following the relevant checks as provided by the IPCC Guidelines. • Proposes technical improvements for immediate action. • Proposes improvements for next cycle.
National Expert Committee on Climate Change Mitigation	• Carries out quality assurance of the GHG inventory estimates and the section on the national inventory of the BTR. • Proposes technical improvements for immediate action. • Proposes improvements for the next cycle.
Political Validation (NSC)	• Conducts high-level political validation of the National GHG Inventory as prepared for the NID and BTR chapter on the inventory.

Proposed timeline

The implementation of the verification steps is aligned with the proposed timeline for the steps of the MRV cycle, acknowledging the approximate timeframes foreseen for each activity. Note, the indicated timeline corresponds to conducting each verification step, thus potential corrective action for immediate response identified in the process is implemented either within the same time frame of the QA/QC check identifying the shortcoming or should be undertaken shortly after. For the improvement plan for the next MRV cycle, the last six months of the cycle are reserved for the CCS to conduct an overall QC on the MRV processes.

Table 14. Proposed Timeline for Verification Steps.

Verification steps	Months											
	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
Distribution of QA/QC Plan and informing stakeholders	Planning											
QC check by sectoral leads		Collec-tion	QC	Providing results								
QC check by CCS				QC	Estimation				Improving			
QA and QC by IMWG and NECCCMM and high-level validation by NSC									Technical QC	Technical QA	Political QA	
QC by CCS on overall MRV									Verifying			QC on processes
Development of Improvement Plan by CCS and IMWG for immediate action and next MRV cycle									Improve-ment plan for immediate action	Improve-ment plan for imme-diate action		Improve-ment plan for next cycle

QA/QC submission of checklist

Activity in the MRV cycle

1.3.2. Quality Control Activities

QC activities are designed to prevent errors and ensure that the data for the GHG inventory is correctly processed as well as that the methods are consistent with the established guidelines and standards. These activities include document review, data checks and calculation tests. They should be carried out throughout the MRV cycle to ensure the data is reliable and consistent.

First, QC checks are to be carried out by the sectoral leads checking the quality of the data submitted by the data providers in their respective sector. Second, the CCS then separately assesses the quality of the compiled activity data and confirms further processability or, if necessary, reverts to the sectoral leads for clarifications. Third, the IMWG carries out the overall quality control of the estimated GHG inventory and on the developed reports. Fourth, the CCS conducts a QC on the overall functionality of the MRV from a managerial perspective in order to identify improvements.

Sectoral leads:

Linked to the time plan for the activities, QC activities commence around month 5 with a review of the data compiled from the data providers by the sectoral compilers. This check mainly aims at ensuring sufficiently detailed data is obtained allowing for further estimation and elaboration of the inventory.

Climate Change Secretariat:

Following the submission of sectoral data to the CCS for estimation, the CCS conducts quality checks between months 7-9 and reverts to the sectoral leads for potential clarifications on the data. This is a crucial quality check as the CCS needs to ensure complete, accurate and coherent data is submitted by the leads. The 2 months period for conducting this quality check therefore is rather indicative as during the estimation process further checks on the compiled data may become necessary. To respond to this need, the CCS and the lead ministries should maintain a close collaboration throughout the MRV cycle.

GHG Inventory and Mitigation Working Group:

The IMWG is tasked with the main technical verification and quality control of the compiled GHG inventory of Sri Lanka and does so by undertaking quality control activities for each sector of the GHG inventory. The review further helps to prioritise areas for improvement and develop the improvement plan of the GHG inventory. As a tentative timeframe, the technical QC check should occur around months 17-18 of the MRV cycle. The template provided for the general QC check includes questions for the IMWG to review the data completeness, data quality and accuracy, timeliness of data flows, and consistency. The template is valid for generalised checks on the data for both energy sector and IPPU sector emission data.

Climate Change Secretariat:

Around month 19, the CCS begins to review the processes of the current MRV cycle for which it continuously gathered information throughout the duration of the MRV cycle. This step aims to identify procedural issues which may need to be addressed in the planning and coordination of subsequent MRV cycles. In the last two months of the cycle, the CCS then correspondingly fills the designated QC template.

Reflecting the different steps and challenges of the MRV cycle, distinct data collection protocols are developed for the institutions involved in these QC steps. The respective focus is hence set on either the collected raw data, the data completeness and consistency, the estimation methodology or on procedural aspects.

All the processes carried out for the QC will need to be documented and stored accordingly. Dedicated QC checklists by entity – individual checklists for the sectoral leads and the CCS – can be found in this order in Annex VI.

In addition to the checklists provided in the annex, the CCS and the Sustainable Energy Authority as the sectoral lead entity for energy sector emissions should engage in targeted sector specific quality checks which are developed for different IPCC emissions categories. In the context of the industry sector of Sri Lanka, these sector specific checks are to be conducted for the selected energy and IPPU sector categories. For the relevant energy sector emissions, which are the stationary emissions categories **1.A.1. Energy industries and 1.A.2. Manufacturing industries and construction**, the following quality checks are recommended by the IPCC guidelines[18]:

[18] IPCC Guidelines, Energy, Chapter 2, 2.43-2.44, https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

Table 15. QA/QC Procedures for Stationary Sources.

QA/QC Procedures for Stationary Sources		
Activity	**Calculations of CO2 emissions from stationary combustion**	**Calculations of non-CO2 emissions from stationary combustion**
Comparison of emission estimates using different approaches	• The inventory compiler should compare estimates of CO2 emissions from fuel combustion prepared using the Sectoral Approach with the Reference Approach, and account for any difference greater than or equal to 5 percent. In this comparative analysis, emissions from fuels other than by combustion, that are accounted for in other sections of a GHG inventory, should be subtracted from the Reference Approach.	• If a Tier 2 approach with country-specific factors is used, the inventory compiler should compare the result to emissions calculated using the Tier 1 approach with default IPCC factors. This type of comparison may require aggregating Tier 2 emissions to the same sector and fuel groupings as the Tier 1 approach. The approach should be documented, and any discrepancies investigated. • If possible, the inventory compiler should compare the consistency of the calculations in relation to the maximum carbon content of fuels that are combusted by stationary sources. Anticipated carbon balances should be maintained throughout the combustion sectors.
Activity data check	• The national agency in charge of energy statistics should construct, if resources permit, national commodity balances expressed in mass units, and construct mass balances of fuel conversion industries. The time series of statistical differences should be checked for systematic effects (indicated by the differences persistently having the same sign) and these effects eliminated where possible. • The national agency in charge of energy statistics should also construct, if resources permit, national energy balances expressed in energy units and energy balances of fuel conversion industries. The time series of statistical differences should be checked, and the calorific values cross-checked with the default values given in the Introduction chapter. This step will only be of value where different calorific values for a particular fuel (for example, coal) are applied to different headings in the balance (such as production, imports, coke ovens and households). Statistical differences that change in magnitude or sign significantly from the corresponding mass values provide evidence of incorrect calorific values. • The inventory compiler should confirm that gross carbon supply in the Reference Approach has been adjusted for fossil fuel carbon from imported or exported non-fuel materials in countries where this is expected to be significant. • Energy statistics should be compared with those provided to international organisations to identify inconsistencies. • There may be routine collections of emissions and fuel combustion statistics at large combustion plants for pollution legislation purposes. If possible, the inventory compiler can use these plant-level data to cross-check national energy statistics for representativeness. • If secondary data from national organisations are used, the inventory compiler should ensure that these organisations have appropriate QA/QC programmes in place.	

QA/QC Procedures for Stationary Sources		
Activity	**Calculations of CO2 emissions from stationary combustion**	**Calculations of non-CO2 emissions from stationary combustion**
Emissions factors check and review	• The inventory compiler should construct national energy balances expressed in carbon units and carbon balances of fuel conversion industries. The time series of statistical differences should be checked. Statistical differences that change in magnitude or sign significantly from the corresponding mass values provide evidence of incorrect carbon content. • Monitoring systems at large combustion plants may be used to check the emission and oxidation factors in use at the plant. • Some countries estimate emissions from fuel consumed and the carbon contents of those fuels. In this case, the carbon contents of the fuels should be regularly reviewed.	• If country-specific emission factors are used, the inventory compiler should compare them to the IPCC defaults and explain and document differences. • The inventory compiler should compare the emission factors used with site or plant level factors if these are available. This type of comparison provides an indication of how reasonable and representative the national factor is.
Evaluation of direct measurements	• The inventory compiler should evaluate the quality control associated with facility-level fuel measurements that have been used to calculate site-specific emission and oxidation factors. If it is established that there is insufficient quality control associated with the measurements and analysis used to derive the factor, continued use of the factor may be questioned.	• If direct measurements are used, the inventory compiler should ensure that they are made according to good measurement practices including appropriate QA/QC procedures. Direct measurements should be compared to the results derived from using IPCC default factors.
CO2 capture	• CO2 capture should be reported only when linked with long-term storage. The captured amounts should be checked with amount of CO2 stored. The reported CO2 captured should not exceed the amount of stored CO2 plus reported fugitive emissions from the measure. The amount of stored CO2 should be based on measurements of the amount injected to storage.	• Not applicable.
Expert review	• The inventory compiler should carry out a review involving national experts and stakeholders in the different fields related to emissions from stationary sources, such as: energy statistics, combustion efficiencies for different sectors and equipment types, fuel use and pollution controls. In developing countries, expert review of emissions from biomass combustion is particularly important.	

Reference Approach

As specified in the previous table, energy sector emissions estimates should be cross-checked against the Reference Approach. This approach is a top-down method, using a country's energy supply data to calculate the emissions of CO2 from combustion of mainly fossil fuels. As such it is only available for the IPCC category 1A Fuel Combustion for energy emissions. Exhaustive guidance on using the Reference Approach is provided in the IPPC Guidelines Volume 2 – Energy, Chapter 6. The Reference Approach is a straightforward method that can be applied based on available energy supply statistics. In Sri Lanka, such statistics are likely provided in the National Energy Balance.

The Energy Balance of Sri Lanka provides a comprehensive overview of the country's energy sector, reflecting the quantity of energy produced, imported, exported, and consumed, along with the sources of energy and the sectors of energy use. The energy balance is published annually by the Ministry of Power and Renewable Energy of Sri Lanka.

The scope of the energy balance includes all forms of primary energy, such as fossil fuels, renewable energy, and other energy sources. The methodology followed to prepare the energy balance is based on the guidelines of the International Energy Agency (IEA), which requires data on physical units, energy prices, and conversion factors to be reported. The institutional arrangements in place for the compilation of the energy balance statistics are carried out by the Sustainable Energy Authority which acts as the national energy data centre.

The statistics available in the energy balance provide a clear picture of the energy situation in Sri Lanka. It shows the energy consumption trends, energy consumption by sector, energy consumption by fuel, energy production and imports and exports, and energy consumption by end-use. The data is presented in the form of tables and charts, which provide an easy-to-understand format for the reader.

For conducting the reference approach, for each fuel, the production, import, export, international bunker, and stock change data is summed to determine the apparent national consumption. As the carbon content of these fuel types is known, the total carbon emissions can be estimated using this approach. From this value, certain fuel amounts should be excluded to obtain the actual CO2 emissions estimates. These excludable categories include feedstock fuel consumption as wells reductants and other non-energy fuel purposes. In doing so, the methodology of the reference approach aligns with the sectoral classification of the IPCC. In sum, the results pf the reference approach, reflecting the national fuel consumption, should be close to the estimates derived using the sectoral approach of the IPCC methodology. That means if the difference is very large, further analysis and recalculations may be necessary to identify the source of the deviations between the sectoral and reference approaches. The IPCC software provides functionalities to conduct the reference approach in a streamlined manner.

1.3.3. Quality Assurance Activities

QA consists of a series of reviews conducted by cross-sectoral technical personnel and by high-level policy bodies not directly involved in the data collection and estimation procedures.

QA procedures provide:

- an assessment of the respective procedures followed to arrive at the estimates and reporting. For that, they are used to verify all prior QC steps taken and check whether they have been implemented accordingly.
- an unbiased technical intersectoral perspective of the accuracy of the data and information used in the analysis and presented in the reports.
- recommendations for immediate improvements and possible areas of improvement for the next MRV cycle.

Firstly, QA activities will be conducted by the NECCCM. Secondly, the NSC will carry out a final validation to grant political approval before the reporting of the GHG inventories. Throughout the process, the Coordination entity, which is the CCS, will provide oversight ensuring the QA activities are conducted according to the timeline and procedures defined in the QA/QC plan.

Technical QA:

To conduct the QA, the NECCCM collaborates with the CCS to obtain all required information. Linked to the timetable, this step commences with detailed technical QA/QC review of the estimated inventory in month 19. The core QA activities of the NECCCM thus includes the following key tasks aiming to provide high-level verification of the inventory reporting:

- Conduct critical review of the reporting documents, scrutinising the technical aspects.
- Provide structured feedback in the form of a template, clearly identifying shortcomings as well as proposing targeted improvements for each shortcoming.
- Assess and verify the overall implementation and effectiveness of the QCs in the MRV cycle.

The review task for the QA carried out by the NECCCM is formalized in template found in Annex VII. Note, the template is developed as a guide to identify areas of improvement of the data estimates and data collection procedures as well as on the reporting formats and technical assessments. However, the recommendations by the IPCC Guidelines are vaguer on the QA checks and the exact formats and checks can be further refined by the NECCCM in communication with the CCS and IMWG.

During this verification exercise, areas for improvement should be identified and the timeframes for implementation proposed. The following section will further detail the levels and method applied for elaborating the improvement plan.

High-level Validation:

This review is less rigorous on the methodology and usually does not engage in recalculations. Rather, the objective of the political validation is to ensure that the inventory, and the underlying assumptions, are judged as reasonable and there is no double counting nor omissions in the assessments. It is at the discretion of the designated entity (NSC) to determine the most appropriate format for conducting and formally sharing the review results. Hence, no particular templates re provided for the political validation of the national GHG inventory.

1.3.4. Improvement Plan

The Inventory Improvement Plan draws upon the corrective actions and/or areas of improvement identified through the QA/QC procedures. Each improvement activity identified is prioritised and assigned a deadline and responsible entity for its execution.

The prioritisation of improvement areas is aimed at achieving practicality, acceptability, cost-effectiveness, and the incorporation of existing experience.

The prioritisation criteria therefore include:

- **Key categories:** Key categories should be prioritised as they contribute the most to the national GHG emission and removal totals and trends, as well as the level of uncertainty of the inventory. Priority should be given to key categories as their improvement will significantly increase the quality of the inventory overall while maximizing cost-effectiveness.
- **Technical viability:** Improvement areas for which the required technology and capacity already exist in the country should be prioritised. As the mobilisation of resources can be simplified, improvement implementation periods can be shortened, and existing experience can be incorporated.
- **Budget:** Cost-effectiveness of inventory implementation may be reached by prioritising simple actions that have a significant impact on quality.
- **Required time for execution:** Short-term actions that can be implemented immediately and/or by the next inventory cycle should be prioritised as they can increase the inventory quality within a reduced period of time.
- **Length of time the improvement has been overdue from previous inventory cycles:** It is of fundamental importance that inventory improvement recommendations not only be identified but also implemented for effective refinement of inventory quality. Improvement actions that are overdue from previous inventory cycles should therefore be given priority.

Based on these criteria, actions are classified as:

- **Immediate:** Corrective action should be undertaken before the finalisation of the current inventory cycle.
- **Short/medium-term:** Corrective action should be undertaken by the next inventory cycle.
- **Long-term:** Improvement measures should be undertaken within the next 5 years or longer, as per resource availability and evaluation of national priorities.

The identified improvements are formalized in two plans detailing formats procedures for:

1. immediate corrective action within the ongoing MRV cycle and
2. for medium-term improvements and long-term improvements considering barriers encountered and lessons learned in each MRV cycle.

Three levels of implementation should be considered as follows:

- **Level 1:** Immediate action: Corrective measures to be implemented immediately for the current MRV cycle because they do not need additional resources and the errors identified have a wide impact on the results presented in the report.
- **Level 2:** Next MRV cycle: General improvements in the data collection and documentation process that should be implemented in the next MRV cycle and technical improvements that require additional research.
- **Level 3:** Long-term action: Actions that need additional stakeholders to be involved in the process, more complex assessment methodologies and/or that are not mandatory requirements under the ETF.

Level 1 - Immediate action improvement plan:

This includes issues identified that require immediate action which are generally related to errors in the calculations which will require further data collection, recalculations of mitigation impacts or refinement of tracking indicators. The coordinator, CCS, will be responsible for the development of the immediate action plan, and will collect critical issues from the IMWG and NECCCM conducting the QC and QA procedures within the mitigation MRV cycle. Linked to the timeframe of the MRV cycle, the plan is to be distributed to the CCS who will be responsible for implementing the immediate corrections between months 17-19 and the latest month 20.

Level 2 and 3 - Medium-term improvement plan:

This includes issues identified throughout the entire 2-year MRV cycle that relate to improvements to the processes to improve the data over time but are not critical to the data that is currently being collected and measured. The ME as coordinator, will be responsible for developing the medium-term improvement plan and is informed by recommendations provided by the IMWG, the NECCCM and the NSC tasked with technical verification and validation within the MRV cycle. The CCS will subsequently be responsible for identifying and defining the relevant entities that will be responsible for implementing the issues during the next cycle. As such, the medium-term improvement plan will be taken on board as part of the planning stage of the following MRV cycle.

A proposal of templates for the improvement plans for urgent actions (level 1) and short- and long-term actions (levels 2 and 3) are included in Annex XII and Annex XIII. However, the eventual design is at the discretion of the CCS in collaboration with the IMWG considering the nature and urgency of the improvements. These templates are valid for the GHG inventory and for mitigation.

1.3.5. Archiving

A robust archiving system is a crucial component of the MRV cycle both for electronic and hard copy versions of stored information. Systematic documentation and archiving of information will enhance the transparency and long-term sustainability of the MRV process. It will additionally help the entities involved in the cycle to:

- Access previous information and data.
- Easily reproduce calculations produced in previous reports.
- Respond to government, expert, or public inquiry.
- More easily review estimates.
- Safeguard against loss of information or data.
- Ensure roles and responsibilities are understood.
- Standardise tasks.
- Create transparency and improves credibility.
- Provide a clear starting point for future reporting.
- Build a sustainable national system.

An Archiving Coordinator within the CCS will be appointed for this function and will be responsible for the storing of information. The core informational items and data to be archived, as well as the source for the data within each inventory MRV cycle are listed in Table 16.

All information should be stored in both a digital version as well as a hard-copy (electronic) version such as on USB-sticks or external hard drives according to the UNFCCC best practice guidelines. It is essential to establish a clear organisational structure to easily access the archived information according to the MRV cycle. All information within a single MRV cycle should be stored together in a clearly identified location, ensuring that information from different mitigation MRV cycles is archived separately. The CCS – specifically, the archive coordinator – will be responsible for storing, organising, and labelling all information as well as managing and updating the data archive logs. As such, while the archive coordinator is tasked with managing the archive, he/she is not solely responsible for collecting all the data to be archived as the sectoral leads and the responsible staff for the estimation of the inventory in the CCS will be asked to input relevant information to the designated location. Table 17 shows a template for the management of the archive.

Table 16. GHG Inventory Data and Documentation to be Archived.

Data type	Documentation to be archived
GHG inventory estimation data	• Inventory plan and chronogram. • All raw data by sector obtained for the measurement procedure. • Methodology documentation and explanation. • Key category analysis. • Uncertainty analysis. • Reference approach analysis. • All files used for calculations, including drafts (e.g., spreadsheets, models, databases, data sources, references). • All submitted GHG inventories and auxiliary information to the UNFCCC.
Procedural documents from the inventory cycle	• Institutional arrangements. • QA/QC plan. • Completed QC checklists within the inventory MRV cycle. • Completed improvement plan within the inventory MRV cycle. • Completed QA checklists within the inventory MRV cycle. • Signed confidentiality and data sharing agreements between entities within the mitigation MRV cycle. • All internal reports, reports provided to relevant stakeholders, and reports provided to the CCS. • Any other relevant information on the GHG emissions data obtained during the MRV cycle.

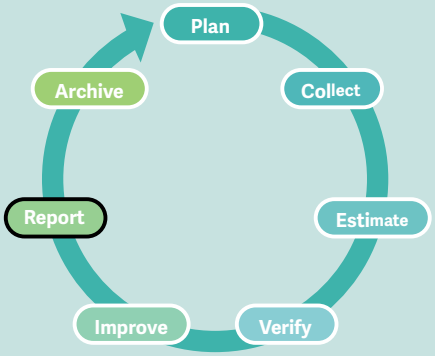
Table 17. Data Archiving Template.

MRV year				
Document No.	Document type*	Document name**	Submitting Staff	Date archived
1				
2				
3				
4				
5				

* Please indicate the type of document, such as data collection template, calculation, data sharing agreement, etc.
** Please provide the exact name of the document, assigning a distinct name to avoid confusion.

Requests for retrieving data should be directed to and approved by the archive coordinator who assesses whether the request is deemed adequate. Adequacy in this context relates to the level of information requested and to potential confidentiality agreements established within the MRV cycle. The development of a guideline determining adequacy for data sharing from the repository should be fostered to facilitate the evaluation of data retrieval requests at the CCS.

1.4. Reporting

Summary	
Main objective	**Stage of MRV cycle**
The reporting phase for the elaboration of the GHG inventory of the industry sector in Sri Lanka includes the preparation and submission of several elements in line with the MPGs of the Paris Agreement, such as the Common Reporting Tables (CRT), the National Inventory Document (NID), and the Biennial Transparency Report (BTR) chapter on the inventory.	
Responsible entities	**Timeframe**
• Reporting ○ Climate Change Secretariat (CCS)	Months 19 – 24

The reporting phase is the final phase of the MRV cycle for the industry sector GHG inventory of Sri Lanka. As previously introduced in Section A to this document, the UNFCCC obliges Parties to communicate and report reliable, transparent, and comprehensive information relevant to the implementation of the Paris Agreement. The format of the reporting is determined by the reporting formats of the international reporting framework under the UNFCCC. This involves the preparation and submission of different reporting elements related to the GHG inventory in line with the MPGs of the Paris Agreement which are further addressed below but can be summarised as:

- **National Inventory Document (NID)** – a report containing transparent and detailed information on the inventory. It should include descriptions of the methodologies used in the estimations (including references and sources of information), the data sources, the institutional arrangements for the preparation of the inventory (including quality assurance and control procedures), and recalculations and changes compared with the previous inventory.

- **Common Reporting Tables (CRT)** – a series of standardised data tables containing mainly quantitative information.

- **Biennial Transparency Report (BTR) chapter on the inventory** – constitutes the CRT and NID

The main objective of this phase is to communicate the results of the inventory to the international community, as well as to provide information on the country's progress in reducing greenhouse gas emissions. The CCS will be responsible for the elaboration of reports, completion of CRT tables, and subsequent submission to the UNFCCC. In order to prepare these reporting elements, the country will need to follow a set of procedures to ensure the accuracy and consistency of the data.

The **first step** in the reporting phase is to review the data collected in the previous phases of the MRV cycle. This involves verifying that the data is complete, accurate, and consistent. Any errors or discrepancies should be identified and corrected before the data is reported. The CCS will be responsible for conducting this final check on the elaborated data.

The **second step** in the reporting phase concerns compiling the data into the appropriate reporting formats. As stated above, the different reporting elements related to the GHG inventory are the NID, CRT and BTR chapter on the inventory, each having specific formats and templates that must be followed. The CCS, responsible for the elaboration of the reports and completion of the CRT tables, will need to ensure that the data is entered correctly into these formats and that all required information is included. The following paragraphs provide more information on each reporting element and the formats to be followed:

- The **National Inventory Document (NID)** provides a detailed description of the country's greenhouse gas inventory and explains the methods used to measure and estimate GHG emissions, as well as the data sources and assumptions used in the inventory. The NID also includes a summary of the key findings of the inventory, such as the total greenhouse gas emissions, emissions by sector, and trends over time. The NID is a comprehensive document that provides a detailed and transparent account of the country's greenhouse gas emissions. The outline for reporting the GHG inventory information in the NID for all Parties is included in Annex V to Decision 5/CMA.3[19]. Annex VIII to this document provides the outline of the NID. As part of the industry sector MRV framework for Sri Lanka, the relevant sections of the NID related to emissions from fuel use to produce electricity (1.A.1. Energy Industries), emissions from fuel use in the manufacturing industry (1.A.2. Manufacturing Industries), and emissions from the transformation of products and the use of products in the industry (2. Industrial Processes and Product Use) are to be prepared and reported.

- The **Common Reporting Tables (CRT)** are a set of tables that contain detailed information on the country's greenhouse gas emissions and removals. The CRT contains tables for each of the sectors covered by the inventory, such as energy, industrial processes, agriculture, and waste. The tables show the amount of emissions and removals for each sector, as well as the methods used to calculate these values. The latest CRT for the electronic reporting of the information in the national inventory reports of anthropogenic emissions by sources and removals by sinks of greenhouse gases are available at CRT for SBSTA 52-55. As part of the industry sector MRV framework for Sri Lanka, the relevant CRT related to emissions from fuel use to produce electricity (1.A.1. Energy Industries), emissions from fuel use in the manufacturing industry (1.A.2. Manufacturing Industries), and emissions from the transformation of products and the use of products in the industry (2. Industrial Processes and Product Use) are to be filled-in and reported.

- The **Biennial Transparency Report (BTR) chapter on the inventory** provides an overview of the country's GHG emissions and removals. The BTR is a report that is submitted every two years by countries that have ratified the Paris Agreement. The outline of the BTR for all Parties is included in Annex IV to Decision 5/CMA.3[20]. Chapter I of the BTR refers to a national inventory report of anthropogenic emissions by sources and removals by sinks of GHG. This national inventory report consists of a NID and the CRT. As such, the BTR chapter on the inventory summarises the key findings of the inventory, such as the total greenhouse gas emissions, emissions by sector, and trends over time. The BTR chapter also includes information on the methods used to calculate GHG emissions, as well as any changes in these methods since the previous report.

The **third step** in the reporting phase will require the CCS to conduct a final review once the data has been compiled into the appropriate formats to ensure that it is consistent with the MPGs of the Paris Agreement. This includes checking that the inventory covers all relevant sectors and gases according to the scope of the industry sector MRV framework of Sri Lanka, that the methods used to calculate emissions are appropriate, and that the data is transparent and accurate. The country may need to consult with experts or other stakeholders to ensure that the inventory meets these requirements.

The **fourth step** in the reporting phase is the act of submitting all the appropriate reporting elements to the UNFCCC.

[19]Guidance operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement. Available at: Decision 5/CMA.3

[20]Guidance operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement. Available at: Decision 5/CMA.3

2. Mitigation MRV Cycle

The objective of the MRV cycle for Mitigation is for Sri Lanka to be able to sustainably monitor the progress in implementing mitigation actions and achieving mitigation objectives for the industry sector, and thus support the achievement of the country's NDC. In doing so, the international reporting obligations as stipulated by the ETF must be adhered to, meaning Sri Lanka should report to the UNFCCC in a two-year cycle detailing progress on its NDC and on mitigation actions in line with the reporting formats of the MPGs. Within such two-year MRV cycles, the country should move through clearly defined stages of planning, collecting, and measuring as well as monitoring data on mitigation actions, all the while ensuring good quality and continuous archiving of the data and any other relevant information and documentation.

In a final stage, before reporting to the UNFCCC, high-level verification is required. In this section, the order of the phases is clearly defined, and the key activities linked to the roles and responsibilities as well as required formats and templates for each stage are provided.

Note that the methodology developed in this section, while streamlined for industrial sector PAMs elaborated in NDC Implementation Plan[21], is generally applicable to other mitigation sectors as well as PAMs not included in the NDC Implementation Plan. Thus, the developed Mitigation MRV System can and should be scaled to cover additional mitigation sectors of the NDC in the future.

2.1. Planning

<table>
<tr><th colspan="2">Summary</th></tr>
<tr><th>Main objective</th><th>Stage of MRV cycle</th></tr>
<tr><td>The goal is to organise the activities of the MRV cycle and set the schedule for the cycle's activities. The templates used in the cycle will also be defined and updated, if necessary. The priorities outlined in the previous cycle's improvement plan will be incorporated into the current cycle.</td><td>
</td></tr>
<tr><th>Responsible entities</th><th>Timeframe</th></tr>
<tr><td>• Coordination
○ Climate Change Secretariat (CCS)
• Inter-agency Coordination and QC
○ GHG Inventory and Mitigation Working Group (IMWG)</td><td>Months 1-2; 23-24</td></tr>
</table>

The planning stage entails developing a line of approach for the temporal and managerial aspects of the MRV cycle.

The main responsible entity, the CCS, in view of the BTR and UNFCCC reporting cycles, must develop a plan for accomplishing the necessary steps of the MRV cycle. To that end, first the managerial aspects such as the institutional arrangements, including roles and responsibilities as well as information flows between the data providers, key ministries, and the CCS as the main compiler must be consolidated via data sharing agreements, memoranda of understanding, or other agreements. For each subsequent MRV cycle, these arrangements will need to be evaluated on their effectiveness and amended if necessary. Furthermore,

[21] http://www.climatechange.lk/CCS2023/FinalNDCIP.pdf

in this stage, the CCS should refine and share the PAM Data Collection Template in collaboration with the sectoral leads to ensure that the data which will be collected is in line with the data requirements for reporting. The PAM Data Collection Template is further explained in the section covering Measuring and Monitoring, and descriptions of each of the required fields in the template is provided in Annex IX.

In a next step, a clear timeline for the steps and activities of the MRV cycle is to be established. The table below presents a general time frame for the seven stages of the MRV cycle, spanning a 24-month period. Regarding the exact timelines for finalising each step of the cycle, it is at the discretion of the CCS to establish the concrete deadlines for each activity for each cycle. These deadlines should be set during the planning stage at the beginning of each reporting cycle, using the time frame presented in this document as guidance. As the CCS and Sri Lanka as a whole develop experience with executing MRV cycles, timeframes can be better adjusted to the particular needs of the country.

The MRV cycle commences with a planning phase in months 1 and 2 of the cycle and concludes with planning in months 23 and 24 for the key steps of the next MRV cycle and ensure that information from the past cycle is archived properly, that the improvement plan is developed and shared, and that any data sharing agreements required, and feedback loops are in place and up to date. A brief description of the proposed cycle is as follows:

- The data collection stage starts in month 3 and stretches until month 9, with the third stage, estimation, beginning in month 7. The two months overlap between data collection and estimation is included so the sectoral leads and the CCS can request additionally required information from the data providers and seek any clarifications on the collected data.

- The estimation phase then spans from month 7 through month 16 and is conducted by the CCS for the elaboration of the required reporting formats and of the sections of mitigation policies and measures and NDC tracking as reported in the BTR. Similarly, in this period, the sectoral leads carry out the monitoring of the implementation progress of the mitigation PAMs.

- Around month 17, the technical verification process carried out by the IMWG is initiated, similarly granting a two month overlap between estimation and verification to allow for necessary clarifications and consultations between the IMWG and the CCS.

- This process is then followed directly by the improvement phase in which the CCS addresses indicated errors, shortcomings, and recommendations for immediate action resulting from the QA/QC of the verification phase. The main improvement phase is proposed to run from month 17 to month 22 and includes the elaboration of an improvement plan for the MRV system processes and technical improvements to increase completeness, accuracy, consistency, and comparability for the next MRV cycle.

- The final step, reporting, is to be led by the CCS and spans from month 19 through the end of month 24. The improvement and reporting activities can be conducted simultaneously as the reports should incorporate data changes before the PAMs and NDC progress are presented for political validation to obtain final approval.

Note that archiving is to be conducted throughout the 24-month period by all involved stakeholders to ensure relevant data is continuously and properly stored for QA/QC procedures to be carried out as well as for future transparency cycles and other external validation exercises. However, an Archive Coordinator at the CCS will be responsible for administering both the hard-copy and electronic storage systems through continuous process of storing, organising, and labelling of all information as well as regular management and updating of the data archive logs.

In view of subsequent cycles, anticipatory planning is foreseen to commence towards the end of each cycle during months 23 and 24 to ensure all necessary data is archived correctly for future retrieval and that feedback from stakeholders on MRV processes and procedures can be obtained before the new cycle commences. This includes thoroughly analysing quality checks conducted, identifying any immediate corrections that must be addressed, and creating a comprehensive improvement plan for the following cycle. Based on this, and after revisiting the roles, responsibilities, and data sharing agreements, the

CCS then develops a new timeline for each step of the new transparency cycle during months 1 and 2 of the new cycle. These linkages between cycles serve to facilitate continuous improvement of MRV protocols based on the experiences of previous cycles.

It is important to note that the presented timeline is based on an estimation of time requirements for each step of the MRV cycle. For eventual implementation, the stakeholders, with increasing experience carrying out the activities, are encouraged to adapt this timeline according to the national context and needs while maintaining the overall cycle length of 24 months as this is based on Sri Lanka's reporting obligations to the UNFCCC.

Lastly, it is necessary to mention that, per the NDC Implementation Plan, sectoral Project and Monitoring Committees (PMC) are to be established for each of the NDC sectors. Related to the industry sector scope, this includes the PMCs for the Electricity (Power) sector and Industry sector. These PMCs will be responsible for developing internal activities and associated timelines to ensure the implementation of mitigation measures within their sector. The PMCs, in this capacity, shall be closely aligned with the activities of the MRV cycle to streamline the overall reporting.

Table 18. Proposed Timeline of the Mitigation MRV Cycle.

MRV cycle steps	Specific activities	Months										
		1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
Plan	Analysis and update of stakeholders, definition of chronogram, streamlining of priorities in IMWG activities.	■											■
Collect	Identification of PAMs, liaison with data providers, definition and update of MoU and data sharing agreements.		■	■	■								
Estimate	Data estimation of impact of PAMs, monitoring of progress by the lead ministries commences.				■	■	■	■	■				
Verify	Identification of necessary immediate improvements, definition and update of the QA/QC plan and its implementation.			■	■	■	■	■	■	■			■
Improve	As a result of the implementation of QA/QC activities, errors will be identified and corrected before reporting.					■	■	■	■	■	■	■	
Report	Reporting in line with modalities, procedures, and guidelines (MPGs) and reporting procedures of the MRV system.										■	■	■
Archive	Archiving is a continuous activity occurring throughout the cycle to adequately store relevant information when it is generated.	■	■	■	■	■	■	■	■	■	■	■	■

2.2. Measuring and Monitoring

<table>
<tr><th colspan="2">Summary</th></tr>
<tr><th>Main objective</th><th>Stage of MRV cycle</th></tr>
<tr><td>The objective of this stage is to identify the key policies and measures that have been implemented or planned by Sri Lanka for the industry sector in order to report on the progress towards achieving the emissions reductions targets of the NDC and to monitor the implementation of the policies and measures (PAMs) developed under the NDC.</td><td>
</td></tr>
<tr><th>Responsible entities</th><th>Timeframe</th></tr>
<tr><td>• Sectoral Data Collection
o Energy:
* Sri Lanka Sustainable Energy Authority
o IPPU
* Ministry of Industries

• Data estimation
o Energy:
* Sri Lanka Sustainable Energy Authority
o IPPU
* Ministry of Industries
o Climate Change Secretariat in support of both sectors</td><td>Months 3—9:
Identification & Data collection

Months 7-17:
▪ Estimation and Measuring
▪ Monitoring</td></tr>
</table>

The activities to be conducted under this stage are undertaken during the "Collect" and "Estimate" stages of the MRV cycle, and involve:

- **Identifying** sectoral mitigation actions
- **Collecting** required **data** from data providers
- **Estimating and measuring the mitigation impact** of PAMs
- **Monitoring** the implementation progress of PAMs.

In order to reflect the need to identify, collect, measure the impact of, and subsequently monitor the progress of the PAMs using targeted tracking indicators, this section is split into three parts:
Identification and Data Collection, Measuring, and Monitoring.

The flow of information between stakeholders for the measuring and for the monitoring components is presented in the figures below.

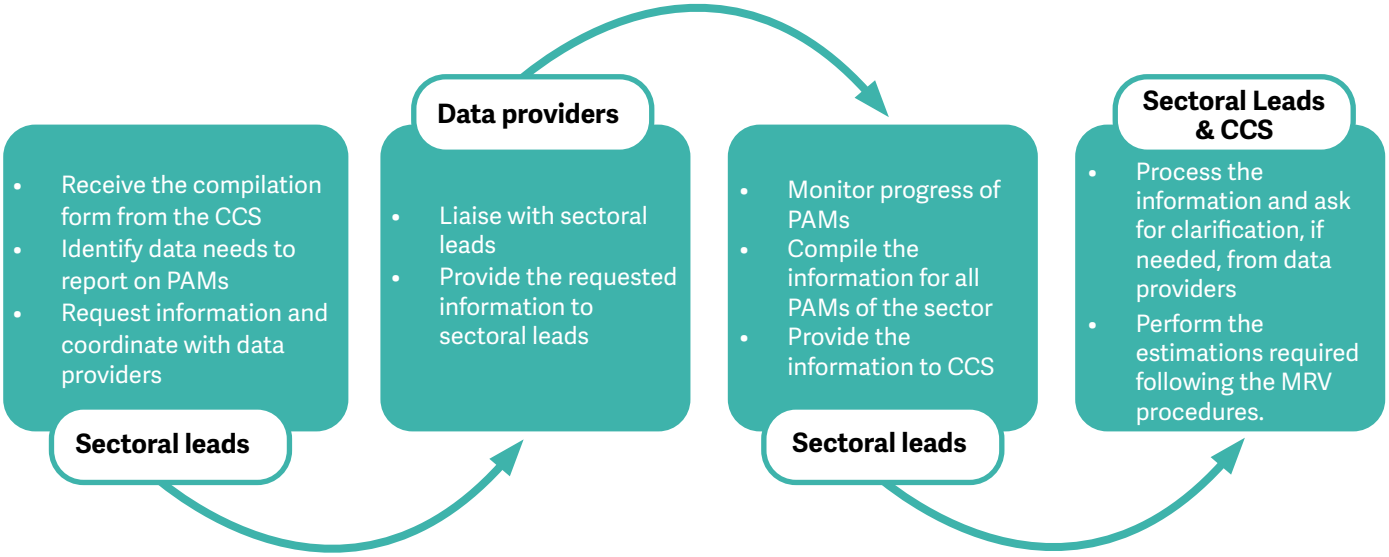


Figure 9. Summarized Steps for "Measuring" in the Policies and Measures MRV.

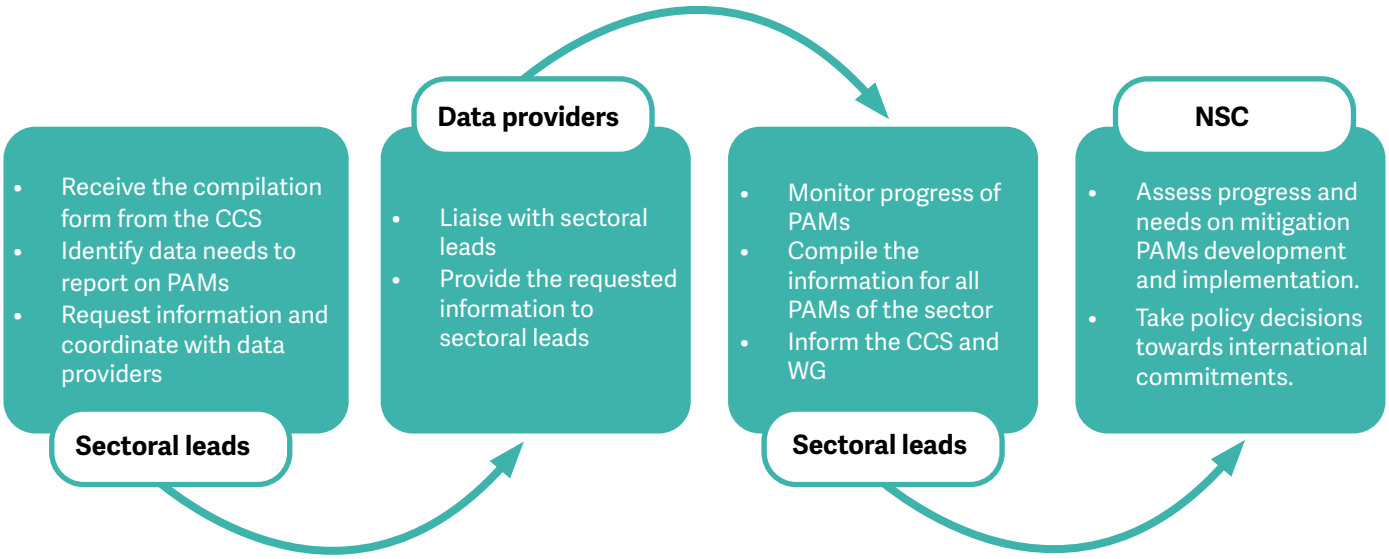


Figure 10. Summarized Steps for "Monitoring" in the Policies and Measures MRV.

2.1.1. Identification of Mitigation PAMs

Responsible entities:

Sectoral leads

Energy:
- Sri Lanka Sustainable Energy Authority

Industry:
- Ministry of Industries

Objective:
Identify relevant PAMs with substantial mitigation impact on the emissions categories of the industry sector.

The **identification of relevant mitigation industry sector PAMs is the responsibility of the sectoral leads**, which also act as the leads of the sectoral PMCs. The leads therefore are tasked with coordinating the institutions participant to the PMCs to enable continuous monitoring of existing, ongoing, and new PAMs in Sri Lanka. In this capacity, the sectoral leads also need to closely collaborate with the CCS to support a streamlined MRV process. To extend on this, the NDC Implementation Plan sets forth detailed arrangements for realising the national NDC targets. However, not all PAMs planned to be implemented will have a major impact on the NDC targets and thus not all PAMs will need to be reported on because only PAMs with significant impacts towards achieving sectoral emissions reduction targets need to be reported to the UNFCCC.

As such, for the **identification of the PAMs**, it is important to consider the core aim of reporting on the mitigation PAMs – to report on the progress achieved on the NDC in terms of substantial reductions in GHG emissions. Therefore, the mitigation PAMs with the largest emissions reduction impact on the IPCC categories of the energy and industry sector should be selected. In other words, those PAMs which substantially help Sri Lanka achieve its NDC targets. Moreover, by focusing on substantial PAMs, it is ensured that the eventual reporting is streamlined, and resources are deployed efficiently. This begs the question now how "substantial PAMs" are defined, as the impact of PAMs is always relative to the emissions levels of certain categories.

What is a substantial PAM?

Substantial PAMs are policies and measures that are expected to reduce GHG emissions of the IPCC emissions category it affects, by an amount (in % of the total emissions of that category) that is larger than the uncertainty (in %) of that IPCC category. To explain in more detail, when developing GHG inventories, all countries carry out an uncertainty assessment that determines the degree of uncertainty of the estimation of each emissions category occurring in the country. This way, the precision of the GHG inventory estimates is assessed. To illustrate, consider the following example:

Category 1A1: **Energy Industry**

Annual CO2eq. emissions of 1A1: **3000 kt**

Uncertainty of the estimate of category 1A1: **10%**

Significance PAM: **PAM reduces emissions of category 1A1 by more than 10% of 3000 kt = expected annual mitigation impact needs to be >300 kt**

The rationale for this is that any emissions reduction smaller than the uncertainty of the category it affects will not make an observable contribution toward the NDC targets. This is because the overall achievement of the NDC is assessed by the reduction of emissions which are ultimately observed in the national GHG inventory. Therefore, only substantial PAMs above the uncertainty level of the emissions category in question should be prioritised for data collection and reporting.

To facilitate this further, a fixed percentage could be considered for the largest emissions categories as identified by the GHG inventory. The logic is that these emission categories should be prioritised in the inventory data compilation process, hence the quality of the data and the estimations should be higher and the uncertainty lower. Based on this, an uncertainty value in the range between 5% or 10% may be used if the key categories are reported to have uncertainty values in a similar range.

In following such an approach, the process for deciding whether a certain PAM has a substantial impact or whether the impact of the PAM would be "hidden" in the uncertainty range of the category it affects, would be facilitated for the sectoral leads.

Now, to identify the PAMs with the largest mitigation impact, sectoral expert knowledge and estimations on the expected emissions reductions impact need to be considered. Therefore, it is important the sectoral leads can conduct prior assessments of the key PAMs. Again, the NDC Implementation Plan crucially supports this process for the duration of the NDC until 2030 because many of the PAMs have detailed objectives that enable the estimation of the potential mitigation impacts of many PAMs. The following figure describes a step-by-step decision tree that can be followed by the sectoral leads to structurally implement a PAM identification and prioritisation procedure.

Strongly aligned with the arrangements put forward by the NDC Implementation Plan, the protocols of the MRV Framework at hand provide general methodologies to identify, collect and estimate PAMs and thus allowing for the inclusion of additional PAMs as needed. Such flexibility is necessary to capture any new major projects and policies in Sri Lanka which are not captured by the Implementation Plan and to further enable continuous identification of PAMs beyond the duration of the NDC until 2030.

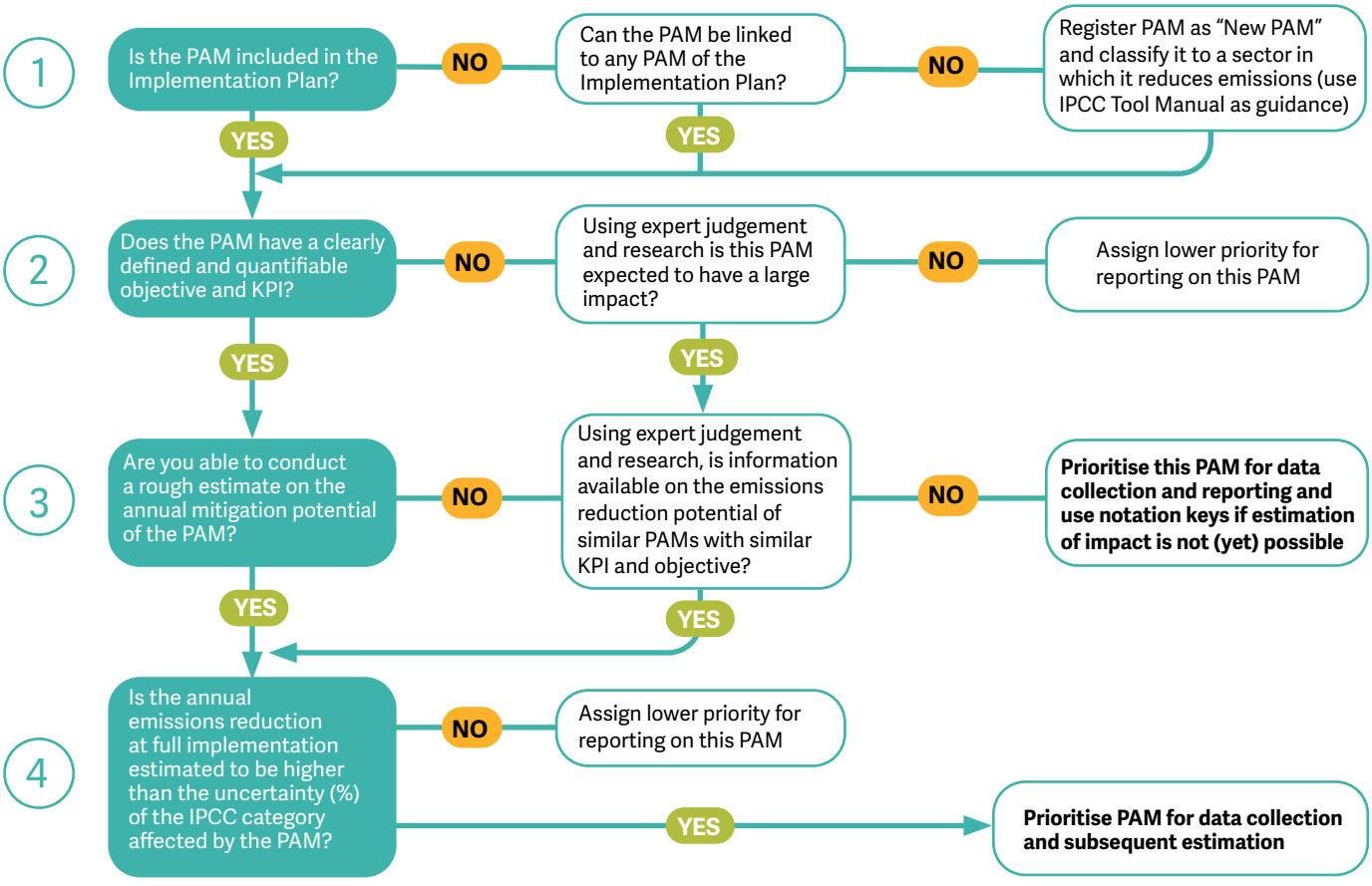


Figure 11. Decision Tree for Prioritisation of PAMs.

2.1.2. Data Collection Procedures

Responsible entities:

Sectoral leads

Energy:

- Sri Lanka Sustainable Energy Authority

IPPU:

- Ministry of Industries

Data providers

Energy:

- Energy sector data providers

IPPU:

- IPPU sector data providers

Objective:

Collect information on sectoral Policies and Measures in line with the PAMs compilation template (Annex IX – PAM Compilation Template)

Once the main PAMs have been identified, the required data needs to be collected. Principally, the sectoral leads are responsible for conducting this crucial step and will collaborate directly with the data providers to obtain the data for estimating the mitigation impacts and implementation progress of the main PAMs.

Such procedures should follow nationally appropriate processes; existing mandates should be taken into consideration and synergies with existing data sharing mechanisms should be leveraged. **The PAM data collection template** will be a key tool for compiling data as it is designed to facilitate the subsequent estimation and reporting of the mitigation PAMs. In this section, the data collection protocols are described. Similar to the protocols for the GHG inventory, first the mitigation data needs are described after which they are matched to key data providers in Sri Lanka. Lastly, an analysis on the top-down data collection as opposed to the bottom-up data collection approaches is provided.

Mitigation Data Needs

The data needs for mitigation PAMs are strictly linked to the descriptions and objectives of the individual PAMs. As such, unlike for the GHG inventory, which is based on the IPCC sector categorisation, the data needs cannot be clearly distinguished in industry and energy sector data needs. That is, while mitigation PAMs affect certain IPCC categories, the specific data needs are not formalised by the IPCC Guidelines and are highly diverse depending on the objectives of the PAM. Therefore, **the PAM Compilation Template** is designed in a way to capture relevant information to measure, track and report the PAM independently of the sector of the PAM. The template is found in (Annex IX – PAM Compilation Template).

The main information required to be filled out in the template for all relevant PAMs is strongly linked with the reporting requirements discussed in more detail in section 2.4. Moreover, the PAM Compilation Template requests information relevant to monitoring progress on the PAM over time, as it is important to track the implementation status of the relevant policy and measure to accurately estimate its impact. The key data needs thus include the following:

- Data needs
- Description of the PAM
- Objective of the PAM
- Type of intervention
- Sectors affected
- Gases affected
- Responsible entity
- Time frame
- Information on the indicator(s) to measure progress on the PAM

These data elements are crucial for obtaining information on the emissions categories the PAM will impact, to understand the scope and magnitude (size, extent) of the PAM and to facilitate the progress monitoring and identification of further data requirements.

The PAM Compilation Template found in Annex IX provides descriptions and guides for filling out the required information. The template furthermore is aligned with the NDC Implementation Plan of Sri Lanka, which defines key information on each PAM using a common method to register information for all PAMs across all sectors. In the following figure, an excerpt of the NDC Implementation Plan, organized by the categories Electricity (Power) and Industry and other sectors, is shown and the direct links with the PAM Data Collection Template to be used by the sectoral leads are underlined. Moreover, in Annex II, an exhaustive overview of the PAMs of the Implementation Plan is included, underlining the breadth of information that is already defined by Sri Lanka regarding mitigation reporting.

Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)																	
Activities / Sub Activities	Implementation Responsibility		Key Performance Indicator (KPI)	Means & Source of Verifica-tion	Baseline	Target	Time Frame										Relevant SDG Target
	Lead Agency	Other Key Agencies					2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
1.1 Establish wind, solar (rooftop, small-scale and large solar PV), biomass12, large and small hydro power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.1 - Establish wind power plants	SLSEA, CEB	MoP&E, CEA, Private investors, Land custodians	MW installed	CEB statistical digest & SLEB	178 MW	Addition of 865 MW Unconditional 28 MW, Conditional 737 MW	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7.2

Figure 12. Excerpt of Sri Lanka´s NDC Implementation Plan.

As seen in the figure above, the NDC Implementation Plan defines a range of key data elements for each PAM. This includes:

- Description of the PAM by activity and sub activity.
- Responsible entities split by lead entity and other key agencies.
- Objective of the PAM including baseline of the PAM if known, as well as a target.
- An indicator to measure progress on the PAM as Key Performance Indicator.
- Data source as means or source of verification.
- An implementation time frame.

As such, the NDC Implementation strongly facilitates the data collection process for mitigation, because most of the required information is already available. The main task for the sectoral leads and data providers will thus be to ensure any updates to the information regarding for instance the scope of the PAM, the time frame, the implementation status, or any other relevant update, are obtained in a timely manner to enable accurate estimation of the PAM as well as effective tracking of progress.

How to obtain the necessary data?

In order to adequately collect data for each relevant PAM that is prioritised for estimation and reporting, the sectoral leads need to identify the data providers that hold information on the relevant elements of the PAM. The basis for this is the NDC Implementation Plan, which defines key stakeholders for each PAM. Related to the overall data collection strategy, the following section provides a discussion of the main approaches that may be followed for collecting data. These two approaches are the top-down approach by which the sectoral leads obtain data through high-level data and national statistics, and the bottom-up approach by which implementation status and other information on PAMs is obtained through piecing together individual data elements as provided by multiple data providers Note that a single approach is not recommended for all PAMs and that the scope of a PAM along with available capacities will determine the best data collection approach for a PAM.

Top-down vs. Bottom-up Data Collection

For the collection of data, two main approaches can be considered: the top-down approach and the bottom-up approach.

The **top-down approach** relies on collecting high-level data such as national statistics which can be utilised to estimate mitigation impacts and implementation progress.

On the other hand, the **bottom-up approach** relies on collecting primary data from implementing entities to directly collect the data which would then be used to estimate mitigation impacts and the implementation progress of PAMs.

Top-down Approach

The information to complete the data compilation template may be obtained using high-level information on the PAMs such as national statistics, which can be directly compiled by the sectoral leads in collaboration with other data providers, if required. This approach can be called top-down approach as it primarily relies on compiling sufficient data and information to track the evolution and estimate the impact of a given PAM as per internationally recognised methodologies. It requires the development of robust, evidence-based assumptions on the implementation and associated impacts of a PAM on sectoral emissions.

A key advantage of the top-down approach is that it is relatively resource-efficient as compared to other methods of estimating the mitigation impacts and implementation progress of PAMs; it is possible to rely mainly on the sectoral leads collecting the required data from national sectoral strategies, policies, and published data as they will have core competencies in policy development for their sector. A major advantage here is that the NDC Implementation already contains most of the required data on the PAMs. Hence, most or all of the information required to complete the PAM data compilation template will be readily available to the sectoral leads. Nonetheless, in some cases the sectoral leads may need to actively liaise with data providers to obtain additional information, especially in the following situations:

1. When there is a sectoral mitigation PAM for which implementation responsibilities are assumed by an entity other than the sectoral leads. This might occur, for instance, when the entity responsible for a PAM in a certain sector is a local government entity or an implementer of a project that is likely to or does contribute to major reductions of GHG emissions in line with the NDC.
2. When any of the data required for completion of the PAM reporting template is not available to sectoral leads. This will more commonly occur when collecting data on key progress indicators that monitor the implementation progress of the PAM. Further information on indicators for monitoring is provided in the following section on Monitoring.

In the section on mitigation data sources and data collection procedures, the mapping of responsibilities for each of the PAMs for the Electricity (Power) and Industry sector shows the PAMs for which the sectoral leads may need to liaise with additional data providers.

Bottom-up Approach

The bottom-up approach, on the other hand, aims to collect primary data on the implementation of PAMs. This requires the eventual aggregation of data collected from the ground level to estimate the mitigation impacts and implementation progress of PAMs. This approach has the potential to deliver more precise data which can be particularly beneficial to estimate the impact of PAMs after they have been implemented; however, if the full population of individual units for which the PAM is being implemented does not provide data which has been collected using the same methodologies, there will be deficiencies related to the completeness and accuracy of the estimations. Naturally, this second approach is also more resource intensive as it requires strong management and linkages to the relevant data providers from the sectoral leads, high technical capacities among the data providers, and an effective system for measuring, submitting, and performing quality controls on the data collected. Such a system could leverage Sri Lanka's World Bank MRV Platform or any other national data sharing platform that allows data providers to submit information on individual policies, measures, or actions under their purview. These systems would have to be improved to properly support this approach and the sectoral leads should be responsible for controlling the data submissions.

When considering a bottom-up approach, it is important that best practices for data collection and sampling methodologies are followed to hedge against the cited accuracy and completeness concerns. Ultimately, complete data sets will be necessary for this approach, though the definition of a complete data set may differ depending on a desire to directly collect and report only on collected data from the entire population, or if sampling will be utilised to estimate impacts across the entire population affected by the PAM (e.g., individuals, industries, plants, units, etc.). To ascertain whether a bottom-up approach is appropriate, and to determine if sampling is necessary, it is important to strongly consider the capacities of the relevant data providers to measure the reported data effectively; this includes considering whether the data providers regularly collect the data already or will need to develop new processes, which tools or equipment may be necessary to collect the data, if the tools or equipment are used and maintained properly, the number of potential data providers, etc. If a bottom-up approach is then deemed appropriate, the following considerations will need to be addressed:

- For a bottom-up approach that requires collecting data from the entire population potentially affected by the PAM, it is necessary that the number of units within a population is identified, or, alternatively, that the population size is not too large for the available resources and capacities to accommodate. Moreover, all data provided should have been collected using the same methodological approach.
- For a bottom-up approach for which sampling will be used, it is important that proper sampling methodologies are employed; if not, bias in the sample can produce over- or under-estimations. Key aspects of best practices for sampling include:
    - Samples should be selected randomly and not based on, for example, whether units within the population are more likely to comply with data requests. This example would create response bias.
    - The sample size should be selected so that it is representative of the full population. If the sample size is too small, the estimates from the sample may not be statistically valid for the production of estimates that are to be applied across the full population.
    - The data monitoring scheme, which involves the submission of data by each entity affected, needs to be defined by the authority responsible for implementing the PAM and communicated to all relevant data providers at the onset of each mitigation MRV cycle.

In sum, in order to collect data which satisfies the needs to monitor the implementation and progress as well as the reporting of the PAMs of the NDC Implementation Plan and additional PAMs if required, a top-down approach led by the sectoral lead institutions is sufficient. The top-down approach helps to streamline the reporting to the UNFCCC, particularly during the first MRV cycles that are conducted whereby it will be particularly important to implement approaches which are less demanding on available resources and capacities. However, as MRV cycles are successfully completed and the resource and capacity requirements for completing a cycle are reconciled with available resources and capacities, this procedure can be amended to deploy bottom-up approaches for some PAMs. Doing so can help to refine the overall mitigation objectives within different sectors, set more realistic

national targets in future NDC update processes, and better inform the development of national climate policies and interventions.

In any case, before commencing the estimations, sectoral leads shall conduct quality control checks on the data collected, following the checklists described in the Verification section of this document. If inconsistencies or incomplete data are identified, the sectoral leads must revert to the data providers to make appropriate adjustments. Moreover, to facilitate the exchange with data providers, the sectoral leads are encouraged to develop data sharing agreements and additional questionnaires if required to ease the regular provision of data. The following section contains a mapping of the main identified data providers, and further displays the relevant linkages and data flows between stakeholders for which DSA may be considered to carry out an effective data collection process.

Collection Procedures

In this section, the matching process of data needs with the data sources is depicted. Similar to the GHG inventory data collection procedure, the following graphs thus show the data needs linked to the relevant data providers. Moreover, the data flow directionality and the required DSA to enable these flows are included. Note that due to the large number of PAMs, the graphs are somewhat more complex than their GHG inventory counterparts, yet they follow the same rationale.
In addition, a full list of the identified data providers for each of the PAMs and additional information as identified by the NDC Implementation is provided in Annex II.

Mitigation Data Sources and Data

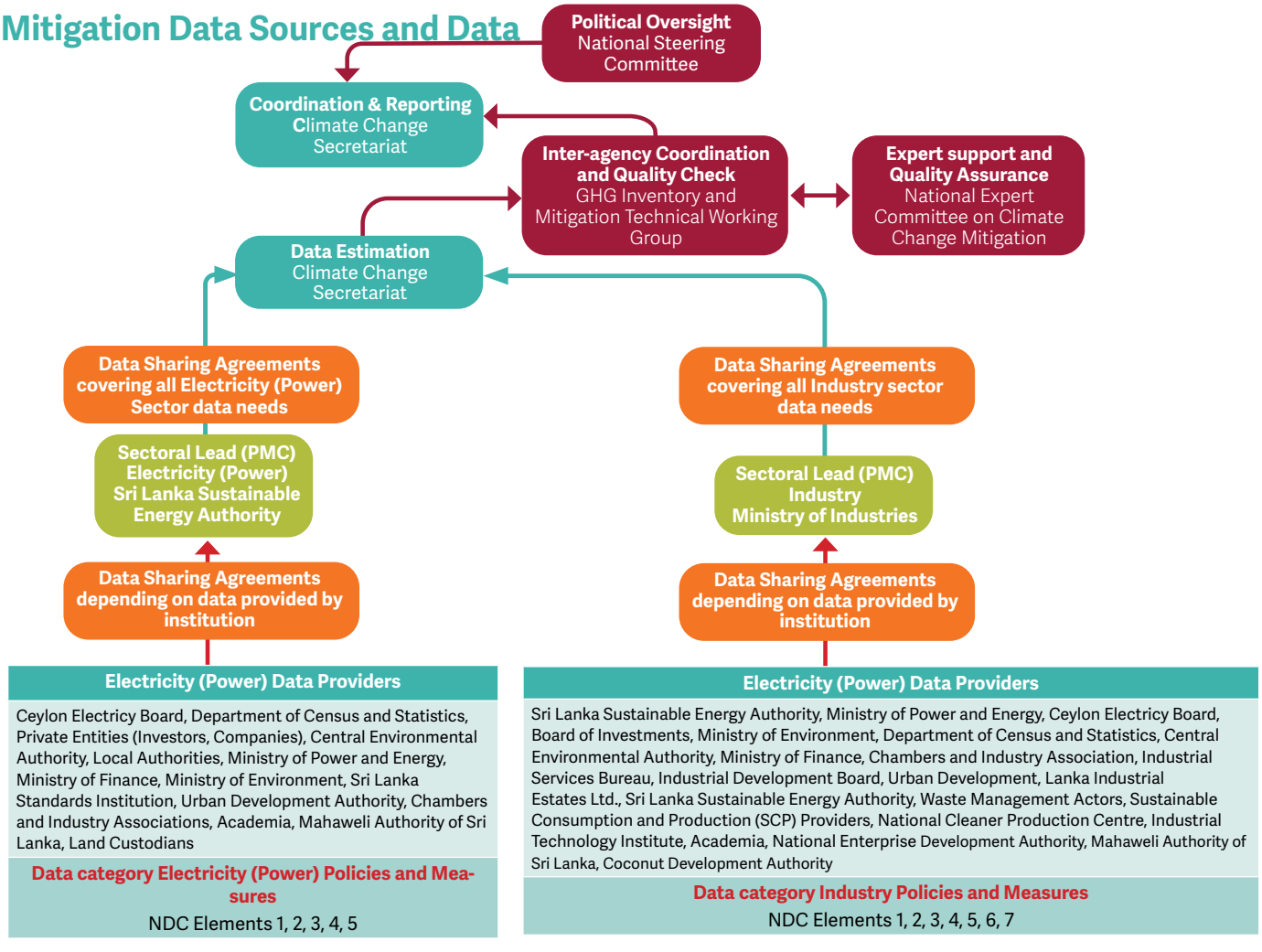


Figure 13. Mitigation Data Collection Flows for the Electricity (Power) and Industry Sector.

2.1.3. Measuring

Responsible entities:

Sectoral leads
Sri Lanka Sustainable Energy Authority (Energy Sector) & Ministry of Industries (IPPU Sector) with support from the CCS.

Objective:
Develop the estimations needed to produce the information required for reporting in the BTRs under the UNFCCC as well as for reporting to donors and the public.

The information collected by the sectoral leads will include several items for each PAM. This information will then be used by the sectoral leads to estimate the mitigation impacts of PAMs following several steps, ensuring that a consistent methodology is applied[22].

Note that a data compilation template for PAMs, furnished with descriptions of all required items, is provided in Annex IX. Moreover, an example of a data compilation template for an actual PAM, as detailed in Sri Lanka´s NDC, is included to clearly demonstrate the scope of information required for estimating the mitigation impacts of and monitoring the progress of the PAMs. The following figure summarised the steps to be followed by the sectoral leads, with support from the CCS as needed, to properly estimate the mitigation impact of PAMs.

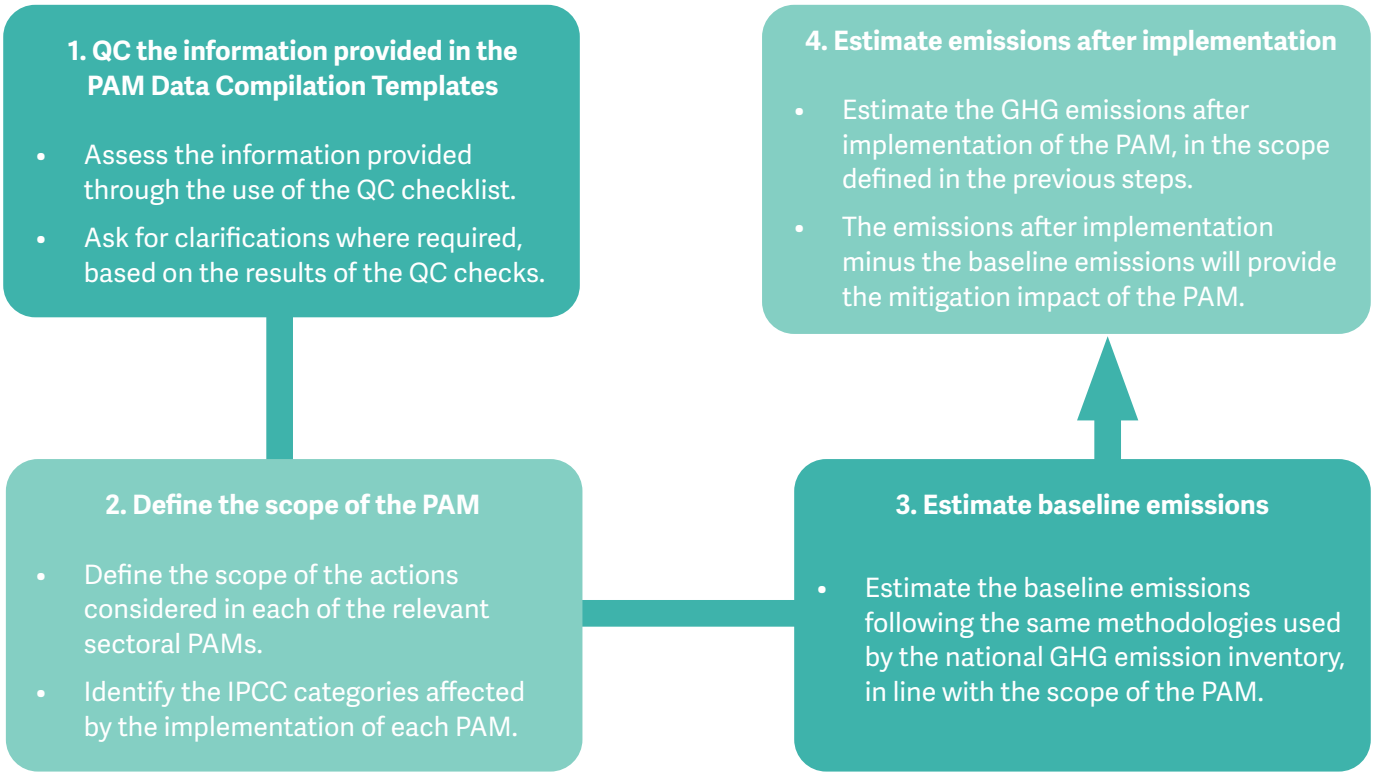


Figure 14. Summarized Steps for Estimating the Impact of Policies and Measures.

[22]In the long term, the estimation of the mitigation impact could be made by sectoral leads with the assistance of the CCS. However, the capacities need to be developed to allow such arrangement, and the quality control procedures would need to be reinforced to reflect the wider QC activities that will be developed by CCS.

QC on the information Reported by Sectoral Leads

As a first step in the estimation phase, the sectoral leads, with any support from the CCS as required, will utilise the checklist provided for the compiler function in Annex X for ascertaining the quality of the data provided. In case any gaps are identified or if clarifications are needed, the sectoral leads should develop a list of action areas to refine the data provided so that it will pass all QC checks. Any issues should be addressed and clarified as appropriate, often requiring additional attention from relevant data providers. Corrections should be made promptly, ideally within one week.

Define the Scope of the PAM

Defining the scope of each PAM is essential for the estimation of their mitigation impacts. In particular, for each PAM, the following information helping to elicit specific data needs is required. This information is provided by the PAM Compilation Template which should be filled by the sectoral leads.

Description of the PAM:

Detailed information of each Policy and Measure, including details on what specific activities or interventions are going to be implemented.

- Supports the identification of IPCC categories affected by a given PAM.

Objectives of the PAM:

Information on what objectives each PAM is expected to achieve after implementation.

- Extent to which the relevant IPCC categories are affected, providing information on the potential and/or actual magnitude of the intervention.

Start year of implementation of the PAM:

This is the year in which the implementation of a given PAM starts.

- Temporal scope of the PAM and the development of the baseline emissions estimate from which the mitigation impacts will be derived.

Target year(s) or period(s) of the PAM:

This defines the year for which the PAM implementation should be completed.

- Temporal scope of the PAM.

The four items above provide the core information needed to properly set the scope of a given PAM. In case any of the listed information is incomplete or ambiguous, the sectoral leads and CCS should liaise with other relevant entities which are responsible for implementing the specific policy or measure to fill in any gaps.

Obtaining this information is essential and builds the foundation for estimating both the baseline emissions and the emissions after the implementation of the PAM. The reference for the national emissions by IPCC category is the national GHG emission inventory. In the absence of estimations/methodologies for a particular source, the methodological reference that should be relied upon are the 2006 IPCC Guidelines[23] and the 2019 Refinement[24].

Gaps in the information on the scope of the PAM will require the sectoral leads to make assumptions to fill those gaps and, furthermore, to estimate the impact of the given PAM. These assumptions are generally focused on gaps in the temporal scope (starting or end years) and/or the magnitude of the PAM. It is good practice to contact data providers and sectoral leads for developing these assumptions and to clearly document and archive the responsible entity and/or individual, date, and rationale for the assumption. Information on the assumptions made for the estimations should be reported in the assumption fields of the relevant CTF tables and, in a qualitative manner, in the BTR. The formats for the CTF and BTR are described in the Reporting section of this chapter.

Once the scope of PAMs is defined, the next step is to develop the **estimation of baseline emissions** and the **emissions after implementation** of the PAM.

Historical GHG emissions of the industry sector of Sri Lanka are estimated in the national GHG emission inventory, which accounts for all emissions occurring in the country using the principles and methodologies of 2006 IPCC Guidelines and 2019 Refinement. The inventory and the 2006 IPCC Guidelines are the main methodological references for the estimation of mitigation impacts.

[23] https://www.ipcc-nggip.iges.or.jp/public/2006gl/
[24] https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html

Theoretically, the implementation of mitigation policies and measures affects the evolution of the emissions and removals estimated in the emission inventory. To estimate this difference, both the baseline emissions and the emissions after implementation need to be estimated. These estimations can be obtained through ex-post or ex-ante estimation approaches. Ex-post estimates use observed information on the impact of policies and measures to provide an accurate indication of the impact of the PAM. Ex-ante estimates approximate the emission reduction impact of each PAM by using prospective/forecasting approaches on their impact. The rationale to be followed and the overall approach are the same in both approaches.

Estimation of Baseline Emissions

The baseline emissions shall be calculated using the methodology used by the GHG emissions inventory as a reference and, in the absence of such estimations, the 2006 IPCC Guidelines are to be used. The scope of the PAM will identify what IPCC categories are affected by the PAM. The sectoral leads, with support from the CCS as necessary, will identify the methodologies (emission factors and other parameters) that are used as a basis for the estimation of the PAM's mitigation impact.

$$Baseline\ Emission_{t,g,c} = Magnitude_{t,g,c} \cdot Emission\ Factor_{g,c} \quad \{1\}$$

Baseline emissions are calculated starting in the year (t) when the PAM is implemented, until the end of the reporting period . Baseline emissions will be calculated for all gases (g) and categories (c) affected by the PAM. The global warming potentials used in the inventory will be used to convert emissions of non-CO2 GHGs to CO2-eq emissions for purposes of comparability and to satisfy reporting requirements.

The magnitude of a PAM is defined by its scope, and is a critical value to be ascertained. The magnitude can be obtained by assessing:

1. Information on the specific activities that the PAM aims to implement;
2. Information on the objectives of the PAM; and/or
3. In the absence of the above, through assumptions on its activities or objectives.

1) is the preferred option to obtain information on the magnitude, as it approaches the actual impact of the PAM's implementation. If information on the specific activities of the PAM are not available or not sufficient for determining the magnitude, 2) the overall objectives or aims of the PAM can also be used to estimate the mitigation of impact of the PAM. The magnitude for the baseline and the emissions after implementation should be the same unless the PAM affects the magnitude of the emitting source.

The emission factor shall be, by default, determined by the emission factors used in the latest inventory year. If this is not available, default emission factors from the 2006 IPCC Guidelines and the 2019 Refinement can be used. Note that the magnitude of a PAM can evolve through the years, depending on the nature of the PAM.

Box 1 – Deriving the magnitude of a PAM – Illustrative Example

The objective of a national law on electric transport is to promote the adoption and use of electric cars at the national level. The law aims at replacing 20% of the current fleet of diesel cars (20,000 cars) with electric vehicles. The law sets two different actions: 1) Provision of guarantees for personal loans for renovating old diesel cars with electric cars of up to 10,000; and 2) Replacement of the diesel fleet of ministries (5,000 diesel cars) with electric cars. The modality through which the remaining 5,000 electric cars will be introduced is not defined in the law.

In this case, information on the magnitude of the PAM is available twice. First, the objective of the PAM is defined as replacing 20,000 diesel cars and, secondly, the expected activities (replacing 15,000 diesel cars). As information on activities is available, it is preferrable to use 15,000 cars as the magnitude of the baseline. In the absence of this information, the information on the objective of the PAM could be used as a proxy of the magnitude. If no information is available, the sectoral leads should gather additional information from any relevant entity or entities identified on the expected scope of the PAM to approximate its impact.

Once the magnitude and the emission factors are identified, baseline emissions are calculated using expression {1} and converted into CO2-eq using the global warming potentials of the national GHG inventory.

The sectoral leads and CCS may utilize the IPCC Mitigation Tool (forthcoming) to support the estimation of PAMs.

Estimation of Emissions after Implementation

The emissions after implementation consider the new situation after the implementation of a given PAM, which could involve:

- A change in the activity levels of the emission source (represented in the item Magnitude in expression {1}).
- A change in the emission factor, as a result of the implementation of a new technology.
- A change in both the activity levels and the emission factor.

The emissions after implementation estimated in expression {1} consider the changes in activity levels and emission factors. A change in the activity levels could be motivated by alternative PAMs that would affect consumption or production patterns. Nevertheless, it is important to ensure the magnitude of the baseline emissions and the emissions after implementation is equivalent. An example of energy efficiency interventions in the industrial sector could provide more clarity on this issue. That is, the amount of energy used for producing a certain unit of industrial output will be reduced as a result of the PAM, affecting the values used in item magnitude within expression {1}. However, when this occurs, the estimation needs to make sure that the scope of the magnitude remains equivalent, i.e., the same number and categories of industrial outputs are considered in the field magnitude of the two estimations (baseline emissions vs emissions after implementation).

The estimation of impact shall be estimated starting with the year of implementation of the PAM. The estimation will be replicated until the end of the reporting period; this will be the final year of the NDC implementation timeline (2030 in the time of writing this report). Depending on the nature of the PAM and the information available, several alternatives are possible to estimate the "future" mitigation impact of PAMs:

A. Defining ad hoc the temporal scope of implementation

B. Forecasting

C. Defining a constant value for the whole implementation period

Option A is used when the penetration of the PAM (temporal implementation of the PAM) is defined by sectoral leads in the PAM Compilation Template (Information provided in "Target year(s) or period(s)"). When the penetration of the PAM is done throughout several years, it is recommendable to define the Magnitude of the PAM for each of the years of implementation. This definition requires the CCS to make assumptions on the Magnitude in line with the penetration of the PAM. For instance, if a PAM start its implementation in 2020 and its target year is 2030, being its objective to install 2000 MW of renewable energy capacity, the magnitude can be defined as 0 for year 2019 and 2000 MW in 2030, interpolating lineally the magnitude of the PAM for the intermediate years. The impact of the PAM will remain to be the same beyond the target year of implementation. This means that the impact of the PAM will go beyond the implementation period, as in the absence of the PAM, the emissions would have remained as estimated in the baseline emissions.

Option B is used when the evolution of the magnitude evolves through the implementation period, or when the scope of the PAM is defined in relative terms. This is, for instance, the case when the magnitude is a percentage of the energy consumption, a portion of the market, or a share of emitting process. When forecasting, the CCS must consider if the PAMs are to be used in wider mitigation scenarios. Mitigation scenarios often use as a reference national total baseline emissions for then considering the impact of PAMs in mitigation scenarios. If this is available, the CCS is recommended to use the same projection approach to estimate the future Magnitude levels; alternatively, if the wider emission projections are already developed, CCS can apply the following expression using the results of the emission scenarios to estimate the future Magnitude of the PAM:

$$Magnitude_{t}+1 = Magnitude_{t} \cdot \left(\frac{E_{t}+1}{E_{t}}\right)$$

With E being the emission estimate of the baseline emission scenario for the corresponding category.

If emission scenarios are not available, the CCS can forecast the magnitude of the PAM extrapolating historical trends or using econometric techniques with proxy projected data[26].

Once the estimation for both the baseline emissions and emissions after implementation are made, the mitigation impact of the PAM is obtained by subtracting the emissions after implementation from the baseline emission for each of the implementation years.

Table 19. Example of Results Obtained in the PAMs Estimation.

Year	Baseline emissions (Gg CO2-eq)	Emissions after implementation (Gg CO2-eq)	Mitigation impact (Gg CO2-eq)	Cumulative mitigation impact (Gg CO2-eq)
2020	300	300	0	
2021	330	314	17	17
2022	360	342	18	35
2023	390	371	20	54
2024	420	399	21	75
2025	450	428	23	98
2026	480	456	24	122
2027	510	485	26	147
2028	540	513	27	174
2029	570	542	29	203
2030	600	570	30	233

The cumulative impact of PAMs does not need to be reported in the BTR.

The description below provides the overall theoretical framework for estimating the sectoral impact of PAMs.

This overall framework is simplified and specified at the sectoral level in several tools available at international level for estimating the impact of PAM. Relevant examples of these tools are GACMO[27] and the Mitigation tool of the UNFCCC[28]. These approaches directly estimate the difference between the baseline emissions and emissions after implementation; however, the approach followed is the same. The CCS could choose to use these approaches for estimating the mitigation impact of PAMs.

[26]The easiest way is to use a linear regression using ordinary least squares (OLS) within ARIMA models. However, if this option is selected, it is essential that the requirements of the model are met (normality, stationarity, no heteroscedasticity, etc.). Further information can be obtained academic sources, for instance: https://statisticsbyjim.com/regression/ols-linear-regression-assumptions/

[27]https://unepccc.org/publications/the-greenhouse-gas-abatement-cost-model-gacmo/

[28]Publication forthcoming.

Estimating Sectoral Mitigation Impact

The following provide information on the main issues to be addressed in the estimation of impact of PAMs depending on the sectoral level. In the context of the industry sector in Sri Lanka, potential key PAMs of the energy and IPPU sector are listed. Aside from the necessity to estimate the mitigation impact in order to progress on the NDC targets, it is highly relevant to estimate the impact by sector if the NDC defines specific sectoral targets. That is, as NDC progress is determined by the evolution of the emissions as per the GHG inventory, assessing the impact of sectoral PAMs helps understanding such evolution and facilitates identification of main drivers.

Energy

In the energy sector there are numerous possibilities to implement PAMs to reduce emissions. Energy PAMs are mainly encompassed under IPCC category 1A Fuel Combustion, hence fall under the classification of energy industry made in this project. Fugitive emissions (IPCC category 1B) can also be reduced to a lesser extent. Under these considerations, the main PAMs of the sector involve:

1. The commissioning of renewable electricity capacity in the power industry. This type of PAMs affect the emissions of subcategory 1A1a Public electricity and heat production.
2. The introduction of less carbon intensive fossil technologies in the power and manufacturing industries.
3. Energy efficiency interventions in the industry, residential or commercial sector

The estimation of impact of renewable energy PAMs involves defining the emission factors from current thermal plants (baseline emissions), considering own use emissions (about 5-10% of total electricity production) and transmission and distribution losses (this could range from 2 to 20%). Information on electricity production or total capacity installed could be used in the estimation; In all cases, the mitigation effect comes from the replacement of fossil fuels by renewable energy sources for electricity production. The grid emission factor[29] could also be used to estimate the amount of emissions applying it to the amount of electricity that will be produced annually by a renewable.

The introduction of less carbon intensive technologies involves defining the amount of fuel used by current technologies, as well as the emission factors and efficiency factors of old and new technologies. A similar approach is required for estimating energy efficiency interventions in the industry, residential or commercial sector. In this case, information on the heating or cooling needs is very helpful for estimating the impact of PAMs.

IPPU

IPPU policies and measures refer to actions impacting industrial production and product use emissions. On the product use side, those PAMs are generally focused on the replacement of technologies such as for example the phase out of technologies producing F-gases in air conditioning and refrigeration. When possible and applicable, the magnitude variable would identify a common variable as a reference, such as cooling need or square meters cooled. Alternatively, the number of equipment affected could be used as a proxy. The two technologies in question should result in the same type of end product for the estimation of impact to be consistent.

On the production use side, the mitigation impact comes from changes in the input materials and/or composition of products for instance in the cement industry. In this context, typical PAMs for instance relate to reduction of clinker in the cement composition. However, PAMs might target any production process with substantial contribution to greenhouse gas emissions in a country.

The key issue to consider when estimating this type of PAMs is to ensure that equivalent production levels are used for both baseline and emissions after implementation.

[29]The grid EF could be obtained by dividing emissions from category 1A1a by total electricity production of the year. If this is not available, grid emission factors can be obtained from IJES https://www.iges.or.jp/en/pub/list-grid-emission-factor/en?__cf_chl_tk=GBVeip3WptfDfhmQpqCjN9WIfP8pc0Lv_0RbPLbo_x0-1668588853-0-gaNycGzNCNE

2.1.4. Monitoring

Monitoring is a management function that consists of reviewing current conditions and historical trends against performance indicators. In other words, it relates to the monitoring of the implementation progress of PAMs based on agreed modalities and approaches and assessing the progress towards their related mitigation goals.

Performance indicators are specific to a policy and designed to demonstrate progress or change as a result of policy implementation, and to assess the achievement of defined outcomes and goals.[30] They can be expressed as qualitative (e.g., information on implementation status of policies and measures) or quantitative measures (e.g., percentage reduction compared to base year) and as financial or non-financial metrics and should be formulated in a SMART (Specific, Measurable, Achievable, Realistic, and Timely) manner. In addition, the selected performance indicators should consider the following six key (policy relevance, variety, data quality and availability, comparability, clarity, and timeliness) principles[31]:

- **Policy relevant:** The indicators selected should target a specific element of change and be relevant to the policy being monitored. As such, indicators should be suitable for measuring progress on the important or determining factors.
- **Representative of a variety of indicator types:** Strive towards the use of several different, non-overlapping indicators, for each policy or measure to ensure balanced information.
- **Based on available data and/or on data that can be collected in a cost-effective manner:** Indicators should be based on a realistic assessment of the feasibility of data collection and be measurable and based on available data that are of good quality and regularly updated. It is thus important to ensure regular data availability of indicators and that the available data needed for the indicator is sufficiently robust, reliable, and valid.
- **Supportive of meaningful comparisons among policies:** Indicators should support a meaningful and true comparison across geographical areas to allow for the comparison of results.
- **Unambiguous and understandable:** An indicator should be clearly defined and easily monitored to avoid confusion and enable correct interpretation. It should have internal consistency with other indicators and facilitate reproducibility.
- **Reported sufficiently frequently for meaningful change to be tracked:** Indicators should be reported over the timeframe of the policy with sufficient frequency so that meaningful change can be observed, and measurements can be made.

Monitoring can either take place before a policy or measure has been undertaken (i.e., assessing the anticipated effects), after the activity has been completed, or during the implementation of an action. Performance indicators track the implementation progress which thus entails monitoring while the policy or measure is being performed as well as monitoring the outcome of the activity to assess whether the objective has been reached.

The development of performance indicators generally involves three broad steps as seen in the figure below, that will need to be undertaken as part of the MRV cycle. Firstly, a list of possible performance indicators should be developed related to the PAMs for NDC implementation. The use of different types of performance indicators together provides useful information to assess both policy implementation and policy effectiveness. Subsequently, the identified list of performance indicators requires to be prioritised based on the aforementioned six principles to ultimately obtain the final list of performance indicators to be monitored within the national MRV cycle. The final step entails the collection and monitoring of data to ascertain the implementation process of said PAMs.

[30]UNDP (United Nations Development Programme). 2009. "Handbook on Planning, Monitoring and Evaluating for Development Results." New York, NY: UNDP.
[31]Singh, N. and M. Vieweg. 2015. "Monitoring Implementation and Effects of GHG Mitigation Policies: Steps to Develop Performance Indicators." Working Paper. Washington, DC: World Resources Institute. Available online at http://www.wri.org/publication/performanceindicators.

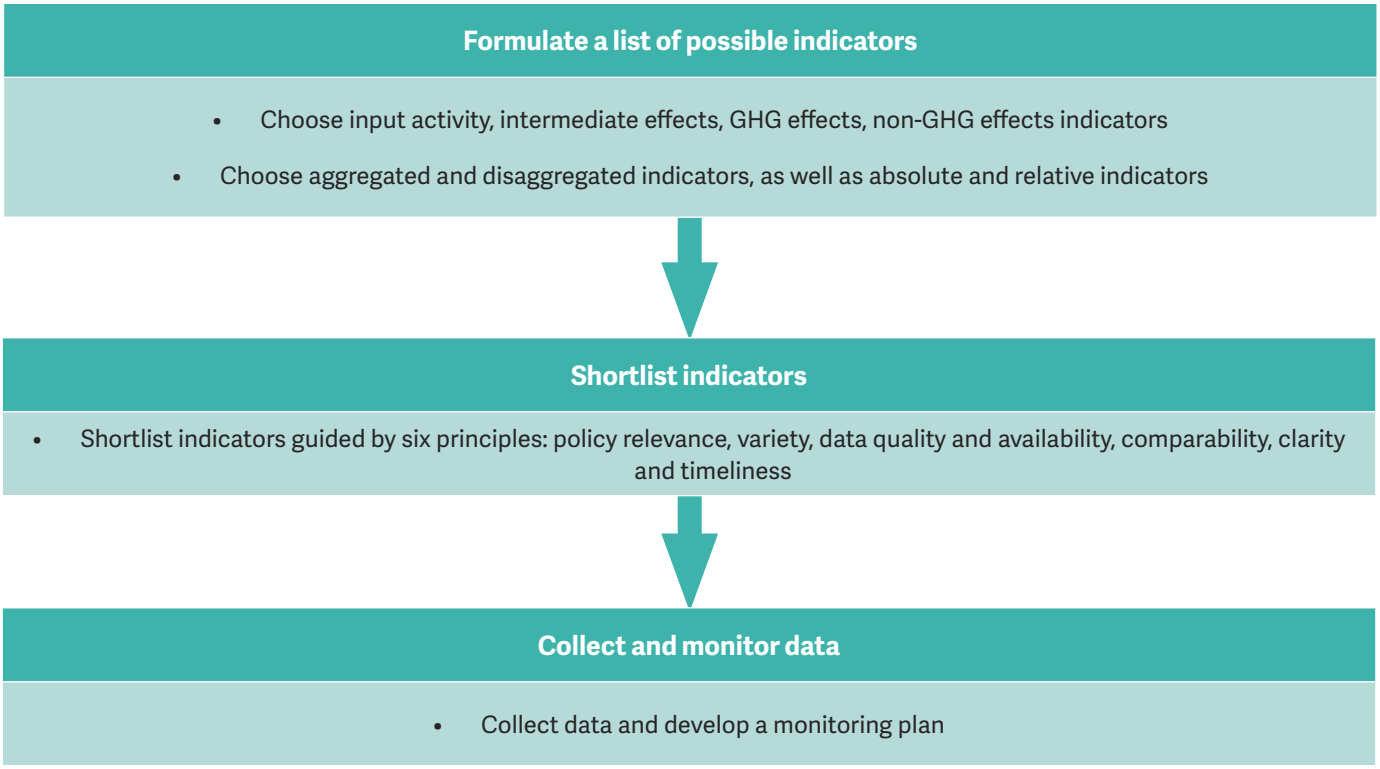


Figure 15. Steps to Develop Performance Monitoring Indicators.

These three steps within Monitoring meet the information requirements defined in the PAM Compilation Template. It will be the task of the CCS and of the IMWG to amend and refine the informational requirements for filling the monitoring component of the PAM collection template in line with identified data needs.

The main goal to undertake monitoring of policies and measures is therefore to track the implementation and achievement of Sri Lanka´s NDC within the overall MRV cycle. As such, monitoring the policies and measures put in place or planned, facilitates the country to assess whether it is meeting its domestic and international climate goals, and understand the status of the policy implementation process for policies considered in the country's NDC.

Additional benefits include improved transparency and accountability around policy implementation to help track progress toward NDC goals and other national commitments and goals, provides an indication of the policy effectiveness, and allows Sri Lanka to meet the UNFCCC requirements related to reporting on progress of implementation of policies and measures (Figure 15). Further information on the reporting requirements is provided in the section "Reporting" in chapter 2.4. of this document.



Figure 16. Benefits of Monitoring Policies and Measures.

Formulate a List of Possible Performance Indicators

Responsible entities:

Sectoral leads

Energy:

- Sri Lanka Sustainable Energy Authority

Industry:

- Ministry of Industries

Objective:

Develop a list of possible performance indicators for the sectoral PAMs to track their implementation.

The first step in the Monitoring process is the formulation of a list of possible performance indicators to track the implementation of the sectoral PAMs for the industry sector and thereby the relevant energy and IPPU sector PAMs for the NDC. The sectoral leads can strongly rely on the KPIs defined in the NDC Implementation Plan, as long as they satisfy the provisions outlined in this chapter and allow for effective progress tracking of the PAMs.

In order to provide the sectoral with the tools to revise and update KPI as required and in order to be able to develop new indicators in case new PAMs are implemented, these protocols provide with a clear step by step procedure for the formulation, shortlisting and monitoring of PAMs through indicators.

The sectoral leads will need to develop this list of possible indicators considering the aim of the MRV to inform and track on the evolution of NDC commitments by completing the following table with the identified performance indicators by sectoral PAM.

Table 20. Compilation of Performance Indicators by PAM.

	Policy and Measure	Performance indicator
Energy	Policy and Measure #1	...
		...
	Policy and Measure #2	...
		...
IPPU	Policy and Measure #1	...
		...
	Policy and Measure #2	...
		...
...	...	...
		...

To provide guidance to the sectoral leads in the identification of indicators, the following table provides several examples of performance indicators for the sectors Energy and IPPU as representing the industry sector in the context of this project.

Table 21. Examples of Performance Indicators by Sector.

Energy		
	Energy efficiency	Extent (%) of feasibility study completed on fiscal incentives for energy efficiency measures in buildings. Percentage market share (%) of energy efficient appliances.
	Renewable energy	Percentage share (%) of solar power in national electricity generation. Total installed capacity (MW) of solar PV power plants in MW.
IPPU		
	Innovative Technologies and Processes	Percentage share (%) clinker used in the cement production. Number (#) of industrial companies participating in the industrial energy conservation and efficiency campaign.
		Extend (%) of implementation of quality assurance and certification procedures for industrial equipment and installation. Number (#) of industrial companies taking up best-available techniques.

Responsible entities:

Sectoral leads

Energy:

- Sri Lanka Sustainable Energy Authority

Industry:

- Ministry of Industries

Compiler

- The CCS will use the indicators for explaining the progress towards the achievement of the NDC in the BTR

Objective:

Shortlist a subset of indicators for use in regular monitoring according to the six key principles.

Shortlist Performance Indicators

The next step entails shortlisting a subset of indicators for use in regular monitoring according to the six key principles (policy relevance, variety, data quality and availability, comparability, clarity, and timeliness) presented in section "Monitoring" of this document.

This will be completed following the checklist provided in the table below, which defines the key aspects to be examined for each of the identified indicators, resulting in a positive or negative outcome for each check. Based on these results, the most appropriate indicators will be shortlisted to be monitored.

Firstly, the sectoral leads will conduct this shortlisting check based on the list of indicators that were identified in the previous step by them. Following the shortlisting of the performance indicators by the sectoral leads, the CCS will undertake the assessment as well to ensure that the shortlisted indicators are adequate to track the implementation of the PAMs and track the NDC.

Table 22. Checklist for Shortlisting Performance Indicators for Tracking PAMs.

Checklist item	Assessment	Outcome (ü/)
Does the performance indicator target a specific element of change and is it relevant to the policy being monitored?		
Does the performance indicator overlap with another performance indicator?		
Is there regularly available data for the performance indicator and is this data sufficiently robust, reliable, and valid?		
Does the performance indicator support meaningful and true comparison across geographical areas to allow for the comparison of results?		
Is the performance indicator clearly defined and easily monitored to ensure it is unambiguous and understandable?		
Can the performance indicator be reported sufficiently frequently for meaningful change to be tracked?		

Monitor Performance Indicators

Responsible entities:

Sectoral leads

Energy:

- Sri Lanka Sustainable Energy Authority

IPPU:

- Ministry of Industries

Compiler

- The CCS will use the indicators for explaining the progress towards the achievement of the NDC in the BTR

Objective:

Monitor the implementation of the sectoral PAMs to track the evolution of the NDC commitments for 1) developing the BTR chapter on PAMs and 2) help in the processes of decision making.

The final step in the process is the monitoring of the shortlisted performance indicators for PAMs to track the evolution of NDC commitments.

Data collection related to the selected shortlisted performance indicators will be required to determine the indicator values and trends and ultimately to adequately monitor a policy's implementation and effectiveness. To this end, the initial aspect to define is what specific data is required to monitor a particular policy or measure. The data requirements to be collected within the overall MRV cycle are defined in the Outline of the National Inventory Document in Annex VIII.

When solely focussing on the monitoring aspect, the following table depicts the monitoring plan for performance indicators. This will allow the country to generate accurate data which can also be used as the basis for regular reporting to national and international stakeholders (see "Reporting" section of this document).

In Annex IX a fully filled PAM Compilation Template is provided referencing an example of a PAM of the industry sector of Sri Lanka as per the country´s NDC.

In general, a wide variety of data will be required to monitor each of the performance indicators adequately. Therefore, the sectoral leads will need to determine whether this monitoring plan can be followed using existing data or whether new data should be gathered. Data sources can relate to records and reports (progress reports) maintained by the authority implementing the policy, published government data, unpublished sources, and conducted surveys. Nevertheless, new data may be required to track specific performance indicators, which can be done through, among others, measurements, surveys, or estimations. If necessary, new data sharing agreements may be considered to ensure effective tracking policies and measures.

Table 23. Performance Indicator Monitoring Plan.

Mitigation Policy or Measure	
Title of performance indicator	
Definition	
Purpose	
Rationale	
Method	
Assumptions	
Unit	
Reference point, baseline, base year or starting point	
Objective	
Objective deadline	
Yearly target	
Data source	
Data collection frequency	
Monitoring frequency	
Entity(ies) or person(s) responsible for data collection and monitoring activities	
Reporting frequency	
Verification procedures	
Procedures for quality assurance (QA) and quality control (QC)	
Archiving procedures	

2.3. Verification

Summary	
Main objective	**Stage of MRV cycle**
Verification is essential to ensure quality of the compiled and estimated data and thus enhancing quality and accuracy of the reports. Verification involves several quality controls at each stage of the transparency cycle from the collection of data to archiving as well as quality assurance from qualified oversight and external stakeholders.	
Responsible entities	**Timeframe**
▪ Coordination o Ministry of Environment • Sectoral Data Collection o Energy: * Sri Lanka Sustainable Energy Authority o Industrial Processes and Product Use IPPU * Ministry of Industries • Data estimation o Sri Lanka Sustainable Energy Authority o Ministry of Industries o Support provided by Climate Change Secretariat (CCS) • Technical QA/QC o GHG Inventory and Mitigation Working Group (IMWG) o National Expert Committee on Climate Change • Political Oversight and Validation o National Steering Committee (NSC)	**Months 12; 5-18; 23-24**

The verification stage of the MRV cycle is a crucial part of ensuring the quality of the estimation of the mitigation policies and measures. The verification process involves the systematic and independent review of the selected PAMs, procedures, and progress indicators to ensure their accuracy. The objective of this stage is to identify any inconsistencies, errors, or omissions that require to be addressed by targeted improvements. To ensure the effectiveness of the QA/QC system, it is essential to establish a clear division of responsibilities and to ensure that all stakeholders are aware of their roles and obligations. In the following, the key steps of the verification phase are linked to responsible stakeholders and clear timeframes for implementing the QA/QC system.

The verification procedures consist of a Quality Control and Quality Assurance Plan (QA/QC Plan) for each MRV cycle. The CCS as the MRV coordinator should develop a clear plan in collaboration with the IMWG including devising roles, setting up a timeline and delivering templates for all QC/QA procedures. Moreover, based on the quality checks, an improvement plan is to be followed detailing the areas of improvement as well as classifying them by urgency. The QA/QC Plan for the MRV of mitigation PAMs therefore requires elaboration of the following procedures and templates:

Elements of the verification process:

- QA/QC Plan
- QC checklists
- QA checklist
- QA/QC documentation template
- Improvement plan template for immediate action
- Improvement plan template for next MRV cycles
- Archiving procedures

Moreover, QC procedures should be implemented throughout all stages of data collection, data estimation and reporting. The overall goal is to attain a transparent, accurate, consistent, comparable, and complete tracking system for mitigation PAMs according to the TTACCCI principles defined as follows:

- **Timeliness:** Data quality verification procedures should be regularly scheduled to ensure reports can be delivered on a biannual basis to all relevant stakeholders in a timely manner.
- **Transparency:** Sufficient and clear documentation should be provided to understand how all data provided was attained. Any assumptions and methodologies for data analysis should be clearly explained and documented.
- **Accuracy:** Estimates of the effect of mitigation PAMs and their implementation should be as exact as possible. As far can be judged according to the available information, estimates must be neither systematically over- nor under-estimated.
- **Consistency:** Data collection and estimation methodologies should be implemented in the same manner between PAMs and between MRV cycles such that any differences between years can be accurately reflected and evaluated to track the impact from mitigation PAMs and the progress of their implementation.
- **Comparability:** Assessment of mitigation PAMs effects and the progress in their implementation should be done following internationally agreed methodologies to the extent possible.
- **Completeness:** All relevant mitigations PAMs across all sectors that are ongoing or planned in Sri Lanka should be accounted for.
- **Improvement:** Areas of refinement should be identified to improve the quality of data and estimates for subsequent MRV cycles.

2.3.1. Establishing the QA/QC Plan

The first step, in months 1-2, is implementing a QA/QC system by developing a comprehensive plan that outlines the quality objectives, procedures, and responsibilities for each stage of the transparency cycle. The plan should also define the scope and frequency of quality control activities and establish performance indicators and targets to measure the effectiveness of the system. The plan should be reviewed and updated periodically to ensure that it remains relevant and effective.

The backbone for implementing effective QA/QC procedures is the development of a concise plan (QA/QC Plan) that details the steps to be undertaken by entity, provides a timeframe and sets adequate targets. As such, the plan serves as a guide for all verification procedures along every step of the MRV cycle. The entity responsible for developing the QA/QC Plan is the CCS charged with coordination and oversight of the implementation of the MRV cycle.

In a first phase, the QA/QC Plan as well as the relevant checklists to the stakeholders are distributed. This should occur in a timely manner to ensure all relevant checks and documentation are understood and ready for use. To that end, the CCS should organize a meeting with all stakeholders to inform them of the timeline for QA/QC activities and to explain all relevant guides as well as discuss changes to the previous MRV cycles during the first meeting on planning of the MRV cycle.

Responsibilities

The following table lists the entities and their respective roles and responsibilities in the QA/QC process. Each role and corresponding activities are further explained in more detail in the respective sections on QC, QA, and Improvement Plan.

Table 24. Roles and Responsibilities for Verification Procedures.

Entities	Responsibilities
Climate Change Secretariat (Coordination)	• Develops the QA/QC Plan, distributes the checklists and templates and agrees them with the key stakeholders during the first planning meeting of the MRV cycle. • Performs the QC of the MRV procedures during the whole cycle and propose improvements for the next MRV cycle. • Acts as the focal point for inquiries and oversees implementation. • Develops, refines, and archives QC and QA documentation.
Sectoral leads	• Perform QC on the data collected from data providers.
Climate Change Secretariat (Data estimation)	• Conducts internal checks on the estimates.
GHG Inventory and Mitigation Working Group	• Conducts technical quality control (QC) checks on the estimated policies and measures. • Proposes technical improvements for immediate action. • Proposes improvements for next cycle.
National Expert Committee on Climate Change Mitigation	• Carries out quality assurance (QA) of the policies and measures. • Proposes technical improvements for immediate action. • Proposes improvements for next cycle.
Political Validation (NSC)	• Conducts high-level political validation of the PAMs to be reports in the BTR.

Proposed timeline

The implementation of the verification steps is aligned with the proposed timeline for the steps of the MRV cycle, acknowledging the approximate timeframes foreseen for each activity. Note, the indicated timeline corresponds to conducting each verification step, thus potential corrective action for immediate response identified in the process is implemented either within the same time frame of the QA/QC check identifying the shortcoming or should be undertaken shortly after. For the improvement plan for the next cycle, thus for medium-term improvements, the last six months of the cycle are reserved in order to conduct an overall QC by the CCS.

Table 25. Proposed Timeline for Verification Steps.

Verification steps	Months											
	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
Distribution of QA/QC Plan and informing stakeholders	Planning											
QC check by sectoral leads		Collection	QC	Pro-viding results								
QC check by CCS				QC	Estimation				Improving			
QA and QC by IMWG and NECCCM and high-level validation by NSC									Techni-cal QC	Technical QA	Political QA	
QC by CCS on overall MRV process									Verifying			QC on pro-cesses
Development of Improvement Plan by CCS and IMWG for immediate action and next MRV cycle									Improve-ment plan for imme-diate action	Improve-ment plan for imme-diate action		Im-prove-ment plan for next cycle

QA/QC submission of checklist

Activity in the MRV cycle

2.3.2. Quality Control Activities

QC activities are designed to prevent errors and ensure that the data of the mitigation PAMs and the estimation and methods are consistent with the established guidelines and standards. These activities include document review, data checks and calculation tests. They should be carried out throughout the MRV cycle to ensure that the data is reliable and consistent. First, QC checks are to be carried out by the sectoral leads checking the quality of the data submitted by the data providers in their respective sector. Second, the CCS then separately assesses the quality of the compiled data on PAMs and confirms further processability or if necessary, reverts to the sectoral leads for clarifications. Third, the ME conducts a QC on the overall functionality of the MRV from a managerial perspective.

Sectoral leads:
Linked to the time plan for the activities, QC activities commence around month 5 with a review of the data compiled from the data providers by the sectoral compilers. This check mainly aims at ensuring sufficiently detailed data is obtained allowing both for further estimation and for effective monitoring of progress of the PAMs.

Climate Change Secretariat:
Following the submission of sectoral data to the CCS for estimation, the CCS conducts quality checks between months 7-9 and reverts to the sectoral leads for potential clarifications on the data. This is a crucial quality check as the CCS needs to ensure complete, accurate and coherent data is submitted by the leads. The 2 months period for conducting this quality check therefore is rather indicative as during the estimation process further checks on the compiled data may become necessary. To respond to this need, the CCS and the lead ministries should maintain a close collaboration throughout the MRV cycle.

GHG Inventory and Mitigation Working Group:
The IMWG is tasked with the main technical verification and quality control of the estimated mitigation policies and measures of Sri Lanka´s NDC. It does so by undertaking quality control activities for each sector of the NDC. The review further helps to prioritise areas for improvement and develop the improvement plan of the mitigation improvement plan. As a tentative timeframe, the technical QC check should occur around months 17-18 of the MRV cycle. The template provided for the general QC check includes questions for the to review the data completeness, data quality and accuracy, timeliness of data flows, and consistency. The template is valid for generalized checks on the mitigation PAMs data for both the Electricity (Power) and Industry Sector.

Climate Change Secretariat:
Around month 19, the CCS begins to review the processes of the current MRV cycle for which it continuously gathered information throughout the duration of the MRV cycle. This step aims to identify procedural issues which may need to be addressed in the planning and coordination of subsequent MRV cycles. In the last two months of the cycle, the CCS then correspondingly fills the designated QC template.

All designated QC templates will be considered for elaborating the improvement plan for the subsequent MRV cycle.

Reflecting the different steps and challenges of the MRV cycle, distinct data collection protocols are developed for the institutions involved in these QC steps. The respective focus is hence set on either the collected raw data, the data completeness and consistency, and the estimation methodology or on the procedural aspects.

All the processes carried out for the QC will need to be documented and stored accordingly. The dedicated QC checklists for the sectoral leads and the CCS can be found in this order in Annex X.

2.3.3. Quality Assurance Activities

QA consists of a series of reviews conducted by cross-sectoral technical personnel and by high-level policy bodies not directly involved in the data collection and estimation procedures.

QA procedures provide:

- an assessment of the respective procedures followed to arrive at the estimates and reporting. For that, they are used to verify all prior QC steps taken and check whether they have been implemented accordingly.
- an unbiased technical intersectoral perspective of the accuracy of the data and information used in the analysis and presented in the reports.
- recommendations for immediate improvements and
- possible areas of improvement for the next MRV cycle.

Firstly, QA activities will be conducted by the NECCCM. Secondly, the NSC will carry out a final validation provide political approval before the reporting of the policies and measures information to the UNFCCC. Throughout the process, the Coordination entity, the CCS, will provide oversight ensuring the QA activities are conducted according to the timeline and procedures defined in the implementation plan.

Technical QA:

To conduct the QA, the NECCCM collaborates with the CCS to obtain all required information to conduct QA activities. Linked to the timetable, this step commences with detailed QA review of the estimated mitigation PAMs in month 19 and includes activities to:

- Conduct critical review of the reporting documents scrutinizing the technical aspects.
- Provide structured feedback in the form of a template clearly identifying shortcomings as well as proposing targeted improvements.
- Assess and verify the overall implementation and effectiveness of the QCs in the MRV cycle.
- Approve the mitigation PAMs reporting and submit them to the Council for approval.

The review task for the QA carried out by the NECCCM is formalized in template found in Annex XI. The template is developed as a guide to identify areas of improvement of the data estimates and data collection procedures as well as on the reporting formats and technical assessments. The template hence includes questions for the NECCCM to review the data completeness, data quality and accuracy, timeliness of data flows, and consistency. Note, the template is developed as a guide to identify areas of improvement of the data estimates and data collection procedures as well as on the reporting formats and technical assessments. Note, the QA template may be further refined by the NECCCM in communication with the CCS and IMWG. During this verification exercise, areas for improvement should be identified and the timeframes for implementation proposed. The following section will further detail the levels and method applied for elaborating the improvement plan.

High-level Validation:

The review is less rigorous on the methodology and usually does not engage in recalculations. Rather, the objective of the political validation is to ensure that the mitigation estimation and the underlying assumptions are judged as reasonable in the assessments. Moreover, it is important to approve the chapters related to mitigation for the BTR. It is as the discretion of the designated entity (NSC) to determine the most appropriate format for conducting and formally sharing the review results. Hence, no particular templates re provided for the political validation of the mitigation and NDC tracking component-

2.3.4. Improvement Plan

To formalize the QA/QC activities, the CCS develops two improvement plans detailing formats and procedures for 1) immediate corrective action within the ongoing MRV cycle and 2) for medium-term improvements and long-term improvements considering barriers encountered and lessons learned in each MRV cycle.

Three levels of implementation should be considered as follows:

Level 1: Immediate action:
Corrective measures to be implemented immediately for the current MRV cycle because they do not need additional resources and the errors identified have a wide impact on the results presented in the report.

Level 2: Next MRV cycle:
General improvements in the data collection and documentation process that should be implemented in the next MRV cycle and technical improvements that require additional research.

Level 3: Long-term action:
Actions that need additional stakeholders to be involved in the process, more complex assessment methodologies and/or that are not mandatory requirements under the ETF.

Level 1 - Immediate action improvement plan:

This includes issues identified that require immediate action which are generally related to errors in the calculations which will require further data collection, recalculations of mitigation impacts or refinement of tracking indicators. The coordinator, CCS, will be responsible for the development of the immediate action plan, and will collect critical issues from the relevant entities conducting the QC and QA procedures within the mitigation MRV cycle. Linked to the timeframe of the MRV cycle, the plan is to be distributed to the CCS who will be responsible for implementing the immediate corrections between months 17-19 and the latest month 20.

Level 2 and 3 - Medium-term improvement plan:

This includes issues identified throughout the entire 2-year MRV cycle that relate to improvements to the processes to improve the data over time but are not critical to the data that is currently being collected and measured. The CCS as coordinator, will be responsible for developing the medium-term improvement plan and is informed by recommendations provided by the entities conducting the QC and QA procedures within the MRV cycle. The CCS will subsequently be responsible for identifying and defining the relevant entities that will be responsible for implementing the issues during the next cycle. As such, the medium-term improvement plan will be taken on board as part of the planning stage of the following MRV cycle.

A proposal of templates for the improvement plans for urgent actions (level 1) and short- and long-term actions (levels 2 and 3) are included in Annex XII and Annex XIII. However, the eventual design is at the discretion of the CCS in collaboration with the IMWG considering the nature and urgency of the improvements. These templates are valid for the GHG inventory and for mitigation.

2.3.5. Archiving

A robust archiving system is a crucial component of the MRV cycle both for electronic and hard copy versions of stored information. Systematic documentation and archiving of information will enhance the transparency and long-term sustainability of the MRV process. It will additionally help the entities involved in the cycle to:

- Access previous information and data.
- Easily reproduce calculations produced in previous reports.
- Respond to government, expert, or public inquiry.
- More easily review estimates.
- Safeguard against loss of information or data.
- Ensure roles and responsibilities are understood.
- Standardise tasks.
- Create transparency and improves credibility.
- Provide a clear starting point for future reporting.
- Build a sustainable national system.

An Archiving Coordinator within the CCS will be appointed for this function and will be responsible for the storing of information. The core informational items and data to be archived, as well as the source for the data within each inventory MRV cycle are listed below.

Table 26. Mitigation Data Archiving Template.

Data type	Documentation to be archived
Mitigation estimation data	▪ Mitigation cycle plan and chronogram. ▪ All raw data by sector obtained for the measurement procedure. ▪ Methodology documentation and explanation. ▪ All filled PAM Data Collection Templates. ▪ Extracts of all information on mitigation actions shared through the online system. ▪ All files used for calculations, including drafts (e.g., spreadsheets, models, databases, data sources, references). ▪ Monitoring indicators and auxiliary information measuring progress on the NDC and individual mitigation PAMs. ▪ All filled reporting templates to the UNFCCC.
Procedural documents from the inventory cycle	▪ Institutional arrangements. ▪ QA/QC plan. ▪ Completed QC checklists within the inventory MRV cycle. ▪ Completed improvement plan within the inventory MRV cycle. ▪ Completed QA checklists within the inventory MRV cycle. ▪ Signed confidentiality and data sharing agreements between entities within the mitigation MRV cycle. ▪ All internal reports, reports provided to relevant stakeholders, and reports provided to the CCS. ▪ Any other relevant information on mitigation of emissions and NDC progress obtained during the MRV cycle.

All information should be stored in both a digital version as well as a hard-copy, yet electronic version such as on USB-sticks or external hard drives according to the UNFCCC best practice guidelines. It is essential to establish a clear organisational structure to easily access the archived information according to the MRV cycle. All information within a single MRV cycle should be stored together in a clearly identified location, ensuring that information from different mitigation MRV cycles is archived separately. The CCS – specifically the archive coordinator – will be responsible for storing, organising, and labelling all information as well as managing and updating the data archive logs. As such, while the archive coordinator is tasked with managing the archive, he/she is not solely responsible for collecting all the data to be archived as the sectoral leads and the responsible staff for the estimation of the inventory in the CCS will be asked to input relevant information. The following table shows a template for the management of the archive.

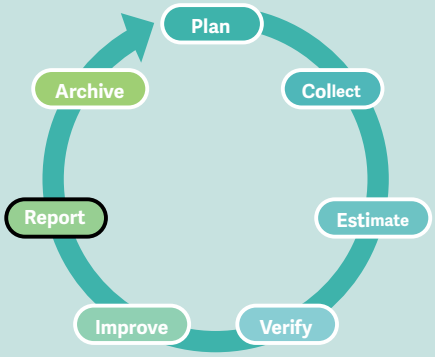
Requests for retrieving data should be directed to and approved by the archive coordinator who assesses whether the request is deemed adequate. Adequacy in this context relates to the level of information requested and to potential confidentiality agreements established within the MRV cycle. The development of a guideline determining adequacy for data sharing from the repository should be fostered to facilitate the evaluation of data retrieval requests at the CCS.

Table 27. Data Archiving Template.

MRV year				
Document No.	Document type*	Document name**	Submitting Staff	Date archived
1				
2				
3				
4				
5				

*Please indicate the type of document, such as data collection template, calculation, data sharing agreements, etc.
** Please provide the exact name of the document, assigning a distinct name to avoid confusion.

2.4. Reporting

Summary	
Main objective	**Stage of MRV cycle**
Reporting the estimated mitigation PAMs to the UNFCCC and preparation of the BTR chapter on mitigation in a two-year cycle in line with the MPGs of the Paris Agreement, such as the Common Reporting Tables, and the Biennial Transparency Report chapter on mitigation.	
Responsible entities	**Timeframe**
▪ Reporting o Climate Change Secretariat	**Months: 19-24**

Reporting represents the last main step of the transparency cycle and takes place between months 19-24. For this step, the CCS under the Ministry of Environment as the UNFCCC focal point, is responsible for ensuring the elaboration and quality of the reporting. Regarding the procedural level, reporting occurs every two years in alignment with the new requirements the ETF of Article 13 of the Paris Agreement requesting the development of BTRs containing a chapter on revised and updated information on national mitigation PAMs from 2024 onward in a two-year rhythm. More specifically, Decision CMA.3 under Article 13 taken at the COP 26 in Glasgow, reaffirming 18/CMA.1, states that countries shall report their mitigation PAMs in textual format in the BTR as well as report in line with the CTF.[32]Herein, the textual or narrative format may complement the information provided in the tabular formats.

Regarding the mandatory reporting in the tabular formats, CTF 4 and 5 are relevant for the mitigation. More specifically, CTF 4 is required for showing progress on the NDC target(s) and CTF 5 is designed to report on each individual mitigation measure or policy in a country.

In the following sections, the outline and the tables are presented in an adapted form to link to the mitigation MRV of Sri Lanka including information on how the templates are to be completed.

[32]Guidance operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement. Available at: Decision 5/CMA.3

2.4.1. Reporting on International Transparency Requirements

To correctly report via the reporting template and formats, the UNFCCC has provided more extensive explanations for each item to be reported which can be retrieved from the Methodological Guidelines of the Draft decision -/CMA.3. Below an overview of the CTF 4 and CTF 5 is provided and in Annex XIV, the full formats are included. Moreover, the information compiled in for the mitigation PAMs and to be reported in textual format in the BTR is briefly explained.

CTF 4

To report on the progress on the NDC target(s), Sri Lanka is required to provide CTF 4. As discussed, progress on the NDC is measured in reduction of GHG emissions following a specific type of target or goal (see Annex I for reference). In either case, such target is principally estimated by the evolvement of emissions as seen in the GHG inventory. Hence, in order to fill the table, it is necessary to have estimated and consolidated the national GHG inventory. In the context of the industrial sector of Sri Lanka, the sectoral contribution to progress on the NDC would be the percentage reduction in these sectors as a fraction of the emissions of these sectors of overall national emissions. In order then to fill the table correctly, the chosen indicator for the target and any other additional indicator should be added. Adding additional indicators is voluntary, and countries can choose to do so, for instance, to refer to specific sectoral emission reduction targets.

Once the indicators are chosen, the reference point or baseline value and the current implementation year of the NDC are identified and the target level and target year (usually 2030) are defined. The progress then is usually a percentage of the target level envisioned for the country by 2030.

CTF 5

For mitigation PAMs, the CTF 5, "Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement"[33], applies to Sri Lanka.

In this table, all individual PAMs implemented by Sri Lanka should be reported. Note, only the PAMs, that were identified and estimated to have substantial emissions reduction potential should be reported. The summarized version of the CTF 5 seen below shows the main items to fill for CTF 5 including the description and objectives as well as links to sectors and types of gases affected. Moreover, the start year of implementation and the responsible entity developing the policy or measure should be referenced. Lastly, the estimated GHG emissions reduction is reported either as actually achieved if the PAM is already being implemented and the effect could be estimated or as expected, thus before implementation.

Table 28. CTF 5 for Reporting on Mitigation PAMs in the BTR.

Name	Descriptions	Objectives	Type of instrument	Status	Sector(s) affected	Gases affected	Start year of implemen-tation	Imple-menting entity or entities	Estimates of GHG emission reductions (kt CO2 eq.)	
									Achieved	Expected

BTR Chapter on NDC Tracking

Decision CMA.3 furthermore states that countries shall report their mitigation PAMs in textual format in the BTR in addition to report them in CTF tables. Annex IV of the Decision provides an outline of the future biennial transparency report that could be used as a reference for the content of the BTR to be reported by Sri Lanka from 2024 onward. Below the outline, highlighting the areas where information on NDC progress and policies and measures is to be reported, is added[34].

[33] FCCC/PA/CMA/2021/L.21 - Methodological issues relating to the enhanced transparency framework for action and support referred to in Article 13 of the Paris Agreement, 2021, https://unfccc.int/sites/default/files/resource/cma2021_L21E.pdf

[34] It is to remark that Sri Lanka will have to develop the full BTR, going beyond the industry sector, and cover all required chapters and all relevant sectors.

Chapter II -

Outline of the biennial transparency report, pursuant to the modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement

II. Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement (paras. 59-103 of the MPGs).

A. National circumstances and institutional arrangements (paras. 59–63 of the MPGs)

B. Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates (para. 64 of the MPGs)

C. Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement (paras. 65–79 of the MPGs).

D. Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement (paras. 80–90 of the MPGs).

2.4.2. Reporting to National Policymakers

Whilst the UNFCCC transparency framework represents the core activity of the reporting obligations for Sri Lanka, the information gathered on mitigation PAMs is highly relevant for national policymakers and sectoral project developers. Annex XV proposes a streamlined and less technical reporting template to inform policy makers on the progress in the implementation of mitigation PAMs in Sri Lanka in order to enable them to make informed decisions on climate change related policies and actions.

2.4.3. Reporting to the Public

In addition to the institutional recipients, potential climate finance donors and investors as well as the public in general shall also have access to information on mitigation PAMs in the country as well as on the status and progress of the NDC implementation.

Granting the public access to the climate change progress in the country serves both to raise awareness nationally as well as it shows commitment to the international community and can thus strengthen investor trust in climate change action due to enhanced transparency. As the content of such information should be appropriate to the level of understanding as well as in light of the need for good accessibility, the information on mitigation for the public should be presented in a user-friendly manner, for instance in the form of an online platform. The platform should be hosted within the CCS or Ministry of Environment´s IT infrastructure.

Note, there are a growing number of international examples for awareness platforms on climate action and progress on countries towards the achievement of the commitments established in the NDC, but they differ in focus, completeness, and accessibility.

Annex I – Examples of Indicators for Types of Goals in NDCs

Type of NDC Goal	Example of Indicators
Absolute emission reduction or limitation target relative to a base year	GHG emissions (tCO_2eq) with or without LULUCF, as appropriate, in base year/ period, current year and target year/period; or emission reductions (tCO_2eq)
Emission reduction target below a BAU level	GHG emissions (tCO_2eq) for BAU scenario (if different from the reference level) with or without LULUCF, as appropriate; or values for drivers of BAU scenario (e.g., GDP, population, fuel demand); or current emissions below BAU level
Intensity target	Base, current or target year/period GHG emissions; base, current or target year/ period drivers (e.g., GDP, population, energy consumption)
Peaking target	GHG emissions (tCO_2eq) in all years leading to the target year, with or without LULUCF
Policies and actions	Status of implementation of policies and measures (e.g., planned, adopted, implementing); description of what would have happened in the country without the policy; emission quantification of the policy impacts; number of policies and measures implemented; financial, technological and/ or capacity-building support received for implementing policies and measures
Other (e.g., mitigation co-benefits of adaptation actions, non-GHG targets)	Description of current adaptation actions with mitigation co-benefits; quantification of mitigation co-benefits; or indicators under 'policies and actions' (as above).

Source: UNFCCC (2022), Reference Manual for the Enhanced Transparency Framework under the Paris Agreement. Available at: Reference Manual for the ETF

Annex II – Data Providers for GHG Inventory and Mitigation PAMs

Data providers for the IPCC categories of the GHG Inventory related to the Industry sector
(Energy Industries 1A1; Manufacturing Industries and Construction 1A2; 2 Industrial Processes and Product-Use)

IPCC sector	Main IPCC categories	Description of data need	Potential data providers
Energy	1A1 Energy Industries	• National total Fuel consumed by type of fuel and by activity. • Fuel characteristics (carbon content, calorific value).	Sustainable Energy Authority, Ceylon Electricity Board, Department of Census and Statistics, Ministry of Power and Energy, Lanka Electricity Company, Lanka Coal Company, Ceylon Petroleum Corporation, Laugfs Gas, Litro Gas, Sri Lanka Customs, Lanka IOC and Sinopec
	1A1a Main Activity Electricity and Heat	• Fuel consumed by type of fuel and by activity (energy production, manufacturing, construction). • Fuel characteristics (carbon content, calorific value).	Ceylon Electricity Board, Sustainable Energy Authority, Lanka Coal Company, Ceylon Petroleum Corporation, Lanka IOC and Sinopec, Ministry of Power and Energy
	1A1ai Electricity Generation		Ceylon Electricity Board, Sustainable Energy Authority, Lanka Electricity Company, Ministry of Power and Energy, Central Environmental Authority
	1A1aii Combined Heat and Power Generation (CHP)		Ceylon Electricity Board, Sustainable Energy Authority, Ministry of Power and Energy
	1A1aiii Heat Plants		Ceylon Electricity Board, Sustainable Energy Authority, Ministry of Power and Energy
	1A1b Petroleum Refining	• Fuel consumed by type of fuel in activities supporting the refining of petroleum products including on-site combustion for the generation of electricity and heat for own use. • Fuel characteristics (carbon content, calorific value).	Ceylon Petroleum Corporation, Sri Lanka Standards Institution, Sri Lanka Sustainable Energy Authority
	1A1c Manufacture of Solid Fuels and Other Energy Industries	• Fuel consumed by type of fuel in activities supporting the manufacture of secondary and tertiary products from solid fuels including production of charcoal. Emissions from own on-site fuel use should be included. Also includes combustion for the generation of electricity and heat for own use in these industries. • Fuel characteristics (carbon content, calorific value).	Sustainable Energy Authority, Sri Lanka Standards Institution, Ministry of Industries, Board of Investments, Ministry of Power and Energy

IPCC sector	Main IPCC categories	Description of data need		Potential data providers
Energy	1A2 Manufacturing Industries and Construction	• National total Fuel consumed by type of fuel by the industry (aggregates). • Fuel characteristics (carbon content, calorific value). • Total Fuel consumed by type of fuel by type of industry: • Iron and Steel • Non-Ferrous Metals • Chemicals • Pulp, Paper and Print • Food Processing,	• Beverages and Tobacco • Non-Metallic Minerals • Transport Equipment • Machinery • Mining (excluding fuels) and Quarrying • Wood and Wood Products • Construction • Textile and Leather • Non-specified Industry	Sustainable Energy Authority, Sri Lanka Standards Institution, Board of Investments, Department of Census and Statistics, Central Environmental Authority, Ceylon Electricity Board, Lanka Electric Company, Sri Lanka Tea Board, Geological Survey and Mines Bureau, Lanka Indian Oil, Sinopec, Ceylon Petroleum Corporation, Sri Lanka Customs, Litro gas and Laugfs gas
	2.A.1 Cement Production, import or export	• National Cement production and clinker production. • Plant level cement production and clinker production		Cement Manufactures (INSEE), Dept. Census and Statistics, Ministry of Industry and Commerce, Geological Survey and Mines Bureau, Board of Investments, Central Environmental Authority, Siam City Cement, LANWA, Tokyo
	2.A.2 Lime Production	• National total lime production • Consumption of carbonates for the production of lime		Department of. Census and Statistics, Geological Survey and Mines Bureau, Pradeshiya Saba (local government), DS offices, Board of Investments, Central Environmental Authority
	2.A.3 Glass Production	• National total lime production by type of glass • Amount of Carbonates consumed to produce glass.		Glass Manufactures (Piramal Glass), Dept. Census and Statistics, Ministry of Industry, Central Environmental Authority, Piramal glas

IPCC sector	Main IPCC categories	Description of data need	Potential data providers
IPPU	2.A.1 Cement Production, import or export	• National Cement production and clinker production. • Plant level cement production and clinker production	Cement Manufactures (INSEE), Dept. Census and Statistics, Ministry of Industry and Commerce, Geological Survey and Mines Bureau, Board of Investments, Central Environmental Authority, Siam City Cement, LANWA, Tokyo
	2.A.2 Lime Production	• National total lime production • Consumption of carbonates for the production of lime	Department of. Census and Statistics, Geological Survey and Mines Bureau, Pradeshiya Saba (local government), DS offices, Board of Investments, Central Environmental Authority
	2.A.3 Glass Production	• National total lime production by type of glass • Amount of Carbonates consumed to produce glass.	Glass Manufactures (Piramal Glass), Dept. Census and Statistics, Ministry of Industry, Central Environmental Authority, Piramal glass
	2.A.4. Other Process Uses of Carbonates	• National total consumption of carbonates (limestone, dolomite, soda ash, and others) • Consumption of carbonates by type of activity (including ceramics, non-metallurgical magnesia production and others	Ceramic based product manufacturers, Min. of Industry and Commerce, Central Environmental Authority, Geological Survey and Mines Bureau, Dept. Census and Statistics
	2B Chemical Industry	• Data on production levels by chemical industry, specifically for: • Ammonia production • Nitric acid production • Adipic acid production • Soda ash production • Petrochemical and carbon black production • others	Department of Census and Statistics, Central Environmental Authority, Ministry of Industries,
	2C Metal Industry	• (Currently Steel Rolling only)	Steel rolling industries, Board of Investments, Min. of Industries, Central Environmental Authority, Ceylon Petroleum Corporation, LIOC, Sinopec
	2.D.1, 2.D.2 Non-energy Products from Fuel and Solvent Use	• Lubricant consumption data and paraffin wax use • Non-energy use of fuels	Lubricant manufacturers CPC, Lubricant importers, Sri Lanka Customs (Dept. Census and Statistics), Sustainable Energy Authority
	2.E Electronics Industry	• Data on use of fluorinated compounds (FCs)	Board of Investments, Central Environmental Authority

IPCC sector	Main IPCC categories	Description of data need	Potential data providers
IPPU	2.F Product Uses as Substitutes for Ozone Depleting Substances	• Data on Refrigeration and Air Conditioning Units and Technical Specifications • Data on use of Foam Blowing Agents • Data on Fire Protection product use (extinguishers) • Data on Aerosol use • Data on Solvents use	Sustainable Energy Authority, Sri Lanka Standards Institution, Board of Investments, Department of Census and Statistics, Central Environmental Authority, Ceylon Electricity Board, Lanka Electric Company, Sri Lanka Tea Board, Geological Survey and Mines Bureau, Lanka Indian Oil, Sinopec, Ceylon Petroleum Corporation, Sri Lanka Customs, Litro gas and Laugfs gas
	2.G Other Product Manufacture and Use	• Data on electrical equipment and several other products include sulphur hexafluoride (SF6), perfluorocarbons (PFCs), and nitrous oxide (N2O)	Sri Lanka Customs, Ceylon Electricity Board, Lanka Electricity Company
	2.H Other	• Data on Pulp and Paper Production • Data on Food and Beverages Industry	National Paper Corporation, Sri Lanka Bakery Owners' Association; Prema Serendib Flour mills, Sri Lanka Customs Department of Census and Statistics, Liquor manufacturing industries in Sri Lanka, Department of Excise

Data providers for the Policies and Measures related to the industry sector as per the NDC Implementation Plan of Sri Lanka

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1	Electricity (Power) 1.1	Establish wind, solar (rooftop, small-scale and large solar PV), biomass12, large and small hydro power plants								
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.2	Electricity (Power) 1.2	Develop the required transmission network infrastructure to enable integration of renewable energy	CEB	MoP&E, CEB	Length of network infrastructure developed/up graded	CEB statistical di-gest	3,160 km	480 km. (Could be a very elaborate target under REDMAP)	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 2 -Implement Demand Side Management (DSM) measures by promoting energy efficient equipment, technologies, and system improvements in a national energy efficiency improvement and conservation (EEI&C) programme	2.1	Electricity (Power) 2.1	Realize energy saving of 2,603 GWh by phasing out incandescent bulbs as an unconditional measure	SLSEA	CEB, MoP&E, SLSI	GWh saved	SLEB	14 GWh	2,603 GWh	2021	2025
Electricity (Power)	NDC 2 -Implement Demand Side Management (DSM) measures by promoting energy efficient equipment, technologies, and system improvements in a national energy efficiency improvement and conservation (EEI&C)programme	2.2	Electricity (Power) 2.2	Realize energy saving of 5,189 GWh by introducing efficient lighting, fans, refrigerators, and chillers as a conditional measure	SLSEA	CEB, MoP&E, SLSI, EE service providers, Private sector	GWh saved	SLEB	724 GWh	5,189 GWh (2023-401) (2024-600) (2025-794) (2026- 1,051) (2027- 1,549) (2028- 1,487) (2029- 1,737) (2030- 1,737)	2023	2030
Electricity (Power)	NDC 2 -Implement Demand Side Management (DSM) measures by promoting energy efficient equipment, technologies, and system improvements in a national energy efficiency improvement and conservation (EEI&C)programme	2.3	Electricity (Power) 2.3	Implement energy efficiency building code on a mandatory basis	SLSEA	MoP&E, UDA, LAs, CIDA, Institute of Architects, IESL, GBCSL, Construction companies	Number of installations	SLSEA records of building applications	None	1,073 GWh	2022	2022
Electricity (Power)	NDC 2 -Implement Demand Side Management (DSM) measures by promoting energy efficient equipment, technologies, and system improvements in a national energy efficiency improvement and conservation (EEI&C) programme	2.4	Electricity (Power) 2.4	Promote High Efficiency Motors (HEM), Variable Frequency Drives (VFD), tri-generation, and other energy efficiency measures in the industrial sectors	SLSEA	CEB, MoP&E, MoI, EE service providers, Chambers of Commerce, and Industry Associations (CC&IAs), Private Investors	GWh saved	SLEB / SLSEA statistical information	HEM - 775 GWhVFD - 590 GWh (Facilitat ed by Energy NAMA Project) Efficient Chillers - 1,300 GWh	466 GWh (2024-10) (2025-20) (2026-50) (2027-86) (2028-100) (2029-100) (2030-100)	2024	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 2 -Implement Demand Side Management (DSM) measures by promoting energy efficient equipment, technologies, and system improvements in a national energy efficiency improvement and conservation (EEI&C) programme	2.5	Electricity (Power) 2.5	Plan and implement specific and targeted activities to engage women service providers and energy users in the promotion of measures for demand side management (DSM)	SLSEA	CEB, MoP&E, SLSI	No of women focused/target ed specific activities conductedNo of women befitted	Progress reports, Numbers of women service providers and energy users engaged/ reached	Baseline to be es-tablished through an industry census	100 women per year	2022	2030
Electricity (Power)	NDC 3 - Conversion of existing fuel oil-based combined cycle power plants to Natural Gas (NG) and establishment of new NG plants as conditional measures (once the necessary infrastructure is available)	3.1	Electricity (Power) 3.1	Conversion of existing 600 MW of fuel oil-based power plants to NG	CEB	MoE, MoF, MoP&E,	converted MW	statistical CEB digest	0 MW	600 MW	2025	2030
Electricity (Power)	NDC 3 - Conversion of existing fuel oil-based combined cycle power plants to Natural Gas (NG) and establishment of new NG plants as conditional measures (once the necessary infrastructure is available)	3.2	Electricity (Power) 3.2	Establishment of new combined cycle power plants in place of anticipated coal power capacity additions in the BAU and gas turbines with approximately 700 MW of capacities to be operated from NG	CEB	MoP&E, MoE, MoF, Private sectors (IPPs)	MW established	CEB statistical digest	0 MW	830 MW	2025	2030
Electricity (Power)	NDC 4 – Transmission and distribution network efficiency improvements (Loss reduction of 0.5% compared with BAU by 2030) as unconditional measures (Target - Approximately 1,848 GWh energy savings between 2021-2030)	4.1	Electricity (Power) 4.1	Carry out develop-ments in the trans-mission network, reconductoring of existing transmis-sion lines and reac-tive power compen-sation activities	CEB	MoP&E, MoF	GWh saved	CEB statistical digest	302 GWh	1,848 GWh	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 4 – Transmission and distribution network efficiency improvements (Loss reduction of 0.5% compared with BAU by 2030) as unconditional measures (Target - Approximately 1,848 GWh energy savings between 2021-2030)	4.2	Electricity (Power) 4.2	Carry out the conversion from bare conductors to bundled conductors, line maintenance, load balancing and reduction of line length by installation of transformers in the distribution system	CEB	MoP&E, MoF	GWh saved	CEB statistical digest	As reported above	GWh target shall be established through a loss reduction study	2021	2030
Electricity (Power)	NDC 5 – Conduct R&D activities to implement pilot scale projects for NCRE sources that have not yet reached commercial maturity and develop other grid supporting infrastructures as conditional measures	5.1	Electricity (Power) 5.1	Conduct R&D activities to implement pilot scale projects for new renewable energy (NRE) sources (exotic technologies) like Geothermal Energy conversion, Ocean Thermal Energy Conversion (OTEC), Ocean Energy (Wave), etc. which have not yet reached commercial scale maturity	SLSEA	CEB, MoP&E, Academia	Number of exotic technologies researched and piloted	CEB statistical digest & SLEB	Initial studies are in progress.	5 technologies to be piloted	2021	2030
Electricity (Power)	NDC 5 – Conduct R&D activities to implement pilot scale projects for NCRE sources that have not yet reached commercial maturity and develop other grid supporting infrastructures as conditional measures	5.2	Electricity (Power) 5.2	Develop pumped storage hydro power plants and pilot scale storage systems such as Behind the Meter (BtM) and Grid Scale Battery Energy Storage (BES) solutions, to support the integration of intermittent renewable energy to the system	CEB, SLSEA	MoP&E, Academia, Private sector	Number of installations / MW installed, MWh storage capacity	CEB statistical digest & SLEB	Initial studies is conducted for pump storage.	600 MW PSPP installation, 100 MW BESS installation (for grid support services)	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 5 – Conduct R&D activities to implement pilot scale projects for NCRE sources that have not yet reached commercial maturity and develop other grid supporting infrastructures as conditional measures	5.3	Electricity (Power) 5.3	Introduce ICT interventions such as Smart Grids Technologies to support integration of intermittent renewable energy to the system	SLSEA	CEB, MoP&E, Academia	Number of interventions	SLSEA annual report	One Smart Mini-grid in operation (in Galamu-duna village (Knuckles)	4 new ICT interventions introduced	2021	2030
Electricity (Power)	NDC 5 – Conduct R&D activities to implement pilot scale projects for NCRE sources that have not yet reached commercial maturity and develop other grid supporting infrastructures as conditional measures	5.4	Electricity (Power) 5.4	Conduct a gender assessment and analysis for the Energy sector to identify main gender issues in the sector relevant for mitigation, and to set a baseline	MoP&E	SLSEA, CEB, PUCSL	Main gender issues in the sector identifiedBaseline for introducing/ pr omoting gender responsive mitigation measures identified	Sector gender assessment document with recommendati ons for identifying and promoting gender responsive mitigation activities available	0	Gender assessment document on the energy sector with updated information	2023	2023
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.1	Electricity (Power) 1.1.1	Establish wind power plants	SLSEA, CEB	MoP&E, CEA, Private in-vestors, Land custodians	MW installed	CEB statistical digest & SLEB	178 MW	Addition of 865 MW (Uncondition al 128 MW, Conditional 737 MW)	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.2	Electricity (Power) 1.1.2	Establish rooftop and groundmounted solar PV	SLSEA, CEB	MoP&E, LECO, Solar PV service providers, Private investors, CEA, Land custodians	MW installed	CEB statistical digest & SLEB	425 MW	Addition of 2,263 MW (Uncondition al 335 MW, Conditional 1,928 MW)	2021	2030
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.2.1	Electricity (Power) 1.1.2.1	Encourage and increase women in the rooftop solar PV installation pro-gramme	SLSEA	MoP&E, LECO, Solar PV service providers, Private investors, CEA, Land custodians	Number of women in the rooftop solar PV installation pro-gramme increased	CEB statistical digest & SLEB with data on women's engagement and numbers of women in the programme	Approxi mately 200 women out of 10,000 (2%)	Increase from 2% to 5%	2022	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.3	Electricity (Power) 1.1.3	Power generation through sustainable biomass resources	SLSEA	MoE, MoLR, MoP&E, CEA, MASL, LAs, Land custo-dians	MW installed	CEB statistical digest & SLEB	50 MW	Addition of 65 MW (Uncondition al 10 MW, Conditional 55 MW)	2021	2030
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.3.1	Electricity (Power) 1.1.3.1	Encourage women in supplying sustainable biomass for power plants	SLSEA	MoP&E, MoE, MoLR, CEA, MASL, LAs, Land custo-dians	No of women suppliers	CEB statistical digest & SLEB with data on women suppliers	Baseline to be provided by SLSEA in 2023	Target to be set by SLSEA in 2023	2022	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.3.2	Electricity (Power) 1.1.3.2	Establish an institutional mechanism to enable the collection of sex disaggregated data	SLSEA	CEB, LECO	Sex disaggregated data collection institutional mechanism	CEB statistical digest & SLEB	0	Institutional mechanism for consistent collection of sex disaggregate d data established	2023	2023
Electricity (Power)	NDC 1 - Enhance renewable energy contribution to the national electricity generation mix by increasing Solar PV, Wind, Hydro and Sustainable Biomass based electricity generations (Target: Develop an additional capacity of 3,867 MW renewable energy over the RE capacity considered in Business-As-Usual scenario, out of which approximately 950 MW are on an unconditional basis and 2,917 MW on a conditional basis)	1.1.4	Electricity (Power) 1.1.4	Establish large and small hydro power plants	SLSEA, CEB	MoP&E, CEA, MASL, LAs, Land custo-dians	MW installed	CEB statistical digest & SLEB	410 MW	Addition of Large Hydro: Unconditiona l 31 MW. Mini Hydro: Unconditiona l 20 MW, Conditional 110 MW (Total Mini Hydro 130 MW)	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Electricity (Power)	NDC 5 – Conduct R&D activities to implement pilot scale projects for NCRE sources that have not yet reached commercial maturity and develop other grid supporting infrastructures as conditional measures	5.4.1	Electricity (Power) 5.4.1	Build awareness and capacities of the main planning and implementation teams/agencies on gender issues in the energy sector	MoP&E	International agencies	Gender awareness at the planning and decisionmaking level	No of Awareness and training programmes conducted on gender issues, on gender responsive planning & implementation No of officials trained	Partial awareness created	All agencies of MoP&E gender sensitized	2024	2030
Industry	NDC 1 - Continue fuel switching to sustainable biomass energy & improve user efficiency in selected industrial subsectors such as tea, rubber, apparel, hotel & tourism, rice processing, etc.	1.1	Industry 1.1	Conversion of industry furnaces to steam boilers and hot-water systems, and continued use of sustainable biomass energy in the industry	SLSEA	MoI, MoP&E, SLTB, TRI, SLTDA, CIAs	Number of industrial boiler conversions	Through NEEA applications, ESCO & boiler supplier records	500	90	2021	2030
Industry	NDC 1 - Continue fuel switching to sustainable biomass energy & improve user efficiency in selected industrial subsectors such as tea, rubber, apparel, hotel & tourism, rice processing, etc.	1.2	Industry 1.2	Biomass user efficiency improvement in industry (SMIs and Large) – Across industry sub sectors	SLSEA	MoI, MoP, SLTB, TRI, SLTDA, CIAs, SLSI	Number of improvements, Feed quality Standard	Through NEEA applications, ESCO & boiler supplier records	500	300	2021	2030
Industry	NDC 1 - Continue fuel switching to sustainable biomass energy & improve user efficiency in selected industrial subsectors such as tea, rubber, apparel, hotel & tourism, rice processing, etc.	1.3	Industry 1.3	Introduce biomass co-generation (heating & cooling) in industries	SLSEA	MoI, SLTDA, CIAs	Number of systems installed	SLSEA Records	4	25	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 1 - Continue fuel switching to sustainable biomass energy & improve user efficiency in selected industrial subsectors such as tea, rubber, apparel, hotel & tourism, rice processing, etc.	1.4	Industry 1.4	Switching fossil fuel fired thermal energy generators to biomass energy in government institutions for thermal energy requirements – Biomass fired hot water heaters in hospitals, prisons, arm forces, hostels, universities, etc.	SLSEA	MoH, MoD, MoEd	Number of hot water systems installed	SLSEA Records	25	192	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.1	Industry 2.1	Conduct RECP and energy audits and develop baselines based on industry classifications & importance	MoI	NCPC, SLSEA, SLEMA, BOI, Service providers of SCP & EE	Percentage and number of industries CP & energy audits conducted (Of total 3000 - 5000 industries source NCPC and CEA)	Records of MoI	300	500	2021	2025
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.2	Industry 2.2	Adopt RECP practices including low carbon technologies and processes	MoI	MoPC&LG, NCPC, IDB, CDA, RRI, ITI, Service providers of WM, CIAs	Number of industries which had RECP and energy audits adopting RECP practices and acquiring low carbon technologies and processes	Records of MoI	250	400	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.3	Industry 2.3	Improve water use efficiency in selected industrial subsectors	MoI	MoPC&LG, NCPC, SLSEA, IDB, CDA, RRI, CIAs	Percentage of relevant industries engaged (such as Agro based industries: Food & Beverages, dairy, fish processing, Dessicated Coconut, textile finishing, etc.)	Records of MoI	100	50%	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.4	Industry 2.4	Promote energy efficient appliances & technologies for selected industrial sub-sectors:								
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5	Industry 2.5	Waste minimization, waste management, resource recovery & residual (sludge & sewage) processing while enhancing resource efficiency in selected industrial subsectors (such as coconut, food industry)								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1	Industry 3.1	Transform existing IPs, incorporating maximum possible green industrial concepts	BOI, MoI	RISC, IDB, ISB, LINDEL, UDA	Number of existing BOI EPZs transformed to eco IPs, Percentage of existing non-BOI IPs transformed to eco Ips	Records of IP operators	0	04 (BOI to upgrade existing infrastructure of wastewater treatment plants in Seethawaka, Horana, Koggala & Mawathagama EPZs), 50 Non-BOI IPs	2021	2030
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.2	Industry 3.2	Introduce policy and regulatory regime, including guidelines to ensure all new IPs will be set up as Eco-IPs								
Industry	NDC 4 - Introduce Circular Economy concept to selected industrial subsectors or selected industrial zones	4.1	Industry 4.1	Conduct a survey to identify and determine the potential subsectors to implement circular economy concept	MoI	BOI, RISC, IDB, NEDA, ISB, LINDEL, UDA, Service providers of SCP & WM, CIAs	Number of industries & sub sectors identified for circular economy	Records of MoI	No data available	All relevant industries	2021	2022

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 4 - Introduce Circular Economy concept to selected industrial subsectors or selected industrial zones	4.2	Industry 4.2	Introduce the life cycle approach for selected subsectors for greening the supply chain	MoI	NCPC, Service providers of SCP, CIAs	Percentage of sub sectors & industries engaged in greening the supply chain, Pilot demonstration project	Records of MoI, (NCPC, UoM, UoP, UoJP)	15	100	2021	2030
Industry	NDC 4 - Introduce Circular Economy concept to selected industrial subsectors or selected industrial zones	4.3	Industry 4.3	Practice Industrial symbiosis concept in selected industrial parks or industrial subsectors (Agro-based, Apparel, Metal, etc.)	MoI	BOI, RISC, IDB, NEDA, ISB, UDA, LINDEL, Service provider of SCP & WM, Academia	Number of sub sectors & new IPs adopted industrial symbiosis	Records of MoI	Less than 10	All sub sectors & new Ips	2021	2030
Industry	NDC 4 - Introduce Circular Economy concept to selected industrial subsectors or selected industrial zones	4.4	Industry 4.4	Establish a pilot project on the zero waste concept in selected industrial parks or industrial subsectors	MoI	BOI, RISC, IDB, NEDA, ISB, LINDEL, UDA, SCP & WM service providers, Academia	Number of zero waste pilots in sub sectors	Records of MoI	A few from apparel and hotel industries	10 industrial subsectors	2021	2025
Industry	NDC 4 - Introduce Circular Economy concept to selected industrial subsectors or selected industrial zones	4.5	Industry 4.5	Adopt ISO standards for circular economy concept (ISO/TC 323)	SLSI	MoI, BOI, RISC, IDB, NEDA, ISB, LINDEL, UDA, Service providers of SCP & WM, CIAs	Percentage of industries adopted ISO/ITC 323	SLSI records	None	70% relevant industries	2021	2030
Industry	NDC 4 - Introduce Circular Economy concept to selected industrial subsectors or selected industrial zones	4.6	Industry 4.6	Build industry capacity to adopt circular economy concept	MoI	NCPC, SCP & Service providers of WM, CIAs, Academia	Percentage of industries adopted circular economy concept	Records of MoI	10% of industries	70% relevant industries	2021	2030
Industry	NDC 5 - Introduce Tri-generation facilities to selected industrial parks	5.1	Industry 5.1	Carry out a rapid assessment of tri-generation potential in 10 industrial parks	SLSEA	BOI, MoI, Academia	Number of rapid assessments completed	Records of SLSEA	1	9	2021	2024

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 5 - Introduce Tri-generation facilities to selected industrial parks	5.2	Industry 5.2	Carry out a detailed assessment in one of the BoI industrial parks for piloting at Biyagama export processing zone - EPZ	SLSEA	BOI	Detailed assessment	Records of SLSEA	None	Detailed assessment completed	2021	2022
Industry	NDC 5 - Introduce Tri-generation facilities to selected industrial parks	5.3	Industry 5.3	Develop business models and funding options	BOI	MoI, SLSEA	Business models and funding options	BOI records	None	3 Business models and funding options completed	2022	2023
Industry	NDC 5 - Introduce Tri-generation facilities to selected industrial parks	5.4	Industry 5.4	Implement one tri-generation facility as a pilot project	BOI	SLSEA	Pilot trigeneration facility	BOI records	None	1 Pilot trigeneration facility established at Biyagama	2024	2027
Industry	NDC 5 - Introduce Tri-generation facilities to selected industrial parks	5.5	Industry 5.5	Depending on the success of the pilot project, expand it into BoI and other industrial parks and other prospective applications	BOI	MoI, SLSEA, CIAs	Number of tri- generation facilities established	Records of MoI, SLSEA, CIAs	None	5	2028	2030
Industry	NDC 5 - Introduce Tri-generation facilities to selected industrial parks	5.6	Industry 5.6	Make provisions through policy in-struments to have tri-generation for new industrial zones	MoI	SLSEA, CIAs	Policy package	Records of MoI	None	Policy package introduced	2028	2030
Industry	NDC 6 - GHG reduction of clinker production in the Cement industry	6.1	Industry 6.1	Make necessary amendments to SLSI standards for cement production enabling the increase of ash and other similar materials as substi-tutes for clinker in line with industry standards / trends worldwide (GHG re-duction through the avoided production of clinker)	SLSI	Relevant cement in-dustry, MoI, MoE, CEA	Introduction of relevant standards, GHG reduction	Records of SLSI, Relevant cement indus-try	Existing SLSI standard	Two relevant standards already introduced but the awareness of prospective users needs to be created. Percentage and absolute amount of GHG reduction	2021	2021

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.1	Industry 7.1	Facilitate industries in selected sub sectors to adopt relevant ISO systems having a focus on GHG emission reduction such as ISO 50001 & ISO 14064-1 (updated) (Subsectors: Tea, Garment and Apparel, Food processing, etc.)	MoI	SLSI, BOI, RISC, IDB, NEDA, ISB, UDA, LINDEL, NCPC, Service providers of EE, SCP & WM, CIAs	Percentage of industries adopting various ISO systems	NCPC records	100	25% relevant industries	2021	2030
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.2	Industry 7.2	Introduce and promote suitable tax incentives such as double deduction to promote the acquiring of sustainable technologies	MoI	MoF	Financial and non-financial incentives	MoI records	Baseline to be established	50% relevant industries	2021	2024
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.3	Industry 7.3	Facilitating the entry of environment related ISO certified companies to enter the Sustainable (Green) Public Procurement system of Sri Lanka	MoE (Env Planning & Economics Division)	MoI, MoF	Number & percentage of environment related ISO certified industries entering into Sustainable (Green) Public Procurement system	MoE & MoF records	None	Target to be established after introducing the Sustainable Public Procurement System	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.4	Industry 7.4	Facilitating transformational investment, favourable loans through financing institutions linking with green financing	MoI	MoF	Number & percentage of industries benefitting from green financing	MoI records	SMILE III Loan scheme – 2,997 projects and Rs 13,522.8 0 million from 2013 to 2020 E-Friends II Loan scheme – 96 projects and Rs 935.75 million from 2018 to 2020	SMILE III Loan scheme – Rs 1.5 billion per yearE-Friends II Loan scheme – Rs 600 million per year	2021	2030
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.5	Industry 7.5	Introduce a national policy to address siting of industrial parks and stand-alone industries, new concepts like circular economy, industry ecology, RECPs, digitalization, etc.	MoI	MoE, CEA, Relevant CIAs, Aca-demia	Policy package	MoI records	None	Policy pack-age strength-en	2021	2024
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.6	Industry 7.6	Ensure the availability of sustainable biomass for industry use								

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.7	Industry 7.7	Promote National Green Reporting System (NGRS) as an encouragement for industries to embrace low carbon initiatives	MoE (Env Planning & Economics Division)	MoI, CEA, SLSEA, BOI, RISC, IDB, NEDA, ISB, LINDEL, UDA, NCPC, CCC,ITI, CIAs	Number of Green Reporters registered and reported	MoE records	Approxi-mately 178 registered to date out of which less than 10 an-nual report submissions	20% annual increase of registration s and 50% annual report submission s	2021	2030
Industry	NDC 1 - Continue fuel switching to sustainable biomass energy & improve user efficiency in selected industrial subsectors such as tea, rubber, apparel, hotel & tourism, rice processing, etc.	1.2.1	Industry 1.2.1	Improve biomass feedstock quality (type, size, dryness, storage, etc.) through standardization	SLSEA							
Industry	NDC 1 - Continue fuel switching to sustainable biomass energy & improve user efficiency in selected industrial subsectors such as tea, rubber, apparel, hotel & tourism, rice processing, etc.	1.2.2	Industry 1.2.2	Energy efficiency improvement by O&M and system design improvements (Including flue gas recirculation, Air preheaters)	SLSEA							
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.4.1	Industry 2.4.1	High-Efficient Motors (HEM) for water sector (focusing National Water Supply and Drainage Board)	NWSDB	SLSEA	Annual Energy saving from High-Efficient Motors (HEM)	Records of NWSDB	775 GWh	18 GWh	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.4.2	Industry 2.4.2	Variable Frequency Drives (VFD) for appropriate industries (focusing tea industry)	SLSEA	SLTB, TRI	Energy saving from Variable Frequency Drives (VFD)	ESCO records through SLSEA & MoI	590 GWh	2900 GWh	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.4.3	Industry 2.4.3	Efficient chillers & refrigeration technologies (replacement) for supermarkets, textile and apparel, hotel, dairy sectors	SLSEA	MoI, MoP&E, BOI, RISC, IDB, ISB, LINDEL, UDA, NCPC, NERDC, GBCSL, CIAs	Energy saving from efficient chillers & refrigeration technologies	ESCO records through SLSEA & MoI	1300 GWh	170 GWh	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.1	Industry 2.5.1	Promote wastewater treatment with optimum water reuse possibilities for Food & Beverage, dairy, rice, and other water-based industries	MoI	MoPC&LG, NCPC, IDB, CDA, RRI, ITI, Service providers of WM, Relevant CIAs	Percentage of relevant industries engaged	Industrial database of CEA	1500	50%	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.2	Industry 2.5.2	Promote sewage treatment (with optimum water reuse possibilities) facilities for hotel, apartment complex, garment and apparel and other potential industries (on-site and centralised)	MoI	MoPC&LG, NCPC, IDB, CDA, RRI, ITI, Service providers of WM, Relevant CIAs	Percentage of relevant industries engaged	Industrial database of CEA	Treatment plants including sewage Garment & Apparel – 715, Food & Beverage – 3,952, Hotels & Apartment complexes – 2,171 (From CEA EPL database)	50%	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.3	Industry 2.5.3	Encourage biodegradable waste treatments (composting and biogas where applicable	MoI	MoPC&LG, NCPC, IDB, CDA, RRI, ITI, NSWMSC, Service providers of WM, Relevant CIAs	Percentage of relevant industries engaged	EPL database of CEA	According to CEA, as at May 2019, 119 composting projects were in operation out of 137 composting projects assisted by the Pilisaru programme in Local Authorities No data available in the industry sector and hence baseline to be established		2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.4	Industry 2.5.4	Minimizing packaging, raw material & rejections, etc.	MoI	MoPC&LG, NCPC, IDB, CDA, RRI, ITI, Service providers of WM, Relevant CIAs, SLIP	Percentage of relevant industries engaged	BOI, CEA, SLIP Records	70% of BOI industries have already minimized packaging to the extent possible	70%	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.5	Industry 2.5.5	Minimizing chemical use	MoI	MoPC&LG, NCPC, IDB, CDA, RRI, ITI, Service providers of WM, Relevant CIAs	Percentage of relevant industries engaged	CEA, BOI Records	25% of BOI Industries	70%	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.6	Industry 2.5.6	Adopt low carbon technologies and processes for improved resource efficiency	MoI	Technology providers, Relevant CIAs	Percentage of relevant industries engaged	To be identified	Baseline to be established	70%	2021	2030

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.7	Industry 2.5.7	Promote VOC emission controlling system for painting industry, tire factories & printing industries.	CEA	BOI, MoI, IDB, ISB, RISC, NCPC	Percentage of relevant industries engaged	CEA EPL Database	No data available in the industry sector and hence baseline to be established	30%	2021	2030
Industry	NDC 2 - Enhance the application of Resource Efficient Cleaner Production (RECP) practices in selected industrial sub sectors	2.5.8	Industry 2.5.8	Introduce waste heat recovery systems for rice milling & textile finishing, ceramics	SLSEA	MoI, Service providers of Energy, Relevant CIAs	Number of systems installed	SLSEA Records	Baseline to be established after carrying out a potential identification survey	Targets to be established after carrying out a potential identification survey	2021	2030
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.1	Industry 3.1.1	Conduct a survey of all existing Ips to assess the present level of resource efficiency and the adoption of SCP best practices								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.10	Industry 3.1.10	Establish pilot Eco-IP at suitable locations under the Ministry in charge of Industries								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.2	Industry 3.1.2	Establish criteria for eco-industrial park establishment								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.3	Industry 3.1.3	Review and improve the existing designs and optimize guidelines for Ips, including environmental, economic, and social standards								

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.4	Industry 3.1.4	Search & adapt innovative concepts of other countries (D4S, eco-innovation, LCA, circular economy, eco-certification system and digital economy, etc.)								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.5	Industry 3.1.5	Design & implement improved energy, water and materal efficiency, and circular economy measures for Ips which would engages SMIs								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.6	Industry 3.1.6	Introduce holistic waste management (solid, liquid and gaseous) approach including minimization of waste generation								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.7	Industry 3.1.7	Retrofit existing infrastructures of SMIs & redesigning processes aligned with SCP and Green Concepts								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.8	Industry 3.1.8	Prepare SMIs for digital economy (networking between key stakeholders & SMIs through data sharing, self-certificate & monitoring)								

Sector	NDC	PAM Code	PAM	PAM Description	Lead Agency	Support Agencies	KPI	Means of Verification	Baseline	Target	Start Year	End Year
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.1.9	Industry 3.1.9	Assist the development of site-specific designing and planning based on experience of other countries for 1 or 2 Eco-IP sites earmarked by the government								
Industry	NDC 3 - Establish eco-industrial parks and eco industrial villages	3.2.1	Industry 3.2.1	Develop standards and guidelines based on best international practices for setting up future Eco-IPS	MoI	MoE, CEA, BOI, RISC, IDB, ISB, UDA, LIN-DEL, CIAs	Policy package for Eco-IPs	Records of MoI	0	Policy package for Eco-IPs introduced	2021	2024
Industry	NDC 7- Introduce NDC Support Policy Tools and Instruments (Enabling generic activities)	7.6.1	Industry 7.6.1	Ensure the availability of sustainable biomass for industry use through necessary facilitation and coordination with relevant policy making and regulatory authorities by adopting policy tools such as SLSI 1551	SLSEA	FD , MoP&E, MASL	Percentage of Industries having access to sustainable biomass	SLSEA records	Baseline to be established after introducing a mandatory reporting system	100% relevant industries	2021	2030

Annex III – Template for Defining the Objectives of the GHG Inventory

Objective[1]	Gases[2]	Sectors & Categories[3]	Geographical Resolution[4]	Temporal Resolution of Estimates[5]	Time Series Span[6]	Reporting Frequency[7]	Reporting Formats[8]

[1] The objectives that the GHG inventory supports (e.g., UNFCCC: BTR, NDC)

[2] Add gases included (e.g., CO2, CH4, N2O, fluorinated GHGs, other gases such as precursor pollutants)

[3] Add sectors included (e.g., Energy, IPPU, AFOLU, Waste, other sectors.)

[4] Add the geographical scope of the GHG inventory (e.g., the country + overseas territories)

[5] Add the temporal resolution of the GHG inventory (usually annual (e.g., 2010, 2011, 2012), however, some GHG inventories have different durations spanning several years or sub-yearly (e.g., monthly data)

[6] Indicate the start and end date of the time series (e.g., yearly values from 1990 until two years prior to current calendar year)

[7] Indicate the frequency of the reporting/updating of data (e.g., annual biennial)

[8] Indicate any specific reporting formats (e.g., table structures, schemas, variables needed for specific reporting such as NIR, CRT)

Annex IV – Example of Data Collection Template for the Energy Sector

ANNEX I: Data Needs for IPCC Category 1A1 Energy Industries

The categories referred to in the Energy Industries, comprise emissions from fuels combusted by the fuel extraction or energy-producing industries which covers three main processes:

1) **Main Activity Electricity and Heat Production**, further split into:
   - Electricity Generation
   - Combined Heat and Power Generation (CHP)
   - Heat Plants

refers to the emissions from main activity producers of electricity generation, combined heat and power generation, and heat plants. These are often power lants run by public utilities.

2) **Petroleum Refining** covers all combustion activities supporting the refining of petroleum products including on-site combustion for the generation of electricity and heat for own use.

3) **Manufacture of Solid Fuels** refers to the combustion emissions from fuel use during the manufacture of secondary and tertiary products from solid fuels including production of charcoal.

Data needs for this category are therefore information on fuel combustion of different fuels in the relevant process as well as the characteristics of these fuels.

a. Fuel Combustion tables

Year:												
IPCC Sub-Category	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)	Wood / wood waste	Charcoal	Biogas
1.A.1.a.i Electricity Generation												
1.A.1.a.ii Combined Heat and Power Generation												
1.A.1.a.iii Heat Plants												

b. Petroleum Refining (fuels combusted to support the refining process)

Year	Fuel refined in TJ										
	Total fossil fuels	Crude Oil (input)	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Aviation Fuel	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)
2018											
2019											
2020											

c. Manufacture of Solid Fuels (Fuels combusted to support the manufacture of solid fuels)

→ **Sub-category 1.A.1.c.i** refers to the emissions arising from fuel combustion for the production of coke, brown coal briquettes and patent fuel.

→ **Sub-category 1.A.1.c.ii** refers to combustion emissions arising from the energy-producing industries own (on-site) energy use not included in Sub-category 1.A.1.c.i or for which separate data are not available. This includes the emissions from own-energy use for the production of charcoal, bagasse, saw dust, cotton stalks and carbonizing of biofuels as well as fuel used for coal mining, oil and gas extraction and the processing and upgrading of natural gas.

Year:												
IPCC Sub-Category	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)	Wood / wood waste	Charcoal	Biogas
1.A.1.c.i Manufacture of Solid Fuels												
1.A.1.c.ii Other Energy Industries												

d. Fuel characteristics by fuel

→ In order to specify the fuel characteristics, information on the carbon content, the gross or net calorific value and the fuel density should be provided.

→ These data need to be reported in specific units as specified in the table below. If data is only available in different units, this should be noted accordingly, and any unit conversion be documented.

→ To facilitate data provision on fuel characteristics an overview of the units is provided as follows:

- Carbon content: Kg C / GJ => to report the kilogram of carbon contained in one Gigajoule of fuel (1 GJ = 0.001 TJ)
- Gross calorific value: TJ / Gg => to report the terajoules per Gigagram of fuel (1 Gg = 1 kiloton = 1000 tonnes)
- Net calorific value: TJ / Gg => to report the terajoules per Gigagram of fuel (1 Gg = 1 kiloton = 1000 tonnes)
    - Note the Net calorific value is lower than the Gross calorific value because the Gross accounts for the maximum potential energy content, while the Net refers to the practical amount of energy to be realised. The Net calorific value is therefore preferable if data is readily available.
    - Information on the conversion can be found in the 2006 IPCC Guidelines Volume 2, Chapter 1: Link

Fuel density: kg / m_3 => to report the amount of fuel in relation to its mass.

→ The fuel characteristics correspond to a Tier 2 approach following the IPCC 2006 Guidelines for GHG inventories, therefore, it should be prioritised when a Tier 1 approach is properly implemented. Linked to this, if data is not available on the fuel characteristics it should be noted in the reporting instructions provided below the table.

Fuels	Fuel characteristics			
	Carbon content	Gross calorific value	Net calorific value	Fuel density
	Kg C/GJ	(TJ/ Gg)	(TJ/ Gg)	(kg / m3)
Crude Oil				
Industrial Diesel				
Motor Gasoline				
Kerosene				
Naphtha				
Fuel Oil				
Liquefied Petroleum Gas (LPG)				
Coal				
Wood/Wood waste				
Charcoal				
Biogas				

Data Needs for the reference approach (not industry-specific)

Reporting guidance

The Reference Approach is a top-down approach, using energy supply data to calculate the emissions of CO_2 from combustion of, mainly, fossil fuels. Use Tables a, b, c, and d to collect the data required for the Reference Approach. The Reference Approach is a straightforward method that can be applied on the basis of relatively easily available energy supply statistics. It is, however, good practice to apply both the Sectoral Approach and the Reference Approach to estimate CO_2 emissions from fuel combustion and to compare the results of these two independent estimates. Significant differences may indicate possible problems with the activity data, net calorific values, carbon content, excluded carbon calculation, etc.

a. Production of Fuels

Year	Fuel Produced in TJ													
	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Aviation Fuel	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)	Wood / wood waste	Charcoal	Biogas	Non-energy use (please specify by fuel)

b. Stock changes: Indicate stock increases with positive values and stock reductions with negative values

Year	Stock Changes in TJ													
	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Aviation Fuel	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)	Wood / wood waste	Charcoal	Biogas	Non-energy use (please specify by fuel)

c. Imports

Year	Fuel Imported in TJ													
	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Aviation Fuel	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)	Wood / wood waste	Charcoal	Biogas	Non-energy use (please specify by fuel)

d. Exports

Year	Fuel Exported in TJ													
	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Aviation Fuel	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Others (specify)	Wood / wood waste	Charcoal	Biogas	Non-energy use (please specify by fuel)

Data Needs for IPCC Category 1A2 Manufacturing Industries and Construction

Data needs for this category are information on fuel consumption of different fuels in the relevant industrial subsectors in the country. As such, it refers to stationary combustion of fuels and includes all fuel use in industrial processes including combustion for the generation of electricity and heat for own use in these industries.

Reporting Guidance

- The following tables are aimed at collecting disaggregated information by sub-sector in the energy industry for estimating the national GHG emission inventory.
- Please fill out the fuel consumption for each of the industry sectors which apply for the relevant years. This means to only fill in data for the industries that have direct fuel consumption in Sri Lanka.
- If disaggregation by ISIC industry is not possible due to data not being available, but overall data on industry sector energy use is available, you may only fill the first row on Combined Manufacturing and Construction.

Year												
Industry Sector	**Consumption in TJ or other available unit (specify)**											
	Total	Crude Oil	Industrial Diesel	Motor Gasoline	Kerosene	Naphtha	Fuel Oil	Liquefied Petroleum Gas (LPG)	Coal	Wood/ wood waste	Charcoal	Biogas
Combined Manufacturing and Construction												
Iron and Steel												
Non/Ferrous Metals												
Chemicals												
Pulp, Paper, and Print												
Food Processing, Beverages, and Tobacco												
Non/Metallic Minerals												
Transport Equipment												
Machinery												
Mining (excluding fuels) and Quarrying												
Wood and wood products												
Construction												
Textile and Leather												
Non/specified Industry												
Other (specify)												

Annex V – Examples of Data Collection Templates for the IPPU Sector

Category 2.A: Mineral Industry

Approach 1: Consumption of carbonates by end use sector

Year								
End Use Sector	Carbonate consumption (tonnes)							
	Calcite	Magnesite	Dolomite	Siderite	Ankerite	Rhodochrosite	Sodium	Other (specify)
Ceramics								
Lime Production								
Clinker Production								
Glass Production								
Sugar Production								
Other (specify)								

Approach 2: Production data

If data on consumption of carbonates is not available (Approach 1), alternative information can be used for estimating the GHG emissions of those activities consuming carbonates if the information is available. This information will allow us to estimate the apparent consumption = production + imports – exports

End use sector	Unit	Production data						
		1994	1995	1996	...	2019	2020	2021
Ceramics Production	Tonnes							
Lime Production	Tonnes							
Production of Clinker	Tonnes							
Mineral Production of Calcite	Tonnes							
Mineral Production of Magnesite	Tonnes							
Mineral Production of Dolomite	Tonnes							
Mineral Production of Siderite	Tonnes							
Mineral Production of Ankerite	Tonnes							
Mineral Production of Rhodochrosite	Tonnes							
Mineral Production of Sodium Carbonate	Tonnes							
Others (Specify)	Tonnes							
End use sector	Unit	Imports data						
		1994	1995	1996	...	2019	2020	2021
Ceramics Production	Tonnes							
Lime Production	Tonnes							
Production of Clinker	Tonnes							
Mineral Production of Calcite	Tonnes							
Mineral Production of Magnesite	Tonnes							
Mineral Production of Dolomite	Tonnes							
Mineral Production of Siderite	Tonnes							
Mineral Production of Ankerite	Tonnes							
Mineral Production of Rhodochrosite	Tonnes							
Mineral Production of Sodium Carbonate	Tonnes							
Others (Specify)	Tonnes							

End use sector	Unit	Exports data						
		1994	1995	1996	...	2019	2020	2021
Ceramics Production	Tonnes							
Lime Production	Tonnes							
Production of Clinker	Tonnes							
Mineral Production of Calcite	Tonnes							
Mineral Production of Magnesite	Tonnes							
Mineral Production of Dolomite	Tonnes							
Mineral Production of Siderite	Tonnes							
Mineral Production of Ankerite	Tonnes							
Mineral Production of Rhodochrosite	Tonnes							
Mineral Production of Sodium Carbonate	Tonnes							
Others (Specify)	Tonnes							

Category 2.B: Chemical Industry

Required data on production to infer the apparent national consumption.

Parameter	Unit	Production data						
		1994	1995	1996	...	2019	2020	2021
Ammonia	Tonnes							
Conventional reforming – natural gas	Tonnes							
Excess air reforming – natural gas	Tonnes							
Autothermal reforming – natural gas	Tonnes							
Partial oxidation	Tonnes							
Nitric acid	Tonnes							
Plants with Non-Selective Catalytic Reduction (NSCR)	Tonnes							

Parameter	Unit	Production data						
		1994	1995	1996	...	2019	2020	2021
Plants with process-integrated or tail-gas N2O destruction	Tonnes							
Atmospheric pressure plants (low pressure)	Tonnes							
Medium pressure combustion plants	Tonnes							
High pressure plants	Tonnes							
Adipic acid	Tonnes							
Nitric Acid Oxidation	Tonnes							
Caprolactam	Tonnes							
Raschig	Tonnes							
Glyoxal	Tonnes							
Glyoxylic	Tonnes							
Carbide	Tonnes							
Titanium dioxide	Tonnes							
Titanium slag	Tonnes							
Synthetic rutile	Tonnes							
Rutile TiO_2	Tonnes							
Soda ash	Tonnes							
Natural soda ash	Tonnes							
Solvay soda ash	Tonnes							
Petrochemical	Tonnes							
Methanol	Tonnes							
Ethylene	Tonnes							

Parameter	Unit	Production data						
		1994	1995	1996	...	2019	2020	2021
Ethylene Dichloride / Vinyl Chloride Monomer	Tonnes							
Ethylene Oxide	Tonnes							
Acrylonitrile	Tonnes							
Carbon Black	Tonnes							
Furnace Black Process	Tonnes							
Thermal Black Process	Tonnes							
Acetylene Black Process	Tonnes							
Fluorochemical	kg							
HCFC-22	kg							

Category 2.C: Metal Industry

Required data on production, imports, and exports to infer the apparent national consumption.

Parameter	Unit	Production data						
		1994	1995	1996	...	2019	2020	2021
Sinter	Tonnes							
Metallurgical Coke	Tonnes							
Iron	Tonnes							
Direct Reduced Iron	Tonnes							
Pellet	Tonnes							
Steel	Tonnes							
Ferroalloy	Tonnes							
Ferrosilicon 45% Si	Tonnes							

Parameter	Unit	Production data						
		1994	1995	1996	...	2019	2020	2021
Ferrosilicon 65 % Si	Tonnes							
Ferrosillicon 75% Si	Tonnes							
Ferrosillicon 90% Si	Tonnes							
Ferromanganeses (7% C)	Tonnes							
Ferromanganeses (1% C)	Tonnes							
Silicomanganese	Tonnes							
Silicon metal	Tonnes							
Ferrochromium	Tonnes							
Aluminium	Tonnes							
Prebake process	Tonnes							
Søderberg process	Tonnes							
Magnesium	Tonnes							
Dolomite	Tonnes							
Magnesite	Tonnes							
Lead	Tonnes							
Imperial Smelt Furnace (ISF)	Tonnes							
Direct Smelting (DS)	Tonnes							
Treatment of Secondary Raw Materials	Tonnes							
Zinc	Tonnes							
Waelz Kiln	Tonnes							
Pyrometeallurgical	Tonnes							
Electro-thermic	Tonnes							

Category 2.D: Non-Energy Products from Fuels and Solvent Use

Consumption of solvents and other products

Required data on production, imports, and exports to infer the apparent national consumption.

Parameter	Unit	Production of solvents and other products						
		1994	1995	1996	...	2019	2020	2021
Paint for domestic use	Tonnes							
Paint for industrial use	Tonnes							
Solvent for domestic use	Tonnes							
Solvent for industrial use	Tonnes							
Ink	Tonnes							
Glues and adhesive	Tonnes							
Pharmaceutical product use	Tonnes							
Dry cleaning (clothes treated)	Tonnes of clothes treated							
Dry cleaning	Nº of installations							

Parameter	Unit	Imports of solvents and other products						
		1994	1995	1996	...	2019	2020	2021
Paint for domestic use	Tonnes							
Paint for industrial use	Tonnes							
Solvent for domestic use	Tonnes							
Solvent for industrial use	Tonnes							
Ink	Tonnes							
Glues and adhesive	Tonnes							
Pharmaceutical product use	Tonnes							
Dry cleaning (clothes treated)	Tonnes of clothes treated							
Dry cleaning	Nº of installations							

Parameter	Unit	Exports of solvents and other products						
		1994	1995	1996	...	2019	2020	2021
Paint for domestic use	Tonnes							
Paint for industrial use	Tonnes							
Solvent for domestic use	Tonnes							
Solvent for industrial use	Tonnes							
Ink	Tonnes							
Glues and adhesive	Tonnes							
Pharmaceutical product use	Tonnes							
Dry cleaning (clothes treated)	Tonnes of clothes treated							
Dry cleaning	Nº of installations							

Category 2.E: Electronics Industry

Sectors	Unit	Annual production capacity of surface area by glass substrate processed						
		1994	1995	1996	...	2019	2020	2021
Semiconductor	kg/m^2							
Thin-film-transistor flat panel display (TFT-FPD)	g/m^2							
Photovoltaic (PV) cells	g/m^2							
Heat Transfer Fluids	kg/m^2							
Total								

Sectors	Unit	Annual production capacity of surface area by silicon substrate processed						
		1994	1995	1996	...	2019	2020	2021
Semiconductor	kg/m^2							
Thin-film-transistor flat panel display (TFT-FPD)	g/m^2							
Photovoltaic (PV) cells	g/m^2							
Heat Transfer Fluids	kg/m^2							
Total								

Category 2.F: Product Uses as Substitutes for Ozone Depleting Substances

Approach 1: F-gases by gas or by product (or blend) and application

1.1. F-gases by gas and application

Required data on production, imports, and exports to infer the apparent national consumption.

Year									
Application	Unit	Production of F-gases by gas and application							
		HFC-134a	HFC-143a	HFC-23	HFC-32	HFC-152	C3F8	C4F10	Other (specify)
Refrigeration and air conditioning	Tonnes								
Domestic Refrigeration (Fridges)	Tonnes								
Stand-alone Commercial Applications	Tonnes								
Medium & Large Commercial Applications	Tonnes								
Transport Refrigeration	Tonnes								
Industrial Refrigeration including Food Processing and Cold Storage	Tonnes								

Year									
Application	Unit	Production of F-gases by gas and application							
		HFC-134a	HFC-143a	HFC-23	HFC-32	HFC-152	C3F8	C4F10	Other (specify)
Chillers	Tonnes								
Residential and Commercial A/C including Heat Pumps	Tonnes								
Mobile A/C	Tonnes								
Fire extinguishers	Tonnes								
Aerosols	Tonnes								
Foam blowing	Tonnes								
PU Flexible Foam	Tonnes								
PU Flexible Moulded Foam	Tonnes								
PU Integral Skin Foam	Tonnes								
PU One Component Foam	Tonnes								
PU Continuous Panel	Tonnes								
PU Discontinuous Panel	Tonnes								
PU Appliance Foam	Tonnes								
PU Injected Foam	Tonnes								
PU Continuous Block	Tonnes								
PU Discontinuous Block	Tonnes								
PU Continuous Laminate	Tonnes								
PU Spray Foam	Tonnes								
PU Pipe-in-pipe	Tonnes								
Extruded Polystyrene	Tonnes								
Phenolic Laminate	Tonnes								
Total	Tonnes								

Year									
Application	Unit	Imported F-gases by gas and application							
		HFC-134a	HFC-143a	HFC-23	HFC-32	HFC-152	C3F8	C4F10	Other (specify)
Refrigeration and air conditioning	Tonnes								
Domestic Refrigeration (Fridges)	Tonnes								
Stand-alone Commercial Applications	Tonnes								
Medium & Large Commercial Applications	Tonnes								
Transport Refrigeration	Tonnes								
Industrial Refrigeration including Food Processing and Cold Storage	Tonnes								
Chillers	Tonnes								
Residential and Commercial A/C including Heat Pumps	Tonnes								
Mobile A/C	Tonnes								
Fire extinguishers	Tonnes								
Aerosols	Tonnes								
Foam blowing	Tonnes								
PU Flexible Foam	Tonnes								
PU Flexible Moulded Foam	Tonnes								
PU Integral Skin Foam	Tonnes								
PU One Component Foam	Tonnes								
PU Continuous Panel	Tonnes								
PU Discontinuous Panel	Tonnes								
PU Appliance Foam	Tonnes								
PU Injected Foam	Tonnes								
PU Continuous Block	Tonnes								
PU Discontinuous Block	Tonnes								

PU Continuous Laminate	Tonnes								
PU Spray Foam	Tonnes								
PU Pipe-in-pipe	Tonnes								
Extruded Polystyrene	Tonnes								
Phenolic Laminate	Tonnes								
Total	Tonnes								
Year									
Application	Unit	**Exported F-gases by gas and application**							
		HFC-134a	HFC-143a	HFC-23	HFC-32	HFC-152	C3F8	C4F10	Other (specify)
Refrigeration and air conditioning	Tonnes								
Domestic Refrigeration (Fridges)	Tonnes								
Stand-alone Commercial Applications	Tonnes								
Medium & Large Commercial Applications	Tonnes								
Transport Refrigeration	Tonnes								
Industrial Refrigeration including Food Processing and Cold Storage	Tonnes								
Chillers	Tonnes								
Residential and Commercial A/C including Heat Pumps	Tonnes								
Mobile A/C	Tonnes								
Fire extinguishers	Tonnes								
Aerosols	Tonnes								
Foam blowing	Tonnes								
PU Flexible Foam	Tonnes								
PU Flexible Moulded Foam	Tonnes								
PU Integral Skin Foam	Tonnes								
PU One Component Foam	Tonnes								

PU Continuous Panel	Tonnes								
PU Discontinuous Panel	Tonnes								
PU Appliance Foam	Tonnes								
PU Injected Foam	Tonnes								
PU Continuous Block	Tonnes								
PU Discontinuous Block	Tonnes								
PU Continuous Laminate	Tonnes								
PU Spray Foam	Tonnes								
PU Pipe-in-pipe	Tonnes								
Extruded Polystyrene	Tonnes								
Phenolic Laminate	Tonnes								
Total	Tonnes								

1.2. F-gases by product (or blend) and application

Required data on production, imports, and exports to infer the apparent national consumption.

Year									
Application	Unit	**Production of F-gases by product (or blend) and application**							
		R-134	R-400	R-401A	R-402B	R-500	R-507A	R-422C	Other (specify)
Refrigeration and air conditioning	Tonnes								
Domestic Refrigeration (Fridges)	Tonnes								
Stand-alone Commercial Applications	Tonnes								
Medium & Large Commercial Applications	Tonnes								

Year									
Application	Unit	Production of F-gases by product (or blend) and application							
		R-134	R-400	R-401A	R-402B	R-500	R-507A	R-422C	Other (specify)
Industrial Refrigeration including Food Processing and Cold Storage	Tonnes								
Chillers	Tonnes								
Residential and Commercial A/C including Heat Pumps	Tonnes								
Mobile A/C	Tonnes								
Fire extinguishers	Tonnes								
Aerosols	Tonnes								
Foam blowing	Tonnes								
PU Flexible Foam	Tonnes								
PU Flexible Moulded Foam	Tonnes								
PU Integral Skin Foam	Tonnes								
PU One Component Foam	Tonnes								
PU Continuous Panel	Tonnes								
PU Discontinuous Panel	Tonnes								
PU Appliance Foam	Tonnes								
PU Injected Foam	Tonnes								
PU Continuous Block	Tonnes								
PU Discontinuous Block	Tonnes								
PU Continuous Laminate	Tonnes								
PU Spray Foam	Tonnes								
PU Pipe-in-pipe	Tonnes								
Extruded Polystyrene	Tonnes								
Phenolic Laminate	Tonnes								
Total	Tonnes								

Year									
Application	Unit	Imported F-gases by product (or blend) and application							
		R-134	R-400	R-401A	R-402B	R-500	R-507A	R-422C	Other (specify)
Refrigeration and air conditioning	Tonnes								
Domestic Refrigeration (Fridges)	Tonnes								
Stand-alone Commercial Applications	Tonnes								
Medium & Large Commercial Applications	Tonnes								
Transport Refrigeration	Tonnes								
Industrial Refrigeration including Food Processing and Cold Storage	Tonnes								
Chillers	Tonnes								
Residential and Commercial A/C including Heat Pumps	Tonnes								
Mobile A/C	Tonnes								
Fire extinguishers	Tonnes								
Aerosols	Tonnes								
Foam blowing	Tonnes								
PU Flexible Foam	Tonnes								
PU Flexible Moulded Foam	Tonnes								
PU Integral Skin Foam	Tonnes								
PU One Component Foam	Tonnes								
PU Continuous Panel	Tonnes								
PU Discontinuous Panel	Tonnes								
PU Appliance Foam	Tonnes								
PU Injected Foam	Tonnes								
PU Continuous Block	Tonnes								
PU Discontinuous Block	Tonnes								

PU Continuous Laminate	Tonnes								
PU Spray Foam	Tonnes								
PU Pipe-in-pipe	Tonnes								
Extruded Polystyrene	Tonnes								
Phenolic Laminate	Tonnes								
Total	Tonnes								
Year									
Application	Unit	**Exported F-gases by product (or blend) and application**							
		R-134	R-400	R-401A	R-402B	R-500	R-507A	R-422C	Other (specify)
Refrigeration and air conditioning	Tonnes								
Domestic Refrigeration (Fridges)	Tonnes								
Stand-alone Commercial Applications	Tonnes								
Medium & Large Commercial Applications	Tonnes								
Transport Refrigeration	Tonnes								
Industrial Refrigeration including Food Processing and Cold Storage	Tonnes								
Chillers	Tonnes								
Residential and Commercial A/C including Heat Pumps	Tonnes								
Mobile A/C	Tonnes								
Fire extinguishers	Tonnes								
Aerosols	Tonnes								
Foam blowing	Tonnes								
PU Flexible Foam	Tonnes								
PU Flexible Moulded Foam	Tonnes								
PU Integral Skin Foam	Tonnes								
PU One Component Foam	Tonnes								

PU Continuous Panel	Tonnes								
PU Discontinuous Panel	Tonnes								
PU Appliance Foam	Tonnes								
PU Injected Foam	Tonnes								
PU Continuous Block	Tonnes								
PU Discontinuous Block	Tonnes								
PU Continuous Laminate	Tonnes								
PU Spray Foam	Tonnes								
PU Pipe-in-pipe	Tonnes								
Extruded Polystyrene	Tonnes								
Phenolic Laminate	Tonnes								
Total	Tonnes								

Approach 2: F-gases in bulk and blends

2.1. F-gases in bulk

Required data on production, imports, and exports to infer the apparent national consumption.

F-gases	Unit	Production of F-gases						
		1994	1995	1996	...	2019	2020	2021
HFC-134a	Tonnes							
HFC-143a	Tonnes							
HFC-23	Tonnes							
HFC-32	Tonnes							
HFC-152	Tonnes							
C3F8	Tonnes							
C4F10	Tonnes							
Other (specify)	Tonnes							

F-gases	Unit	Imports of F-gases						
		1994	1995	1996	...	2019	2020	2021
HFC-134a	Tonnes							
HFC-143a	Tonnes							
HFC-23	Tonnes							
HFC-32	Tonnes							
HFC-152	Tonnes							
C3F8	Tonnes							
C4F10	Tonnes							
Other (specify)	Tonnes							
F-gases	Unit	Exports of F-gases						
		1994	1995	1996	...	2019	2020	2021
HFC-134a	Tonnes							
HFC-143a	Tonnes							
HFC-23	Tonnes							
HFC-32	Tonnes							
HFC-152	Tonnes							
C3F8	Tonnes							
C4F10	Tonnes							
Other (specify)	Tonnes							

2.2. F-gases in blends

Required data on production, imports, and exports to infer the apparent national consumption.

Blends	Unit	Production of blends						
		1994	1995	1996	...	2019	2020	2021
R-134	Tonnes							
R-400	Tonnes							
R-401A	Tonnes							
R-402B	Tonnes							
R-500	Tonnes							
R-507A	Tonnes							
R-422C	Tonnes							
Other (specify)	Tonnes							
Blends	Unit	Imports of blends						
		1994	1995	1996	...	2019	2020	2021
R-134	Tonnes							
R-400	Tonnes							
R-401A	Tonnes							
R-402B	Tonnes							
R-500	Tonnes							
R-507A	Tonnes							
R-422C	Tonnes							
Other (specify)	Tonnes							

Blends	Unit	Exports of blends						
		1994	1995	1996	...	2019	2020	2021
R-134	Tonnes							
R-400	Tonnes							
R-401A	Tonnes							
R-402B	Tonnes							
R-500	Tonnes							
R-507A	Tonnes							
R-422C	Tonnes							
Other (specify)	Tonnes							

Approach 3: Applications by end use sector

Devices by end use sector	Number of produced units by end use sector						
	1994	1995	1996	...	2019	2020	2021
Refrigeration and air conditioning							
Domestic Refrigeration (Fridges)							
Stand-alone Commercial Applications							
Medium & Large Commercial Applications							
Transport Refrigeration							
Industrial Refrigeration including Food Processing and Cold Storage							
Chillers							
Residential and Commercial A/C including Heat Pumps							
Mobile A/C							
Fire extinguishers							
Aerosols							

Foam blowing							
PU Flexible Foam							
PU Flexible Moulded Foam							
PU Integral Skin Foam							
PU One Component Foam							
PU Continuous Panel							
PU Discontinuous Panel							
PU Appliance Foam							
PU Injected Foam							
PU Continuous Block							
PU Discontinuous Block							
PU Continuous Laminate							
PU Spray Foam							
PU Pipe-in-pipe							
Extruded Polystyrene							
Phenolic Laminate							
Total							

Devices by end use sector	Number of imported units by end use sector						
	1994	1995	1996	...	2019	2020	2021
Refrigeration and air conditioning							
Domestic Refrigeration (Fridges)							
Stand-alone Commercial Applications							
Medium & Large Commercial Applications							
Transport Refrigeration							
Industrial Refrigeration including Food Processing and Cold Storage							
Chillers							
Residential and Commercial A/C including Heat Pumps							

Mobile A/C							
Fire extinguishers							
Aerosols							
Foam blowing							
PU Flexible Foam							
PU Flexible Moulded Foam							
PU Integral Skin Foam							
PU One Component Foam							
PU Continuous Panel							
PU Discontinuous Panel							
PU Appliance Foam							
PU Injected Foam							
PU Continuous Block							
PU Discontinuous Block							
PU Continuous Laminate							
PU Spray Foam							
PU Pipe-in-pipe							
Extruded Polystyrene							
Phenolic Laminate							
Total							

Devices by end use sector	Number of exported units by end use sector						
	1994	1995	1996	...	2019	2020	2021
Refrigeration and air conditioning							
Domestic Refrigeration (Fridges)							
Stand-alone Commercial Applications							
Medium & Large Commercial Applications							
Transport Refrigeration							

Industrial Refrigeration including Food Processing and Cold Storage							
Chillers							
Residential and Commercial A/C including Heat Pumps							
Mobile A/C							
Fire extinguishers							
Aerosols							
Foam blowing							
PU Flexible Foam							
PU Flexible Moulded Foam							
PU Integral Skin Foam							
PU One Component Foam							
PU Continuous Panel							
PU Discontinuous Panel							
PU Appliance Foam							
PU Injected Foam							
PU Continuous Block							
PU Discontinuous Block							
PU Continuous Laminate							
PU Spray Foam							
PU Pipe-in-pipe							
Extruded Polystyrene							
Phenolic Laminate							
Total							

Category 2.G: Other Product Manufacture and Use

Electrical equipment

Category	Unit	Production of SF_6						
		1994	1995	1996	...	2019	2020	2021
Sealed-Pressure	Tonnes							
Closed-Pressure	Tonnes							
Gas Insulated Transformers	Tonnes							
Total	Tonnes							
Category	Unit	Imported SF_6						
		1994	1995	1996	...	2019	2020	2021
Sealed-Pressure	Tonnes							
Closed-Pressure	Tonnes							
Gas Insulated Transformers	Tonnes							
Total	Tonnes							
Category	Unit	Exported SF_6						
		1994	1995	1996	...	2019	2020	2021
Sealed-Pressure	Tonnes							
Closed-Pressure	Tonnes							
Gas Insulated Transformers	Tonnes							
Total	Tonnes							

N2O from product uses

Category	Unit	Production of N_2O						
		1994	1995	1996	...	2019	2020	2021
Medical applications	Tonnes							
Anaesthetic use	Tonnes							
Analgesic use	Tonnes							
Veterinary use	Tonnes							
Use as a propellant in aerosol products	Tonnes							
Oxidising agent and etchant used in semiconductor manufacturing	Tonnes							
Oxidising agent used, with acetylene, in atomic absorption spectrometry	Tonnes							
Production of sodium azide	Tonnes							
Fuel oxidant in auto racing	Tonnes							
Oxidising agent in blowtorches used by jewellers and others	Tonnes							
Total	Tonnes							
Category	Unit	Imported N_2O						
		1994	1995	1996	...	2019	2020	2021
Medical applications	Tonnes							
Anaesthetic use	Tonnes							
Analgesic use	Tonnes							
Veterinary use	Tonnes							
Use as a propellant in aerosol products	Tonnes							

Oxidising agent and etchant used in semiconductor manufacturing	Tonnes							
Oxidising agent used, with acetylene, in atomic absorption spectrometry	Tonnes							
Production of sodium azide	Tonnes							
Fuel oxidant in auto racing	Tonnes							
Oxidising agent in blowtorches used by jewellers and others	Tonnes							
Total	Tonnes							

Category	Unit	Exported N_2O						
		1994	1995	1996	...	2019	2020	2021
Medical applications	Tonnes							
Anaesthetic use	Tonnes							
Analgesic use	Tonnes							
Veterinary use	Tonnes							
Use as a propellant in aerosol products	Tonnes							
Oxidising agent and etchant used in semiconductor manufacturing	Tonnes							
Oxidising agent used, with acetylene, in atomic absorption spectrometry	Tonnes							
Production of sodium azide	Tonnes							
Fuel oxidant in auto racing	Tonnes							
Oxidising agent in blowtorches used by jewellers and others	Tonnes							
Total	Tonnes							

Category 2.H: Other

Paper and pulp production

Parameter	Unit	Production						
		1994	1995	1996	...	2019	2020	2021
Pulp and paper production								
Kraft pulping production	Tonnes							
Acid sulphite pulping production	Tonnes							
Neutral sulphite pulping production	Tonnes							

Agro-food industry production

Parameter	Unit	Production						
		1994	1995	1996	...	2019	2020	2021
Bread production	Tonnes							
Sugar production	Tonnes							
Production of cereals, cookies and sweets	Tonnes							
Beer production	Hectolitres							
Wine production	Hectolitres							
Whiskey production	Hectolitres							
Rum production	Hectolitres							
Other spirits production	Hectolitres							
Toasted coffee production	Tonnes							
Animal feed production	Tonnes							
Production of butter and margarine	Tonnes							
Meat production	Tonnes							
Fish production	Tonnes							
Eggs production	Tonnes							

Annex VI – QC Checklist for the GHG Inventory by Entity

QC checklist for the Sectoral Leads.

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check that all data providers identified have reported on relevant emissions data in their sector. If a data provider identified does not report sufficient information reach out for clarification.						
Check for timeliness. Assess whether all data providers provide the best available and most recent information.						
Check for relevance. The data provided should be relevant for estimating the GHG emissions for the relevant sectors.						
Check for completeness. Ensure that all data available to data providers is reported.						
Check for consistency. Ensure the data reported are consistent with previous years and do not deviate strongly.						
Check for errors. Control that the correct units and parameters have been specified for all provided information.						
Check that the information provided include official data sources and includes assumptions, documentary evidence and references.						

QC checklist for the Climate Change Secretariat (Compiler in the MRV).

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check all sectoral leads have submitted relevant and complete data. In case of doubt, confirm with respective lead and check the data provision by the initial data providers.						
Check that assumptions and criteria for compiled data on production, consumption or emissions are documented sufficiently.						
Check for timeliness. Ensure the sectoral leads submit the data on time and if not reach out to them.						
Check for completeness. Assess whether the compiled data is complete and fulfil all technical requirements for subsequent estimation.						
Check for consistency. Compare the estimates in the current MRV cycle with prior estimates to identify structural inconsistencies in the methodology applied.						
Check for errors. Assure transcription errors are identified and the data parameters correspond to the required format.						
Check for errors. Control for structural errors in the reported data and identify inconsistencies in the magnitudes reported by conducting recalculations.						
Check the estimates are prepared in line with the envisioned timeline of the MRV cycle and are passed on to the IMWG and NECCCM for follow up QA/QC.						
Check the format and the BTR reporting requirements. Ensure the inventory data are formatted and comprehensively listed to facilitate QA and final reporting and to meet international reporting requirements.						

General QC checklist for the GHG Inventory and Mitigation Working Group – GHG Inventory QC.

QC Activity	Procedures	Task Completion			Corrective Measure (If applicable)		
		Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check that assumptions and criteria for the selection of activity data, emission factors, and other estimation parameters are documented.	• Cross-check descriptions of activity data, emission factors and other estimation parameters with information on categories and ensure that these are properly recorded and archived.						
Check for transcription errors in data input and references.	• Confirm that bibliographical data references are properly cited in the internal documentation. • Cross-check a sample of input data from each category (either measurements or parameters used in calculations) for transcription errors.						
Check that emissions and removals are calculated correctly.	• Reproduce a set of emissions and removals calculations. • Use a simple approximation method that gives similar results to the original and more complex calculation to ensure that there is no data input error or calculation error.						
Check that parameters and units are correctly recorded and that appropriate conversion factors are used.	• Check that units are properly labelled in calculation sheets. • Check that units are correctly carried through from beginning to end of calculations. • Check that conversion factors are correct. • Check that temporal and spatial adjustment factors are used correctly.						

QC Activity	Procedures	Task Completion			Corrective Measure (If applicable)		
		Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check the integrity of database files.	• Examine the included intrinsic documentation (see also Box 6.4) to: • confirm that the appropriate data processing steps are correctly represented in the database. • confirm that data relationships are correctly represented in the database. • ensure that data fields are properly labelled and have the correct design specifications. • ensure that adequate documentation of database and model structure and operation are archived.						
Check for consistency in data between categories.	• Identify parameters (e.g., activity data, constants) that are common to multiple categories and confirm that there is consistency in the values used for these parameters in the emission/ removal calculations.						
Check that the movement of inventory data among processing steps is correct.	• Check that emissions and removals data are correctly aggregated from lower reporting levels to higher reporting levels when preparing summaries. • Check that emissions and removals data are correctly transcribed between different intermediate products.						

QC Activity	Procedures	Task Completion			Corrective Measure (If applicable)		
		Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check that uncertainties in emissions and removals are estimated and calculated correctly.	• Check that qualifications of individuals providing expert judgement for uncertainty estimates are appropriate. • Check that qualifications, assumptions and expert judgements are recorded. • Check that calculated uncertainties are complete and calculated correctly. • If necessary, duplicate uncertainty calculations on a small sample of the probability distributions used by Monte Carlo analyses (for example, using uncertainty calculations according to Approach 1).						
Check time series consistency.	• Check for temporal consistency in time series input data for each category. • Check for consistency in the algorithm/method used for calculations throughout the time series. • Check methodological and data changes resulting in recalculations. • Check that the effects of mitigation activities have been appropriately reflected in time series calculations.						

QC Activity	Procedures	Task Completion			Corrective Measure (If applicable)		
		Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check completeness.	• Confirm that estimates are reported for all categories and for all years from the appropriate base year to the period of the current inventory. • For subcategories, confirm that entire category is being covered. • Provide clear definition of 'Other' type categories. • Check that known data gaps that result in incomplete estimates are documented, including a qualitative evaluation of the importance of the estimate in relation to total emissions (e.g., subcategories classified as 'not • estimated', see Chapter 8, Reporting Guidance and Tables).						
Trend checks.	• For each category, current inventory estimates should be compared to previous estimates, if available. If there are significant changes or departures from expected trends, re-check estimates and explain any differences. Significant changes in emissions or removals from previous years may indicate possible input or calculation errors. • Check value of implied emission factors (aggregate emissions divided by activity data) across time series. • Do any years show outliers that are not explained? • If they remain static across time series, are changes in emissions or removals being captured? • Check if there are any unusual and unexplained trends noticed for activity data or other parameters across the time series.						

QC Activity	Procedures	Task Completion			Corrective Measure (If applicable)		
		Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Review of internal documentation and archiving.	• Check that there is detailed internal documentation to support the estimates and enable reproduction of the emission, removal and uncertainty estimates. • Check that inventory data, supporting data, and inventory records are archived and stored to facilitate detailed review. • Check that the archive is closed and retained in secure place following completion of the inventory. • Check integrity of any data archiving arrangements of outside organisations involved in inventory preparation.						

QC checklist for the Climate Change Secretariat (Coordinator of the MRV).

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Ensure all relevant prior QC checklists by the sectoral leads and by the CCS are used to assess the quality of estimates.						
Holistic approach. Consult internal documentation from prior MRV cycles engage the IMWG for further insight into each MRV cycle step to identify inconsistencies in the estimates.						

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check for completeness. Assess whether the data estimates are complete and fulfil all technical requirements.						
Check for thoroughness. Verify any methodological changes to the estimates or data treatment have been correctly applied and are well documented.						
Check the format. Ensure the estimates are formatted and comprehensively listed to facilitate QA and final reporting.						
Check that all QA/QC checklists have been well documented to develop the improvement plan.						
Check that all immediate actions undertaken during the MRV cycle are documented and assess whether they have been implemented.						
Check for timeliness. Assess whether the steps of the MRV cycle have been carried out in line with the proposed timeline at the outset of the cycle.						
Check for completeness. Check that all steps of the MRV cycle are followed and confirm that communication channels and data flows are sustained satisfactorily, allowing for a complete reporting.						
Check for coherence. Confirm the data estimates align with the compiled data and check if the magnitude levels differ too greatly from previous cycles.						

Annex VII – QA Checklist for the GHG Inventory

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Ensure all relevant prior QC checklists by the sectoral leads and by the CCS are used to assess the quality of estimates.						
Check for completeness. Assess whether the data estimates are complete and fulfil all technical requirements.						
Check for thoroughness. Verify any methodological changes to the estimates or data treatment have been correctly applied and are well documented.						
Check for coherence. Verify the assumptions made for estimations to identify shortcomings in the rationales used or in the explanation thereof.						
Check for coherence. Confirm the data estimates align with the compiled data and check if the magnitude levels differ too greatly from previous cycles.						
Check the format. Ensure the estimates are formatted for final reporting.						
Check that all immediate actions undertaken during the MRV cycle are documented and assess whether they have been implemented.						
Check for completeness. Check that all steps of the MRV cycle are followed and confirm that communication channels and data flows are sustained satisfactorily, allowing for a complete reporting.						

Annex VIII – Outline of the NID

- **Executive summary**
  - ES.1 Background information on GHG inventories and climate change
  - ES.2 Summary of trends related to national emissions and removals
  - ES.3 Overview of source and sink category emission estimates and trends
  - ES.4 Other information (e.g., indirect GHGs, precursor gases)
  - ES.5 Key category analysis
  - ES.6 Improvements introduced

- **Chapter 1: National circumstances, institutional arrangements and cross-cutting information**
  - 1.1 Background information on GHG inventories and climate change
  - 1.2 Description of national circumstances and institutional arrangements
    - 1.2.1 National entity or national focal point
    - 1.2.2 Inventory preparation process
    - 1.2.3 Archiving of information
    - 1.2.4 Processes for official consideration and approval of inventory
  - 1.3 Brief general description of methodologies and data sources used
  - 1.4 Brief description of key categories
  - 1.5 Brief general description of QA/QC plan and implementation
  - 1.6 General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals
  - 1.7 General assessment of completeness
    - 1.7.1 Information on completeness
    - 1.7.2 Description of insignificant categories (if applicable)
    - 1.7.3 Total aggregate emissions considered insignificant (if applicable)
  - 1.8 Metrics
  - 1.9 Summary of any flexibility applied

- **Chapter 2: Trends in greenhouse gas emissions and removals**
  - 2.1 Description of emission and removal trends for aggregated GHG emissions and removals
  - 2.2 Description of emission and removal trends by sector and by gas

- **Chapter 3: Energy (CRT sector 1)**
  - 3.1 Overview of the sector
  - 3.2 Fuel combustion (CRT 1.A), including detailed information on:
    - 3.2.1 Comparison of the sectoral approach with the reference approach
    - 3.2.2 International bunker fuels
    - 3.2.3 Feedstocks and non-energy use of fuels
    - 3.2.4 Category (CRT category number)
      - 3.2.4.1 Category description
      - 3.2.4.2 Methodological issues
      - 3.2.4.3 Description of any flexibility applied
      - 3.2.4.4 Uncertainty assessment and time-series consistency
      - 3.2.4.5 Category-specific QA/QC and verification (if applicable)
      - 3.2.4.6 Category-specific recalculations (if applicable)
      - 3.2.4.7 Category-specific planned improvements (if applicable)
  - 3.3 Fugitive emissions from solid fuels and oil and natural gas and other emissions from energy production (CRT 1.B)
    - 3.3.1 Category (CRT category number)
      - 3.3.1.1 Category description
      - 3.3.1.2 Methodological issues
      - 3.3.1.3 Description of any flexibility applied
      - 3.3.1.4 Uncertainty assessment and time-series consistency
      - 3.3.1.5 Category-specific QA/QC and verification (if applicable)

        - 3.3.1.6 Category-specific recalculations (if applicable)
        - 3.3.1.7 Category-specific planned improvements (if applicable)
    - 3.4 Carbon dioxide transport and storage (CRT 1.C)
        - 3.4.1 Category (CRT category number)
            - 3.4.1.1 Category description
            - 3.4.1.2 Methodological issues
            - 3.4.1.3 Description of any flexibility applied
            - 3.4.1.4 Uncertainty assessment and time-series consistency
            - 3.4.1.5 Category-specific QA/QC and verification (if applicable)
            - 3.4.1.6 Category-specific recalculations (if applicable)
            - 3.4.1.7 Category-specific planned improvements (if applicable)

- **Chapter 4: Industrial processes and products use (CRT sector 2)**
    - 4.1 Overview of the sector
    - 4.2 Category (CRT category number)
        - 4.2.1 Category description
        - 4.2.2 Methodological issues
        - 4.2.3 Description of any flexibility applied
        - 4.2.4 Uncertainty assessment and time-series consistency
        - 4.2.5 Category-specific QA/QC and verification (if applicable)
        - 4.2.6 Category-specific recalculations (if applicable)
        - 4.2.7 Category-specific planned improvements (if applicable)

- **Chapter 5: Agriculture (CRT sector 3)**
    - 5.1 Overview of the sector
    - 5.2 Category (CRT category number)
        - 5.2.1 Category description
        - 5.2.2 Methodological issues
        - 5.2.3 Description of any flexibility applied
        - 5.2.4 Uncertainty assessment and time-series consistency
        - 5.2.5 Category-specific QA/QC and verification (if applicable)
        - 5.2.6 Category-specific recalculations (if applicable)
        - 5.2.7 Category-specific planned improvements (if applicable)

- **Chapter 6: Land use, land-use change and forestry (CRT sector 4)**
    - 6.1 Overview of the sector
    - 6.2 Land-use definitions and the land representation approach(es) used and their correspondence to the land use, land-use change and forestry categories
    - 6.3 Country-specific approaches
        - 6.3.1 Information on approaches used for representing land areas and on land-use databases used for the inventory preparation
        - 6.3.2 Information on approaches used for natural disturbances (if applicable)
        - 6.3.3 Information on approaches used for reporting harvested wood products
    - 6.4 Category (CRT category number)
        - 6.4.1 Category description
        - 6.4.2 Methodological issues
        - 6.4.3 Uncertainty assessment and time-series consistency
        - 6.4.4 Description of any flexibility applied
        - 6.4.5 Category-specific QA/QC and verification (if applicable)
        - 6.4.6 Category-specific recalculations (if applicable)
        - 6.4.7 Category-specific planned improvements (if applicable)

- **Chapter 7: Waste (CRT sector 5)**
    - 7.1 Overview of the sector
    - 7.2 Category (CRT category number)
        - 7.2.1 Category description
        - 7.2.2 Methodological issues
        - 7.2.3 Uncertainty assessment and time-series consistency
        - 7.2.4 Description of any flexibility applied
        - 7.2.5 Category-specific QA/QC and verification (if applicable)
        - 7.2.6 Category-specific recalculations (if applicable)
        - 7.2.7 Category-specific planned improvements (if applicable)

- **Chapter 8: Other (CRT sector 6) (if applicable)**

- **Chapter 9: Indirect carbon dioxide and nitrous oxide emissions (related to non-mandatory provisions as per para. 52 of the MPGs)**
    - 9.1 Description of sources of indirect emissions in the GHG inventory
    - 9.2 Methodological issues
    - 9.3 Uncertainty assessment and time-series consistency
    - 9.4 Category-specific QA/QC and verification (if applicable)
    - 9.5 Category-specific recalculations (if applicable)
    - 9.6 Category-specific planned improvements (if applicable)

- **Chapter 10: Recalculations and improvements**
    - 10.1 Explanations and justifications for recalculations
    - 10.2 Implications for emission and removal trends
    - 10.3 Implications for emission and removal trends, including time-series consistency
    - 10.4 Areas of improvement and/or capacity-building in response to review process
    - 10.5 Areas of improvement and/or capacity-building in response flexibility provisions

- **Annexes to the national inventory document**
    - Annex 1: Key categories (flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 25 of the MPGs)
    - Annex 2: Uncertainty assessment (flexibility provided as per para. 29 of the MPGs)
    - Annex 3: Detailed description of the reference approach of the energy sector (including inputs to the reference approach such as the national energy balance) and the results of the comparison of national estimates of emissions with those obtained using the reference approach (related to a non-mandatory provision as per para. 36 of the MPGs)
    - Annex 4: Quality Assurance and Quality Control (QA/QC) plan (related to a non-mandatory provision as per para. 35 of the MPGs, with flexibility provided as per paras. 34–35 of the MPGs)
    - Annex 5: Any additional information, as applicable, including detailed methodological descriptions of source or sink categories and the national emission balance
    - Annex 6: Common reporting tables

- **References**

Annex IX - PAM Compilation Template

Reporting item	Clarification on the content
Name of the PAM	Name of the policy or project
Description	Provide the scope of the policy/project, defining what specific activities are being undertaken
Objectives	Provide the scope of the policy/project, defining what specific activities are being undertaken
Type of instrument	Regulatory, economic instrument or other
Status	Planned, adopted, or implemented
Sectors affected	Energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other
Gases affected	CO_2, CH_4, N_2O, HCF, PFC, SF_6, NF3
Entities responsible for implementing the policy	Name of the entities or entities responsible for implementing the policy.
Start year of implementation	Year in which the policy or Project start to be implemented
Target year(s) or period(s)	Target years for implementation of measure.
Ex ante assessment - Mitigation impact (not cumulative, in kt CO2 eq) for different years (1)	Additionally to the below indicators, this row captures the assessment of impact of the policy, if this information is available in the corresponding entity.
Ex post assessment - Mitigation impact (not cumulative, in kt CO2 eq) for different years (1)	Additionally to the below indicators, this row captures the assessment of impact of the policy, if this information is available in the corresponding entity.
Description of the methodologies and assumptions used to estimate the GHG emission reductions or removals due to each action, policy, and measure (1)	Description of the methodologies and assumptions followed to estimate impact. It is particularly important to define what activity data has been used, the parameters used, assumptions and their source of information.
Identified co-benefits of the policy & measure	This item intends to identify the co-benefits of the referred policy & measure. Co-benefits include reduced air pollution, national energy security, reduced fuel costs, employment, reduction of vulnerability to climate change impacts, etc.
Data provider	Name of the entity or entities providing data on this PAM.
Costs	Expected or realised cost of implementation
Other information	Other information that the data providers consider relevant related the description of the policy/project, and its impact.

Reporting item	Clarification on the content
By indicator – Name	Name of the indicator
By indicator – Definition	Definition of the indicator used to monitor progress of the PAM
By indicator – Purpose	Purpose of the indicator, if different to monitoring progress of the PAM
By indicator – Rationale	Description of the rationale followed for the selection of the indicator and its methodology.
By indicator – Methodology	Describe the method followed for estimating the indicator, if applicable.
By indicator – Assumption	Assumptions made for estimating the indicator, if applicable.
By indicator – Unit	Unit of the indicator
By indicator – Base year value	Reference value for the indicator, if applicable
By indicator – Latest available year value	This value provides the most updated value of the indicator, allowing the tracking of progress of the PAM
By indicator – Target year value	Objective value for the indicator, if applicable
By indicator – Data source	Sources of the data used for estimating the indicator.
By indicator – Data collection frequency	Frequency of data collection for the estimation of the indicator.
By indicator – Monitoring frequency	Frequency of monitoring for the indicator (annually, quarterly, biannually, etc.)
By indicator – Entity(ies) or person(s) responsible for data collection and monitoring activities	Entity or entity responsible for the data collection and monitoring activities.
By indicator – Reporting frequency	Frequency considered for reporting information on the indicator.
By indicator – Verification procedures	Verification procedures followed, if applicable.
By indicator – Procedures for quality assurance (QA) and quality control (QC)	QA/QC procedures followed, if applicable.
By indicator – Archiving procedures	Archiving procedures followed, if different from the archiving procedure proposed under the PAMs MRV

1. This information could be available in the entities responsible for the design and implementation of the PAM. If this information is not available, or if the methodology is not consistent with the remaining PAMs, the CCS will estimate the mitigation impact following the guidance provided in section 6

Example PAM - Conversion of existing 600 MW of fuel oil-based combined cycle power plants to NG

Reporting item	Clarification on the content
Name of the PAM	Name of policy or project. Conversion of existing 600 MW of fuel oil-based combined cycle power plants to NG.
Description	Provide the scope of the policy/project, defining what specific activities are being undertaken. This PAM is part of the power sector NDC3 target to convert fuel oil-based plants to NG and establish new NG plants. The target is dependent on the NG infrastructure capacity.
Objectives	Describe the objective of the policy/project, and the specific goals that it aims to achieve. The objective is to convert fuel oil based combined cycle power plants to NG instead, thus operating the installed capacity of 600MW with NG instead of with fuel oil.
Type of instrument	Regulatory, economic instrument or other. Other.
Status	Planned, adopted, or implemented – for project PAMs planned refers to not started, adopted refers to ongoing and implemented to finalized. Adopted.
Sectors affected	Energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other. Energy.
Gases affected	CO2, CH4, N2O, HCF, PFC, SF6, NF3. CO2, CH4, N2O.
Entities responsible for implementing the policy	Name of the entities or entities responsible for implementing the policy. Ministry of Energy and Power, Ceylon Electricity Board are both mentioned.
Start year of implementation	Year in which the policy or Project start to be implemented. 2021. Rationale for the provision of this year: This PAM as per the "Updated NDC" is to be implemented between 2021-2026. "Therefore, we assumed 2021 is the first year for the implementation of this PAM. Please confirm an update if necessary."

Reporting item	Clarification on the content
Target year(s) or period(s)	Target years for implementation of measure. 2021 - 2026.
Ex ante assessment - Mitigation impact (not cumulative, in kt CO2 eq) for different years (1)	Additionally, to the below indicators, this row captures the assessment of impact of the policy, if this information is available in the corresponding entity. This information is to be estimated by the CCS considering its description and objectives.
Ex post assessment - Mitigation impact (not cumulative, in kt CO2 eq) for different years (1)	Additionally, to the below indicators, this row captures the assessment of impact of the policy, if this information is available in the corresponding entity. This information is to be estimated by the CCS considering its description and objectives.
Description of the methodologies and assumptions used to estimate the GHG emission reductions or removals due to each action, policy, and measure (1)	Description of the methodologies and assumptions followed to estimate impact. It is particularly important to define what activity data has been used, the parameters used, assumptions and their source of information. This information is to be elaborated by the CCS considering its description.
Identified co-benefits of the policy & measure	Description of the methodologies and assumptions followed to estimate impact. It is particularly important to define what activity data has been used, the parameters used, assumptions and their source of information. This information is to be estimated by the CCS considering its description and objectives. Any information that could be provided to the CSS is beneficial. Co-benefits may include GDP growth, USD savings, employment benefits, health benefits, air quality benefits, etc. For this PAM, co-benefits could be: - Air quality benefits due to combustion of NG instead of fuel oil. - Return on the investment in the long run due to cleaner energy production mechanism.
Data provider	Name of the entity or entities providing data on this PAM. Sri Lanka Sustainable Energy Authority will collect data on this PAM. Primary information is likely available at the Ceylon Electricity Board and at the Ministry of Power and Energy.

Reporting item	Clarification on the content
Costs	Expected or realised cost of implementation. Not known. The costs should be provided by the entity implementing the PAM.
Other information	Other information that the data providers consider relevant related to the description of the policy/project, and its impact. As per the updated NDC, it is stated that this PAM is conditional upon availability and usability of adequate NG infrastructure.
By indicator – Name	Name of the indicator. Installed capacity converted to NG.
By indicator – Definition	Definition of the indicator used to monitor progress of the PAM. Installed capacity using fuel-oil converted to use NG in MW.
By indicator – Purpose	Purpose of the indicator, if different to monitoring progress of the PAM The purpose of the indicator is to monitor progress of the PAM.
By indicator – Rationale	Description of the rationale followed for the selection of the indicator and its methodology. The PAM aims to convert existing installed capacity; hence the indicator targets this aim.
By indicator – Methodology	Describe the method followed for estimating progress on the indicator, if applicable. The information is obtained directly from the project implementer providing information on the progress of the converted capacity.
By indicator – Assumption	Assumptions made for estimating the indicator, if applicable. Not applicable.
By indicator – Unit	Unit of the indicator MW.
By indicator – Base year value	Reference value for the indicator, if applicable 0 MW installed.
By indicator – Latest available year value	This value provides the most updated value of the indicator, allowing the tracking of progress of the PAM. Please indicate the value for the latest available year.

Reporting item	Clarification on the content
By indicator – Target year value	Objective value for the indicator, if applicable 600 MW converted in 2026.
By indicator – Data source	Sources of the data used for estimating the indicator. Project implementers.
By indicator – Data collection frequency	Frequency of data collection for the estimation of the indicator. Every year.
By indicator – Monitoring frequency	Frequency of monitoring for the indicator (annually, quarterly, biannually, etc.) Every year.
By indicator – Entity(ies) or person(s) responsible for data collection and monitoring activities	Entity or entity responsible for the data collection and monitoring activities. Sri Lanka Sustainable Energy Authority as the sectoral lead for the energy sector.
By indicator – Reporting frequency	Frequency considered for reporting information on the indicator. Every two years in the BTR and in the CTF tables in line with the reporting requirements under the ETF.
By indicator – Verification procedures	Verification procedures followed, if applicable. Please describe any verification procedure. If there is none, specify "Not applicable".
By indicator – Procedures for quality assurance (QA) and quality control (QC)	QA/QC procedures followed, if applicable. Please describe any QA/QC procedure followed. If there is none, specify "Not applicable.
By indicator – Archiving procedures	Archiving procedures followed, if different from the archiving procedure proposed under the PAMs MRV Please describe any specific archiving procedure, if different from the overarching archiving system of the MRV.

Annex X – QC Checklists for Mitigation by Entity

QC checklist for the Sectoral Leads.

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check that all data providers identified have reported on each PAMs under their responsibility. If a data provider identified does not report on all the PAMs reach out for clarification.						
Check for timeliness. Assess whether all data providers provide the best available and most recent information.						
Check for relevance. The PAMs reported should have substantial mitigation potential to track the NDC component for the industry sector.						
Check for completeness. Ensure that all data on the PAMs is reported in the collection template and assess whether the progress reporting template captures all relevant information on the PAMs.						
Check for consistency. Ensure the PAMs reported and the mitigation effect are consistent with previous years and do not deviate strongly.						
Check for errors. Control that the correct units and parameters have been specified for all provided information.						
Check that the information provided include official data sources and includes assumptions, documentary evidence and references.						

QC checklist for the Climate Change Secretariat (Compiler in the MRV).

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check all sectoral leads have submitted a full list of PAMs capturing all mitigation PAMs of the sector. In case of doubt, confirm with respective lead and check the data provision by the initial data providers.						
Check that assumptions and criteria for compiled PAMs are documented sufficiently.						
Check for timeliness. Ensure the sectoral leads submit the data on time and if not reach out to them.						
Check for completeness. Assess whether the compiled data is complete and fulfil all technical requirements for subsequent estimation.						
Check for consistency. Compare PAM estimates in the current MRV cycle with prior estimates to identify structural inconsistencies in the methodology applied.						
Check for errors. Assure transcription errors are identified and the data parameters correspond to the required format.						
Check for errors. Control for structural errors in the reported PAMs and identify inconsistencies in the magnitudes reported by conducting recalculations.						
Check the estimates are prepared in line with the envisioned timeline of the MRV cycle and are passed on to the IMWG for follow up QA/QC.						
Check the format and the BTR reporting requirements. Ensure the PAM estimates are formatted and comprehensively listed to facilitate QA and final reporting and to meet international reporting requirements.						

General QC checklist for the GHG Inventory and Mitigation Working Group – Mitigation MRV.

	QA Activity	Recommendation					
Focus area	Description	Area of concern	Recommendation	Description of supporting documentation or expert judgment	Level of implementation (Check one)		
					Level 1	Level 2	Level 3
MRV transparency system efficiency	Are all responsibilities regarding the steps of the MRV cycle been carried out?						
	Have all QC procedures been carried out? Are they documented and archived?						
	Have all stakeholders assumed their roles and responsibilities and mandates and did they have the required capacity to carry out their tasks?						
	On what basis are data providers providing the data on mitigation PAMs to the sectoral leads and to the CCS? For example, are legal contracts or confidentiality agreements used to formally establish a channel for data collection?						
	Have improvements resulting from the QC been incorporated?						
	Has an improvement plan for the next cycle being developed?						

	QA Activity	Recommendation					
Focus area	Description	Area of concern	Recommendation	Description of supporting documentation or expert judgment	Level of implementation (Check one)		
					Level 1	Level 2	Level 3
Consistency	Are the estimated PAMs consistent with previous MRV cycles?						
	Are major methodological changes to the estimation procedure implemented and documented?						
	Were there inconsistencies observed between data on PAMs as they were moved across the stakeholders in the MRV cycle?						
Completeness	Are the relevant sectors for mitigation PAMs of the industry considered?						
	Are all mitigation PAMs across the sector accounted for?						
	Are the reported mitigation PAMs relevant for tracking the NDC? Is the reasoning for including or excluding certain mitigation PAMs documented?						
	Is the improvement plan for the MRV cycle implemented? To a sufficient degree?						

	QA Activity	Recommendation					
Focus area	Description	Area of concern	Recommendation	Description of supporting documentation or expert judgment	Level of implementation (Check one)		
					Level 1	Level 2	Level 3
Formats	Do the templates used for compiling data on PAMs by the sectoral leads provide sufficient information to elaborate the section and CTF tables of the BTR on PAMs?						
	Are the estimated PAMs sufficiently detailed and comprehensive for allowing understanding and decision making?						
	Does the reporting fulfil the international transparency requirements? Are the CTF tables 5 filled, described and documented correctly?						
Data handling	Are potential confidentiality requests acknowledged during data collection?						
	Are all the forms and supporting information from all data providers archived and stored to facilitate a detailed review or audit?						

QC checklist for the Climate Change Secretariat (Coordinator of the MRV).

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Ensure all relevant prior QC checklists by the sectoral leads and by the CCS are used to assess the quality of estimates.						
Holistic approach. Consult internal documentation from prior MRV cycles and use the NEC for further expert knowledge on each MRV cycle step to identify inconsistencies in the estimates.						
Check for timeliness. Ensure Sectoral Leads complete the compilation form on time and the CCS submits the data on time for QC and if not reach out to them.						
Check for completeness. Assess whether the data estimates are complete and fulfil all technical requirements.						
Check for thoroughness. Verify any methodological changes to the estimates or data treatment have been correctly applied and are well documented.						

QC Activity	Task Completion			Corrective Measure (If applicable)		
Description	Staff responsible	Date	Areas of attention	Staff responsible	Date	Description
Check the format. Ensure the PAM estimates are formatted and comprehensively listed to facilitate QA and final reporting.						
Check that all QA/QC checklists have been well documented to develop the improvement plan.						
Check that all immediate actions undertaken during the MRV cycle are documented and assess whether they have been implemented.						
Check for timeliness. Assess whether the steps of the MRV cycle have been carried out in line with the proposed timeline at the outset of the cycle.						
Check for completeness. Check that all steps of the MRV cycle are followed and confirm that communication channels and data flows are sustained satisfactorily, allowing for a complete reporting.						
Check for coherence. Confirm the data estimates align with the compiled data and check if the magnitude levels differ too greatly from previous cycles.						

Annex XI – A Checklist for Mitigation

QA Activity			
Description	Area of concern	Recommendation	Description of supporting documentation or expert judgment
Are the estimated PAMs consistent with previous MRV cycles?			
Are major methodological changes to the estimation procedure implemented and documented?			
Were there inconsistencies observed between data on PAMs as they were moved across the stakeholders in the MRV cycle?			
Are the relevant sectors for mitigation PAMs of the industry considered?			
Are all mitigation PAMs across the sector accounted for?			
Are the reported mitigation PAMs relevant for tracking the NDC? Is the reasoning for including or excluding certain mitigation PAMs documented?			
Is the improvement plan for the MRV cycle implemented? To a sufficient degree?			
Do the templates used for compiling data on PAMs by the sectoral leads provide sufficient information to elaborate the section and CTF tables of the BTR on PAMs?			
Are the estimated PAMs sufficiently detailed and comprehensive for allowing understanding and decision making?			
Does the reporting fulfil the international transparency requirements? Are the CTF tables 5 filled, described and documented correctly?			
Are all the forms and supporting information from all data providers archived and stored to facilitate the detailed review or audit?			

Annex XII – Documentation of Immediate Actions for the MRV Cycle

Proposed template for documentation of immediate improvements.

Improvements implemented	Immediate action required	Area of improvement	Proposed measure for improvement	Responsible staff of the implementation	Date of implementation	Description on how the improvement was addressed
	Detail the issue/ shortcoming identified	e.g. data format, PAMs estimation, indicators	Explain in detail the proposed measure for improvement	Name of the stakeholder(s) in charge of the improvement	Provide the date of the implementation of the improvement	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
...						

Annex XIII – Mid-term Improvement Plan Template for the MRV Cycle

Proposed template for documentation of medium-term improvements.

Type of improvement				
	Shortcoming identified/Required improvement	Proposed measure for improvement	Responsible entity for implementation	Timeline for implementation
	Describe the identified issue to be improved	Explain in detail the proposed measure for improvement	Assign stakeholder(s) in charge of the improvement	Provide an approximate timeline for implementing the improvement
Technical aspects				
Procedural aspects				

Annex XIV – Reporting Templates for PAMs in the BTR

BTR outline of the section on PAMs under the NDC tracking chapter

- Information on mitigation PAMs institutional arrangements.
- Information on actions, policies and measures that support the implementation and achievement of its NDC focusing on **those that have the most significant impact on GHG emissions or removals and those impacting key categories** in the national GHG inventory in narrative and tabular format and **organised by sector (energy, transport, industrial processes and product use, agriculture, LULUCF, waste management and other)**.
- Description of the **methodologies and assumptions** used to estimate the GHG emission reductions or removals (may be presented in an annex of the BTR).
- Improvement plan on mitigation PAMs MRV procedures and to improve the completeness, transparency, accuracy, consistency and comparability of the information assessed on PAMs

CTF 4

Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement

	Unit, as applicable	Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)						Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
			Year 1	Year 2	...	...	End Year	Target year	Target year or period	
Indicator(s) selected to track progress of the NDC or portion of NDC under Article 4 of the Paris Agreement (paras. 65 and 77(a) of the MPGs):										
{Indicator}										
{Parties can add rows for each additional indicator and supporting information for each indicator, e.g. baseline values, baseline for the portion of NDC, target values, mitigation effects of policies and measures, etc.}										

CTF 5

Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement [a,b]

Name	Description [c,d,e]	Objectives	Type of instrument [f]	Status [g]	Sector(s) affected [h]	Gases affected	Start year of implementation Implementing entity or entities	Estimates of expected and achieved GHG emission reductions [j,k] [(not cumulative in kt CO2 eq)]
								Option1: Years [l]
								Option 2: Reporting year/End year period of NDC

[a] Each Party shall provide information on actions, policies and measures that support the implementation and achievement of its NDC under Article 4 of the Paris Agreement, focusing on those that have the most significant impact on GHG emissions or removals and those impacting key categories in the national GHG inventory. This information shall be presented in narrative and tabular format (para. 80 of the MPGs).

[b] For each Party with an NDC under Article 4 of the Paris Agreement that consists of mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans consistent with Article 4, para. 7, information to be reported under paras. 80, 82 and 83 of the MPGs includes relevant information on policies and measures contributing to mitigation co-benefits resulting from adaptation actions or economic diversification plans (para. 84 of the MPGs).

[c] Parties may indicate whether a measure is included in the 'with measures' projections.

[d] Additional information may also be provided on the cost of the mitigation actions, non-GHG mitigation benefits, and how the mitigation action interacts with other mitigation actions, as appropriate (para. 83(a–c) of the MPGs).

[e] Parties should identify actions, policies and measures that influence GHG emissions from international transport (para. 88 of the MPGs).

[f] Parties should, to the extent possible, provide information about how actions, policies and measures are modifying longer-term trends in GHG emissions and removals (para. 89 of the MPGs).

[g] Parties shall, to the extent possible, provide information on the types of instrument: regulatory, economic instrument or other (para. 82(d) of the MPGs).

[h] Parties shall, to the extent possible, use the following descriptive terms to report on status of implementation: planned, adopted or implemented (para. 82(e) of the MPGs).

[i] Parties shall, to the extent possible, provide information on sector(s) affected: energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other (paras. 81 and 82(f) of the MPGs).

[j] Each Party shall provide, to the extent possible, estimates of expected and achieved GHG emission reductions for its actions, policies and measures in the tabular format; those developing country Parties that need flexibility in the light of their capacities with respect to this provision are instead encouraged to report this information (para. 85 of the MPGs).

[k] To the extent available, each Party shall describe the methodologies and assumptions used to estimate the GHG emission reductions or removals due to each action, policy and measure. This information may be presented in an annex to the biennial transparency report (para. 86 of the MPGs).

[l] Years deemed relevant by the Party in relation to implementation and achievement of its nationally determined contribution, including the end year of the NDC. {no relevant provision in the MPGs; this is CFs proposal}].

Annex XV – Reporting template for monitoring PAMs for decision making

Proposed outline for reporting on mitigation PAMs for decision making purposes.

PAM	Indicator	Estimation methodology and source of information	Baseline situation		Objective 2025	Objective 2030	Progress achieved	Explanation of progress	Results
			Starting year	Value					

Last column will indicate progress in the implementation of the PAM using the following coding colours:

- **Green** if the PAM is on track of expected implementation period.
- **Yellow** if at risk on meeting its targets on time.
- **Red** if there is no progress

Annex XVI - Terms of Reference for the Key MRV Functions

Terms of Reference – Climate Change Secretariat

Role in the MRV System

- Coordinator of the MRV system
- Estimator of the GHG Inventory
- Support for estimation of Mitigation Policies and Measures
- Reporting of the BTR including the chapters and estimates for the GHG Inventory and Mitigation
- Chair of the GHG Inventory and Mitigation Working Group to lead the inter-agency coordination.

Responsibilities

- Ensure the functioning of the MRV system and plan the MRV cycles.
- Convene stakeholders and chairs Inter-agency Coordination meetings.
- Host and administer the MRV IT platform.
- Update and communicate the list of stakeholders involved in the MRV cycle activities.
- Define data needs with the sectoral leads for the GHG inventory and Mitigation in view of the reporting elements of the BTR.
- Provide oversight and management of processes and data flows.
- Responsible for estimation of sectoral GHG emissions and for supporting the estimation of the mitigation impact of policies and measures.
- Identification and application of appropriate methodology for estimations in line with the 2006 IPCC Guidelines.
- Identification and application of appropriate tools and software facilitating the estimations provided the use is aligned with the methodology. - The use of the IPCC Software and the IPCC Tool (forthcoming) may be considered.
- Develop and implement improvement plans of MRV processes.
- Prepare the BTR material and submit integrated and final reports to the UNFCCC.
- Act as National Focal Point during the UNFCCC review processes.

Work and Meetings Modalities

The CCS will work and meet under its governmental mandate for climate change and reports to the Ministry of Environment. As the Chair of the GHG Inventory and Mitigation Working Group (IMWG), the CCS will attend all meetings of the Group.

Sharing of Information

Relevant information will be communicated in a timely and effective manner to the relevant institutions in Sri Lanka. The CCS will emphasise the sharing of up-to-date formats and templates as well as commit to immediately inform on procedural changes within the MRV cycle. The CCS commits to disclose all relevant information with the sectoral leads and with the IMWG as well as with the National Steering Committee (NSC) to ensure they are properly informed.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate. The Terms of Reference may be amended by the CCS, requiring written agreement by the Ministry of Environment and after consultation with the IMWG representing the key institutions and ensuring inter-agency coordination of the MRV activities.

Written Agreements

This Terms of Reference are valid upon formal and written approval by the CCS.

Terms of Reference – Sustainable Energy Authority

Role in the MRV System

- Sectoral Lead for the energy sector of the GHG inventory and mitigation MRV.
- Data estimation of energy sector policies and measures (PAMs).
- Lead of the Energy Sector NDC Planning and Monitoring Committee (PMC) of the NDC Implementation Plan.
- Member of the GHG Inventory and Mitigation Working Group (IMWG)

Responsibilities

- Participate in IMWG meetings.
- Define data needs with the Climate Change Secretariat (CCS) for the GHG inventory and Mitigation in view of the reporting elements of the BTR.
- Support the CCS in the development of sectoral data compilation templates.
- Organise the data collection process with the relevant data providers.
- Collaborate with the CCS as determined by the Data Sharing Agreement (DSA).
- Ensure the DSA with relevant data providers are updated and contain all necessary provisions and templates.
- Collaborate strongly with the Central Environmental Authority to obtain fuel consumption data by industry through the EPL in view of higher Tier levels for the GHG inventory.
- Provide sectoral expertise for the preparation of the UNFCCC reports.
- Store and safeguard all relevant information obtained throughout data collection.

GHG Inventory

- Compile energy sector data required for the estimation of the GHG inventory categories 1A1 Energy Industries and 1A2 Manufacturing Industries and Construction. This includes collecting data on:
  - Fuel consumption data by fuel in the energy industry including import, export and production of fuel – Category 1A1.
  - Fuel consumption data by fuel by industry according to the International Standard Industrial Classification (ISIC) – Category 1A2.
  - Information on characteristics of different fuel types including net-calorific values.
  - National Energy Balance to allow for conducting the Reference Approach.

Mitigation

- Compile data on policies and measures of the Electricity (Power) sector as defined in the NDC Implementation Plan, including:
  - Data on the progress of implementation of individual PAMs and development of targeted progress tracking indicators (KPIs or else).
  - Data required for estimating the mitigation impact of individual PAMs as required by the IPCC Tool Manual.
  - Other relevant information by PAM, such as: objective, type of intervention, sectors affected, gases affected, Implementation time frame.
- Monitor progress of the energy sector mitigation policies and measures as per the lead role in the PMC

Terms of Reference – Sustainable Energy Authority

Work and Meetings Modalities

The SLSEA works under its institutional mandates and reports to the CCS regarding MRV activities. The SLSEA will further participate in all meetings of the IMWG. The SLSEA may organise additional meetings with data providers as applicable. This does not require formal approval.

Sharing of Information

The SLSEA will share all sectoral data and information with the CCS as determined by the DSA and as additionally requested by the CCS in line with the MRV activities.

Relevant data collection templates and associated updates to the DSA are shared in a timely manner with the data providers. The SLSEA also commits to provide information to the data providers if requested and if appropriate.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate.

The Terms of Reference may be amended by the IMWG Chair – the CCS - in writing and after consultation and agreement by all IMWG members.

Written Agreements

This Terms of Reference is valid upon formal and written approval by the Climate Change Secretariat and the Sustainable Energy Authority.

Terms of Reference – Ministry of Industries

Role in the MRV System

- Sectoral Lead for the IPPU/Industry sector of the GHG inventory and mitigation MRV.
- Data estimation of Industry sector policies and measures (PAMs).
- Lead of the Industry Sector NDC Planning and Monitoring Committee (PMC) of the NDC Implementation Plan.
- Member of the GHG Inventory and Mitigation Working Group (IMWG)

Responsibilities

- Participate in the IMWG meetings.
- Define data needs with the CCS for the GHG inventory and Mitigation in view of the reporting elements of the BTR.
- Support the CCS in the development of sectoral data compilation templates.
- Organise the data collection process with the relevant data providers.
- Collaborate strongly with the DCS to obtain data from the Annual Industry Survey.
- Collaborate with the CCS as determined by the Data Sharing Agreement (DSA)
- Ensure the DSA with relevant data providers are updated and contain all necessary provisions and templates.
- Provide sectoral expertise for the preparation of the UNFCCC reports.
- Store and safeguard all relevant information obtained throughout data collection.

GHG Inventory

- Compile Industrial Process and product-use (IPPU) sector data required for the estimation of the GHG inventory including production, import and export data for the:
  - 2.A. Mineral Industry.
  - 2.B. Chemical Industry.
  - 2.C. Metal Industry.
  - 2.D. Non-Energy Products from Fuels and Solvent Use.
  - 2.E. Electronics Industry.
  - 2.F. Product Uses as Substitutes for Ozone Depleting Substances.
  - 2.G. Other Product Manufacture and Use.
  - 2.H. Other (Pulp and Paper and Food and beverages).

Mitigation

- Compile data on policies and measures of the industry sector as defined in the NDC Implementation Plan, including:
  - Data on the progress of implementation of individual PAMs and development of targeted progress tracking indicators (KPIs or else).
  - Data required for estimating the mitigation impact of individual PAMs as required by the IPCC Tool Manual
  - Other relevant information by PAM, such as: objective, type of intervention, sectors affected, gases affected, Implementation time frame.
- Monitor progress of the industry sector mitigation policies and measures as per the lead role in the PMC.

Terms of Reference – Ministry of Industries

The Work and Meetings Modalities

The MoI works under its institutional mandates and reports to the CCS regarding MRV activities. The MoI will further participate in all meetings of the IMWG. The MoI may organise additional meetings with data providers as applicable. This does not require formal approval.

Sharing of Information

The MoI will share all sectoral data and information with the CCS as determined by the DSA and as additionally requested by the CCS in line with the MRV activities.

Relevant data collection templates and associated updates to the DSA are shared in a timely manner with the data providers. The MoI also commits to provide information to the data providers if requested and if appropriate.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate.

The Terms of Reference may be amended by the IMWG – the CCS - in writing and after consultation and agreement by all IMWG members.

Written Agreements

This Terms of Reference is valid upon formal and written approval by the Climate Change Secretariat and the Ministry of Industries.

Terms of Reference – Central Environmental Authority

Role in the MRV System

- Key Data Provider for the Energy sector of the GHG inventory.
- Data Provider for the IPPU sector of the GHG inventory.
- Member of the GHG Inventory and Mitigation Working Group (IMWG).

Responsibilities

- Participate in the IMWG meetings.
- Maintain the EPL updated to support the MRV activities related to the compilation of the GHG inventory using Tier 3 methodology.
- Provide data as per the Data Sharing Agreements (DSA) signed with the Sustainable Energy Authority.
- Provide data as per the Data Sharing Agreements (DSA) signed with the Ministry of Industries (conditional upon further updates of the EPL to include IPPU related data).
- Store and safeguard all relevant information obtained throughout data collection.

GHG Inventory

- Provide relevant energy sector data by industry through the EPL, including:
  - Data on fuel consumption by industry and by fuel type
  - Data on fuel characteristics such as net-calorific values
  - Data on fuel combustion processes and technologies used.

GHG Inventory

- Provide IPPU sector data by industry through the EPL, including detailed data on all raw material inputs and production technologies for the:
  - 2.A. Mineral Industry.
  - 2.B. Chemical Industry.
  - 2.C. Metal Industry.
  - 2.D. Non-Energy Products from Fuels and Solvent Use.
  - 2.E. Electronics Industry.
  - 2.F. Product Uses as Substitutes for Ozone Depleting Substances.
  - 2.G. Other Product Manufacture and Use.
  - 2.H. Other (Pulp and Paper and Food and beverages).

Mitigation

- Support the implementation of the PAMs under the purview of the CEA and monitor progress on their implementation.
- Compile data to support the estimation of PAMs as requested by the Sustainable Energy Authority, Ministry of Industries or Climate Change Secretariat.

Terms of Reference – Central Environmental Authority

The Work and Meetings Modalities

The CEA will work in line with its organisational mandates and will report to the sectoral leads and CCS as far as the MRV activities are concerned.
The CEA will participate in meetings of the IMWG and additional meetings when requested by the CCS or the sectoral leads.

Sharing of Information

The CEA will share all sectoral data and information with the sectoral leads as determined by the DSA and as additionally requested by the CCS in line with the MRV activities.

Relevant data collection templates and associated updates to the DSAs are shared in a timely manner with the CEA. The CEA may request well-justified alterations to the DSAs. These require approval by the relevant sectoral lead.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate.

The Terms of Reference may be amended by the IMWG Chair – the CCS - in writing and after consultation and agreement by all IMWG members.

Written Agreements

This Terms of Reference is valid upon formal and written approval by the Climate Change Secretariat and the and the Central Environmental Authority.

Terms of Reference – Department of Census and Statistics

Role in the MRV System

- Key Data Provider for the IPPU sector of the GHG inventory.
- Data Provider for the Energy sector of the GHG inventory.
- Member of the GHG Inventory and Mitigation Working Group (IMWG).

Responsibilities

- Participate in the GHG Inventory and Mitigation Working Group (WG) meetings.
- Maintain the Annual Industry Survey updated to obtain regular data from the industries in line with the MRV requirements.
- Provide data as per the Data Sharing Agreements (DSA) signed with the Ministry of Industries.
- Store and safeguard

GHG Inventory

- Provide IPPU sector data by industry through the Annual Industry Survey, including the:
  - 2.A. Mineral Industry
  - 2.B. Chemical Industry
  - 2.C. Metal Industry
  - 2.D. Non-Energy Products from Fuels and Solvent Use
  - 2.E. Electronics Industry
  - 2.F. Product Uses as Substitutes for Ozone Depleting Substances
  - 2.G. Other Product Manufacture and Use
  - 2.H. Other (Pulp and Paper and Food and beverages)

GHG Inventory

- Provide relevant energy sector data by industry through the Annual Industry Survey (conditional on including such data going forward), including:
  - Data on fuel production, imports, and exports by fuel.
  - Data on fuel consumption by industry and by fuel type.
  - Data on fuel characteristics such as net-calorific values.
  - Data on fuel combustion processes and technologies used (if known).

Mitigation

- Support the implementation of the PAMs under the purview of the CEA and monitor progress on their implementation.
- Compile data to support the estimation of PAMs as requested by the Sustainable Energy Authority, Ministry of Industries or Climate Change Secretariat.

Terms of Reference – Department of Census and Statistics

Work and Meetings Modalities

The DCS will work in line with its organisational mandates and will report to the sectoral leads and CCS as far as the MRV activities are concerned.
The DCS will participate in meetings of the IMWG and additional meetings when requested by the CCS or the sectoral leads.

Sharing of Information

The DCS will share all sectoral data and information with the sectoral leads as determined by the DSA and as additionally requested by the CCS in line with the MRV activities.

Relevant data collection templates and associated updates to the DSAs are shared in a timely manner with the DCS. The DCS may request well-justified alterations to the DSAs. These require approval by the relevant sectoral lead.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate. The Terms of Reference may be amended by the IMWG – the CCS - in writing and after consultation and agreement by all IMWG members.

Written Agreements

This Terms of Reference are valid upon formal and written approval by the Climate Change Secretariat and the Department of Census and Statistics.

Terms of Reference – GHG Inventory and Mitigation Working Group

Role in the MRV System

- Inter-agency coordination between key MRV stakeholders.
- Quality control checks (QC) to verify and approve the climate change reports related to the GHG Inventory and Mitigation of Sri Lanka as part of the reporting requirements under the UNFCCC.

Membership

GHG Inventory and Mitigation Working Group (IMWG) is formed by:

- Climate Change Secretariat (Chair)
- Sustainable Energy Authority
- Ministry of Industries
- Department of Census and Statistics
- Central Environmental Authority
- Ministry of Power and Energy

The size and composition of the IMWG will be dynamic during the effective period of this Terms of Reference. When deemed necessary, additional permanent members can be incorporated. The list of members will be updated by the IMWG Chair to include any new members accordingly.

Duration

The IMWG will convene and act under this Terms of Reference on an ongoing basis and will remain effective until nullification of this Terms of Reference.

Responsibilities

The overall responsibilities of the IMWG are to:

- Participate in the preparation of National Communications and Biennial Transparency Reports.
- Participate in the monitoring, review and updating of the Nationally Determined Contributions (NDCs).

GHG Inventory

- Technically verify the compiled GHG inventory of Sri Lanka by undertaking quality control activities for each sector of the GHG inventory.
- Prioritise areas for improvement and develop the improvement plan of the GHG inventory.
- Provide guidance on GHG inventory compilation to national stakeholders involved in the process.
- Support the planning process of the annual GHG inventory cycle.
- Support the identification of stand-alone tools for compilation, documentation, archiving, analysis, monitoring and evaluating, verifications, repository, sharing and reporting of GHG data and information in all key source sectors.
- Advise the Government on the financial and human resources needed for the annual GHG inventory compilation.
- Provide oversight of GHG inventory related data flows.

Terms of Reference – GHG Inventory and Mitigation Working Group

Mitigation

- Provide advice to the Government on potential climate change mitigation PAMs and supports the identification of the capabilities, infrastructure and policies needed for long-term emissions reduction.
- Technically verify the mitigation PAMs by undertaking quality control and quality assurance procedures to ensure the technical accuracy of the estimated mitigation PAMs.
- Prioritise areas for improvement and develops the improvement plan of the Mitigation cycle.
- Support the planning activities of the MRV cycle in line with MRV protocols.
- Support the identification of tools and instruments that will support the tracking of climate change mitigation PAMs.
- Support the monitoring of progress in reducing GHG emissions and achieving NDC targets.
- Advise the Government on emission targets and oversee the reporting on progress made in reducing GHG emissions.
- Provide oversight of Mitigation and NDC Tracking related data flows.
- Provide overall direction for climate change mitigation issues in the context of national development agenda.
- Provide direction to develop climate change mitigation policies, strategies, legal instruments, and action plans.
- Provide direction on climate change mitigation issues discussed under climate change negotiations via UNFCCC and IPCC
- Provide direction to implement mitigation activities in Sri Lanka based on the outcome of climate change negotiations recognizing regional and bilateral decisions/plans.
- Provide overall guidance to implement the future sustainable market and non-market mechanisms.
- Provide direction, monitor, review, and advice to ensure compliance with the mitigation policy to implement mitigation projects.
- Provide direction for research related to mitigation.

Work and Meetings Modalities

The IMWG will convene at least bi-annually and can convene more frequently when needed, upon request by the Chair or its members. Additional institutions may be invited to the IMWG meetings. All members can suggest institutions to be invited and approval will be granted by the Chair. The IMWG principally reports to the National Steering Committee (NSC).

The modality of the IMWG meetings will be in-person when possible, while allowing members who are unable to be physically present to participate virtually through teleconference. An agenda will be prepared by the IMWG Chair in advance of the meetings and distributed in a timely manner. Meeting minutes will be recorded by the IMWG Chair and made available via e-mail to all members no later than one week after the meeting.

Sharing of Information

Transparent and timely communication on IMWG matters will be emphasised. Each member shall maintain the confidentiality of all shared information. The IMWG will duly inform the CCS and the sectoral leads on the results of the quality control review and will provide additional output to the NSC and to the National Expert Committee on Climate Change Mitigation (NECCCM).

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate. The Terms of Reference may be amended by the IMWG Chair – the CCS - in writing and after consultation and agreement by all IMWG members.

Written Agreements

All IMWG members are required to submit a written communication of acknowledgement of this Terms of Reference to the IMWG Chair.

Terms of Reference – National Expert Committee on Climate Change Mitigation

Role in the MRV System

- Expert support under its mandate for the NDC Implementation Plan and for the MRV System.
- Quality assurance (QA) as part of the overall Technical QA/QC activities in the MRV cycle by providing third-party assurance for the estimations and reports related to the GHG inventory and mitigation, thus ensuring these are externally reviewed.

Membership

Experts and representatives of institutions not directly involved in the key MRV activities. The composition is to be informed by the official mandate set forth by the NDC Implementation Plan

Duration

The NECCCM will convene and act under this Terms of Reference on an ongoing basis and will remain effective until nullification of this Terms of Reference.

Responsibilities

- Conduct external review of the estimated GHG emissions, policies, and measures as well as progress on the NDC.
- Conduct overall quality assurance reviews of the BTR chapters to be reported to the UNFCCC.
- Provide expert support on climate change related issues in the MRV system.
- Additional responsibilities related to the NDC Implementation Plan.

Work and Meetings Modalities

The NECCCM will principally work as per its mandate assigned for the NDC Implementation Plan and therefore will report to the National Steering Committee (NSC). It will additionally convene at least annually and can convene more frequently when needed to fulfil its role to provide expert support and quality assurance for the MRV system activities. To that end, the NECCCM will collaborate closely with the GHG Inventory and Mitigation Working Group (IMWG) and with the CCS preparing the reports.

Sharing of Information

The NECCCM will transparently share the results of its quality assurance assessment with the CCS and with the IMWG. It will furthermore share relevant insights and outputs related to the progress of the NDC Implementation Plan. The NECCCM will provide expert support, principally to the CCS and to the IMWG, if requested.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate. The Terms of Reference may be amended by the NECCCM upon written approval by the NSC and after consulting the IMWG and the CCS.

Written Agreements

All NECCCM members are required to submit a written communication of acknowledgement of this Terms of Reference as an addition to its mandate under the NDC Implementation Plan

Terms of Reference – National Steering Committee

Role in the MRV System

- Political support and approval to legitimise the MRV system and to ensure the reports to the UNFCCC receive high-level approval

Membership

The composition of the National Steering Committee (NSC) is determined by the official mandate set forth by the NDC Implementation Plan.

- Secretary Ministry of Environment (Chair)
- Representatives of line Ministries
- National Sustainable Development Council
- Department of Fiscal Policy
- National Planning Department
- Ministry of Finance

Duration

- The NECCCM will convene and act under this Terms of Reference on an ongoing basis and will remain effective until nullification of this Terms of Reference.

Responsibilities

- Grant final approval of the Biennial Transparency Reports, NDC updates and National Communications to the UNFCCC.
- Provide political support and representation of the MRV system for high-level policymaking instances such as Parliament or Cabinet meetings as required.
- Additional responsibilities related to the NDC Implementation Plan, including ensuring due implementation of the envisioned actions of the Plan.

Work and Meetings Modalities

The The NSC will principally work as per its mandate assigned for the NDC Implementation Plan. It will additionally convene at least annually and can convene more frequently when needed to fulfil its role to provide high-level support for the MRV system activities. To that end, the NSC will collaborate closely with the GHG Inventory and Mitigation Working Group (IMWG) and with the CCS preparing the reports.

Sharing of Information

The NSC will share its final assessment and approval or disapproval, if applicable, of the reports with the CCS and the IMWG within the timeline set out for the MRV cycle, thereby granting the CCS sufficient time to implement final improvements. The NSC may present data sharing requests to all institutions involved in the MRV system and the institutions presented with such request shall duly respond within two weeks.

Amendments

This Terms of Reference will be reviewed and updated on an annual basis, if appropriate. The Terms of Reference may be amended by the NSC without requiring additional approval.

Written Agreements

All NECCCM members are required to submit a written communication of acknowledgement of this Terms of Reference as an addition to its mandate under the NDC Implementation Plan

Annex XVII – Manual IPCC Software

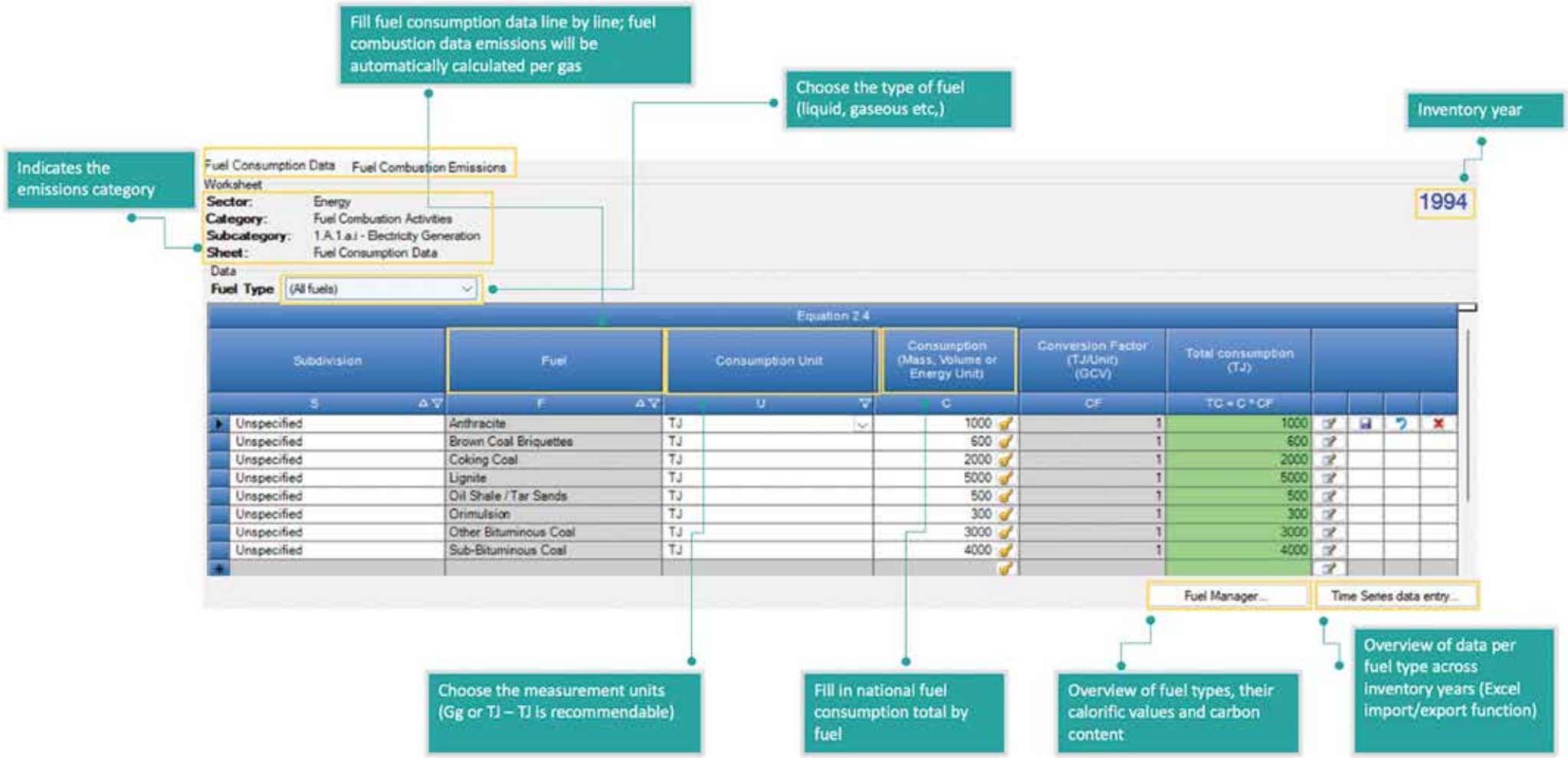
There are several benefits of using the platform for conducting the estimates of the GHG inventory in Sri Lanka. These include the availability of rich information and guides on its use as well as the design of the tool architecture that facilitates conducting the required steps for the inventory in view of the IPCC guidelines.

The IPCC software is structured along the IPCC emission categories and provides default emission factors allowing for streamlined estimation of the GHG emissions by category, subcategory, and activity. The categories and activities are structured hierarchically and category in this case refers to the classifications like for instance 1A Fuel Combustion Activities, subcategory to the 1A1 Energy Industries and activities to 1A1a Main Activity Electricity and Heat Production and more specifically 1A1ai Electricity Generation as potential activities under 1A1a.



Regarding the use of the software, the inventory compiler using the software need to only fill in activity data per sector in the blue categories defining all potential emissions activities in the country. For Sri Lanka this means the CCS will have to compile the required type of activity data for each of the activities occurring in the country. Generally speaking, in the industry sector, the data needs resolve around activity data such as fuel use and fuel types or quantities of industrial production, import and export of a certain product. A comprehensive overview of the data needs per category, which are classified as industrial sector activities, is provided in the main MRV Protocols.

Concerning the adequate use of the software, the CCS will first have to follow the introductory steps as described in the manual to set up the main accounts and users to enable efficient use of the tool in the inventory team. In a next step, the tool can be customized by adapting features, design types and data detail levels. The key workspace is the rider for the worksheets which are provided for each category and activity. Here the CCS will have to upload, and input required data for each of the emissions occurring in the country. On the following page, an example worksheet is added explaining the functions and steps to follow.


Fill fuel consumption data line by line; fuel combustion data emissions will be automatically calculated per gas
Choose the type of fuel (liquid, gaseous etc,)
Inventory year
Indicates the emissions category
Fuel Consumption Data
Fuel Combustion Emissions
Worksheet
Sector: Energy
Category: Fuel Combustion Activities
Subcategory: 1.A.1.a.i - Electricity Generation
Sheet: Fuel Consumption Data
1994
Data
Fuel Type (All fuels)
Equation 2.4
Subdivision
Fuel
Consumption Unit
Consumption (Mass, Volume or Energy Unit)
Conversion Factor (TJ/Unit) (GCV)
Total consumption (TJ)
S
F
U
C
CF
TC = C * CF
Unspecified Anthracite TJ 1000 1 1000
Unspecified Brown Coal Briquettes TJ 600 1 600
Unspecified Coking Coal TJ 2000 1 2000
Unspecified Lignite TJ 5000 1 5000
Unspecified Oil Shale / Tar Sands TJ 500 1 500
Unspecified Orimulsion TJ 300 1 300
Unspecified Other Bituminous Coal TJ 3000 1 3000
Unspecified Sub-Bituminous Coal TJ 4000 1 4000
Fuel Manager...
Time Series data entry...
Choose the measurement units (Gg or TJ – TJ is recommendable)
Fill in national fuel consumption total by fuel
Overview of fuel types, their calorific values and carbon content
Overview of data per fuel type across inventory years (Excel import/export function)

As seen in the table above, the categories are populated in the worksheet rider with the required data. In a first step, the fuel type should be chosen as liquid fuel, solid fuel, gaseous and so forth. Second, the specific fuel consumed is chosen, here the fuel manager provides a concise overview of the calorific values, carbon content by fuel. Third, the consumption unit is determined. Here it is possible to input data in Gigagram (Gg) and in Terajoules (TJ), but it is recommended activity data is generally input using TJ, where available. Fourth, the consumption mass, volume in line with the chosen consumption unit is added. Once this is done, the rider on the top of the worksheet called fuel combustion emissions will then automatically show for all fuels in the category 1A1ai. Energy Generation, the total consumption and associated C02, CH4, and N2O emissions. On the bottom of the worksheet, the rider time series data entry shows the consumption data of all fuels throughout the current and all prior inventory years saved in the software, which allows for clear identification of consumption trends. Note, the process for inputting data in the worksheets is essentially similar across IPCC categories.

The IPCC software further allows for producing summary as well as sectoral data sheets that consolidate the estimated information displaying for each activity category the emissions by different greenhouse gas.

Next to the key procedure to fill the tool with the relevant activity data and thus to obtain the national GHG emissions totals by category, it is important Sri Lanka also utilizes the software to conduct further analyses and quality checks. These include the uncertainty analysis, key category analysis as well as the reference approach for the energy sector data.

Uncertainty analysis

Uncertainty analyses are an essential step for elaborating the national inventory as they indicate the accuracy of the estimations for the variables used such as the emission estimates by category, emissions factors, and activity data. and. In Volume 1 Chapter 3 of the IPCC Guidelines, a comprehensive account of the concept of uncertainty is provided. The aim of conceptualizing and quantifying the uncertainties for the inventory thus is to derive a better idea of the precision and accuracy of the inventory. That is, inventories should be accurate in the sense that they are neither over- nor underestimated as far as can be judged, and precise in the sense that uncertainties are reduced as far as feasible. For adequate analysis of the uncertainties, most countries use various methodologies and apply software-based statistical programs.

In the IPCC software, default activity data uncertainties are prefilled according to 2006 IPCC Guidelines and the default emission factor uncertainties are computed from default values for selected IPCC categories, and for instance fuel types and gas. These default values can be changed in the tool, if more precise estimates of uncertainties are available. In this case, it is recommendable to adapt the default values.

Key category analysis

The key category analysis is an essential step in the development of the GHG inventory as it determines the main emitting categories, which individually or as a group have significant influence on a country´s total inventory in terms of the absolute level, the trend or the level of uncertainty in emissions or removals. The sum of the key categories together accounts for 95% or more of total emissions. Due to the relative weight of these categories, more accurate estimation approaches, hence higher Tier levels should be aimed for. For further reference, the MRV Protocols explain the use of the key category analysis in more detail. Regarding the use of the IPCC software, a function is available for identifying the key categories based on the data input to for the sectoral categories. It is good practice to always conduct the category analysis at the start of the elaboration cycle for the GHG inventory in order to choose the adequate scopes and methods and to bundle efforts on these main categories.

Reference approach

The Reference Approach is a top-down approach, using a country's energy supply data to calculate the emissions of CO2 from combustion of mainly fossil fuels. As such it is only available for the IPCC category for energy emissions. Exhaustive guidance on using the Reference Approach is provided in the IPPC Guidelines Volume 2 – Energy, Chapter 6. The Reference Approach is a straightforward method that can be applied based on available energy supply statistics. In Sri Lanka, such statistics are likely provided in the National Energy Balance.

The Energy Balance of Sri Lanka provides a comprehensive overview of the country's energy sector, reflecting the quantity of energy produced, imported, exported, and consumed, along with the sources of energy and the sectors of energy use. The energy balance is developed by the Sustainable Energy Authority and published annually by the Ministry of Power and Energy of Sri Lanka.

The scope of the energy balance includes all forms of primary energy, such as fossil fuels, renewable energy, and other energy sources. The methodology followed to prepare the energy balance is based on the guidelines of the International Energy Agency (IEA), which requires data on physical units, energy prices, and conversion factors to be reported. The institutional arrangements in place for the compilation of the energy balance statistics are carried out by the Sustainable Energy Authority which acts as the national energy data centre.

The statistics available in the energy balance provide a clear picture of the energy situation in Sri Lanka. It shows the energy consumption trends, energy consumption by sector, energy consumption by fuel, energy production and imports and exports, and energy consumption by end-use. The data is presented in the form of tables and charts, which provide an easy-to-understand format for the reader.

Software, for each fuel, the production, import, export, international bunker and stock change data is summed to determine the apparent national consumption. As the carbon content of these fuel types is known, the total carbon emissions can be estimated using this approach. From this value, certain fuel amounts should be excluded to obtain the actual CO2 emissions estimates. These excludable categories include feedstock fuel consumption as wells reductants and other non-energy fuel purposes. In doing so, the methodology of the reference approach aligns with the sectoral classification of the IPCC. In sum, the results of the reference approach, reflecting the national fuel consumption should be close to the estimates derived using the sectoral approach of the IPCC methodology. That means if the difference is very large, further analysis and recalculations may be necessary.

Importing and exporting data

The software allows for importing and exporting time series data in excel formats (xml). Data can be imported and exported via the time series data entry function on the worksheets. An example of the table produced through the export function is added below.

For conducting the reference approach using the IPCC

	A	B	C	D	E	F	G	H
1	**Generated:**	18/04/2023 10:44:41						
2	**Country:**	Country X						
3	**Sector:**	Energy						
4	**Category:**	Fuel Combustion Activities						
5	**Subcategory:**	1.A.1.a.i - Electricity Generation						
6	**Sheet:**	Fuel Consumption Data						
7	**Parameter:**	Consumption (Mass, Volume or Energy Unit)						
8								
9	**Subdivision**	**Fuel**	**Fuel GUID**	**1990**	**1991**	**1992**	**1993**	**1994**
10	Unspecified	Crude Oil	00000001-0000-0000-0000-000000000000	444	444	260	260	
11	Unspecified	Orimulsion	00000002-0000-0000-0000-000000000000	1410	1410	350	350	300
12	Unspecified	Natural Gas Liquids	00000003-0000-0000-0000-000000000000	3000	3000			
13	Unspecified	Motor Gasoline	00000004-0000-0000-0000-000000000000	233	233			
14	Unspecified	Anthracite	00000017-0000-0000-0000-000000000000	400	400	1200	1200	3000
15	Unspecified	Coking Coal	00000018-0000-0000-0000-000000000000			2200	2200	2000
16	Unspecified	Other Bituminous Coal	00000019-0000-0000-0000-000000000000	3100	3100	3100	3100	3000
17	Unspecified	Sub-Bituminous Coal	0000001a-0000-0000-0000-000000000000	4100	4100	4100	4100	4000
18	Unspecified	Lignite	0000001b-0000-0000-0000-000000000000	15200	15200	5100	5100	5000
19	Unspecified	Oil Shale / Tar Sands	0000001c-0000-0000-0000-000000000000	700	700	580	580	500
20	Unspecified	Brown Coal Briquettes	0000001d-0000-0000-0000-000000000000	610	610	650	650	600
21	Unspecified	Charcoal	0000002e-0000-0000-0000-000000000000					900

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ACCELERATING INDUSTRIES' CLIMATE RESPONSE
SRI LANKA

Accelerating Industries' Climate Response in Sri Lanka Project
Ground Floor, New CSL Building | No. 133, Kinsey Road
Colombo 08, Sri Lanka.
Tel/Fax: +94 112 689 155 Email: aicr-srilanka@unido.org