



GHG Emission
Reduction Impact
Assessment of CRGE
Policies and Actions
within the Energy
Sector in Ethiopia
MRV Capacity
Building

Initiative for Climate Action Transparency - ICAT

GHG Emission Reduction Impact Assessment of CRGE Policies and Actions within the Energy Sector in Ethiopia

MRV Capacity Building

AUTHORS

DerejeKebede

GetnetTesfaye

HilaweLakew

WubishetTadele

Ethio Resource Group (ERG)

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Acronyms and Abbreviations

AfDB	African Development Bank
BAU	Business As Usual
BTR	Biennial Transparency Reports
BUR	Biennial Update Reports
CDM	Clean Development Mechanism
CFL	Compact Fluorescent lamp
CRGE	Climate Resilient Green Economy Strategy
CSA	Central Statistical Agency
DSM	Demand Side Management
EAREP	Electricity Access Rural Expansion Project
EEA	Ethiopian Energy Authority
EEP	Ethiopian Electric Power
EEU	Ethiopian Electric Utility
EFCC	Environment, Forest and Climate Change
EMA	Ethiopian Mapping Agency
ENREP	Electricity Network Reinforcement and Expansion Project
ER	Emission Reduction
EREDPC	Ethiopian Rural Energy Development and Promotion Centre
ES	Ethiopian Standard
ESA	Ethiopian Standards Agency
GEM	Green Economic Modelling
GHG	Greenhouse Gas
GIZ	German Agency for International Cooperation
GMSP	Grid Management Support Program
GOE	Government of Ethiopia
GTP	Growth and Transformation Plan
GWP	Global Warming Potential
ICA	international Consultation and Analysis
ICAT	Initiative for Climate Action Transparency
ICS	Improved Cookstove
IPCC	Intergovernmental Panel on Climate Change
ISO	International Standards Organization
kg	kilogram
kVA	kilo Volt Ampere
kW	kilo Watt
LED	Light Emitting Diode
LUCF	Land Use Change and Forestry
M tCO ₂	Million ton Carbon dioxide
MEPS	Minimum Energy Performance Standard
MFI	Micro Finance Institution
MOA	Ministry of Agriculture
MOH	Ministry of Health
MOTL	Ministry of Transport and Logistics)
MOUID	Ministry of Urban and Infrastructure Development
MOWE	Ministry of Water and Energy
MRV	Measurement, Reporting and Verification
MSW	Municipal Solid Waste
MTF	Multi-Tier Framework

MW	Mega Watt
MWh	Mega Watt Hour
NC	National communications
NDC	Nationally Determined Contributions
NEP	National Electrification Plan
NGO	Non-Governmental Organization
NICS	National Improved Cookstoves (a national program)
NMA	National Meteorological Agency
O&M	Operation and Maintenance
PF	Power Factor
PFC	Power Factor Correction
PV	Photovoltaic
SHS	Solar Home Systems
SL	Solar Lanterns
SNV	Dutch Development Organization
SWDS	Solid Waste Disposal Site
T&D	Transmission and Distribution
tCO ₂ e	Ton Carbon dioxide equivalent
UDP	UNEP-DTU Partnership
UN	United Nations
UNEP-DTU	United Nations Environment Program-Danish Technical University
USD	United States Dollar
W	Watt
WRI	World Resources Institute

1 Introduction

This document is one of the outputs of the work conducted under: GHG emission reduction impact assessment of CRGE policies and actions within the energy sector in Ethiopia; and in supporting the capacity building needs of experts in the line ministries, institutes, and agencies involved in MRV activities in the energy sector.

The overall objective with regard to the energy MRV is "to improve the country's capacity in complying with the international rules on climate action transparency through targeted training for the country's inventory preparation and MRV team for the energy sector.", and the expected output is preparation/compiling of "materials for capacity-building training and a report on the capacity-building activities."

Accordingly, this document outlines major issues and highlights key area where strengthen or build MRV capacity of key staffs of MOWE and EEPA (formerly EEFC¹) in needed; and in particular capacity building needs in defining baseline scenarios, projecting GHG reductions (ex-ante), and estimating ex-post GHG emission reductions of energy sector policy and actions including non-GHG or co-benefits. The training material and on the job training was also aimed at:

- Enhancing staff capacity in identifying required institutional cooperation and coordination and the need for establishing strong institutional linkages to improve the collection of data required for assessing policy and action implementation progress, and
- Inform MOWE and EEPA about the GHG mitigation impacts of the selected CRGE policies and action assessed in the main document², and help MOWE and EEAP identify and prioritise potential GHG mitigation efforts.

Section 2 of the document provides information on the national level MRV institutional set-up established under the Climate Resilient Green Economy (CRGE) framework and the previous and current set-up for climate change MRV at MOWE, as well as, MRV activities conducted, lessons learned in the process and, summarises the key Issues and provides recommendations for establishing/strengthening climate MRV capacity at MOWE.

The third section provides information on the basics of MRV and MRV requirements as applied to developing countries. Section 4 discusses approach and methodology applied in estimating GHG emission reduction of policies and actions, and provides example of application of the approach and methodology adopted in the main document: *GHG Emission Reduction Impact Assessment of CRGE Policies and Actions within the Energy Sector in Ethiopia*.

The background and training material provided in this document is also expected to complement ICAT on-going and future support aimed at enhancing the capacity of MRV experts of MOWE and EEAP on the Enhanced Transparency Framework of the Paris Agreement and the procedures and methodologies required to regularly produce reporting that meets basic quality principles of the UNFCCC reporting guideline

¹Formerly Ministry of Environment Forest and Climate Change (MEFCC)

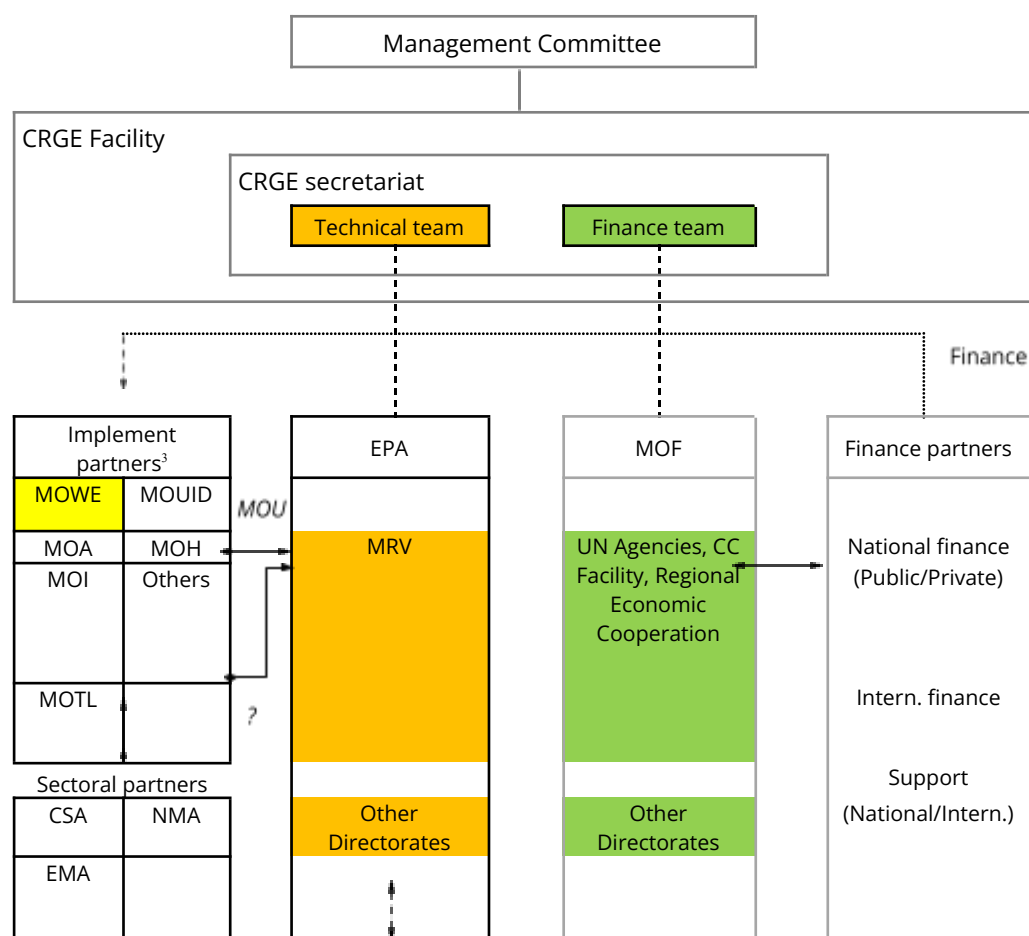
² *GHG Emission Reduction Impact Assessment of CRGE Policies and Actions within the Energy Sector in Ethiopia, October 2022*

2 Institutional set-up for climate MRV in Ethiopia

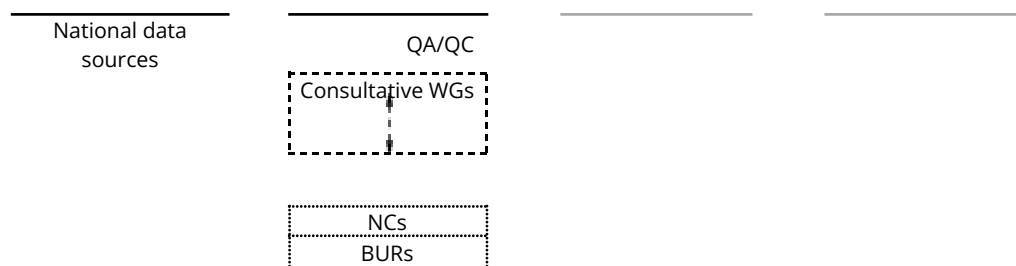
2.1 Institutional set-up for climate MRV at the national level

Ethiopia's climate change mitigation and adaptation policies are contained in its Climate Resilient Green Economy (CRGE) strategy. This strategy, published in 2011, is the basis for Ethiopia's Nationally Determined Contributions (NDC) which was first made in 2015 and updated later in 2021. The CRGE initiative is guided by the government's vision for its economic and social development which is contained in successive five year and ten year plans, the latest of which is Ethiopia's Perspective Plan for 2021-2030.

CRGE activities are managed and implemented under the CRGE facility, which was created in 2015. The facility is overseen by a management committee (composed of state ministers from the relevant ministries) and day to day activities of the facility are undertaken by the CRGE secretariat. The secretariat coordinates the work of two teams: the technical team is under the Ethiopian EPA (EEPA) and is responsible for climate related technical work including climate change data; the finance team is under the Ministry of Finance (MOF) and is responsible for sourcing and disbursing climate finance for the CRGE.



³MOWE (Ministry of Water and Energy), MOA (Ministry of Agriculture), MOI (Ministry of Industry), MOTL (Ministry of Transport and Logistics), MOUID (Ministry of Urban and Infrastructure Development), MOH (Ministry of Health), CSA (Central Statistical Agency), EMA (Ethiopian Mapping Agency), NMA (National Meteorological Agency).



The CRGE secretariat - the national CRGE framework; <https://www.mofed.gov.et/programmes-projects/crge-facility/>

Figure 2.1 CRGE institutional structures

Many of the sector ministries had Directorates that were responsible for coordination and MRV of climate change actions by the sector ministries and agencies reporting to the ministries prior to the recent re-organization of their structure.⁴ Under the new re-organization, however, these climate and environment focused directorates have been relocated at different levels (in some cases answerable to the ministers as previously (which means they coordinate activities for all sub-sectors under that ministry); and in some cases under sub-sector units, as is the case for MOWE where the climate and environment unit is now under the water supply and sanitation sub-sector, which may limit its remit to that sub-sector alone.

The host for consolidation of climate MRV at the national level from all the sector ministries is the EEPA (the Directorate for MRV). The EEPA has signed Memoranda of Understanding (MOUs) with sector ministries to receive GHG mitigation data in 2017. These MOUs between each sector ministry and the MEFCC had the following objectives:⁵

- a) To develop a system of data sharing between both Parties, to support the development of the National Greenhouse Gas Inventory (for UNFCCC reporting obligations namely National Communication (NC) and Biennial Update Report (BUR) and/or national policy purposes).
- b) To commit to work together transparently to generate, provide and compile necessary data on the energy sectors and categories listed below and based on disaggregated activity data list given in the annex for the preparation of timely annual sectoral GHG emission inventory

The MOU further details responsibilities of the EEPA in areas such as managing resources for national GHG inventory, developing work plan for them, creating process and schedules for producing emission estimates, overseeing sector leads that compile reports at sectoral and national levels (NCs, BURs), assist sector experts collect data for their sectors, and assign responsibilities for and manage QA, QC and review processes for data. The EEPA is also responsible for GHG inventory including technical assistance to members of the GHG inventory teams, ensuring funding is available, communication with senior management and establishing work plan for national GHG inventories.

Sector organizations (e.g. MOWE) are responsible to coordinate and manage GHG emission estimates from their sectors. The main responsibilities for the sector agencies include to understand and implement the appropriate GHG assessment methodologies for their sectors

⁴The sources of data for sector ministries include sub-sector institutions (e.g. EEP, EEU for MOWE), regional and Wereda Bureaus (for agriculture and forestry), and the Central Statistical Agency (CSA).

⁵These MOUs were titled: Cooperation in strengthening the national Measuring, Reporting and Verification (MRV) framework for GHG inventory. The MOUs provide the sectors, categories and sub categories for which emission and emission reduction data is to be reported. The activity data that will be required at sector, category and sub category level are provided in an annex to the MOU.

(and categories and sub categories), provide sector specific GHG emission and emission reduction estimates (and where data is not publicly available identify other data providers), work to improve data quality from previous rounds of data collection and review, and perform internal QA/QC and review.

The roles of national data agencies such as the CSA, Ethiopian Mapping Agency (EMA), and the National Meteorological Agency (NMA) in the MRV process are yet to be defined (as far as we can tell). The role of the CSA, particularly, is very important as it is already the source of data for some ministries (e.g. MOA) and may play a critical role in the verification process.

2.2 Institutional set-up for climate change MRV at MOWE

Coordination of climate change activities under MOWE was until recently the responsibility of the *Directorate for Environment and Climate Change*. This directorate was also responsible for the collection, review and submission of climate change mitigation data on behalf of the ministry to the EEPA.

The MOWE had signed an MOU in 2017 with the EEPA to provide climate change mitigation and adaptation data (as all the ministries with climate mitigation activities). The EEPA provided a checklist of climate change data that was to be collected and submitted from each ministry (see Table 2.1 for the contents of this checklist for MOWE). The data requirements in the checklist were aligned with commitments for each ministry in the CRGE document. Data requirements for MOWE include data on climate change activities for both mitigation and adaptation for projects, capacity development activities, and public awareness activities. MOWE created a CRGE consultative forum to do periodic review of climate change activities under all the relevant departments and agencies accountable to it.

The Directorate for climate change and environment at MOWE has provided quarterly and annual reports to the EEPA since 2017 covering some of the issues outlined above. A review of a few of these reports shows, however, that these reports were mainly narrative in form with limited quantitative data related to performance of the emission mitigation actions that were implemented by the ministry and agencies under the ministry.

Table 2.1 Mitigation activities and indicators to be monitored by MOWE⁶

Reduce demand for wood fuels	Distribute Improved cook stoves (ICS) in rural areas	<ul style="list-style-type: none"> ▪ Number of people who have received info on ICS ▪ Number of ICS distributed (by type, size, energy saving rate) ▪ Number of households that have used the ICS (gender disaggregated) ▪ Annual GHG emission reduced due to the ICS ▪ Number of ICS producing cooperatives
	Distribute electric stoves	<ul style="list-style-type: none"> ▪ Number of people who have received info on the efficient electric cook stoves ▪ Number of electric stoves distributed (by type) ▪ Energy saving rate of the electric stoves ▪ Number of households that are using the electric stoves (gender disaggregated) ▪ Annual GHG emission reduced due to the electric stoves

⁶This checklist is for all sector institutions providing indicators for monitoring their CRGE activities; we have extracted indicators that are to be monitored by MOWE. Original list also contains activities on adaptation, research, institutional capacity building for the CRGE (translated from Amharic).

	Distribute LPG stoves	<ul style="list-style-type: none"> Number of people who have received info on LPG stoves Number of LPG stoves distributed in rural areas (by type) Number of LPG stoves distributed in urban areas (by type) Energy saving rate of the LPG stoves Number of households that are using the LPG stoves (gender disaggregated) Annual GHG emission reduced due to the LPG stoves
	Distribute biogas stoves	<ul style="list-style-type: none"> Number of people who have received info on biogas stoves Number of biogas stoves distributed in rural and urban areas (by type) Energy saving rate of the biogas stoves Number of households that are using biogas stoves (gender disaggregated) Annual GHG emission reduced due to the biogas stoves
Promote energy efficient appliances in buildings	Distribute energy efficient lamps for commercial buildings	<ul style="list-style-type: none"> Number of energy saving lamps distributed to residential electricity consumers (compact fluorescent lamps) Number of energy saving lamps distributed to commercial and industrial electricity consumers (high efficiency lamps) Measures undertaken (regulations enacted) to ban import of inefficient lamps

MEFCC (now EEPA), 2016.CRGE activity monitoring check list for sector institutions

2.1.1 Climate change MRV at MOWE after the recent re-structuring

Until the recent re-structuring of MOWE (completed early September 2022), the organization structure of the ministry was as shown below. Under this organization the Directorate for Environment, social and Climate Change reported to the minister and its activities covered all three sub-sectors under the ministry (namely Irrigation and Drainage, Water Supply and Sanitation, and Energy Development).

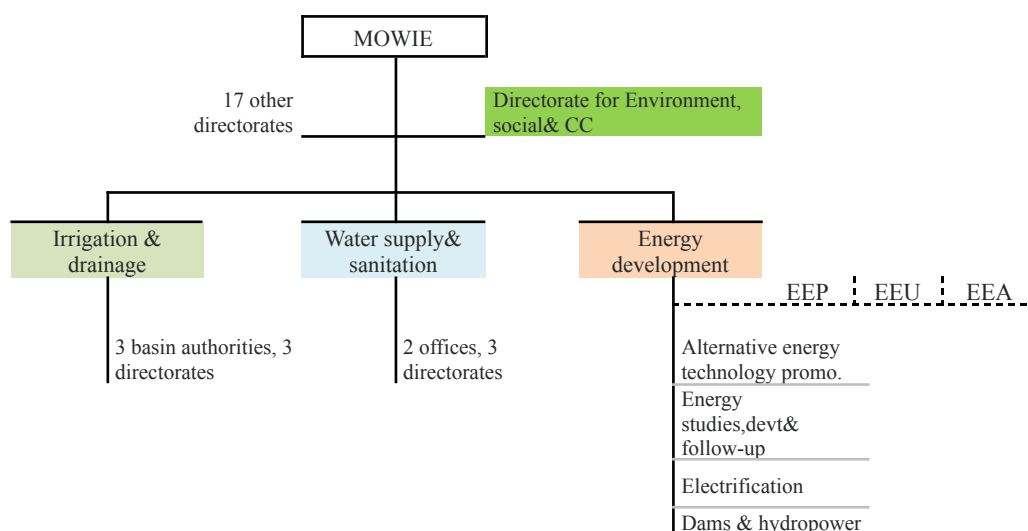


Figure 2.2 The old MOWE organizational structure (only energy related entities shown in detail)

In the new organizational structure for MOWE sector agencies that were formerly accountable to MOWE (EEP, EEU, EEA) are no longer under MOWE. The Directorate for Environment, social and climate change (which was serving both the energy and water sectors) is no longer answerable to the minister and serving all three-sectors but it is now located under the water and sanitation subsector (it is not clear if this unit is to cover the energy sub-sector as well).

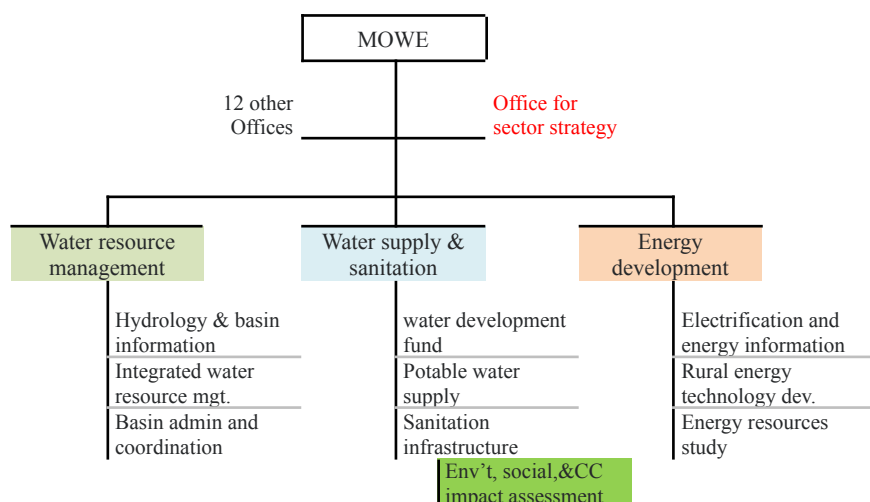


Figure 2.3 The new MOWE organizational structure

2.3 Issues and recommendations for climate MRV at MOWE

In the course of the assessment the issues for climate change MRV at MOWE have been identified and these are presented in this section. The main issues for MRV include the limited mandate and capacity of the climate change unit under the new MOWE organizational structure, placement of energy related climate change mitigation actions under different ministries, lack of program documentation for stated national policies and actions, and limited data flow to the climate unit from sector institutions.

- Placement of the environment, social and climate change impact assessment unit under MOWE: this unit was at a Directorate level serving all sub-sectors within MOWE prior to the recent re-organization of the ministry; it is now a smaller unit under one sub-sector in the ministry (under the Water and Sanitation Office; see Figure 2.3). This relocation of the unit may limit its mandate to address climate change activities under the other subsectors including energy.
 - It is recommended that the ministry reconsider making the unit accountable directly to the minister to serve three subsectors rather than only one. If such relocation is not possible there should be clear understanding that the unit is responsible for coordinating and monitoring climate change (and environment and social) activities for all three subsectors and this should be stipulated among its responsibilities.
- Building the capacity of the environment, social and climate change impact assessment unit: this unit was set up only recently and has a new head and partly new staff. The technical capacity for MRV of climate change activities need to be built within this unit. An initial training will be held as part of this assessment for the energy sector; however, the capacity for MRV for all climate change activities under the ministry should be built into this unit.

- The MRV set-up shall then be designed with the objective of meeting both national and international reporting requirements on tracing policy and actions implementation progress and impacts of climate mitigation policy and actions as are required by UNFCC (and/or specific financing institutions)
- Current and future capacity building for climate change MRV need to be closely linked with the GHG reduction policy and actions included in and implemented within the framework of the updated-NDC. The stringency of MRV requirements may also be dependent on whether the policy and actions monitored are categorized under the “un-conditional (meaning not dependent on external/international technical and financial support)” or is conditional on the provision of technical and financial support from the international community. The latter is expected to require establishment of an effective MRV system.
- Placement of energy sector policies and actions across ministries (instead of only under MOWE): a review of the climate change mitigation policies and actions for the energy sector has shown that the energy sector actions have been implemented at several ministries (not only under MOWE). In some cases responsibilities for one program are shared between two institutions. There is also misalignment of the location of policies even between official government documents – for instance, in the CRGE energy consumed in industry and transport was addressed under the industry and transport sectors whereas in the NDC these are addressed under the energy sector. This makes it difficult to manage and monitor activities.⁷
 - While energy related policies and actions may be implemented by different agencies, there should be clarity for responsibilities for MRV of climate change mitigation for each implementing entity; and there should be mechanisms for data flow from implementers to MOWE.
- Documentation for energy sector programs which have climate change related components: our search for documentation of the policies and actions that were under review for this assessment revealed that several of these policies do not have adequate documentation (documentation for each policy detailing physical activities, financial requirements and disbursement, GHG mitigation estimates, socio-economic benefits; no planning documents and no regular monitoring or evaluation reports).⁸
 - We recommend that for projects where no detailed study is available, MOWE in collaboration with EEPA prepare such documentation following UNFCC requirements for transparency using accepted methodologies such as the GHG Protocol Policy and Action Standard from the WRI.⁹
- Regular collection and documentation of GHG emission and emission reduction data for energy programs: GHG emission and emission reduction data for policies and actions in the energy sector have been collected and documented under this assessment. As discussed in earlier paragraphs data availability has been very limited and what little data that is available could not be fully verified.
 - The climate change unit under MOWE should build on the dataset developed under this assessment, including updating and verifying the datasets. The assessment has also

⁷The ICS program is a good example where ICS development and promotion had been a key action implemented under MOWE for a long time but later transferred to EFCCC after the CRGE then returned back to MOWE after 4 years.

⁸Each policy should have its own implementation document but we have found only one (the investment plan for the ICS program). Such documents should provide details of the policy including MRV.

⁹World Resources Institute (WRI), 2014. GHG Protocol Policy and Action Standard, An accounting and reporting standard or estimating the greenhouse gas effects of policies and actions.

provided the datasets with analytical tools (in EXCEL spread sheets) for emission reduction estimation which the climate change unit can build on.

3 MRV basics¹⁰

MRV under the Convention (UNFCCC): The UNFCCC (2014) publication “Handbook on Measurement, Reporting and Verification for developing country Parties” provided a synthesis of the reporting provisions on climate actions planned and undertaken to mitigate climate change by all developing country Parties to the Convention on climate change. For developing country Parties, the existing MRV framework encompasses submitting national communications every four years and biennial update reports (BURs) every two years, undergoing international consultation and analysis (ICA), setting up domestic MRV of domestically supported nationally appropriate mitigation actions (NAMAs), and undertaking MRV of REDD-plus activities for the purpose of obtaining and receiving results-based incentives.

3.1 MRV as applied to developing countries (non-Annex I Parties)

Measurement

- Applies both to efforts to address climate change and to the impacts of these efforts, including the level of GHG emissions by sources and removals by sinks, emission reductions and other co-benefits. Such measurement occurs at the national level.
- Based on the decisions adopted at COP 16 and 17, non-Annex I Parties now need to measure the specific effects of national mitigation actions as well as the support needed and received, and to provide this information, including a national inventory report, as part of their BURs.
- The methodologies for measurement are not defined by the Convention; therefore, in undertaking measurement Parties rely on methodologies developed externally, including by the Intergovernmental Panel on Climate Change (IPCC) and other organizations, as discussed in more detail below. However, where possible, the COP identifies and endorses the methodologies that Parties should use, at a minimum.

Reporting

- is implemented through the national communications and BURs. Parties are required to report on their actions to address climate change in their national communications, which include information on the GHG inventories, adaptation, mitigation actions and their effects, constraints and gaps, support needed and received, and other information considered relevant to the achievement of the objective of the Convention.
- National communications are to be submitted every four years and prepared following the guidance contained in the revised guidelines for the preparation of national communications from non-Annex I Parties contained in the annex to decision.
- BURs are to be submitted every two years, providing an update of the information presented in national communications, in particular on national GHG inventories, mitigation actions, constraints and gaps, including support needed and received.¹⁶ The first round of submission of BURs is due by December 2014.

Verification

- Is addressed at the international level through ICA of BURs, which is a process to increase the transparency of mitigation actions and their effects, and support needed and received. National communications are not subject to ICA.
- At the national level, verification is implemented through domestic MRV mechanisms to be established by non-Annex I Parties, general guidelines for which were adopted at COP

¹⁰UNFCCC 2014. Handbook on Measurement, Reporting and Verification for developing country Parties.

19 in 2013. Provisions for verification at the domestic level that are part of the domestic MRV framework are to be reported in the BURs. Special provisions have been adopted for verification of REDD plus activities.

3.2 MRV under the Paris Agreement (Enhanced Transparency Framework, ETF)

Parties to the United Nations Framework Convention on Climate Change (UNFCCC) endorsed ambitious goals under the Paris Agreement, including achieving a balance between emissions and removals by the second half of the century, to maintain a chance of holding the average global temperature increase to well below 2°C, and if possible 1.5°C, above preindustrial levels. As part of the efforts to achieve these goals, Parties also agreed to adopt an enhanced transparency framework for action and support with reporting and review requirements and to step up capacity-building efforts. The Paris Agreement notes that the new framework builds from the MRV system put in place under the UNFCCC. In defining how exactly to build on existing processes, countries agreed to the modalities, procedures, and guidelines (MPGs) for the enhanced transparency framework at COP24.

Table A.1, Annex 1 shows the main differences in the reporting requirements under the current transparency system (through NCs and BURs) and under the Paris Agreement (BTRs). As can be noted, the reporting requirements for the BTR have increased significantly compared with those of the NCs and BURs, in terms of both the content and details of the information required and the legal nature of the requirement (“shall” versus “should” versus “may” versus “encouraged”).

The WRI¹¹ 2014 paper summaries the different MRVs related to climate reporting in the following three major types of mitigation-related MRV (Figure 3.1).

- **MRV of GHG emissions:** conducted at national, organizational, and/or facility level to understand an entity’s emissions profile and report it in the form of an emissions inventory.
- **MRV of mitigation actions** (e.g. policies and projects: conducted to assess their GHG effects and sustainable development (non-GHG) effects as well as to monitor their implementation. This type of MRV focuses on estimating the change in GHG emissions or other non-GHG variables.
- **MRV of support** (e.g., climate finance, technology transfer, and capacity building): conducted to track provision and receipt of climate support, monitor results achieved, and assess impact.

¹¹ World Resources Institute (WRI), 2014. MRV 101: Understanding Measurement, Reporting, and Verification of Climate Change Mitigation.

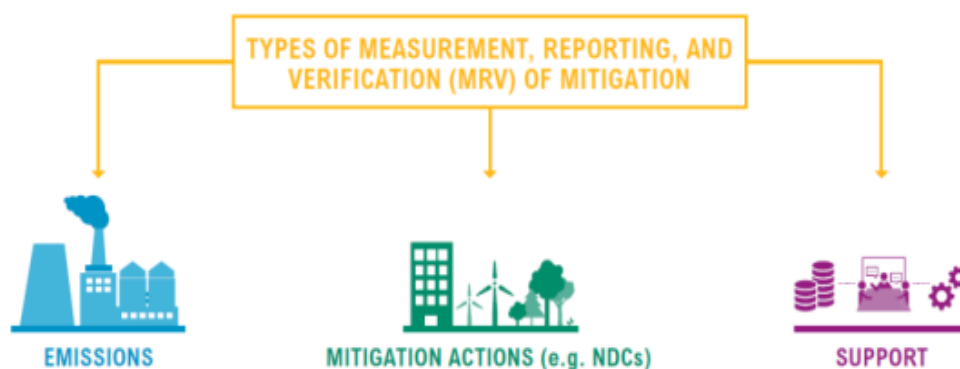


Figure 3-1 Types of MRVs

3.3 Developing/strengthening institutional arrangement to support MRV

The handbook on institutional arrangements to support MRV/transparency of climate action and support (UNFCCC, 2022)¹² provides guidelines on how to establish and strengthen institutions for conducting effective MRV. It suggests that ... “where possible, the development and enhancement of institutional arrangements should be undertaken in parallel with the preparation or updating of climate change strategies (including NDCs) and national reports (such as NCs, BURs and BTRs). Because doing so will ensure that institutional arrangements are developed in the context of needing to produce key outputs and enable stakeholders to be engaged in and focused on producing those outputs” The document also provides the different phases and steps to be taken in establishing institutional arrangements for the transparency system.

¹² (UNFCCC (2022) The handbook on institutional arrangements to support MRV/transparency of climate action and support, Consultative Group on Experts (CGE).

4 Approach and methodology: estimating GHG emission reduction of policies and actions

In estimating the policy and actions outlined in the ToR of the assignment (Figure xx) the study has adopted the methods and approaches outlined in the Policy and Action Standard: An accounting and reporting standard for estimating the greenhouse gas effects of policies and actions.

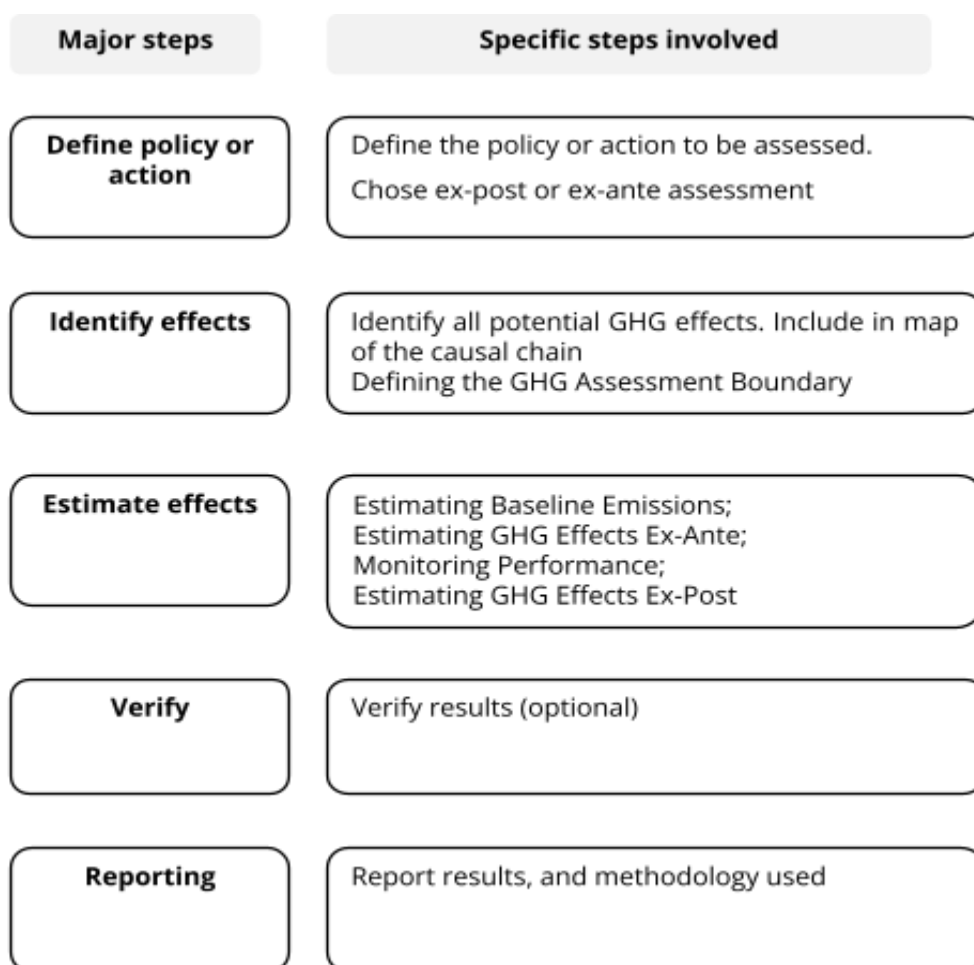


Figure 4-1 Steps in estimating GHG emissions of policy and actions

4.1 Description of steps involved in employing the methodologies for estimating GHG emission reduction

Step 1. Define policy or action and choosing ex-ante or ex-post assessment

Define policy or action: Defining the policy or actions requires providing clear information on the objectives of the policy or action, description of specific interventions, implementing entity

and implementation period, geographic coverage, and other relevant information. A Checklist of information to describe the policy or action assessed is provided in annex.

choosing ex-ante or ex-post assessment: The choice to conduct ex-ante and ex-post or both depend on the status of the policy or action – that is whether the policy or action is planned but not yet implemented – an ex-ante assessment is conducted, and where policy or action is implemented and the objective is to estimate the effects to date, the assessment will be ex-post (or a combination of both ex-ante and ex-post assessment).

Step 2. Identify effects

Both GHG reduction and non-GHG effects/benefits of policy and actions are identified employing a causal map that include inputs activities, intermediate and GHG impacts, And the greenhouse gases associated with the GHG effects. The GHG effects include both increases and decreases in GHG emissions (s well as increases and decreases in GHG removals)-

Step 3. Defining the GHG assessment boundary

The GHG assessment boundary defines the scope of the assessment in terms of the range of GHG effects, sources and sinks, and greenhouse gases included in the assessment. The boundary also specifies the physical or jurisdictional boundary as well as time period over which the identified GHG effects resulting from the policy or action are assessed. In addition, users may separately estimate and report GHG effects over any other time periods that are relevant. (For example, if the GHG assessment period is 2015–40, a user may separately estimate and report GHG effects over the periods 2015–20, 2015–30, and 2015–40).

Step 4. Estimate effects

The effect of a policy or action is estimated against a baseline scenario – which is used as reference that represents what would have happened in the absence of the policy or action being assessed.

The effect is then estimated as the difference between ex-ante estimates of the GHG effects of the policy or action (forward looking), and /or as a difference between ex-post estimates of GHG impact and the baseline scenario. Conducting ex-post assessment requires monitoring the performance of policy or action over the implementation period.

Step 5. Reporting

The GHG Protocol Policy and Action Standard provides a guide as to how report the assessment, and what information shall be publicly reported in order for a GHG assessment report to be in conformance with the Protocol.

Table 4.1 Description of baseline scenario, ex-ante and ex-post assessment

GHG assessment	
Baseline scenario	The baseline scenario represents the events or conditions most likely to occur in the absence of the policy or action being assessed. The baseline scenario is not a historical reference point but is instead an assumption about conditions that would exist over the policy implementation period if the policy or action assessed were not implemented
Ex-ante assessment	The process of estimating expected future GHG effects of a policy or action. Ex-ante assessment can be carried out before or during policy implementation
Ex-post assessment	The process of estimating historical GHG effects of a policy or action. ex-post assessment can be carried out either during or after policy implementation

Table 4.2 Examples of information to be collected in GHG emission reduction policy or action monitoring plan

Indicator or parameter (and unit)	Source of data	Monitoring frequency	Measured, calculated, or estimated (and uncertainty)	Responsible entity
GHG impacts				
CO2e reduced				
New companies and jobs created				
Companies created				
Job created				
Saved energy				

Source: GHG Protocol Policy and Action Standard: An accounting and reporting standard or estimating the greenhouse gas effects of policies and actions. WRI, July 2014. Page 118.

4.2 Application of the methodology to a policy or action

Example Action: Dissemination of Improved Cookstoves

1. Description:

- Development and large-scale dissemination of household ICS both in rural and urban areas has been one of the major priority areas identified in the CRGE strategy document (CRGE 2011)¹³.and based on this strategy document, the MOWE had developed the “Fuelwood-Efficient Stoves Investment Plan for 2011-2015¹⁴ The Investment plan had two phases with the first phase covering the period 2012 to 2015 in which 9 million ICS would be disseminated

2. Potential effects and action boundary

- Reduction in the amount of fuelwood consumed in households who were using inefficient fuelwood/biomass stoves and GHG emissions.
- Lower cost of time and energy expended in collection and transporting of fuelwood (by rural households), and lower cooking and baking cost (for households who purchase fuelwood).
- Other effects include potential reduction of negative health impacts due to lower levels of indoor air pollutants generated when using ICS.
- These effects are considered as in-jurisdiction effects. The NICS program is also expected to contribute to reduction of forest degradation both at local and national levels, however this effect would be difficult to assess (quantify).

¹³FDRE, 2011. Ethiopia’s Climate-Resilient Green Economy Green Economy Strategy.

¹⁴MOWE 2012. Fuelwood-Efficient Stoves Investment Plan, CRGE,

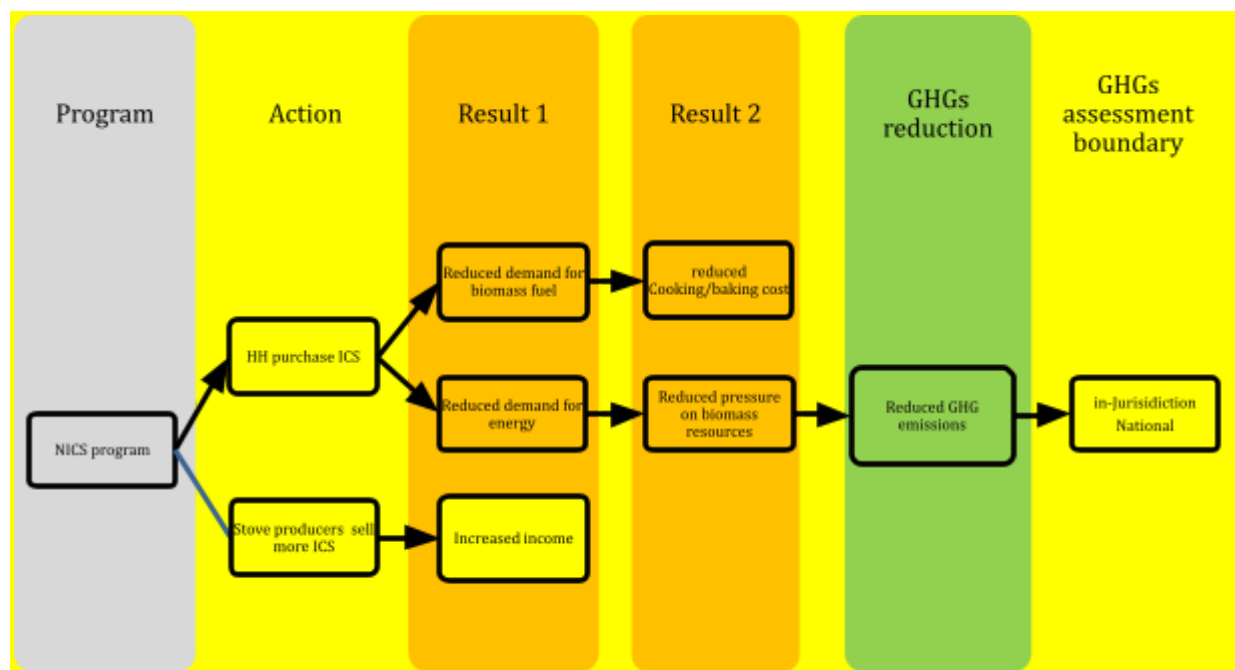


Figure 4.1 Causal chain promotion and use of efficient household biomass cooking stoves

3. Estimating GHG emissions reduction

The total net emission reduction from deployment of ICS to replace inefficient (traditional, baseline stoves) is determined for each project year and for each type of ICS introduced by the project is calculated as the difference between the ex-post baseline and ex-post GHG emissions.

$ERY = \text{Baseline GHG emissions} - \text{Action GHG emissions}$

$\text{Baseline GHG emissions} = N_{b,y} * P_{b,y} * (f_{nb,y} * EF_{b,fuel-CO2} + EF_{b,fuel-non-CO2})^{15}$

$\text{Action GHG emissions} = N_{p,y} * P_{p,y} * (f_{nb,y} * EF_{b,fuel-CO2} + EF_{b,fuel-non-CO2})$

Where:

$N_{p,y}$: Number of project cookstoves of each age group operational in the year y (number)

$P_{p,y}$: Quantity of firewood consumed in year y (ton/hh-y)

$f_{nb,y}$: Fraction of biomass, used in year y for baseline scenario, which can be established as non-renewable.

$EF_{b,fuel,CO2}$: CO2 emission factor of fire wood that is substituted or reduced.

$EF_{b,fuel,non-CO2}$: Non-CO2 emission factor of fire wood that is substituted or reduced

b and p indicates baseline and action/project cases

4.2.1 Key parameters used in defining baseline scenario, and estimating ex-ante and ex-post GHG emissions reductions.

¹⁵A more stringent method for estimating the ERY values may include consideration for loss of efficiency of the ICS over the years as well as usage rates as described in the relevant CDM tools (e.g. AMS.II.G Version 8.0). But as data on these factors may not be available, and also as there will be several factors that influence the use-efficiency of both baseline stoves and ICS, in this analysis these factors are not included.

Table 4.3 **Baseline:** Key parameters used to estimate baseline scenario GHG emissions

Parameter	Baseline value(s) applied over the GHG assessment period	Methodology and assumptions to estimate value(s)	Data source(s)
Efficiency of baseline baking and cooking stove	10%	Laboratory/KPT tests	Studies, EREDPC
Average annual fuelwood consumption per household	2.5 ton/hh-yr ¹⁶	IPCC default and national data	IPCC default and national data
Emission factor of fire wood that is substituted or reduced.	1.747 (t CO ₂ /ton)	Default values	IPCC, 2006
Fraction of biomass, used in year y that is non-renewable	0.76	Calculated according to TOOL30	CDM. ASB0044-2019, Improved Institutional Cookstoves in Ethiopia-Version 01.0.
Non-CO ₂ emission factor of fire wood that is substituted or reduced.	0.46 (t CO ₂ /ton)	Default value	IPCC, 2006

Table 4.4 Ex-ante: Key parameters used to estimate ax-ante GHG emissions

Parameter	Value(s) applied over the ex-post GHG assessment period	Methodology and assumptions to estimate value(s)	Data source(s)
Efficiency of project cooking stove (Mirt and Gonzi)	20 to 25% efficiency	MOWE, lab test laboratory/KPT tests	MOWE (2012).
Emission factor of firewood that is substituted/reduced.	1.747 (tCO ₂ /ton)	Default values	IPCC, 2006
Fraction of biomass, used in year y that is non- renewable	0.76	Calculated according to TOOL30	CDM. ASB0044-2019, Improved Institutional Cookstoves in Ethiopia-Version 01.0.
Non-CO ₂ emission factor of fire wood that is substituted or reduced.	0.46 (tCO ₂ /ton)	Default value	IPCC, 2006

4.2.2 Results: baseline and ex-ante GHG emissions

¹⁶A default value of 0.5 ton/capita per year is also recommended when using AMS II G, Ver 8.0, section 5.4.

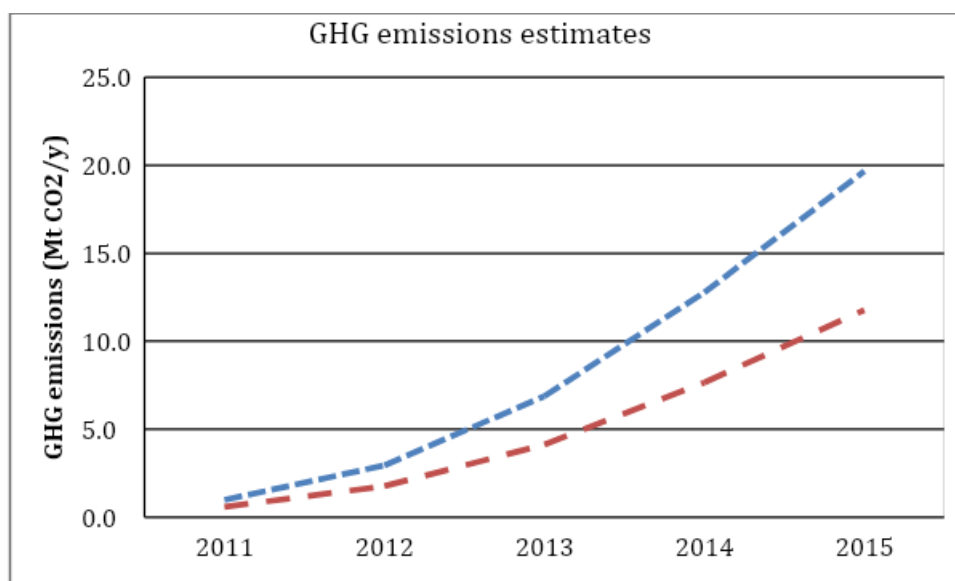


Figure 4-2 Baseline and Ex-ante GHG emission reduction estimates (2011 -2015)

Ex-post GHG emission reduction estimates

Table 4.4 Ex-post: Key parameters used to estimate ex-post GHG emissions

Parameter	Value(s) applied over the ex-post GHG assessment period	Methodology and assumptions to estimate value(s)	Data source(s)
Efficiency of project cooking stove (Mirt and Gonzi)	20 to 25% efficiency	MOWE, lab test laboratory/KPT tests	MOWE (2012).
Emission factor of firewood that is substituted/reduced.	1.747 (tCO ₂ /ton)	Default values	IPCC, 2006
Fraction of biomass, used in year y that is non- renewable	0.76	Calculated according to TOOL30	CDM. ASB0044-2019, Improved Institutional Cookstoves in Ethiopia-Version 01.0.
Non-CO ₂ emission factor of fire wood that is substituted or reduced.	0.46 (tCO ₂ /ton)	Default value	IPCC, 2006

4.2.3 Results. Baseline, ex-ante and ex-post GHG emissions reduction estimates: 2011 – 2015.

The figure below is constructed considering the plan included in the CRGE 2011 plan for dissemination of a total of 9 million ICS. In the figure presented below the results of the initial baseline scenario and ex-ante GHG emission are super imposed on the ex-post baseline and ex-post GHG emissions estimated based on data reported by MoWE on number of ICS disseminated between 2011 to 2015 (the figure also provides ex-post baseline and ex-post GHG emissions is as the data provided by MOWE covers the period until 2020)

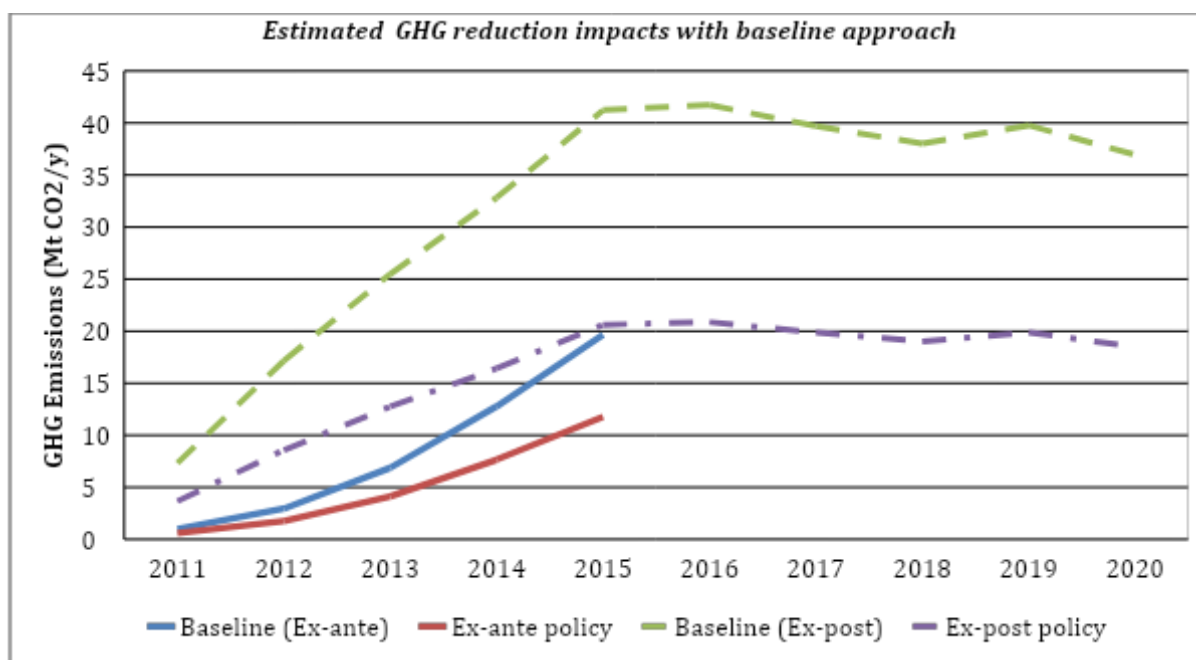


Figure 4.3 Baselines, ex-ante and ex-post GHG emissions: 2011 – 2015

4.3 Co-benefits of measure

- At the national (or regional) level reduced demand for fuelwood implies that less pressure is put on existing resources – that is help reduce forest degradation, and improve local environment,
- At private level – rural households would be spending less time and labor in gathering and transporting fuelwood, and Indoor air pollution is expected to be reduced,
- For rural residents large-scale ICS dissemination programs provide opportunity for employment – as stoves producers and distributors.

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Annex 1 Reporting mandates of non-Annex 1 (developing) countries

Table below illustrates the differences in reporting for non-Annex I Parties/developing country Parties under the existing transparency arrangements—national communications (NCs) and biennial update reports (BURs)—and the new Paris Agreement biennial transparency reports (BTRs). Note that the existing arrangements described in the table apply only to non-Annex I Parties, while the BTR arrangements apply to all Parties to the Paris Agreement (except reporting of support received and needed). The first column generally indicates the information to be provided, and the next three columns note the relevant mandate from the reporting guidelines found in Decision 17/CP.8 for NCs, Decision 2/CP.17 for BURs, and Decision 18/CMA.1 for BTRs. These columns note the relevant paragraph in the guidelines and the legal nature of the mandate (“shall,” “should,” “encouraged,” or “may”).

Source: Dagnet, Y., N. Cogswell, N. Bird, M. Bouyé, and M. Rocha. 2019. “Building Capacity for the Paris Agreement’s Enhanced Transparency Framework: What Can We Learn from Countries’ Experiences and UNFCCC Processes?” Working paper. Washington, DC: Project for Advancing Climate Transparency (PACT). WRI working paper.

Table A.1 Reporting requirements

MAIN INFORMATION REQUIRED	NCS (DECISION 17/CP.8, ANNEX)	BURS (DECISION 2/CP.17 ANNEX III)	BTRS (DECISION 18/CMA.1)
National GHG Inventories			
Institutional arrangements	Encouraged to describe procedures and arrangements undertaken to collect and archive data for the preparation of national GHG inventories, as well as efforts to make this a continuous process, including information on the role of the institutions involved (para. 13).	Same as NCS	Shall report on the following functions related to inventory planning, preparation and management: Its national entity or national focal point with overall responsibility for the national inventory; Its inventory preparation process, including division of specific responsibilities of institutions participating in the inventory preparation to ensure that sufficient activity data collection, choice and development of methods, emission factors and other parameters are in accordance with the IPCC guidelines referred to in chapter II.C.1 below and these modalities, procedures and guidelines; Its archiving of all information for the reported time series, including all disaggregated emission factors and activity data, all documentation about generating and aggregating data, including quality assurance/quality control (QA/QC), review results and planned inventory improvements; Its processes for the official consideration and approval of the inventory (para. 19).

Methodologies	Should use Revised 1996 (para. 8). Encouraged to apply IPCC GPG 2000 (para. 11). Encouraged to provide information on methodologies used,... including a brief explanation of the sources of emission factors and activity data (para. 21).	Should use Revised 1996, IPCC GPG 2000 and IPCC GPG LULUCF 2003 (para. 5).	Shall use 2006 IPCC Guidelines. Encouraged to use the 2013 Wetland Supplement (para. 20). Shall report methods used, including the rationale for the choice of methods, in accordance with good practice elaborated in the IPCC guidelines..., and the descriptions, assumptions, references and sources of information used for the emission factors and activity data used to compile the GHG inventory (para. 39). Shall provide information on the category and gas, and the methodologies, emission factors, and activity data used at the most disaggregated level, to the extent possible, according to the IPCC guidelines (para. 40).
Last reporting year	Shall estimate national GHG inventories for the year 1994 for the initial national communication or alternatively may provide data for the year 1990. For the second national communication, non-Annex I Parties shall estimate national GHG inventories for the year 2000 (para. 7).	Shall cover, at a minimum, the inventory for the calendar year no more than four years prior to the date of the submission... subsequent biennial update reports shall cover a calendar year that does not precede the submission date by more than four years (2/CP.17, para. 41g).	Shall be no more than two years (X-2) prior to the submission of its national inventory report; with flexibility to instead have their latest reporting year as three years (X-3) (para. 58).
Gases	Shall report CO ₂ , CH ₄ and N ₂ O (para. 14). Encouraged to report HFCs, PFCs and SF ₆ (para. 15) and CO, NO _x and NMVOCs (para. 16).	Same as NCs	Shall report CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ and NF ₃ ; with flexibility to instead report at least three gases (CO ₂ , CH ₄ and N ₂ O) as well any of the additional four gases (HFCs, PFCs, SF ₆ and NF ₃) that are included in the Party's NDC, are covered under Article 6, or have been previously reported (para. 48). Shall report actual emissions of HFCs, PFCs, SF ₆ and NF ₃ , providing disaggregated data by chemical (e.g., HFC-134a) (para. 49). Should report CO, NO _x , and NMVOCs (para. 51).
Key categories	Encouraged, to the extent possible, to undertake any key source analysis as indicated in the IPCC good practice (para. 12).	Same as NCs	Shall describe the key categories, including information on the approach used for their identification, and information on the level of disaggregation used (para. 41). Shall report the individual and cumulative percentage contributions from key categories, for both level and trend, consistent with the IPCC guidelines (para. 42).
Mitigation Actions/Information Necessary to Track Progress			
Scope	Shall...provide to the COP information on the general descriptions of	Should provide information, in a tabular format, on	Shall provide a description of its NDC under Article 4, against which progress will be tracked (para. 64).

	steps taken or envisaged for formulating, implementing, publishing and regularly updating national and, where appropriate, regional programmes containing measures to mitigate climate change (para. 37).	actions to mitigate climate change (para. 11).	Shall provide information on actions, policies and measures that support the implementation and achievement of its NDC (para. 80).
Methods	Encouraged to use whatever methods are available and appropriate in order to formulate and prioritize programs containing measures to mitigate climate change; this should be done within the framework of sustainable development objectives, which should include social, economic and environmental factors (para. 38).	No requirement	Shall identify the indicator(s) that it has selected to track progress towards the implementation and achievement of its NDC (para. 65). For the first NDC... shall clearly indicate and report its accounting approach, including how it is consistent with Article 4, paragraphs 13 and 14, of the Paris Agreement (para. 71). For the second and subsequent NDC...shall provide information...consistent with the decision (para. 72). Shall provide a description of each methodology and/or accounting approach used (paras. 74–76). Shall provide the information...in a structured summary to track progress made in implementing and achieving its NDC (para. 77).
Level of detail	Encouraged to provide, to the extent their capacities allow, information on programmes and measures implemented or planned which contribute to mitigating climate change... including, as appropriate, relevant information by key sectors on methodologies, scenarios, results, measures and institutional arrangements (para. 40).	Shall provide the following information to the extent possible: (a) Name and description of the mitigation action, including information on the nature of the action, coverage (i.e., sectors and gases), quantitative goals and progress indicators; (b) Information on methodologies and assumptions; (c) Objectives of the action and steps taken or envisaged to achieve that action; (d) Information on the progress of implementation of the mitigation actions and the underlying steps taken or envisaged, and the results achieved, such	Shall provide the following information on its actions, policies and measures, to the extent possible, in a tabular format: (a) Name; (b) Description; (c) Objectives; (d) Type of instrument (regulatory, economic instrument or other); (e) Status (planned, adopted or implemented); (f) Sector(s) affected (energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other); (g) Gases affected; (h) Start year of implementation; (i) Implementing entity or entities (para. 82). May also provide the following information for each action, policy and measure reported: (a) Costs; (b) Non-GHG mitigation benefits; (c) How the mitigation actions...interact with each other, as appropriate (para. 83). Shall provide, to the extent possible, estimates of expected and achieved GHG emissions reductions for its actions, policies and measures in the tabular format; with flexibility instead to encourage the reporting (para. 85).

		as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible; (e) Information on international market mechanisms (para. 12).	
Projections	No requirement	Same as NCs	Shall report projections, with flexibility instead to encourage the reporting (para. 92).
Finance, Technology, Capacity-Building Support Needs and Support Received			
National circumstances	No requirement	No requirement	Should provide information on national circumstances and institutional arrangements relevant to reporting on support needed and received, including: (a) A description of the systems and processes used to identify, track and report support needed and received, including a description of the challenges and limitations; (b) Information on country priorities and strategies and on any aspects of the Party's NDC under Article 4 of the Paris Agreement that need support (para. 130).
Assumptions, definitions, methodologies	No requirement	No requirement	Should describe the underlying assumptions, definitions and methodologies used to provide information on support needed and received (para. 131).
Financial support needs	Should describe...proposed and/or implemented activities for overcoming the gaps and constraints (para. 49).	Should provide updated information on constraints and gaps, and related financial, technical and capacity-building needs (para. 14).	Should provide textual information to the extent possible, and as available and as applicable: (a) Sectors for which the Party wishes to attract international finance, including existing barriers to attracting international finance; (b) Description of how the support will contribute to its NDC and to the long-term goals of the Paris Agreement (para. 132). Should provide in a tabular format...(para. 133).
Financial support received	Should also provide information on financial resources and technical support provided...(para. 51).	Should also provide updated information on financial resources, technology transfer, capacity-building and technical support received...(para. 15).	Should provide in a tabular format...(para. 134).
Technology support needs	Encouraged to provide information on country-specific	Should provide information on technology needs, which must be	Should provide textual information to the extent possible, and as available and as applicable: (a) Plans, needs and priorities related to technology development and

	technology needs (para. 54).	nationally determined (para. 16).	transfer, including those identified in Technology Needs Assessments, where applicable; (b) Technology development and transfer related needs for the enhancement of endogenous capacities and technologies (para. 135). Should provide in a tabular format... (para. 136).
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Annex 2 Organizational structure of MOWE

The new MOWE organizational structure (August 2022)

