

Final Report



ICAT

Initiative for
Climate Action
Transparency

Initiative for Climate Action Transparency – ICAT –

Final Report

Deliverable: 4

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Acronyms and abbreviations

BUR	Biennial Update Report
CO ₂ e	Carbon dioxide equivalent
DCC	Department of Climate Change
ETF	Enhanced Transparency Framework
GHG	Greenhouse gas
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
MARD	Ministry of Agriculture and Rural Development of Viet Nam
MOIT	Ministry of Industry and Trade of Viet Nam
MONRE	Ministry of Natural Resources and Environment of Viet Nam
MPG	Modalities, procedures and guidelines
MPI	Ministry of Planning and Investment of Viet Nam
MRV	Measurement, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Action
NC	National Communication
NDC	Nationally Determined Contribution
UNFCCC	United Nations Framework Convention on Climate Change

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1. Background

The Viet Nam's INDC includes a greenhouse gas (GHG) mitigation component and an adaptation component. The mitigation component identifies the roadmap for GHG mitigation in the period 2021-2030 for the following sectors: energy; agriculture; land use, land-use change and forestry (LULUCF); and waste. Since the submission of the INDC, Viet Nam has developed and issued several important policy documents on climate change response at the national level, such as Viet Nam's Renewable Energy Development Strategy to 2030, with a vision to 2050 (2015); the Revised National Power Development Plan (PDP) for 2011-2020 with a vision to 2030 (revised PDP VII) (2016); Plan for Implementation of the Paris Agreement (PIPA) (2016); the National Action Plan for Implementation of the 2030 Agenda for Sustainable Development (2017); the Target Programme for Climate Change Response and Green Growth (GG) for the period 2016-2020 (2017); the Resolution of the Politburo of the Central Committee of the Communist Party of Viet Nam on the orientation of Viet Nam's National Energy Development Strategy to 2030, with a vision to 2045 (2020);

After the Paris Agreement (PA) was ratified by the Parties and entered into force, the Parties' INDCs became the Nationally Determined Contributions (NDCs). According to Vietnam's updated NDC (2020), Vietnam with domestic resources, by 2030 Viet Nam will have mitigated GHG emissions by 9% compared to the BAU scenario. This contribution can increase by up to 27% with international support through bilateral and multilateral cooperation and implementation of new mechanisms in the Paris Agreement.

Viet Nam's response to climate change is viewed in context of sustainable development to promote socio-economic benefits and to avoid or mitigate negative impacts of policies and actions. Though a national GHG inventory system is established by Prime Minister decision, it is not yet working properly. For instance, GHG impact assessments have been carried out by some experts, but methodologies, models and tools are not used consistently across groups of experts in various ministries. Communication and sharing of data across sectors and between sub-sectors in agriculture and energy can be improved. To archive Vietnam's NDC targets, tracking progress of NDC implementation under the Enhanced Transparency Framework (ETF) of the PA plays an important role while there was no support from partners such CBIT, GIZ on it.

In the PA on climate change, Article 6 allows Parties to cooperate in implementing their NDCs for the mitigation of GHG emissions. This means that mitigation outcomes can be transferred between countries through cooperative approaches or market mechanisms. As an active country making efforts to cope with climate change, the Government of Vietnam needs to undertake the necessary work to be prepared to cooperate under Article 6 of the PA. In July 2020, the Asian Development Bank (ADB) submitted to the Government of Vietnam a cooperation project with regard to the preparation for implementing the Article 6 in Vietnam. The overall objective of the ADB project is to

research, propose policies and strengthen the capacity of stakeholders in establishing a framework for participation in Article 6 of the PA, including pilot activities.

On this background, the Initiative for Climate Action Transparency (ICAT) project was carried out in Vietnam focusing on agriculture and energy sectors with the goal to support Vietnam's efforts to establish a domestic Measurement, Reporting and Verifiable (MRV)/transparency system for implementation of the ETF of the PA for the mentioned above sectors. In addition to this, and as part of the efforts undertaken by Viet Nam to get prepared to cooperate with other countries under Article 6 of the PA, the ICAT project also included two studies on key elements of Article 6: baseline setting and international transferred mitigation outcomes (ITMOs) accounting.

2. Project objectives

The overall objective of this project is to support the implementation of Viet Nam's domestic MRV/transparency system through capacity building program, training on MRV/transparency concepts, methods and tools, including iterative testing and application of the ICAT Series of Assessment Guides, continued observation of future UNFCCC transparency requirements and development of a road map to sustain ICAT outcomes. This project also pursues the exploration of some relevant instruments and elements that may contribute to Viet Nam's efforts to get prepared to cooperate with other countries under Article 6.

The following specific objectives of the ICAT project in Vietnam are:

- (1) Objective 1: Needs and gap assessment for MRV/transparency in the energy and agriculture sectors incl. synergies with CBIT, GIZ and other support initiatives as needed
- (2) Objective 2: Impact assessment of selected policies and actions for tracking progress of NDC implementation using ICAT methodologies
- (3) Objective 3: Institutional arrangements and capacity developed for interlinked data management of GHG and SD impacts and tracking progress of NDC implementation
- (4) Objective 4: Establishment of “dynamic baseline” for a selected subsector to learn and test how to reflect higher NDC mitigation ambition as the basis for attracting result-based carbon finance and establishment of adequate accounting system for effective implementation of the next NDC
- (5) Objective 5: Present and share ICAT results in a final national workshop

Of which, the objective 4 was developed during the agreement extension.

3. Expected Outcomes

Following the above specific objectives, the expected outcomes are:

- (1) **Deliverable #D1:** Synthesis report covering mapping of ongoing CB initiatives for

MRV/transparency and needs and gap assessment in the energy and agriculture sectors incl. synergies with CBIT and other support providers

- (2) **Deliverable #D2.1:** Interim results of applying the GACMO model presented in national workshop
- (3) **Deliverable #D2.2:** Report on the impact assessment results and a table including relevant indicators for NDC tracking of progress in the energy sector
- (4) **Deliverable #D2.3:** Report on the impact assessment results and a table including relevant indicators for NDC tracking of progress in the agriculture sector
- (5) **Deliverable #D3:** Report on institutional arrangements incl. scheme/demo of data management system
- (6) **Deliverable #D3.1** Report on 'dynamic baseline' of selected action (e.g. demonstration of ambition raising of E.17 on solar PV) integrated with sectoral MRV system in line with §77d of the ETF to attract results-based carbon finance for NDC ambition raising
- (7) **Deliverable #D3.2** Report with table formats on how ITMO's are accounted when tracking progress of NDC implementation informed by the solar PV case study in D#3.1.
- (8) **Deliverable #D4:** National workshop and final report

Table 1. Project activities description

Activity	Output	Description
1.1	1	Mapping of ongoing and past initiatives relevant to Viet Nam's MRV/transparency system at national and sectoral levels focusing on the energy and agriculture sectors. Literature review
1.2		Needs and gaps analysis based on the mapping of ongoing and past initiatives. Consultation with key partners (MONRE, MOIT, MARD, CBIT, ADB, GIZ + others)
2.1	2	Apply the GACMO model to assessment of mitigation potential by sector for NDC implementation (scope of the assessment TBD, avoid duplication of similar work by GIZ)
2.2		Energy sector: Select an NDC policy or action of high priority for GHG and SD impacts based on the needs and gap assessment, in consultation and agreement with MONRE
2.3		Energy sector: Apply the relevant ICAT or other tools and methodologies (e.g. GACMO) for tailor made impact assessment to meet the sector specific needs for tracking progress of NDC implementation

2.4		Energy sector: Identify indicators to track progress of NDC implementation for the energy sector as required in the ETF Katowice decision and subsequent decisions based on the pilot case of the selected NDC policy or action, in consultation and agreement with MONRE
2.5		Agriculture sector: Select an NDC policy or action of high priority for GHG and SD impacts based on the needs and gap assessment, in consultation and agreement with MONRE
2.6		Agriculture sector: Apply the relevant ICAT or other tools and methodologies (e.g. GACMO) for tailor made impact assessment to meet the sector specific needs for tracking progress of NDC implementation
2.7		Agriculture sector: Identify indicators to track progress of NDC implementation for the agriculture sector as required in the ETF Katowice decision and subsequent decisions based on the pilot case of the selected NDC policy or action, in consultation and agreement with MONRE
3.1	3	Support MONRE, MOIT and MARD to establish the entity responsible for greenhouse gas inventory and sustainable development evaluation of policies and actions for tracking progress of NDC implementation
3.2		Consult with relevant stakeholders and support initiatives (CBIT, ADB, GIZ and others) in the energy and agriculture sectors to streamline and strengthen the data collection and management by the entity identified in A3.1
3.3		Report to present results on application of the 'dynamic baseline' approach to a selected action (e.g. demonstration of ambition raising of E.17 on solar PV or an EE action, TBD) integrated with sectoral MRV system in line with the ETF
3.4		Report with tables on how ITMO's are accounted when tracking progress of NDC implementation
4.1	4	Evaluate the ICAT work, present the main outputs and outcomes, identify which barriers and gaps (from the initial assessment) were beyond the scope of ICAT and develop a roadmap to address outstanding issues in the future
4.2		Final national workshop to present and discuss evaluation findings and discuss next steps ensure the sustainability of ICAT outcomes

Note: 3.3 and 3.4 are the Deliverables planned for the agreement extension.

4. Project duration

The project was signed in October 2019 between UNEP DTU Partnership (now UNEP Copenhagen Climate Centre) and the Center for Ozone Layer Protection and Low Carbon Economy Development (CCOZONE) with the expectation that the project will be finished in June 2021. The original outcomes were #D1, #D2.1, #D2.2, #D2.3, #D3 and #D4. During the project, UNEP DTU Partnership became the UNEP Copenhagen Climate Centre. At the end of the 2021, the project was extended with two more activities related to Article 6: an study on the dynamic baseline concept applied to solar PV and ITMO accounting. With this extension, the project has been continued to the end of September 2022.



5. Workplan of the project

Table 2. The original workplan

Activities/ Deliverables	Description	Leading	Delivery date
1	Output 1: Needs and gap assessment of MRV/transparency in the energy and AFOLU sectors incl. synergies with CBIT and other support initiatives		
A1.1	Mapping of ongoing and past initiatives relevant to Viet Nam's MRV/transparency system at national and sectoral levels focusing on the energy and agriculture sectors. Literature review	CCOZONE	
A1.2	Needs and gaps analysis based on the mapping of ongoing and past initiatives. Consultation with key partners (CCOZONE, MOIT, MARD, CBIT, ADB, GIZ + others)	CCOZONE	
D1	Report on the synthesis of A1 and A2	CCOZONE	2/2020
2	Output 2: Impact assessment of selected policies and actions for tracking progress of NDC implementation using ICAT methodologies		

A2.1	Apply the GACMO model to assessment of mitigation potential by sector for NDC implementation (scope of the assessment TBD, avoid duplication of similar work by GIZ)	CCOZONE	
D2.1	Interim results of applying the GACMO model presented in national workshop	CCOZONE	3/2020
	Energy sector (MOIT):		
A2.2	Select an NDC policy or action of high priority for GHG and SD impacts based on the needs and gap assessment, in consultation and agreement with MONRE	MOIT	
A2.3	Apply the relevant ICAT or other tools and methodologies (e.g. GACMO) for tailor made impact assessment to meet the sector specific needs for tracking progress of NDC implementation	MOIT	
A2.4	Identify indicators to track progress of NDC implementation for the energy sector as required in the ETF Katowice decision and subsequent decisions based on the pilot case of the selected NDC policy or action, in consultation and agreement with MONRE	MOIT	
D2.2	Report on the impact assessment results + a table including relevant indicators for NDC tracking of progress in the energy sector	MOIT	9/2020
	Agriculture sector (MARD):		
A2.5	Select an NDC policy or action of high priority for GHG and SD impacts based on the needs and gap assessment, in consultation and agreement with CCOZONE	MARD	
A2.6	Apply the relevant ICAT or other tools and methodologies (e.g. GACMO) for tailor made impact assessment to meet the sector specific needs for tracking progress of NDC implementation	MARD	
A2.7	Identify indicators to track progress of NDC implementation for the agriculture sector as required in the ETF Katowice decision and subsequent decision based on the pilot case of the selected NDC policy or action, in consultation and agreement with CCOZONE	MARD	
D2.3	Report on the impact assessment results + a table including relevant indicators for NDC tracking of progress in the agriculture sector	MARD	9/2020
3	Output 3: Institutional arrangements and capacity developed for interlinked data management of GHG and SD impacts and tracking progress of NDC implementation		
A3.1	Support MONRE, MOIT and MARD to establish the entity responsible for greenhouse gas inventory and sustainable development evaluation of policies and actions for tracking progress of NDC implementation	CCOZONE	
A3.2	Consult with relevant stakeholders and support initiatives (CBIT, ADB, GIZ and others) in the energy and agriculture sectors to streamline and strengthen the data collection and management by the entity identified in A3.1	CCOZONE	

D3	Report on institutional arrangement + scheme/demo of data management system	CCOZONE	4/2021
4	Output 4: Final national workshop to present and share ICAT results		
A4.1	Evaluate the ICAT work, present the main outputs and outcomes, identify which barriers and gaps (from the initial assessment) were beyond the scope of ICAT and develop a roadmap to address outstanding issues in the future	CCOZONE	
A4.2	Final national workshop to present and discuss evaluation findings and discuss next steps ensure the sustainability of ICAT outcomes	CCOZONE	
D4	National workshop and final report	CCOZONE	6/2021

Table 3. The added activities following extension agreement

Activities/ Deliverables	Description	Leading	Delivery date
A3.3	Study the concept of 'dynamic baseline' as presented in the research literature and develop a case study design to apply the concept to the sub-sector of renewable energy as described in the first updated NDC 2020 of Vietnam (e.g. using solar-PV as case)	CCOZONE	
A3.4	Calculate the mitigation outcome of different scenarios for applying the dynamic baseline concept the the solar PV case study and reflect on pros and cons for how this approach can help attract private sector carbon finance to Vietnam for enhanced ambition of Vietnam's NDC in the sub-sector of RE	CCOZONE	
D3.1	Report on establishment of 'dynamic baseline' for the selected action	CCOZONE	2/2022
A3.5	Propose and consult with relevant stakeholders for how ITMO's are accounted when tracking progress of NDC implementation	CCOZONE	
D3.2	Report on the accounting system for ITMOs in NDCs		4/2022

6. Project results

Ozone Layer Protection and Low Carbon Economy Development Center (CCOZONE) is the unit in charge of the project. The expected outcomes of the project have been completed with the coordination of the units: Energy Efficiency and Sustainable Development Department, MOIT (perform work related to using GACMO model for energy sector) and Institute for Agriculture Environment, MARD (perform work related to using GACMO model for agriculture sector).

The project's reports have been sent to ICAT and uploaded to the site <https://climateactiontransparency.org/country/viet-nam/>. The main results of the project are presented in this report in brief form and if needed, can be accessed at the link above.

6.1. Institutional arrangement

6.1.1. Institutional arrangement of national GHG inventory

a. Status

At the time of this project, organizing the implementation of national GHG inventories is done through the National System of GHG inventories as stipulated in Decision No. 2359/QD-TTg December 22, 2015 of the Prime Minister (Decision):

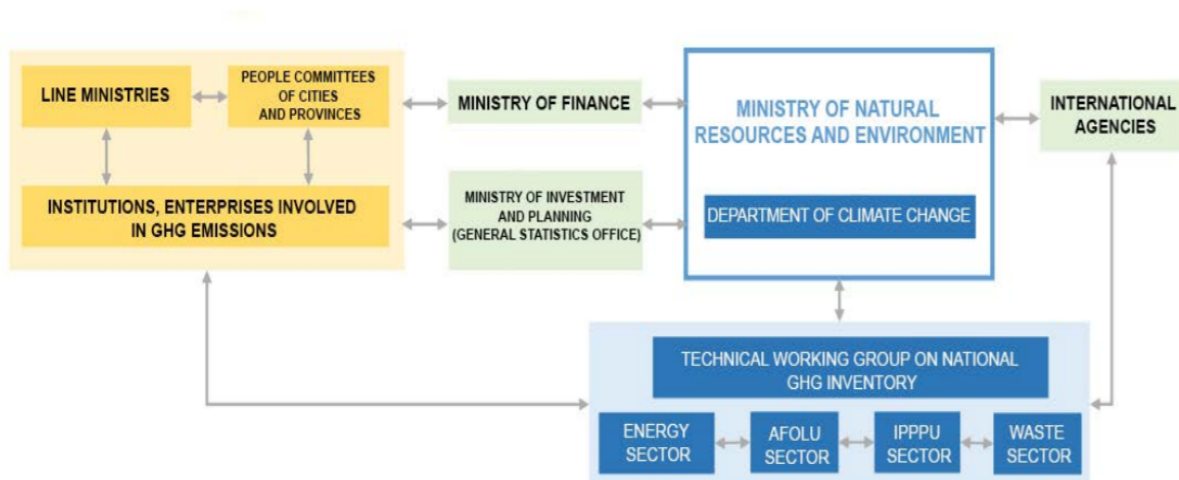


Figure 1. Institutional arrangement of national GHG inventory system in BUR3

Source: MONRE, 2021

The system has been implemented since 2016, focusing on reviewing and supplementing policies and documents related to greenhouse gas inventory. The period after 2020 is the period of completing the national system of greenhouse gas inventory. Greenhouse gas emissions management and monitoring will be strengthened. Gas emissions inventory will be made every two years to develop the National Communication and BUR/BTR based on national funding and funding support from foreign organizations.

b. Shortcomings

- The decision does not have enough legal basis for ministries to collect sector-level data;
- The decision does not have regulations on handling violations for non-compliance, leading to the low effectiveness of the Decision;

- The national and sectoral statistical system does not provide enough data to meet and use for national greenhouse gas inventories;
- The current management model of Viet Nam's national GHG inventory system is centralized: relevant ministries, provincial/municipal committees, organizations and businesses provide operational data for GSO of the Ministry of Planning and Investment. GSO synthesizes and QA/QC data before sending it to MONRE, however, the data collection systems at the sectoral and subnational levels have not been fully established and/or operationalized so most of the data are still being collected by consultants;
- Most of the emission factors/parameters are using the IPCC default coefficient;
- The QA/QC process has not been detailed and strictly implemented;
- Domestic financial resources are still limited; Most GHG inventory activities are carried out under programs and projects, and are funded by international organizations;
- The capacity of domestic inventory experts and the number of experts available for inventory are limited.

c. Recommendation

- Revise Decision 2359/QĐ-TTg to accommodate method changes from 1996 revised IPCC Guidelines to 2006 IPCC Guidelines and 2019 Improvement;
- Improve the legal basis of the national greenhouse gas inventory system by introducing a higher regulatory framework such as a decree, such as a Government Decree on the Roadmap and Measures to reduce GHG emissions under The Law on Environmental Protection, or the document under the Statistics Law, from which relevant ministries can develop guidance for data collection at the sector level;
- Add enforcement terms such as inspecting, urging, collecting data, inspecting parties especially large emission facilities. Handling cases of non-compliance with the proposed Decree;
- Ministries and branches need to update and complete Circulars and instructions to ensure the collection of necessary data for inventory;

- Define a bottom-up approach to data collection applying Tier 3 to major categories;
- The Ministry of Natural Resources and Environment should develop and apply QC procedures in accordance with the QA/QC plan according to the guidance of IPCC;
- Identify a computational methodology to collect data on additional subsectors and additional GHGs and related organizations. Appoint staff in charge and provide additional training to these staff to perform data collection on additional sub-sectors and GHGs in accordance with the 2006 IPCC Guidelines and 2019 Refinement;
- Propose an estimated budget for related improvements that can be afforded by the State budget (e.g. legal/institutional/procedural arrangements, human resources) for MOF to approve. Provides additional training on 2006 IPCC Inventory Guides and 2019 2019 Refinement and how to use the IPCC Inventory Software;
- Strengthen international cooperation to attract financial resources for related improvements that cannot be paid by the State budget (e.g. technical capacity, infrastructure);
- MONRE needs to develop a data collection tool to collect additional subsectors and additional GHGs as required by IPCC 2006.

Recently, the Decree No. 06/2022 on greenhouse gas emission reduction and ozone layer protection was approved in 2022, which also mentioned national inventory system (Article 11) with more detail on responsibilities of relevant stakeholders and its reporting pathway. Following this Article, MONRE is a national focal point of GHG inventory which has responsibility of;

- Organize and lead national GHG inventory; determine period of inventory both sectors and facilities level to ensure consistency.
- Dissemination national and sectoral inventory methods following guidelines of IPCC
- Cooperation with line of ministries to announce inventory at entities level
- Publish list of emission factors
- QA/QC at national inventory, guide to verify outputs of inventory at sectoral level, define process of verification of GHG inventory output at entities level.
- Develop and operate online database of GHG inventory, update active data, outputs of inventor and other relevant information into national database of climate change.

Responsibilities of line of ministries

- Organize implementation of GHG inventory at sector level and report following requirement of national GHG inventory.
- Guide to do GHG inventory at entities level
- Compliance check with regulations on greenhouse gas inventory
- Provide additional active data, information for national GHG inventory following requirement of MONRE
- Develop and operate online database of GHG inventory of managed sectors

Responsibility of entities

- Provide active data, relevant information
- Implement GHG inventory at entity level, biennial report to MONRE

6.1.2. Institutional arrangement of GHG emission mitigation activities

a. Status

At the time of this project, the Decision No. 2053/QĐ-TTg October 28, 2016 of the Prime Minister had approved the Plan for the implementation of the Paris Agreement outlines and established the tasks to be implemented for the 2016-2020 period, in which the MRV system for GHG emission mitigation as describe in the figure below was one of the key tasks of the period 2018-2020.

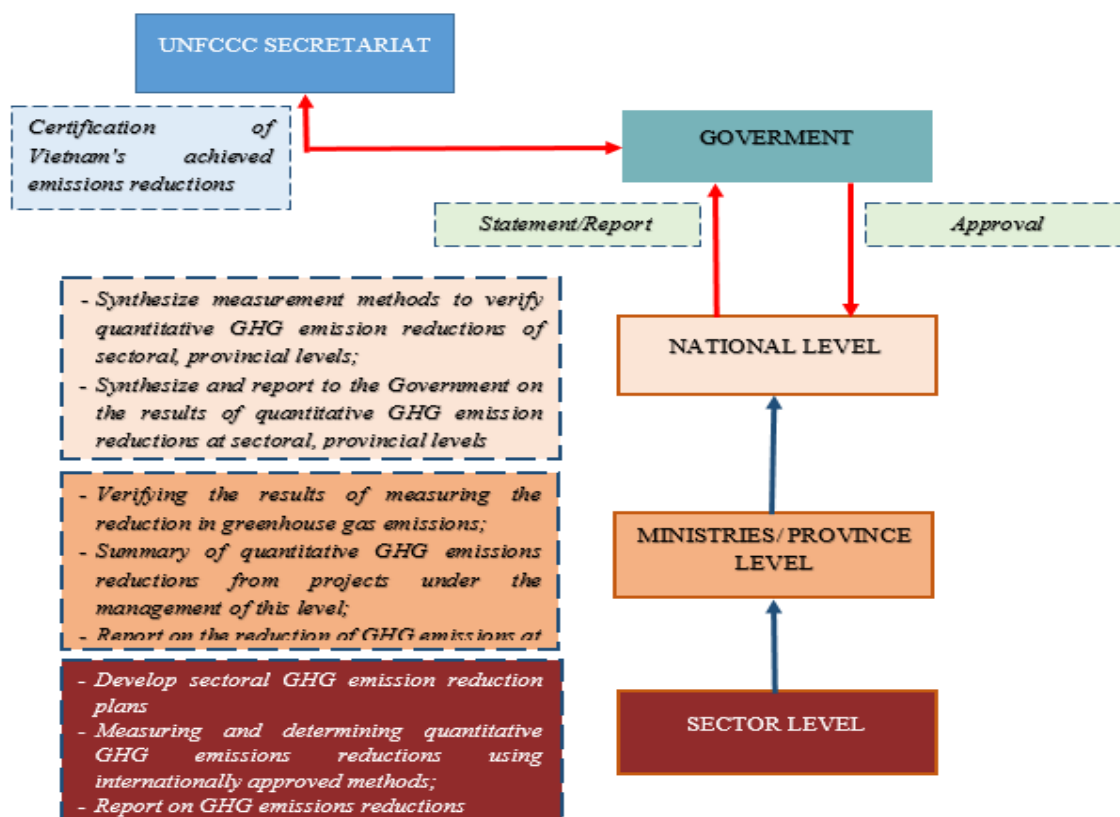


Figure 2. Measurement, reporting and verification (MRV) system for GHG emissions mitigation

Source: updated NDC, 2020

b. Gaps in the MRV system for mitigation actions

Although there have been many efforts in implementing GHG emission mitigation activities, there are still many difficulties and challenges for the MRV system for mitigation activities such as:

- There is no decentralization of management of the MRV system for greenhouse gas emission mitigation activities and there is no decentralization between the central and local levels;
- The responsibility has not been linked with powers to ensure the consistency from central to local;
- The system of measurement, reporting and verification (MRV) has not been established at all levels;
- Skilled and technical human resources are still not enough.

c. Updated institutional arrangement of the national MRV system

- o The Law on Environmental Protection was ratified in 2020 led process of measurement, reporting and verification as the following chart:

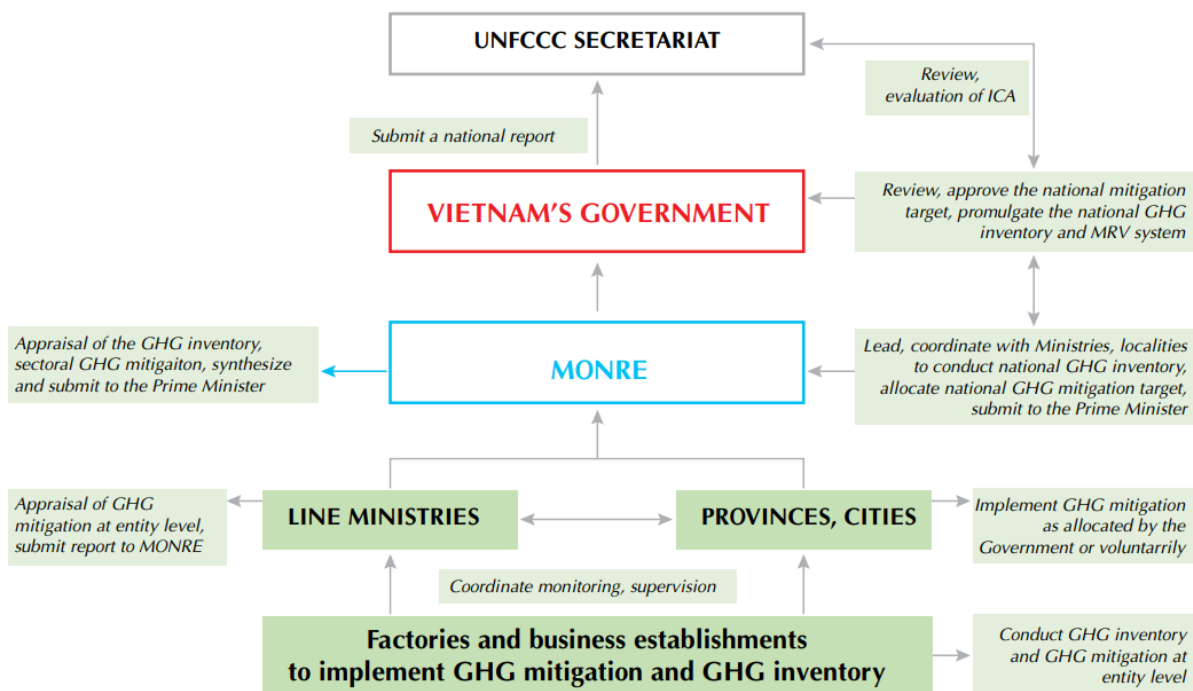


Figure 3. Updated institutional arrangement of the national MRV system

Roles and responsibilities of relevant agencies and organisations:

- MONRE is the national focal point of the national MRV system.
- MOIT, MOT, MOC, MARD, and MONRE are in charge of developing and implementing the sectoral MRV system under their management.
- Relevant ministries and the People's Committees of provinces and centrally-run cities are coordinating agencies for the implementation of the national MRV system.
- Listed entities are required to conduct GHG inventory as prescribed by the law and relevant organisations are required to conduct MRV as per the guidelines of related ministries.

These roles are detailed regulation in the latest Decree No. 06/2022 such: MONRE through Department of Climate Change is the focal point of the national MRV system on GHG mitigation. Line of relevant ministries such MoIT, MoT, MARD, MoRE, MoC have their own responsibilities of developing guidelines for MRV of their management sectors, cooperation with MONRE in supporting active data as well as other relevant information for national MRV. These lines of ministries also have responsibility to

develop and operate online database system of MRV of GHG emission mitigation of their management sectors.

The role of provincial government level also mentioned in more detail. Of which, they have right to monitor, inspect GHG mitigation plans of emitters as well as their compliance with MRV regulation. These emitters are listed in the Decision 1/2022/QĐ-TTg and be updated each year. Provinces also have to provide data and relevant information to sectoral and national MRV system of GHG emission mitigation following requirement of MONRE.

6.1.3. Proposed national MRV system for sectors

According to Decree No. 06/2022, the Ministry of Industry and Trade (MOIT) and Ministry of Agriculture and Rural Development (MARD) are ministries in charge to develop their own MRV system that would be following the national MRV system frame and supporting for national MRV system. However, these ministries have not started with these works, yet. The suggestions below will still be valuable as references.

6.1.3.1. *For energy sector*

The Energy Efficiency and Sustainable Development Department (EESD) belonging to the Ministry of Industry and Trade is responsible for allocating resources, developing plans and implementing the system of greenhouse gas inventory, synthesizing and storing data, and reporting in accordance with regulations when required. Currently, MRV system for energy sector has not yet kicked off as requested in the Decree No.6. The latest proposed system for monitoring GHG emission reduction actions in the energy sector was shown as the following figure:

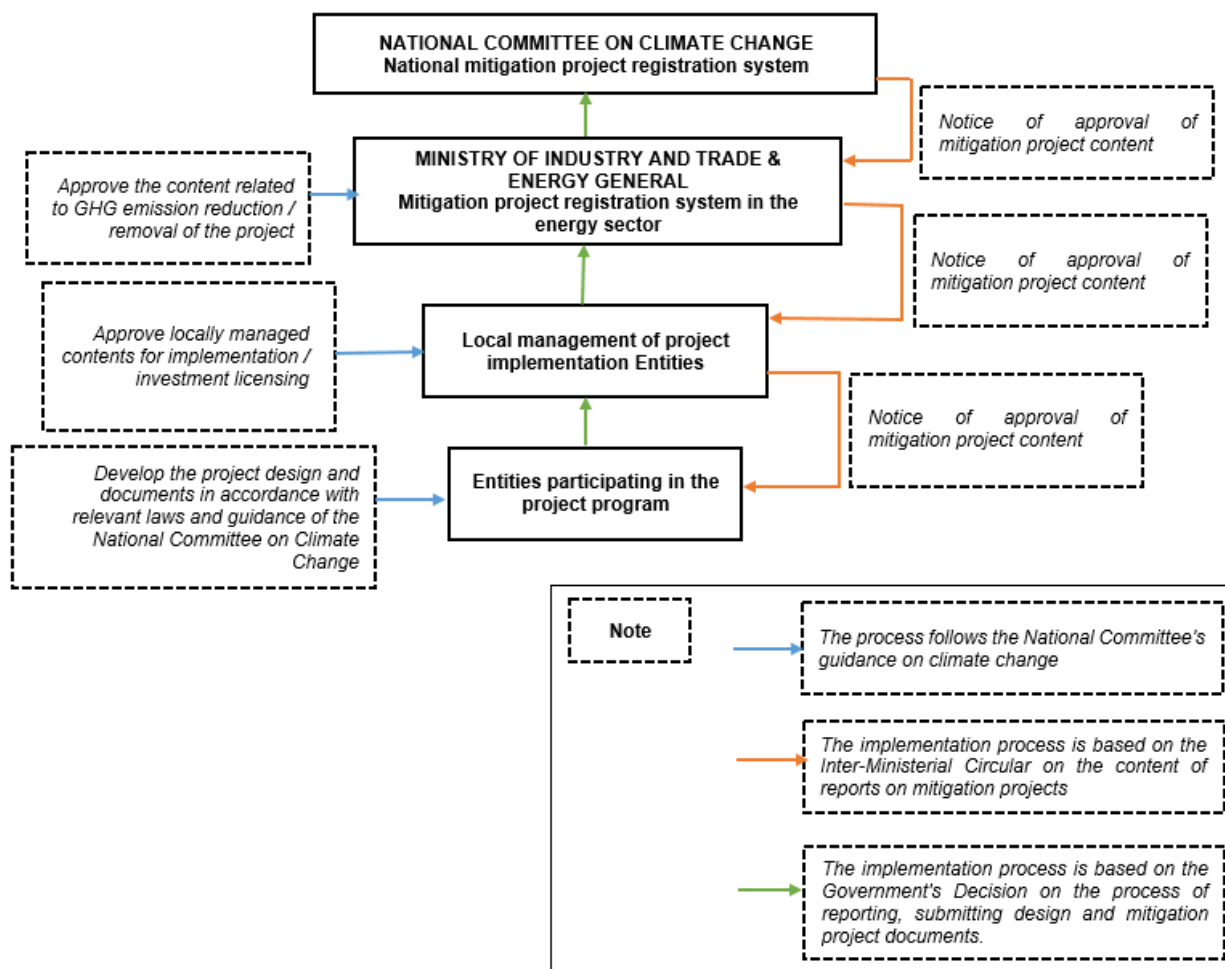


Figure 4. Monitoring model for implementing greenhouse gas emissions mitigation actions in the Energy sector

Source: Luong Quang Huy, 2016

6.1.3.2. For Agriculture sector

For the Ministry of Agriculture and Rural Development, the proposed model were similar to the energy sector while Ministry of Agriculture and Rural Development is main responsibility.

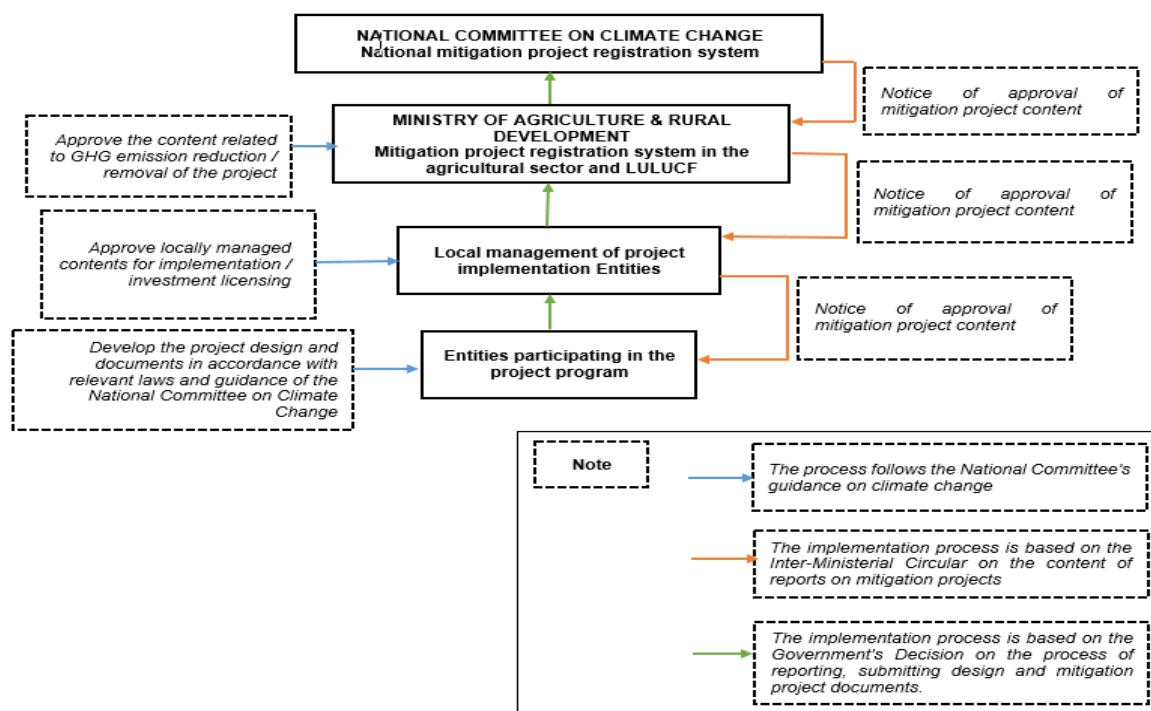


Figure 5. Monitoring model for implementing greenhouse gas emission reduction actions in Agriculture sector

Source: Luong Quang Huy, 2016

Take-home messages:

- Institutional arrangements for national greenhouse gas inventories have been proposed and implemented throughout the inventory cycles, but the implementation process and implementation steps in the institutional arrangements are still having gaps that need to be filled. The gaps are mainly related to the development and preparation of the national greenhouse gas inventory implementation plan; method of data collection; data availability and stakeholders' responsibility for data development and collection. The MONRE is now on the way to finalize the guideline of technical implementation on MRV and GHG inventory of waste management – the sector which is under MONRE's management. Other sectors will develop their own guideline soon.
- Institutional arrangements for GHG emission reduction activities have also been proposed to the Prime Minister and will serve as a basis for readiness for national NDC monitoring activities.
- To meet the requirements of the Enhanced Transparency Framework under the Paris Agreement, in Vietnam, a plan is currently needed to prepare the country to

be “ETF ready”, also to facilitate the transition from BURs to BTRs. Thus, it is necessary to have a thorough review from the preparation stage, to assigning roles to relevant ministries and agencies through the process of institutional arrangement into a national system.

- To prepare for the transition from BUR to BTR, the following steps are recommended such: preparing the indicator(s) for NDC tracking, setting up ETF steering group, improving the GHG inventory system for BTR on time, capacity building on GHG inventory.

6.2. NDC impact assessment using GACMO model – focus on Energy and Agriculture sector

6.2.1. Impact assessment of energy sector

Based on the mitigation measures for the Energy sector in the INDC report, the implementation team has selected 4 solutions related to renewable energy development:

E11: Biomass power plants

E12: Small hydropower plants

E13: Wind power plants by national funding

E17: Solar PV power plants

The implementation team used the GACMO model to calculate emission mitigation potential based on the following data and assumptions:

- The Business As Usual scenario (BAU) was developed based on the assumption that economic growth has not considered existing policy changes.
- The GHG emission factor applied to the development of the BAU mainly applies the default IPCC coefficient.
- The BAU scenario for the energy sector is calculated for the entire process of exploitation, production, processing and use of energy from fossil fuel sources.
- The base year is 2014.
- The data used for GACMO model was collected and aggregated from published data sources of the management agencies.

- The data of population growth in the model is based on the data in the Vietnam Population Forecast 2009-2049 of the General Statistics Office in 2011.
- Average GDP growth of 5 years in the 2016-2020 period will reach 6.5-7% / year (according to Resolution No.142/2016/QH13, April 12, 2016 of the National Assembly, 5-year socio-economic development plan 2016-2020).
- Average 5-year GDP growth in the 2021-2025 period will be around 7% / year (according to the Prime Minister's Directive 18/CT-TTg of April 13, 2020 on elaboration of the socio-economic development plan meeting in 2021-2025).
- The emission factor of Vietnam's electricity grid in 2018 is 0.9130 tCO₂/MWh (as announced by the Department of Climate Change, Ministry of Natural Resources and Environment).
- The assumption of exchange rates with the US dollar, discount rates, raw material prices for the base year are based on Vietnam's statistics published by the General Statistics Office of Vietnam.
- Parameters of small hydroelectric plants, wind power plants, solar power plants, biomass power plants refer to Vietnam Technology Handbook 2019.

The results of the comparison of emission reduction potential calculated when using the GACMO model and LEAP model used in INDC of Vietnam are shown in the following table:

Table 4: Comparison of emission reduction potential when using GACMO model and LEAP model

No	Options	GACMO Model	LEAP Model
		Emission reduction in 2030 (kt/year)	Emission reduction in 2030 (kt/year)
1	E11. Biomass power plants	6,391.00	7,002.20
2	E12. Small hydropower plants	8,764.80	7,994.90
3	E13. Wind power plants by national funding	301.29	180.20
4	E17. Solar PV power plants	3,332.45	2,162.40

There is a difference between the results from calculating the mitigation potential in the GACMO model and from the technical report VietNam's INDC in 2015 when the LEAP

model was used because latter allows the analysis of energy supply and demand - the context of the energy system, including: primary energy sources, conversion, distribution and use of energy on the basis of input assumptions such as: GDP growth, population growth, past energy consumption and fuel prices referred to US Information Agency forecasts, last updated 2014 with base year 2010.

Due to the lack of some specific country parameters, the GAMO model must assume some corresponding parameters. Thus, the application of the GACMO model to the Energy sector is mainly to give an overview when applying the assumptions to implement the mitigation options in order to develop a monitoring plan for the reduction of greenhouse gas emissions.

Due to the lack of some specific country parameters, the GAMO model must assume some corresponding parameters. Thus, the application of this model to the Energy sector provides a first and general estimation of the potential of the different mitigation options which may serve to develop a monitoring plan for the reduction of GHG emissions.

Vietnam's INDC report offers many mitigation options for the Energy sector, but most of the options have not been developed in the GACMO model, so it is necessary to develop spreadsheets for the remaining options to be proactive in monitoring emissions in Vietnam when using the GACMO model for implementation.

Comments

- The options of emission reduction have the potential to reduce high GHG emissions in the energy sector. However, to balance investment costs and the potential to reduce GHG emissions, it is necessary to consider applying many effective solutions.
- It is convenient and easy to use the GACMO model, given that relevant factors in the model is designed in accordance with the national energy statistic book of Vietnam which is annually published.
- Besides, if the database is available and sufficient, the model can help verify the results of past National GHG mitigation efforts and allow the development of mitigation approaches in the future to give an overview of mitigation efforts.

Recommendations

- The GACMO model requires a lot of input data and the accuracy of the input data will greatly affect the calculation results. Therefore, to ensure legal basis of data, in line with the Vietnam's context and the IPCC guidelines, a deeper research is highly recommended to be conducted.
- The remaining options of the energy sector mentioned in Vietnam's INDC report , and also in the subsequent NDC report, are not included in the GACMO model.

Therefore, it is proposed to include more options consistent with the options in the report of Vietnam. In order for Vietnamese experts to build their own spreadsheets for new options and to take the initiative in calculation, specific guidelines should be developed in developing the model.

- The parameters in the calculation outputs of the model need to be built based on the evaluation criteria in the INDC Report of Vietnam to facilitate the evaluation and comment.

6.2.2. Impact assessment of agriculture sector

For mitigation actions from agriculture, the following groups of mitigation options were considered to test by GACMO:

A1: Increased use of biogas

A2, A3, A5, A7, A9: Reduction options in rice cultivation

A6, A8: Integrated crop management (ICM) in annual upland crop cultivation

A11: Improvement of livestock diets

The model has been calibrated on the start year, the sheet “Growth” has to be filled with data on the expected evolution of GDP and population, as well as on energy consumption with the same level of detail used in the balance and emissions for non-energy sectors. The comparisons of emission reduction between using GACMO model and the result which reported in INDC of Vietnam as the table below:

Table 5: Comparisons of emission reduction between using GACMO model and the result which reported in INDC of Vietnam

Reduction options	Scale	Mitigation potential	
		GACMO	INDC
A1. Increased use of biogas	500,000 unit	8.7 tonCO ₂ eq/unit	6.34 tonCO ₂ eq/unit
A2. Reuse of agriculture residue as organic fertilizer	3,500,000 ha	0.39 tonCO ₂ eq/ha	0.1 tonCO ₂ eq/ha
A3. Alternate wetting and drying, and improved rice cultivation system (small scale)	200,000 ha	4 tonCO ₂ eq/ha	4.7 tonCO ₂ eq/ha
A5. Integrated Crop Management (ICM) in rice cultivation	1,000,000 ha	4 tonCO ₂ eq/ha	0.5 tonCO ₂ eq/ha

Reduction options	Scale	Mitigation potential	
		GACMO	INDC
A6. Integrated Crop management (ICM) in upland annual crop cultivation	1,000,000 ha	0.75 tonCO ₂ eq/ha	0.32 tonCO ₂ eq/ha
A7. Substitution of urea with SA fertilizer (Sulfate Amon)	2,000,000 ha	-	1.6 tonCO ₂ eq/ha
A8. Reuse of upland agricultural residues	2,800,000 ha	0.75 tonCO ₂ eq/ha	0.1 tonCO ₂ eq/ha
A9. Dry-wet alternative watering and advanced cultivation system	1,500,000 ha	4 tonCO ₂ eq/ha	4.68 tonCO ₂ eq/ha
A11. Improvement of livestock diets	22,000,000 ha	522 tonCO ₂ eq/%DM fat added	0.08 tonCO ₂ eq/ha
A12. Improvement of quality and services available for aquaculture, such as inputs and foodstuff	1,000,000 ha	-	0.41 tonCO ₂ eq/ha
A13. Improvement of technologies in aquaculture and waste treatment in aquaculture	1,000,000 ha	-	1.21
A14. Improved irrigation for coffee	21,000,000 tons	-	0.16
A15. Improved technology in food processing and waste treatment in agriculture, forestry and aquaculture	640,000 ha	-	5.3

The results show that the use of GACMO model gives quite different results compared to the published results of INDC Vietnam, this may be due to the selection of hypothetical input data between two different implementation methods. The GACMO model allows to change the assumptions to find the most optimal solution. However, some of the mitigation actions mentioned in the table above are not calculated by the GACMO model because there is no calculation option in the model.

6.2.3. Short outcome of GACMO model

The GACMO model allows the assessment of effective solutions to reduce greenhouse gas emissions, facilitating the selection of mitigation options suitable to national conditions. Besides, the model is built so that it is easy to understand, easy to use and highly applicable. Thus, the model helps to track the results of national GHG mitigation efforts and allows the development of future mitigation options.

However, mitigation action options in GACMO model are limited and mitigation options suitable for Vietnam are lacking. Some parameters of the model would need to be developed to match the mitigation actions in the INDC/NDC of Vietnam and some options of mitigation actions suitable for Vietnam should be developed.

6.3. Dynamic baseline study on solar PV policy

Article 6.4 sets the requirements for the establishment of the baseline based on which the mitigation outcomes Parties can exchange or trade with will be calculated. According to Article 6.4, this baseline has to be conservative and below BAU, progressively ambitious, aligned with the country's NDC and long-term strategy, as well as with the PA goals. These requirements are hardly compatible with static baselines and thus open the way for baselines that change over time, i.e., dynamic baselines (DBL). The novel dynamic baseline concept was introduced and explained. Then it was applied both at national level and then to Solar PV developments.

Table 6. Plan to develop solar power by period

Measures	Assumption – implementation period	
	2021-2030	2031-2050
Developing concentrated solar power	Increasing the capacity of concentrated solar power plants from 4,086 MW in 2019 to 8,736 MW in 2030	Reach 25,034 MW in 2035, 75,987 in 2045 and 94,760 MW in 2050
Developing rooftop solar power	Increasing the capacity of rooftop solar power plants from 1,607 MW in 2020 to 7,755 MW in 2030	Reach 20,679 MW in 2045 and 28020 MW in 2050

Source: Technical report on national climate change strategy - Net-Zero Option 2 (MONRE, 2022)

The GHG emissions reduction from solar power is calculated by multiplying the grid's emission factor by total electricity generated from solar power. It is estimated that the potential to reduce GHG emissions comes mainly from concentrated solar power development solutions and is about 81%. The potential for GHG emission reduction of the rooftop solar power solution is only about 19% (MONRE, 2022).

Since the Solar Power developments fall within the Energy Industry subsector (i.e., electricity production), a dynamic baseline for this subsector was calculated for the 2020-2050 period. This was calculated by multiplying the adjusted Ambition Coefficients, which were estimated based on the 2050 Net Zero scenario and taking into account factors such as the expected GDP and electricity demand growth, by the Energy industry subsector BAU emissions intensity. The values of the resulting energy industry sector dynamic baseline are shown as below:

Table 7. The Energy Industry dynamic baseline

Unit: mil tCO₂eq

Dynamic Baseline energy industry	2020	2022	2024	2026	2028	2030	2032	2034
	214.9	245.0	275.7	289.3	285.6	281.8	303.9	327.0
	2036	2038	2040	2042	2044	2046	2048	2050
	343.3	353.8	359.5	353.7	346.7	328.7	305.5	264.0

The resulting dynamic baseline for the energy industry fulfils the requirements mentioned in the Article 6.4 of the Paris Agreement for it is below BAU, conservative and aligned with Vietnam's long-term goals, which in turn are aligned with Paris Agreement long-term targets.

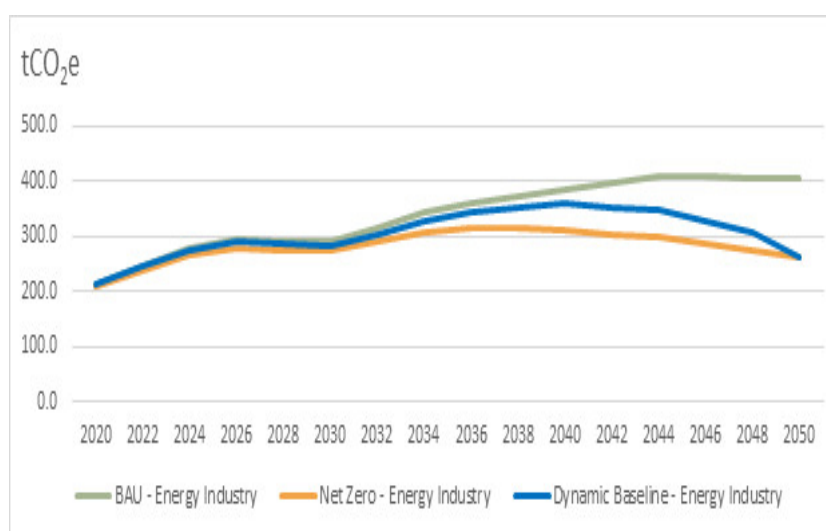


Figure 6. Energy industry dynamic baseline

The so-estimated dynamic baseline can be used to estimate internationally transferred mitigation outcomes (ITMO) and thus serve as departing point to attract carbon finance for implementing mitigation targets.

6.4 The accounting system for Internationally Transferred Mitigation Outcomes (ITMO) – Case study for Solar PV

Article 6 establishes a number of processes and formats to account for the ITMOs. These include the international registry, the Article 6 database and the centralized accounting and reporting platform (UNFCCC, 2021b). Each participating Party shall have access to registry records with unique identifier for the purpose of tracking ITMOs' authorization, first transfer, transfer, acquisition, use towards NDCs, authorization for use towards

other international mitigation purposes, and voluntary cancellation. ITMO is calculated and represented in a Common Tabular Format (CTF). A Party may amend the reporting format to remove specific rows if the information to be provided in those rows is not applicable to the Party's NDC. Similarly, a Party could add rows for each additional selected indicator and related information (UNFCCC, 2021b).

The ITMOs the Solar PV development in Table 5 could potentially were calculated using the dynamic baseline presented in 6.3 and the corresponding data was used to fill out the registration formats the Article 6 rulebook establishes for ITMO accounting.

Table 8. ITMO's accounting toward NDC

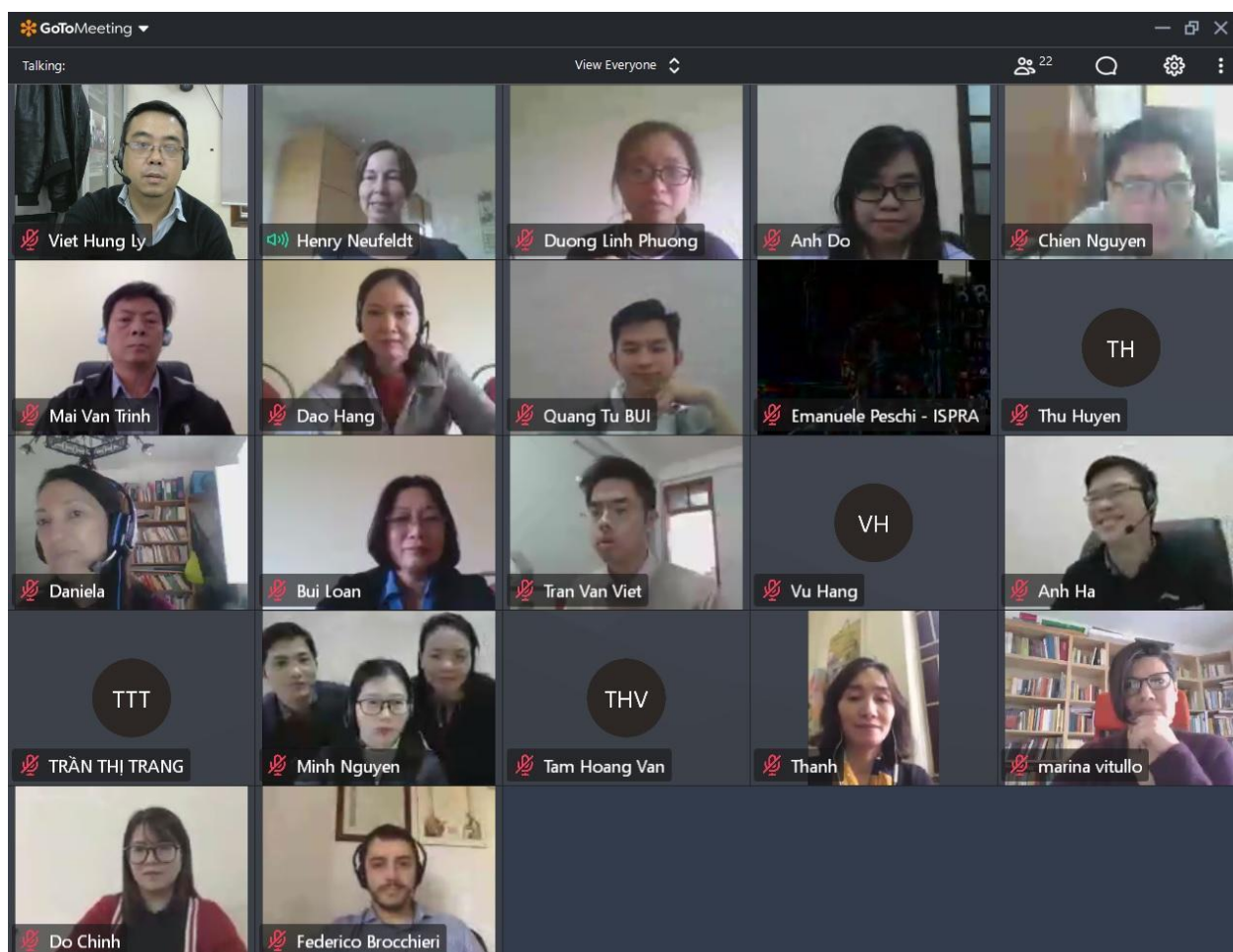
Unit: million tons of CO₂eq

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Solar PV mitigation outcomes towards NDC	2.20	2.40	2.60	2.90	3.10	3.50	3.70	4.10	4.50	5.00
Mitigation outcomes of Concentrated Solar PV according to Draft Power Master Plan VIII	6.47	7.39	8.30	9.22	10.14	10.20	10.26	10.32	10.38	10.44
ITMOs from Solar PV	13.10	14.51	16.10	17.81	11.06	19.76	19.91	20.17	20.37	20.97

The results of the study case show that the planned Solar PV developments in Vietnam will be able to produce some ITMOs from Solar PV even if a highly ambitious baseline, based on the new concept of a "dynamic baseline" is applied. These ITMOs will increase over the years if the Net-Zero scenario mitigation goals are achieved. This show that despite of the challenges, the "dynamic baseline" concept can be operationalized and eventually be used to impel Parties to enhance their mitigation contribution to the global stocktake and also could play an important role in attracting necessary financial mobilization for mitigation in developing countries.

6.5. Sharing outputs of the project

- The outcomes of the ICAT project in Vietnam have been published on the ICAT website at <https://climateactiontransparency.org/country/viet-nam/>.
- During the project, the virtual meeting to introduce ICAT methodologies as well as the Greenhouse Gas Abatement Cost Model (GACMO) took place on 23-24 April 2020. Through the workshop, participants had access to the GACMO model and were instructed on how to analyze and select the appropriate parameters for the model. These knowledge and skills were applied in the two selected sectors (agriculture and energy) to determine and rank priority mitigation actions for each selected sector. From these outputs, relevant solutions and recommendations were discussed in order to propose suggestion for each mitigation actions.



Virtual meeting participants (22) in April 2020

- The outcomes of the ICAT project in Vietnam were also shared in a final workshop, which was organized on 19 August 2022. The workshop took place

both online and physically. More than 150 participants had registered of which, more than 50 people attended in person. Participants came from related ministries, local levels, universities. It also was followed by some climate change experts, as well.



Dr. Nguyen Tuan Quang - Vice Director General of Department of Climate Change
opening the final workshop



In-person participants of the final workshop on 19 August 2022

7. Evaluate the ICAT work

Vietnam is one of the most negatively affected countries by climate change. Even though being a developing country, Vietnam has strong commitment to respond to climate change, as well as actively participate in the international community to reach the ultimate objectives of UNFCCC and the Paris Agreement. With support from partners, the capacity of the Vietnamese people in climate change has been improved. The Initiative for Climate Action Transparency (ICAT), in collaboration with UNEP Copenhagen Climate Centre (UNEP-CCC) and the Italian Institute for Environmental Protection and Research (ISPRA), provided support to Viet Nam to develop its greenhouse gas monitoring, reporting and verification system, in line with the enhanced transparency framework of the Paris Agreement.

The ICAT project has been carried out in Vietnam since late 2019 with the overall objective to support the implementation of Viet Nam's domestic MRV/transparency system through capacity building program, training on MRV/transparency concepts, methods and tools, including iterative testing and application of the ICAT Series of Assessment Guides, continued observation of future UNFCCC transparency requirements and development of a road map to sustain ICAT outcomes.

In general, even though affected by the COVID-19 epidemic, the ICAT project was successful in reaching all its objectives, with both implementing partners and country-based consultants highlighting that ICAT's capacity building activities were well aligned with the country's needs and priorities. Even though, this project just focused on the energy and agriculture sector, the support received has helped to improve our Vietnamese team received capacity. Through the introduction of ICAT methodologies and the fruitful discussions on them during a series workshops and meetings that took place during the project such as the workshop on agriculture, workshop on the indicators for NDC tracking, workshop on ETF and COP26, workshop on data management system,..., the Vietnamese team had the chance to approach a new way to assess greenhouse gas mitigation using quantitative method in the context of sustainable development. The ICAT methodologies would be appropriate to assess impacts of different policies in response to climate change. Thus, it could be a tool to effectively orient investments to archive the objectives of our NDC.

The results of this project also assessed the current institutional arrangement of the GHG inventory system and the GHG emission mitigation activities. Since then, MRV systems for the above activities suitable for national conditions. These proposals on national systems were considered and showed in the Law on Environmental Protection which was ratified in 2020 and the Decree No.6/2022 on greenhouse gas emission reduction and ozone layer protection, as well, of which lines of ministries are in charge with developing their own MRV system following their management sectors (as recommendation above – page 10). For the sector level, the outputs of this project would be somehow useful as a good references for developing MRV system in the next coming year. Through this project the related team also had a chance to get more knowledge on Article 6 elements such as the dynamic baseline concept to increase ambition of NDC as well as the internationally transferred mitigation outcomes (ITMO) accounting system and procedure. Getting to know these and other Article 6 elements may contribute to Vietnam readiness to cooperate with other countries under Article 6 and tap its potential in this field.

Gaps and Barriers of the project implementation

- The MRV systems were proposed by sectors, however, there is no guideline to implement these systems, yet. According to the Decree 6/2022/ND-CP dated 07/1/2022 on greenhouse gases emission reduction and ozone layer protection, each ministry has the responsibility to develop their own guideline for its sectors. So far, only MONRE is on the way to finish its guideline on MRV implementation for the waste management sector. Hence, there has not been enough time and evidence yet for assessing the suitability or finding gaps in the above proposed MRV system for agriculture and energy.
- The “Dynamic baseline” is a new concept and thus, studying the potential application of a dynamic baseline for the calculation of the ITMOs produce by a solar PV is one of the first studies on this topic. We do not have trained people on it. It took time to understand the methodology and to apply it to calculate a new baseline base on different scenarios.
- The enhanced transparency framework (ETF) was the first step considered and applied in the two selected sectors (energy and agriculture) to track NDC

implementation. However, Vietnam has not yet developed a detailed ETF-ready at national level. Thus, we still need support to do that in the future. These outputs of the project will be shared with different concerned organizations and experts as well, with the hope that the ICAT methodologies will be effectively applied.

- Vietnam's NDC is now being updated; thus, the previous proposed mitigation actions need to be reviewed to update for keep track to satisfy transparency requirement.
- COVID-19 pandemic has been a significant barrier during implementing project. The training on using GACMO for two selected sectors could not be in person. However, thanks to the effort put to overcome the difficulties of these COVID-19 epidemic, the project was successful.

CONCLUSION

Despite the delays caused by COVID-19 pandemic, the ICAT project in Vietnam has been successful with both implementing partners and country-based consultants highlighting that ICAT's capacity building activities were well aligned with the country's needs and priorities.

Looking ahead, Vietnam is now working hard to implement the government's net-zero target commitment. The NDC 2022 update is on its way to be finalized and will be submitted soon. The next steps would be reviewing it and include the updated activities as well as the updated ambition that could provide ideas for the next phase of ICAT in Vietnam for tracking NDC. The existing methodologies of ICAT and the GACMO model would be more deeply studied to develop several specific factors suitable for Vietnam and thus, improved the accuracy of the estimation.
