Initiative for Climate Action Transparency - ICAT -

SYNTHESIS REPORT ON NEEDS AND GAP ASSESSMENT FOR MRV/TRANSPARENCY SYSTEM IN THE ENERGY AND THE AGRICULTURE SECTOR OF VIETNAM

Hanoi, 2020

Initiative for Climate Action Transparency - ICAT -

Synthesis report on need and gap asessment for MRV/Transparency systems in the energy and agriculture sector of Vietnam

Deliverable: D1

Date of the deliverable: October 2020

AUTHORS

Nguyen Hung Minh[1], Tran Thu Huyen[1], Ly Viet Hung[1], Ha Quang Anh[1], Hoang Van Tam[2], Mai Van Trinh[3]

[1]Center for Ozone layer protection and Low-carbon Economy Development, Department of Climate Change, Ministry of Natural Resources and Environment of the Socialist Republic of Vietnam

[2]Energy Efficiency and Sustainable Development Department, Ministry of Industry and Trade of the Socialist Republic of Vietnam

[3]Institute for Agriculture Environment, the Ministry for Agriculture and Rural Development of the Socialist Republic of Vietnam;

DISCLAIMER

This publication has been produced as part of a component of the Initiative for Climate Action Transparency project (ICAT) implemented by UNEP DTU Partnership (UDP). The views expressed in this publication are those of the authors and do not necessarily reflect the views of UDP.

PUBLISHED BY

Center for Ozone layer protection and Low-carbon Economy Development, Department of Climate Change, Ministry of Natural Resources and Environment of the Socialist Republic of Vietnam

PREPARED UNDER

Initiative for Climate Action Transparency (ICAT) project supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the Children's Investment Fund Foundation (CIFF), the Italian Ministry of Ecological Transition (IMET) and ClimateWorks.

The ICAT project is managed by the United Nations Office for Project Services (UNOPS)

ACKNOWLEDGEMENT

We would like to acknowledge and express gratitude to Karen Holm Olsen and Gerardo Sanchez Martinez at UNEP-DTU; Emanuele Peschi, Federico Brocchieri, Marina Vitullo, Daniela Romano and Eleonora Di Cristofaro at ISPRA; colleagues at CCOZONE, IAE and EESD for insightful discussions and kind support to this report.

Acronyms and abbreviations

BUR	Biennial Update Report
CDM	Clean Development Mechanism
CO_2e	Carbon dioxide equivalent
COP	Conference of Parties
DCC	Department of Climate Change
ETF	Enhanced Transparency Framework
GHG	Greenhouse gas
GSO	General Statistics Office
HFC	Hydrofluorocarbon
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ITMO	Internationally transferable mitigation outcomes
LULUCF	Land-use, Land-use Change and Forestry
MARD	Ministry of Agriculture and Rural Development of Viet Nam
MBI	Market-based instrument
MOC	Ministry of Construction of Viet Nam
MOF	Ministry of Finance of Viet Nam
MOIT	Ministry of Industry and Trade of Viet Nam
MONRE	Ministry of Natural Resources and Environment of Viet Nam
MOT	Ministry of Transport 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
PMR	Partnership for Market Readiness
QA	Quality assurance
QC	Quality control
UNFCCC	United Nations Framework Convention on Climate Change

CONTENTS

CHAPTER I:

OVERVIEW OF MRV SYSTEM FOR TRANSPARENCY

1.1. Institutional arrangement for inventory preparation

After Vietnam signed the Paris Agreement, the INDC was converted into a Nationally Determined Contribution (NDC). In terms of GHG emission reduction, Vietnam aims to, by the national resources, reduce 8% of total GHG emissions compared to the normal development scenario. The reduction can be increased to 25% when receiving international support through bilateral and multilateral cooperation and implement new mechanisms by 2030 (INDC, 2015). In the Updated NDC of Vietnam (2020), the country's commitment and expectation for the reduction are increased to 9% by the domestic resources and 27% when receiving international supports.

Vietnam's contribution to GHG emission reduction will be periodically reviewed, assessed and adjusted to suit socio-economic conditions in each period.

On October 28, 2016, the Plan for Implementation of the Paris Agreement on Climate Change was issued in the Prime Minister's Decision No. 2053/QD-TTg to concretize Vietnam's commitments to the international community in responding to climate change, fulfill the obligations applicable to Vietnam in the Paris Agreement, including 5 main contents with the following orientations:

- Mitigation of GHG emissions: to make contribution on GHG reduction mentioned in NDC and take advantage of opportunities of developing low carbon economy;
- Climate change adaptation: to follow climate change adaptations in the NDC to reduce vulnerability and increase resilience to climate change;
- Implementation resources: to develop human resource, transfer technologies and mobilize financing to ensure the contributions identified in the NDC; Take advantage of the opportunities provided by the Paris Agreement to develop the country;
- Open and transparent system (MRV system): to monitor and supervise the implementation of GHG emission reduction, climate change adaptation, ensuring resources for implementation;
- Institutions and policies: toward the elaboration and completion of legal documents and technical instructions; stipulate responsibilities of

ministries, sectors and localities and strengthen coordination in handling inter-regional and inter-sector issues.

Following the Decision No. 2053/QD-TTg, the institutional arrangement for the National GHG inventory system of Viet Nam has been established basing on Decision No. 2359/QD-TTg and been reported in the latest national report (NC3) to the UNFCCC as showed in Fig. 1.1.

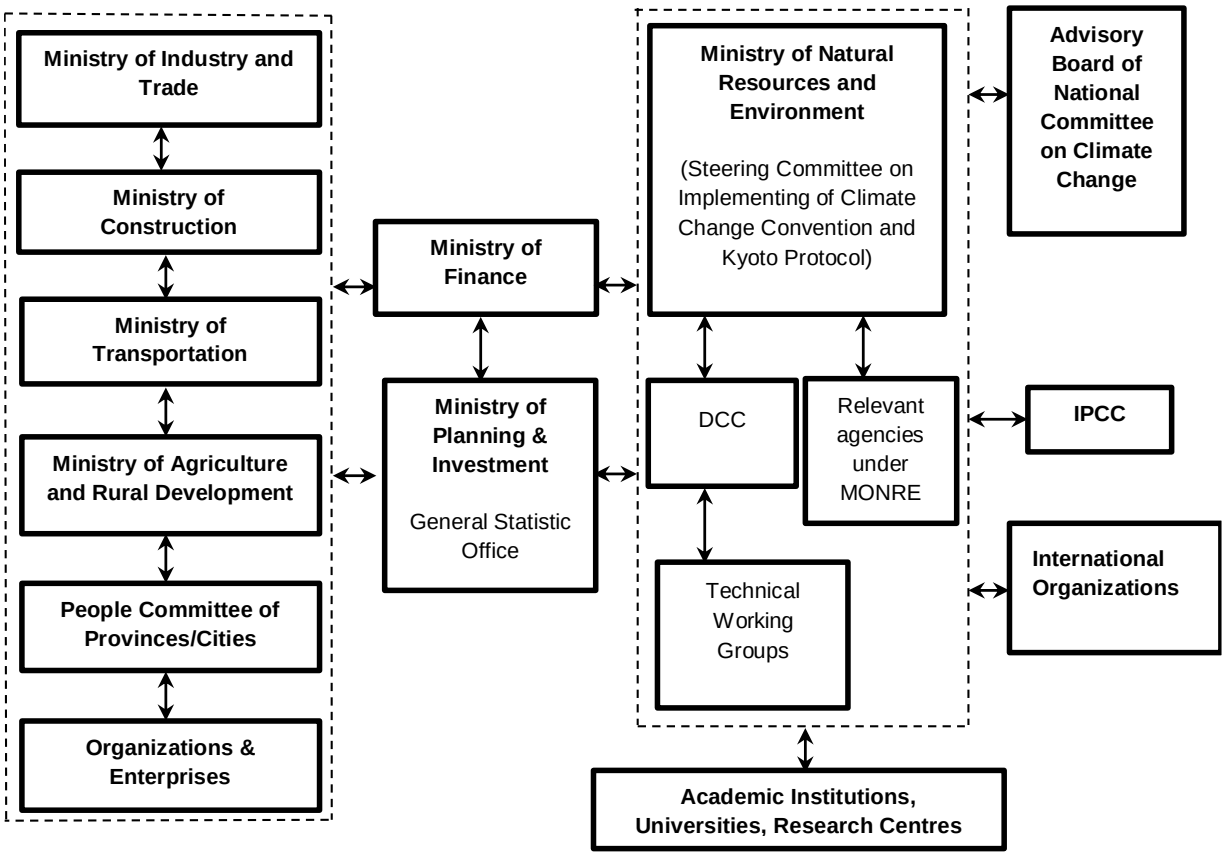

Fig. 1.1: Institutional arrangements for the national GHG inventory system
(Luong Quang Huy (2016))

As being seen, the current institutional arrangement for the national GHG inventory system in Viet Nam is centralized in functioning ministries, provincial Peoples' Committees and organizations which provide activity data to the General Statistic Office (GSO) under MPI. Besides, a guidance for data collection for the GHG Inventory is applied in Vietnam (Ricardo-AEA, 2015).

Since the data collection system at sector level and provincial level has not yet been fully established, most of the activity data for the latest GHG inventory were still collected by consultants of the Department of the Climate Change (DCC) under MONRE. The collected data were then sent to GSO and line ministries for

QA/QC. Responses from GSO and line ministries provided basis for MONRE to finalize the set of activity data for calculation of GHG inventory in the inventory sector.

In order to meet requirements of the Enhanced Transparency Framework (ETF) of the Paris Agreement, enabling measures should be further improved and implemented systematically, including legal arrangements, procedural arrangements, human resources and expertise, financial resources and infrastructure. Recently, a workshop organized under the project "*Vietnam Partnership for Market Readiness*" (PMR) has discussed on gaps and recommendations for improvement of the national GHG inventory to meet such requirements of the Paris Agreement. Although, the report has not been officially published, some of the recommendations can be summarized as follows:

- IPCC 2006 Guidelines should be applied for GHG inventory in Vietnam (it is required by Dec 31 2024 at the latest)
- It is recommended that Vietnam should consider moving to a higher tier for key categories (Tier 1 or 2 as the present practice)
- Need to report a consistent time series starting from the reference year for NDC (2010) and recalculation when updating to 2006 IPCC
- Lack of uncertainty assessment of trend between 2010 and the latest reporting year
- Need to ensure consistent reporting of HFCs emissions

1.2. Institutional arrangement for tracking the NDC implementation progress

In the INDC, which was then converted to the first NDC in 2016, the institutional arrangement for continuous tracking implementing progress of the NDC policies and actions was not addressed clearly. So far, there is no official guideline and regulation for implementation such tracking activities at the national scale.

In order to overcoming this limitation, in the updated NDC (2020), the monitoring and the evaluation of the NDC's implementation are strongly requested. Major procedures and principals for the monitoring and evaluation processes can be summarized as follows:

a/ The monitoring and the evaluation of the NDC's implementation shell be conducted at provincial, sectoral and national levels.

- At the provincial level: DONRE is responsible for advising and helping the provincial People's Committee to supervise and evaluate the implementation of local and community-level tasks in the province; Reviewing the local implementation progress and preparing reports so that the provincial People's Committees can submit MONRE and NCCC before October 31 every year.
- At the sector level: Ministries are responsible for supervising and evaluating the implementation and performance of sector-level tasks within their assigned functions; Reviewing the implementation progress and preparing reports to submit to MONRE and NCCC before October 31 every year.
- At the national level: The NDC's policies and actions will be reviewed and evaluated at the national level for every two years. MONRE in coordination with NCCC, is responsible for tracking the NDC implementation progress and periodically reporting to the Government.
- Encourage socio-political organizations and other organizations to participate in independent monitoring and evaluation of the NDC implementation.

b/ Principals for the monitoring and the evaluation processes

Efforts for adaptation to climate change and mitigation for GHG emissions will be assessed every 2 years.

The efforts of adaptation to climate change are assessed according to the implementation process and the results through the groups of resilience indices of the natural environment; assessing vulnerability to climate change; mitigating risks due to climate change; evaluate the effectiveness of climate change adaptation activities.

The mitigation efforts are assessed according to the results of implementation of potential and feasible GHG emission reduction options. In order to cross-check GHG emission reduction results, the GHG inventory will also be conducted every 2 years for the national and sectoral levels.

The assessment of efforts to adapt to climate change and mitigation for GHG emissions will use the uniform regulations issued by MONRE. This effort will ensure that the results of climate change adaptation and mitigation of Vietnam are periodically monitored, assessed, avoid duplication, ensure verification and create a reliable source of information to develop Vietnam's first Transparency Report by 2024 and every 2 years thereafter.

Monitoring and evaluating climate change adaptation activities and GHG emission mitigation in the NDC must ensure the transparency, accuracy, completeness, consistency and comparability of the UNFCCC, at the same time in accordance with national conditions. The monitoring and evaluation process is carried out at all levels and ensures consistency, transparency and independence of responsibilities of stakeholders.

The results of climate change adaptation efforts will be presented in the National Communication for Climate Change Adaptation and Biennial Transparency Report (BTR) of Vietnam submitting to UNFCCC. The results of climate change adaptation efforts will be evaluated every two years based on an assessment of the implementation of strategic climate change adaptation measures in the NDC and specific adaptation actions in the National Adaptation Plan (NAP).

The monitoring and evaluation of the implementation of GHG emission mitigation activities as well as international support for the implementation of the NDC will be presented in the National Communication (NC), the Biennial Update Report (BUR) and the Biennial Transparency Report (BTR) of Vietnam for UNFCCC.

1.3. Current status of the MRV system in the energy sector of Vietnam

Since GHG emissions reductions are the most important part of the climate negotiations among countries participating in the Climate Convention, there is a need to make these efforts transparent. This is the basis for making the requirement that national emissions reduction reports should be presented in a way that is consistent with the MRV systems.

In Vietnam, Decision No. 2053/QD-TTg (2016) requires MRV systems are to be established and operated at different levels such as national level, provincial level and sectorial level. However, up to now, progresses for developing MRV systems for the GHG mitigation have been very limited at all scales. This can be explained by lacks of resources, capabilities and epxieriences which is needed to formulate and to operate MRV system.

In the updated NDC (2020), a framework for MRV systems has been officially proposed (Fig.1.2.). As can be seen, the National Committee on Climate Change will act as the Steering Committee, promoting coordination among relevant ministries and agencies. MONRE is assigned as the coordinating body for the national MRV system, and is responsible for operating the system. Other ministries and agencies will be in charge and operate the MRV systems for the

respective sectors. For example, MOIT will be in charge of MRV for GHG mitigation activities in the energy sector which is managed by MOIT. In addition, technical working groups will be set up in line ministries, responsible for technical issues, ensuring data quality, and agreeing on methodology. Subsequently, the process of implementing a MRV system is illustrated in more details in Fig.1.3.

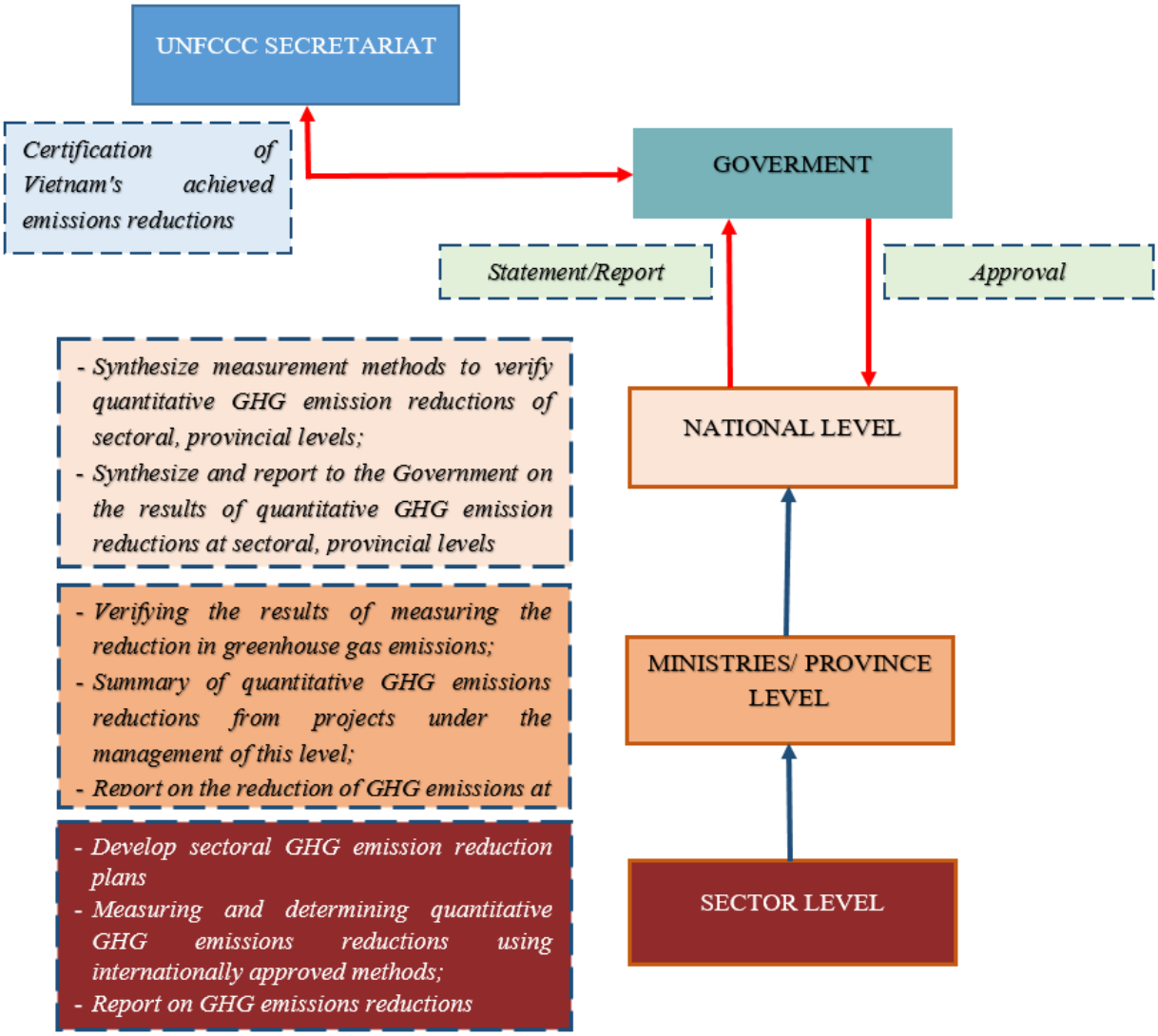

Fig.1.2. A model to establish MRV systems for GhG mitigation actions (NDC 2020)

In the energy sector, a numbers studies on performance standards for sub-industrial sectors have been done such as production of steel, chemical, paper, sea food processing, sugar and plastic. However, those studies could not provide adequate structures for MRV systems as being required by the ETF. Besides, it should be noted that an official MRV systems in the energy sector has not been developed and thus it will become one of major task of MOIT in the NDC 2020

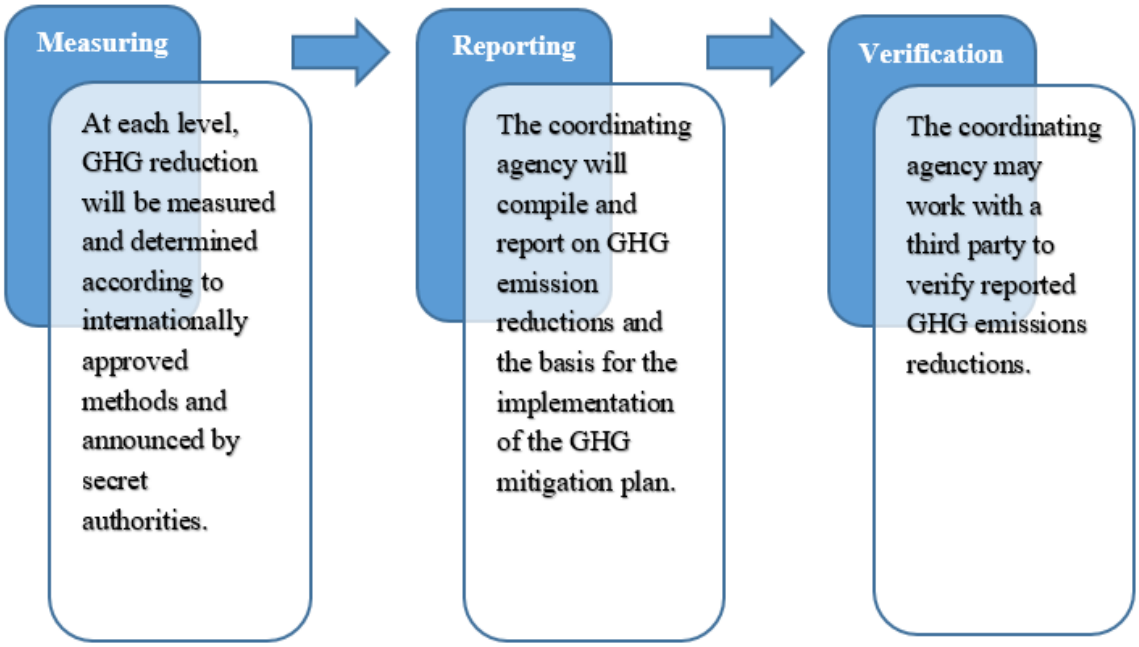

Fig.1.3. Procedure for implementation of MRV systems for GhG mitigation actions (NDC 2020)

Hereafter is examples of projects and activities which were somewhat related to development of MRV systems in the energy sub-sectors.

In research project *"Proposing the organizational structure for measuring, reporting and verification (MRV) system for GHG Nationally Appropriate Mitigation Actions (NAMA) at national and sectoral levels"* carried out by MONRE (Luong Quang Huy, 2016), a process for MRV in the energy sector is proposed with the following requirements:

- Establish energy policies with specific goals to improve energy efficiency;
- Creating a basis for energy use, identifying essential areas and understanding the factors affecting energy use;
- Maintain periodic forecasts on energy use, support investment planning and improvement;
- Consider energy consumption in the decision-making process for the design and procurement of equipment, materials or services.

The project "Mainstreaming Climate Change Mitigation into National infrastructure - CS1 Development of MRV for CTF-funded Projects Consulting Service" (ADB, 2019) has focused on selecting the MRV system for transport sub-sector including projects funded by CTF through ADB management are:

- Project No. 1: Hanoi Metro Rail System (Line 3: Nhon-Ha Noi Station Section) - additional financing
- Project No. 2: Strengthening sustainable Urban Transport for Ha Noi Metro Line 3
- Project No. 3: Sustainable Urban Transport for Ho Chi Minh Mass Rapid Transit Line 2

So far, the project No. 1 has implemented construction works for elevated section and depot areas. Both of projects No. 2 and No. 3 have not started construction works yet.

The MRV process developed and established for these projects was well investigated and formulated through CTF support, starting with the process of selecting methods for measurement.

The measurement methods are mainly based on mechanisms such as CDM, JCM, Verified Carbon Standard (VCS), Gold Standard (GS), JICA Climate-FIT Version 2.0, JICA SPI-NAMA, and feasibility study under the Japan Bilateral Offset Credit Mechanism - BOCM (before renaming the mechanism to JCM). The selection of adequate measurements is done by comparison and analysis among different methods to make the most optimal choice. In this case, basing on the nature of the project, CDM - ACM0016 was chosen because of its high accuracy and transparency.

After selecting the measurement method, the project used formulas to calculate project emissions and reductions following the steps given in Fig.1.4.

For the project's MRV systems, some important conclusions can be drawn out as follows:

- MRV system must be implemented from the stage of planning project and investment;
- MRV should be implemented before the actual project implementation period, which is also important for the purpose of Technical Analysis (TA) to link with the sectoral and national systems;

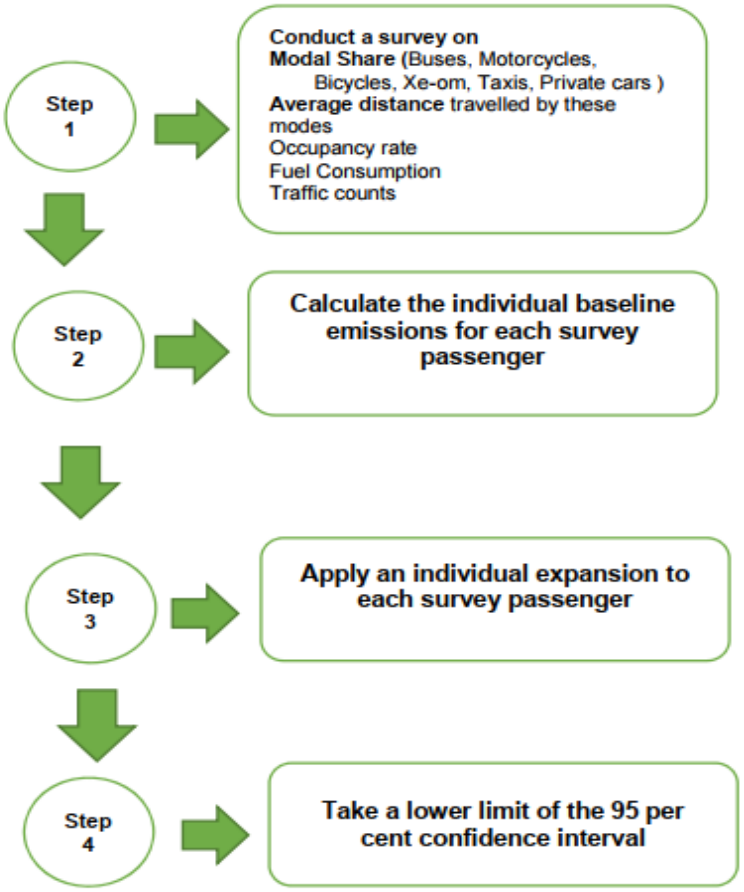

Fig 1.4: Steps to calculate the baseline emissions

1.4. Current status of the MRV system in the agriculture sector of Vietnam

According to the 2014 GHG inventory of Vietnam, the amount of GHG in agricultural production in 2010 was 88.3 million tons of CO_2eq, accounting for 33.2% of the total national GHG emissions. In which, paddy rice cultivation produces 44.8 million tons of CO_2eq/year, accounting for 51% of total agricultural sector emissions (MONRE, 2018). Therefore, calculating GHG emissions from agricultural activities plays an important role in determining the emission structure and proposing methods to reduce GHG emissions. Despite of these facts, there is no official guidence for establishing MRV systems in the agriculture sector and its sub-sectors.

At present, agricultural GHG measurements and inventory activities still rely on guidances from international reference sourcers, there is no official guidance from the authorities for official measuring and calculation methods. This makes staffs involving GHG measurements difficult to perform their works.

In recent years, the Ministry of Agriculture and Rural Development has carried out a number of tasks related to the MRV system in the Agriculture sector. One of those tasks is to establish the Manual "Guidelines for measuring GHG emissions in rice cultivation" which was issued under Decision No. 4831/ QD-BNN-KHCN on November 22, 2016 (MARD, 2016). This document is prepared to standardize methods for the sampling, the laboratorial analysis and the calculation of GHG emissions. This manual can be used as a technical reference for training technical staff, researchers and managers, who involve to inventory of GHG emissions in rice cultivation. This is significant improvement of MRV systems in the Agriculture sector, supporting the implementation of national inventories and NAMA plan in Vietnam.

In 2017, IAE developed the Manual "Guidelines for measuring GHG emissions in dairy farming". This manual presents a method for measuring GHG emissions from milking rumen fermentation as well as for inventory of GHG emissions from waste, livestock production and dairy cattle.

In this sector, there is also an ongoing research under the program namely “Science and technology for climate change, natural resources and environment management in period 2016-2020” for developing a national GHG emission factor for rice and upland crops whic can be used for the national GHG inventory and developing solutions to reduce the GHG emissions from agriculture. However, the result has not been available yet.

The Analysis and Investment for Low-Emission Growth (AILEG) is a global program of the United States Agency for International Development (USAID) to support countries with economic growth and deflation at the same time. The GHG emissions are focused on agriculture, an important source of the national GHG emissions. ALLEG has conducted a number of surveys on agricultural production including a pilot survey on rice and livestock management in three provinces (Thai Binh, Vinh Phuc and An Giang) and demonstrate a MRV tool for the emission from rice cultivation. The purpose of the survey is to develop and test a questionnaire to obtain operational data which can estimate better GHG emissions and understand the costs, potential and barriers to the application of mitigation methods in rice and livestock management. The MRV tool of this project is a web-based design tool (proof-of-concep). This tool can be further refined and used in conjunction with survey data to support national reporting on

GHG emissions, understanding the trajectories of GHG emissions for policy making and monitoring the objectives of Vietnam's Green Growth Strategy.

The project on " Nationally Appropriate Mitigation Actions Plan (NAMA) in rice cultivation and improving gasification stoves in Phu Luong commune, Thai Binh province" has been implemented since February 2016. This is a component under the cooperation project between FAO and IAE on "Strengthening readiness for NAMA actions: Capacity Building for Food and Integrated Energy Systems in Vietnam" started in 2013. In order to participate in the project and receive financial as well as technical support, it is necessary to have an MRV system in order to prove benefit from reducing GHG emissions. The MRV system help assess the potential for GHG mitigation emissions from the national to the village level. The pilot MRV system sellected for Thai Binh's production conditions is the System of Rice Intensification (SRI), which is cover a 10-hectare field, combining with improved gasifier stoves and bio-char generated from byproducts of rice and other crops. The project has contributed to reducing fossil fuel consumption, reducing inorganic fertilizers in rice cultivation, as well as increasing crop yields for sustainable agricultural development and improving farming systems in the context of climate change.

A straw management project has been implemented for effective reuse straw resources in order to limit rural environmental pollution, reduce GHG emissions, and contribute to soil improvement and livelihood improvement for rice farmers in Vietnam. The project aims to Improve farmers' livelihoods by promoting sustainable straw management that adds value to their rice crops and reduces environmental footprint from rice production systems. The supervision and evaluation of mitigation activities of the project is based on indicators such as: The amount of straw collected; Identify technology of carbonization and composting from straw; Economic value achieved.

The biogas program for the Vietnamese livestock industry funded by the Dutch Government is widely implemented in 58 provinces of Vietnam. The overall objective of the project is to support the use and development of biogas technology to manage manure, treat animal waste and produce clean, low-cost energy sources as fuel to contribute to reducing GHG emissions. The MRV process for this project has only been conducted based on the following indicators: the number of biogas digesters, number of training classes, Project anual monitoring reports and estimated GHG mitigation emissions.

The Low Carbon Agriculture Support Project (LCASP) is an ADB loan project, implemented in 10 provinces with four objectives: (i) the management of animal wastes and agricultural residues; (ii) biogas production to reduce environmental pollution and create clean energy; (iii) scaling up economic efficiency low carbon agricultural production models and (iv) reducing GHG emissions. The monitoring and evaluation for the MRV system is based on the following indicators: the number of biogas constructions, number of preferential credits provided, number of research and demonstration models performed, number of biogas users, masons, technicians , engineers and contractors being trained (ADB, 2013).

CHAPTER II

OVERVIEW ON GHG EMISSION IN VIETNAM

2.1. Overview of GHG inventory results in Vietnam

Vietnam is in the list of non-Annex I Parties of UNFCCC and up to 2019, it has completed five inventories included in three NCs and two BURs submitted to the UNFCCC (Table 2.1).

The summary results of the national GHG inventories over the years reported to UNFCCC are provided in Table 2.2

According to estimation of MONRE (2018), GHG emissions in Vietnam will likely to be increased with significant rates. The estimated numbers of GHG emission in 2010, 2020 and 2030 are given in Table 2.3.

As can be seen from Table 2.2, the average annual growth rate of GHG emissions of Viet Nam from 1994 to 2014 was about 5.2%. Of this, GHG emission rate of Viet Nam 1994 - 2000 was 45% (6 years), 2000 - 2010 was 64 (10 years), 2010 - 2013 was 5% (3 years) and 2013-2014 was 10% (1 year).

Table 2.1: Completed national GHG inventories of Viet Nam

National Inventory	Submission year	Year of the Inventory	Method used
First NC	2003	1994	1996 IPCC Guidelines
Second NC	2010	2000	Revised 1996 IPCC Guidelines and IPCC Good Practice Guidance for energy, industrial processes, agriculture, Land-use, Land-use Change and Forestry (LULUCF) and waste sectors
First BUR	2014	2010	Revised 1996 IPCC Guidelines, GPG 2000 and GPG-LULUCF 2003
Second BUR	2017	2013	Revised 1996 IPCC Guidelines, 2006 IPCC Guidelines, GPG 2000, GPG-LULUCF, Agriculture and Land Use GHG Inventory (ALU) software
Third NC	2019	2014	Revised 1996 IPCC Guidelines, 2006 IPCC Guidelines, GPG 2000, GPG-LULUCF 2003

(Source: NCs and BURs of Vietnam)

Table 2.2: Summaries of the five national GhG inventories of Vietnam

GHG Emission *(thousand tons of CO_2e)*	**1994**	**2000**	**2010**	**2013**	**2014**
Energy	25,637.09	52,773.46	141,170.79	151,402.5	171,621.08
Industrial processes	3,807.19	10,005.72	21,172.01	31,767.4	38,619.79
Agriculture	52,450.00	65,090.65	88,354.77	89,407.9	89,751.80
Forestry and land use change	19,380.00	15,104.72	-19,218.59	-34,239.8	-37,540.18
Waste	2,565.02	7,925.18	15,351.57	20,686.4	21,513.04
Total emission (incl. LULUCF)	**103,839.30**	**150,899.73**	**246,830.64**	**259,024.4**	**283,965.53**

(Source: NCs and BURs of Vietnam)

The estimations for GhG emission in 2020 and 2030 were done in 2014 and there have been no update for the data since then (Table 2.3).

Basing on the national inventory 2014, four following sectors were the biggest contributors to the total emission: Energy, Agriculture, LULUCF and Wastes. The estimations for 2020 and 2030 thus focused only on these four sectors.

The GhG emission in 2020 and 2030 had been estimated basing on national studies for average development scenarios of national economy in the respective years which included energy demand, growths of GDP, population, forest, farming land and number of cattle

Table 2.3: GhG emission estimated for 2020 and 2030 (Base year 2010) (INDC 2015)

GHG Emission *(Million tons of CO_2e)*	**2010**	**2020**	**2030**
Energy	141.1	381.1	648.5
Agriculture	88.3	100.8	109.3
Forestry and land use change	-19.2	-42.5	-45.3
Wastes	15.4	26.6	48.0
Total emission (excl. IPPU sector)	**225.6**	**466.0**	**760.5**

(Source: BUR Vietnam 2014)

In 2020, the INDC 2015 is updated to include the emission from industrial processes. As can be seen in Table 2.4, the total emission of GHG in 2030 is estimated to reach 927.9 millions ton of CO2eq (compared to 760.5 millions ton estimated by INDC 2015), including 140.3 millions ton CO2eq contributed by the industrial processes.

Table 2.4. GHG emission estimated for 2020, 2025 and 2030 (Base year 2014) (NDC 2020)

Unit: Million ton CO_2eq

Year	Energy	Agriculture	LULUCF	Wastes	IP	**Total**
2014	171.6	89.8	-37.5	21.5	38.6	**284.0**
2020	347.5	104.5	-35.4	31.3	80.5	**528.4**
2025	500.7	109.2	-37.9	38.1	116.1	**726.2**
2030	678.4	112.1	-49.2	46.3	140.3	**927.9**

(Source: BUR Vietnam 2016)

2.2. National GHG emission mitigation options in Vietnam

The 2015 INDC set a target of reducing 8% of total GHG emissions by 2030 compared to BAU, equivalent to 62.65 million tons CO2eq, with the national resources and it can be increased to 25% compared to BAU, equivalent to 197.94 million tons of CO2eq by 2030, if receiving international support through bilateral, multilateral cooperation and implementation of mechanisms.

In 2020, the targets of GHG reduction are updated in the NDC 2020 which is 9% reduction (83.9 millions ton CO_2eq) using the only national resources and 27% (250.8 millions ton ton CO_2eq) with further support from the international cooperations and mechanisms (Table 2.4).

To achieve these new goals, 66 mitigation options are developed in the 2020 NDC which consists of 35 options for the reduction of GHG emission in the energy sector, 15 for the agriculture sector, 7 for LULUCF, 5 for the waste sector and 4 for the industrial processes. Of the total 66 mitigation options, 42 options are posibly implemented by the national funding and the other options need international support. Below is the mitigation strategies to obtain the expected reduction for the five major sectors. Details of the mitigation options for the energy and the agriculture sector are further discussed in Chapter III & IV.

Table 2.5: GHG reduction scenarios by sector in 2030 (NDC 2020)

Lĩnh vực	National funding		With international support		Total contribution (National and international funding)	
	Compared to national BAU (%)	Reduction (Mil. tCO_2)	Compared to national BAU (%)	Reduction (Mil. tCO_2)	Compared to national BAU (%)	Reduction (Mil. tCO_2)
Energy	5.5	51.5	11.2	104.3	16.7	155.8
Agriculture	0.7	6.8	2.8	25.8	3.5	32.6
LULUCF*	1.0	9.3	1.3	11.9	2.3	21.2
Wastes	1.0	9.1	2.6	24.0	3.6	33.1
IPPU	0.8	7.2	0.1	0.8	0.9	8.0
Total	**9.0**	**83.9**	**18.0**	**166.8**	**27.0**	**250.8**

Note (*): Increasing GHG sequestration

Energy

- Implement investment projects on energy saving and energy efficiency in manufacturing precesses, market conversion of vehicles, equipment, machines, and production lines, improvement for public lighting, energy saving in households and other means.
- Use high efficiency electrical equipment in household, industrial and commercial use.
- Continue improvement for energy efficiency uses in industries.
- Develope renewable energy in accordance with the potentials, advantages and conditions of Vietnam.
- Higher efficient use of energy in transportation.
- Change to more effective transportation means; transport market restructuring.
- Promote public transport.
- Convert from using fosil fuels to biofuels, natural gas and electrical energy.
- Improve the energy efficiency of vehicles.
- Promote innovative technologies in production of building materials.
- Develop and apply energy-saving building materials and green materials in the housing and commercial sectors.
- Implement GHG emission reduction measures in cement production, such as reducing linker content.

Agriculture

- Application of innovative management solutions and technology in cultivation and husbandry; improve the animal's diet; restructure plant varieties; change in land uses.
- Apply technology to treat and reuse by-products and waste in agriculture and livestock production; reduce fertilite uses and develop organic agriculture.

LULUCF

- Protect, conserve and sustainably use forests and forestland to increase carbon sequestration and to obtain forest certification.
- Promote afforestation, forest development, with priority given to production forests, large timber forests and coastal forests; rehabilitation of protective forests and special-use forests.
- Promote regeneration of natural forests, enrichment of planting forest, improving forest carbon stocks and quality.
- Develop agroforestry models to increase carbon stocks and conserve soil.

Solid wastes

- Implement measures to manage, develop and apply innovative technology to treat the municipal solid wastes, industrial solid wastes and specific solid wastes to limit greenhouse gas emissions.

Industrial processes

- Implement solutions for crushing blast furnace slag, crushing fly ash, crushing Puzzolana and crushing limestone to replace clinker in cement production.
- Reduce consumption of HFCs.

CHARTER III:

CURRENT STATUS, NEEDS AND GAPS ASSESSMENT OF MRV SYSTEM IN ENERGY SECTOR

3.1. Assessment for reduction potential and mitigation actions of GHG emission in the energy sector of Vietnam

3.1.1. The mitigation action of GHG emission in energy sector

The mitigation actions of GHG emission for the energy sector of the NDC 2020 consist of 35 options with the GHG emission reduction potential of 155.8 million tons CO_2eq in 2030 (alternatively, the accumulative reduction from 2015 to 2030 is about 943.1 million tons). In 2030, the reduction of the energy sector is expected to account for 5.5% out of the total 9% reduction commited Vietnam in the NDC 2020.

Table 3.1: Assumptions for mitigation options in the energy sector

Option	**Assumption**
E1. High efficiency residential air conditioning	By 2030, high-efficiency air conditioners will increase from 15% in 2014 to 75% of all households using air conditioners in urban areas and similarly from 8% to 55% in rural areas.
E2. High efficiency residential refrigerators	By 2030, high efficiency refrigerators will increase from 15% in 2014 to 80% of all households using refrigerators in urban areas and similarly from 10% to 65% in rural areas. A high efficiency refrigerator with equivalent capacity costs about 15% more, but can save 30% in energy consumption.
E3. High efficiency residential lighting	By 2030, use of energy-saving lighting (LED) will increase from 17% in 2014 to 70% of total lights in 2030 to replace incandescent lamps (or other similar traditional lamps).
E4. Solar water heaters	By 2030, solar water heaters will increase from 1% in 2014 to 30% of all urban households and similarly from 0.3% to 5% in rural areas.
E5. Replace coal by using biogas for household cooking in rural areas	By 2030, biogas equipment will increase from 0.7% in 2014 to 5% of all rural households to replace coal for cooking.

E6. Optimize combustion of clinker kiln	By 2030, combustion optimization measures will be applied for production of about 50% of clinker production.
E7. Use a vertical mill in cement production	By 2030, application of vertical mill will be applied to produce about 50% of the cement output.
E8. Reduce heat loss of clinker kiln	By 2030, measures to reduce the heat loss of clinker kilns will be applied to produce about 40% of clinker production.
E9. Recover waste loss from cement production	By 2030, the measure for recovery of heat loss from cement production to use for electricity generation will be applied to about 50% of cement output.
E10. Apply innovative technology in hard brick production	By 2030, innovative technology measures to replace traditional technology will be applied to the production of about 70% of traditional brick production.
E11. Spray additional anthracite coal powder into blast furnace	By 2030, additional spraying of powdered anthracite coal into blast furnaces will be applied to produce about 50% of cast iron.
E12. Preheat scrap steel before processing into electric arc furnace (EAF)	By 2030, preheating of scrap steel prior to processing in electric arc furnaces will be applied to produce about 75% of steel output.
E13. Heating inside steel rolling machine	By 2030, heating method inside steel rolling machine will be applied to produce about 75% of steel output using electric arc furnace technology.
E14. Recover heat from oxygen blower (BOF)	By 2030, gas heat recovery from an oxygen blast furnace (BOF) is applied to produce about 75% of steel production using blast furnace technology.
E15. Impose standards on fuel consumption for new imported and assembled motor vehicles	By 2030, the standards for fuel consumption will achieve: (*i*) 100% of motorcycles sold will meet the norm of 2.3 liters / 100km; (*ii*) 100% of sold cars meet the following standards: small cars (<1400cc) reach 4.7 liters / 100km, average cars (1400-2000cc) reach 5.3 liters / 100km; large car (> 2000cc) reached 6.4 liters / 100km.
E16. Change the mode of passenger transportation from private vehicles to public transport	By 2030, changes of transport from private to public vehicles will achieve the following results: Bus system development in 05 large cities (Hanoi, Ho Chi Minh, Hai Phong, Da Nang, Can Tho); Operation of 04 new public passenger transport routes BRT in Hanoi, Da Nang & Ho Chi Minh City; Operating 03 new

	public passenger transport routes by urban railway in Hanoi and Ho Chi Minh City
E17. Change the mode of transport from land to inland waterways and coastal routes	By 2030, the volume of goods transported by inland waterways will increase from 127.8 to 128.8 billion tons-km; the rate of land-road transport will be decreased from 23.4% to 23.0%; The volume of freight transported by land converted to sea is assumed to be equal to those from land road to inland waterway during the same period.
E18. Promote electric motorbikes	Newly sold electric scooters account for 07% of the total number of new motorcycles sold in the market every year.
E19. Promote the use of biofuel	The average annual output of ethanol is 145,000 m^3 used to produce biofuel E5 for transportation.
E20. Promote use of CNG buses	By 2030, the total number of CNG buses is 623 cars, including 423 cars in Ho Chi Minh City and 200 cars in Hanoi.
E21. Using high efficiency electrical equipment in commercial service	By 2030, by using high-efficiency equipment, electricity demand will decrease by about 12% compared to BAU (WB-MOIT, 2019).
E22. Develop small hydropower	The capacity of small hydroelectric plants could reach 3,800 MW by 2020; 4,700 MW in 2025 and 5,000 MW in 2030 to replace coal-fired power plants.
E23. Development of solar PV power	Increase capacity from 4,464 MW in 2019 to 5,000 MW by 2020 (and maintain until 2030) to replace coal-fired power plants.
E24. Development of wind power	Increase capacity from 304.6 MW in 2019 to 1,010 MW by 2020 (and maintain until 2030) to replace coal-fired power plants.
E25. Development of biomass thermal power	70 MW from waste-to-energy plants will be installed in 2020 and continuously increase to 210 MW and 350 MW in 2025 and 2030 respectively, to replace coal-fired power plants.
E26. Use cleaner fuels for cooking in rural areas	By 2030, the number of rural households using LPG to replace coal for cooking increases from 30% (in BAU) to 50%

E27. Improve energy efficiency in industrial sub-sectors (except for production of brick, cement and steel)	By 2030, measures to improve energy efficiency in industrial sub-sectors (excluding production of brick, cement and steel) through improving the efficiency of boilers, electric motors and other electrical equipment can save up to 6.5% of energy needs.
E28. Promote electric cars	By 2030, the number of new electric cars sold accounts for 30% of the total sales of cars on the market.
E29. Increase the load factor of trucks	By 2030, the freight load factor will improve from 56% to 60%
E30. Change mode of transport from land road to railways	By 2030, freight transport by railway will increase to 12.5% annually.
E31. Development of biomass thermal power	110 MW of biomass thermal power will be installed in 2020, followed by 550 MW in 2025 and 1,200 MW in 2030
E32. Develop power generation from landfill gasses	10 MW from use of landfill gasses will be installed in 2020, followed by 30 MW in 2025 and 50 MW in 2030
E33. Development of biogas electricity generation	10 MW from biogas electricity generation will be installed in 2020 and 30 MW in 2030
E34. Development of supercritical thermal power technology	2,400 MW from supercritical thermal power plants will be installed in 2020, followed by 10,800 MW in 2025 and 27,600 MW in 2030
E35. Development of mixed gas turbines using LNG	LNG mixed gas turbines will be installed with 750 MW capacity in 2021, followed by 3,000 MW in 2025 and 12,750 MW in 2030.
E18s. Promote electric motorbikes	By 2030, electric scooters sold will account for 14% of the total number of new motorcycles sold in the market annually
E19s. Promote the use of biofuel	E5 gasoline accounts for 40% of total gasoline sold; assuming no supply restrictions.

E23s. Development of solar PV power	The capacity to be increased (compared to E23) to achieve 9,500 MW in 2025 and 16,600 MW in 2030
E24s. Development of wind power	The capacity to be increased (compared to E24) to achieve 3,500 MW in 2025 and 8,200 MW by 2030

3.1.2. GHG reduction potential assessment in the energy sector

Basing on the identified criteria, GHG emission reduction measures are selected, including: 25 national implementation measures; and 14 measures to be taken with international support.

a/ Mitigation options by national funding

National implemented GHG emission reduction measures in the energy sector could reduce 409.2 million tons of CO_2eq in the period 2015-2030 and 51.5 million tons CO_2eq in 2030 alone. Costs and mitigation potential of the 25 national implemented reduction measures in energy sector from 2015 to 2030 is presented in Table 3.2.

Table 3.3: GHG emission reduction options in the energy sector implemented by the national funding (NDC 2020)

Option	**Mitigation potential** *(Mil tCO_2eq)*		**Cost for mitigation ([1])**	**Finance ([2]) (2015-2030)**
	2015-2030	**2030**	*(USD/tCO_2eq)*	*Mil. USĐ*
E1. High efficiency residential air conditioning	23.9	4.6	7.4	4,150.5
E2. High efficiency residential refrigerators	11.3	1.6	2.2	3.334.7
E3. High efficiency residential lighting	47.0	6.4	-16.3	891.4
E4. Solar water heaters	5.2	1.0	23.0	345.9
E5. Replace coal by using biogas for household cooking in rural areas	9.5	1.1	0.1	129.4
E6. Optimize combustion of clinker kiln	3.1	0.4	-6.4	22.9
E7. Use a vertical mill in cement production	6.8	0.9	29.8	368.2

Option	Mitigation potential *(Mil tCO_2eq)*		Cost for mitigation ([1])	Finance ([2]) (2015-2030)
	2015-2030	**2030**	*(USD/tCO_2eq)*	*Mil. USĐ*
E8. Reduce heat loss of clinker kiln	4.3	0.6	-11.5	3.3
E9. Recover waste loss from cement production	15.0	1.8	-6.8	354.8
E10. Apply innovative technology in hard brick production	10.8	1.4	-11.8	36.8
E11. Spray additional anthracite coal powder into blast furnace	2.7	0.7	-10.8	11.8
E12. Preheat scrap steel before processing into electric arc furnace (EAF)	4.1	0.6	-19.9	18.5
E13. Heating inside steel rolling machine	4.9	0.7	-15.1	46.2
E14. Recover heat from oxygen blower (BOF)	4.3	0.9	0.3	56.7
E15. Impose standards on fuel consumption for new imported and assembled motor vehicles	15.8	5.1	-65.5	0.4
E16. Change the mode of passenger transportation from private vehicles to public transport	4.6	0.4	-9.7	411.5
E17. Change the mode of transport from land to inland waterways and coastal routes	16.0	1.6	-78.3	282.7
E18. Promote electric motorbikes	4.6	0.6	-67.2	251.2
E19. Promote the use of biofuel	3.1	0.3	43.8	93.0
E20. Promote use of CNG buses	0.1	0.03	34.1	6.5

Option	Mitigation potential *(Mil tCO_2eq)*		Cost for mitigation ([1])	Finance ([2]) (2015-2030)
	2015-2030	**2030**	*(USD/tCO_2eq)*	*Mil. USĐ*
E21. Using high efficiency electrical equipment in commercial service	23.3	3.8	-16.9	134.4
E22. Develop small hydropower	100.7	9.1	3.1	3,592.9
E23. Development of solar PV power	60.8	5.0	27.3	3,891.0
E24. Development of wind power	18.2	1.5	46.5	1,088.4
E25. Development of biomass thermal power	9.1	1.4	25.1	364.6
TOTAL	**409.2**	**51.5**		**19,887.7**

For the national funding by 2030, the greatest potential mitigation action is E22. Small hydropower plants (9.1 million tons CO_2eq), followed by E3 (high efficiency residential lighting, 6.4 million tons CO_2eq). The total reduction potential by the national funding is about 51.5 million tons CO_2eq).

b/ Mitigation options with international support

The reduction measures with international support in the energy sector could reduce 533.9 million tons of CO_2eq in the period 2015-2030 and 104.3 million tons of CO_2eq in 2030. The details are presented in Table 3.4

Table 3.4: GHG emission reduction options in the energy sector implemented by the international support

Option	Mitigation potential *(Mil tCO_2eq)*		Cost for mitigation ([1])	Finance ([2]) (2015-2030)
	2015-2030	**2030**	*(USD/tCO_2eq)*	*Mill. USD*
E18s. Promote electric motorbikes	7.8	1.0	-67.2	427.1
E19s. Promote the use of biofuel	1.8	0.3	52.8	51.8

E23s. Development of solar PV power	51.3	10.3	46.6	4,321.5
E24s. Development of wind power	47.6	10.0	75.5	4,584.1
E26. Use cleaner fuels for cooking in rural areas	31.9	3.8	22.1	160.5
E27. Improve energy efficiency in industrial sub-sectors (except for production of brick, cement and steel)	87.4	15.0	-6.5	1,469.2
E28. Promote electric cars	7.7	1.9	86.1	1,467.0
E29. Increase the load factor of trucks	7.9	1.3	-40.8	343.4
E30. Change mode of transport from land road to railways	6.9	1.1	-67.8	168.5
E31. Development of biomass thermal power	22.5	4.0	33.5	859.1
E32. Develop power generation from landfill gasses	0.9	0.1	6.7	21.1
E33. Development of biogas electricity generation	0.6	0.1	30.6	27.9
E34. Development of supercritical thermal power technology	120.7	22.4	43.8	18,166.1
E35. Development of mixed gas turbines using LNG	138.9	33.0	25.7	3,706.8
TOTAL	**533.9**	**104.3**		**35,774.1**

For actions supported by international support, the highest potential mitigation of GHG emission is E35, followed by E34, E27, E23s and E24s. The total potential of the GHG emission reduction in 2030 which requires the international support is 104.3 million tons CO_2eq, about twice of those by the national funding (51.5 million tons CO_2eq).

3.2. Selection of priority policy for tracking progress of NDC implementation for the GHG mitigation

3.2.1. Current official energy policies in Vietnam

Even though the Vietnam Government recognises potential of the mitigation options, official policies of the country need to consider also fisibility of each option in order to rank their position adequately in the priorrity list. Hereafter is important policies for the energy sector in Vietnam which is in accordance with commitments of the government:

- No.1855/QD-TTg in December 27th 2007, Decision of the Prime Minister approved Vietnam's National Energy Development Strategy to 2020, with a vision to 2050;
- No.50/2010/QH12 in June 17th 2010 Law promulgated by the National Assembly Law on Economical and Efficient Use of Energy;
- No.21/2011/ND-CP in March 29, 2011, Decree of the Government detailing the Law on Energy Use and thrifty and efficient measures including: economical and efficient use of energy; energy labeling for energy-efficient vehicles and equipment, and measures to promote economical and efficient use of energy;
- No.68/2011/QD-TTg in December 12th 2011, Decision of the Prime Minister promulgated the list of energy-saving devices and equipment equipped and procured for agencies and units use of state budget;
- No.1427/QD-TTg in October 1st 2012, Decision of the Prime Minister approved the National Target Program on economical and efficient use of energy in the 2012-2015 period to form Law on economical and efficient use of energy enforcement network, implementing energy saving programs at central and local levels. The specific goal is to save from 5% to 8% of the total energy consumption compared to the forecast on energy development and socio-economic development according to BAU;
- No.2068/QD-TTg in November 25th 2015, Decision of the Prime Minister approving Vietnam's Renewable Energy Development Strategy to 2030 with a vision to 2050. One of the Strategy’s Goals is to develop and use renewable energy resources to contribute the achievement of sustainable environmental goals and green economy development;

- No.428/QD-TTg in March 18th 2016, Decision of the Prime Minister approved the Adjustment of the National Electricity Development Plan for 2011-2020 period with a vision to 2030 (Total diagram VII-amended) in which increasing the proportion of renewable energy in the total electricity generation expected to reach 6.5% in 2020, 6.9% in 2025 and 10.7% in 2030 with 4 renewable energy sources including wind, solar, biomass and small hydroelectricity;
- No.04/2017/QD-TTg in March 9th 2017, Decision of the Prime Minister promulgated the List of equipment and instruments labeled with energy efficiency and minimum energy efficiency standards and roadmap perform;
- No.11/2017/QD-TTg in April 11th 2017, Decision of the Prime Minister on the mechanism to encourage the development of solar power projects in Vietnam.
- Vietnam Construction Standards on Energy Efficiency Building Rules (EEBC)-QCXDVN 09:2005 in November 17th 2005 issued by the Ministry of Construction according to Decision No. 40 / QD-BXD;
- National technical regulation on energy-saving buildings - QCVN 09: 2013/BXD in September 26th 2013 issued by the Ministry of Construction according to Circular No. 15/2013;
- No.15/2013/TT-BXD in September 26th 2013, Circular promulgated national technical regulation on energy-efficient buildings (This Circular promulgated national technical regulation QCVN 09:2013/BXD);
- No.13443/QD-BCT on December 8th 2015, Decision of the Ministry of Industry and Trade approved the Green Growth Action Plan of the Industry and Trade Sector in 2015-2020 period to concretize the key tasks in industry and trade to carry out the objectives and tasks of the to concretize the key tasks in industry and trade in order to realize the objectives and tasks of the Green Growth National Strategy and the Green Growth National Action Plan for the period of 2014- 2020.
- No.802/QD-BXD in July 26th 2017, Decision of the Ministry of Construction promulgated the Action Plan on GHG emission reduction in cement industry by 2020, with orientations to 2030 with a goal to 2020, reduce 20 million tons of CO2 equivalent (tons of CO2td) and by 2030 reduce 164 million tons of CO2td compared to BAU.

3.2.2. Select priority policies to follow the progress of implementing mitigation actions in the NDC

Selection of priority policies for tracking NDC implementation progresses should base on two criteria: the mitigation potential and the degree of their fisibility (MONRE, 2018). Basing on both the relevant policies in the energy sector (3.2.1) and the mitigation options in Table 3.3 and Table 3.4, some high-priority actions and policies for tracking the NDC implementation progress could be selected as follows:

Table 3.5: Select priority policies to follow the progress of implementing mitigation actions in the NDC

No	Action	Priority Policy
1	E1, E3, E21	• No.50/2010/QH12 in June 17th 2010 Law promulgated by the National Assembly Law on Economical and Efficient Use of Energy; • No.21/2011/ND-CP in March 29, 2011, Decree of the Government detailed the Law on Energy Use and thrifty and efficient measures including: economical and efficient use of energy. fruit; energy labeling for energy-efficient vehicles and equipment, and measures to promote economical and efficient use of energy; • No.04/2017/QD-TTg in March 9th 2017, Decision of the Prime Minister promulgated the List of equipment and instruments labeled with energy efficiency and minimum energy efficiency standards and roadmap perform;
2	E4, E23	• No.2068/QD-TTg in November 25th 2015, Decision of the Prime Minister approved Vietnam's Renewable Energy Development Strategy to 2030 with a vision to 2050. One of the Strategy's Goals is to develop and use renewable energy resources to contribute the achievement of sustainable environmental goals and green economy development;

3	E6, E7, E8, E9	• No.802/QD-BXD in July 26th 2017, Decision of the Ministry of Construction promulgated the Action Plan on GHG emission reduction in cement industry by 2020, with orientations to 2030 with a goal to 2020, reduce 20 million tons of CO2 equivalent (tons of CO2td) and by 2030 reduce 164 million tons of CO2td compared to BAU.
4	E34	• No.428/QD-TTg in March 18th 2016, Decision of the Prime Minister approved the Adjustment of the National Electricity Development Plan for 2011-2020 period with a vision to 2030 (Total diagram VII-amended) in which increasing the proportion of renewable energy in the total electricity generation expected to reach 6.5% in 2020, 6.9% in 2025 and 10.7% in 2030 with 4 renewable energy sources including wind, solar, biomass and small hydroelectricity;

3.3. Needs and gap assessment for the MRV system in the energy sector of Vietnam

3.3.1. Gap assessment for the MRV system in energy sector

a/ Measurement

For the energy sector alone, the starting point for establishing a baseline is the greenhouse gas inventory outlined in NCs and BURs, however the NCs and BURs have been developed using available funding from projects and with ad-hoc basis which sometime are inconsistency with the national intentional inventory cycles. Therefore, determination of the baseline for a mitigation project in energy sector faces difficulties when its implementation doesn't comply the national inventory cycle (Nguyen Quang Huy, 2018).

Moreover, the establishment of baselines for this sector, or this each project may affect the baselines of other sectors or other projects. For example, measuring the effectiveness of a NAMA to promote the energy efficiency of home appliances can affect the baseline of energy structure change to increase energy contribution of renewable or new energy into the national grid. If the emission factor of a national grid decreases (by replacing fossil-based power with renewable energy), the level of emission reduction per unit of household appliances will be lower but of course, the final result is still positive for the entire energy system. Therefore,

the establishment of sectoral or national baselines is very closely related and it is necessary to identify targets by specific time periods and regions. In other words, the establishment of a sectoral or national baseline is linked to the scope and boundaries of mitigation programs and projects. However, at present, the establishment of sectoral and national baselines has not been closely linked.

Measurement activities are a prerequisite for the reporting and verification process. Measurement, firstly, requires a defined and recognized unit of measurement and records are provided for verification through the reporting system. For the national energy sector, it is reported in the NCs and BURs, and the measuring entity is the DCC, MONRE. However, for sub-sectors within the Energy sector that are mission or project-specific, measurements will be made depending on the donor, advisory and implementation units. For example, in the transport sub-sector, the emissions measurement in the BUR and in the project funded by GIZ has a difference of 1,4%. Thus, different approach and level of detail will cause different results. Selection of measuring method depends on financial resources. The measurement activities of the sector and the country should have been closely linked in order to reduce the implementation cost from overlapping measurement activities.

In addition, the establishment of institutional arrangement for the national inventory has been implemented but its operation has several obstacles and incompleteness. Ministries and sectors have not provided sufficient data for the inventories in energy sector; statistical data and those from surveys also show discrepancies.

b/ Report

The timeline for reporting national inventories is inconsistent (as presented in the Chapter I of this report), since they have been being carried out under project budgets from national and international sponsors. Up to now, the inventories has not been implemented annually from the state funding.

c/ Verification

The verification process for the energy sector is carried out through the national QA/QC process. The QC process has been carried out by independent experts. The QA process has only been implemented in the 3rd NC.

In addition, the energy sector verification process is carried out along with the BURs through the ICA process.

As such, the verification of the energy sector has not been fully implemented, has not been continuous throughout the national inventory periods.

For the verification of projects related to the energy sector, the establishment of a third party to verify the project has not been done, there is still gaps in the process of establishing the verification process.

3.3.2. Need assessment for the MRV system in energy sector

Based on the gaps given in section 3.3.1, the needs for improvement of MRV in the energy sector are as follows:

- Establishing and unifying emission baseline for sectors that help to develop mitigation actions based on baseline emissions accurately and transparent;
- Establish organizational structure, institutions, laws and legal documents for the development of MRV systems, governance of the MRV systems. For mitigation projects/programs, there are separate legal frameworks that regulate the operation of an MRV system, taking into account factors that directly affect the effectiveness of the system, such as:

  + Authority: is a government agency with authority to certify the legality and effectiveness of the MRV system;

  + Responsibilities: belong to the stakeholders and is responsible for carrying out work in an MRV system;

  + Verification: usually given to a third party if it is found to be necessary for the operation of an MRV system;

  + Compliance: legality of activities need to be carried out in a project or program;

  + Deadline for reporting: stipulating the time limit for measurement, reporting and evaluation activities;

  + Issuing certification: is the responsibility of the agency competent to issue certification for compliance of a project or program that has had appropriate MRV activities;

  + Penalties and sanctions: Penalty provisions in the case that a project or program fails to comply with the requirements of an MRV system.

- Strengthening the capacity of all relevant subjects to carry out the statistical survey, statistical reports, helping to fill data gaps, creating more favorable conditions for the measurement process;

- Strengthening the capacity of technical experts, meeting the demand for greenhouse gas inventories for the energy sector in particular and the country in general;
- Completing the national greenhouse gas inventory system, especially the smooth coordination between stakeholders, facilitating for the periodic inventory process and helping the implementation of MRV be carried out fully and transparently.
- Regulating Verification functions at the sector level: The organizational structure of the verification process may include different organizations. Reporting and monitoring agencies may act as a de facto appraising body, in that case it will correspond to the appraising process of second party. MRV systems may also use the first-party verification process, which is the organization or agency responsible for implementing one or more NAMAs that commit to an verification through an internal review process;
- Regulating the verification process and issuing credits for MRV-approved projects, this process can be done through the State management agencies responsible for NAMA, consulting companies or through national verification agencies;
- Strengthen cooperation, attract financial resources for periodic inventory activities and MRV activities for emission reduction;

CHAPTER IV

CURRENT STATUS, NEEDS AND GAP ASSESSMENT OF MRV SYSTEM IN AGRICULTURE SECTOR

4.1. Assessment for reduction potential and mitigation actions of GHG emission in the agriculture sector of Vietnam

15 GHG mitigation options were identified and assessed. They were developed based on the BAU scenario, assuming that new policies are developed to support GHG mitigation technologies. The GHG mitigation options were reviewed for efficiency, incremental costs, mitigation potentials and co-benefits compared to the BAU scenario. The economic and technical parameters for each option taken from studies, publications and projects (NDC, 2020; MONRE, 2018) . The assumptions for the options are presented in Table 4.1.

Table 4.1. Assumptions for mitigation options in the agriculture sector

Options	Implementation time	Assumption
A1. Alternate wetting and drying and System of rice intensification (SRI) in areas with adequate infrastruture	2021-2030	By 2030, the government implements rice cultivation with AWD and SRI of 200,000 ha compared with 45,000 ha currently.
A2. Mid-seasonal water withdrawal	2021-2030	By 2030, apply the mid-crop water withdrawal method for 1,000,000 ha of rice to reduce GHG emissions while save water for irrigation, and increase the resilience of plants.
A3. Converting rice - rice cultivation land to rice - aquaculture land	2021-2030	By 2030, convert 200,000 hectares of rice with low and unstable efficiency to rice-shrimp systems to reduce GHG emissions and increase economic efficiency

Options	Implementation time	Assumption
A4. Converting rice cultivation land into upland crops.	2021-2030	By 2030, convert 200,000 ha of rice land with low yield and efficiency to upland crops to adapt to drought and water shortage conditions and reduce GHG emissions.
A5. Improve the quality of dairy cow diets.	2021-2030	By 2030, the government will promote farmers to improve the diet for 400,000 dairy cows compared to the current diet, to increase milk yield of the current dairy herd.
A6. Improve dietary quality for beef cattle.	2021-2030	By 2030, the government will deploy farmers to improve the diet for 2,000,000 beef cows compared to the current diet to increase the yield and meat production of the current herd.
A7. Improve diet quality for buffalo	2021-2030	By 2030, the government will support farmers to improve the diet for 500,000 buffaloes compared to the current diet to increase the productivity and meat production of the current buffalo herd.
A8. Reuse of agricultural residues	2021-2030	By 2030, straw residues of 1,200,000 ha will be collected for use as compost, supplementing organic fertilizers for cultivation.
A9. Integrated Crop Management (ICM) for rice.	2021-2030	By 2030, it will increase the area of integrated crop management to 1,000,000 hectares of rice to increase economic efficiency and the quality of agricultural environment.
A10. Integrated crop management (ICM) for upland crops.	2021-2030	By 2030, it will increase the area of integrated crop management to 1,000,000 ha of upland crops to increase economic efficiency and the quality of agricultural environment.

Options	Implementation time	Assumption
A11. Replace urea fertilizer with slow-soluble nitrogen.	2021-2030	By 2030, urea fertilizer will be replaced with fertilizer $(NH_4)_2SO_4$ per 3,500,000 hectares of crops to reduce GHG emissions.
A12. Alternate wetting and drying (AWD) and System of rice intensification (SRI) in areas with medium infrastructure	2021-2030	With international support, by 2030, alternating wet and dry irrigation technology and SRI will be applied on 500,000 hectares of rice.
A13. Alternate wetting and drying (AWD) and System of rice intensification (SRI) in areas with low infrastructure	2021-2030	With international support, by 2030, alternate wet and dry irrigation technology and SRI will be applied on 1000,000 hectares of rice.
A14. Drip irrigation combined with fertilizing for coffee.	2021-2030	With international support, by 2030, drip irrigation systems integrated with fertilizer will be applied for 450,000 hectares of coffee
A15. Improving technology to reuse livestock wastes as organic fertilizers.	2021-2030	With international support, the technology for making organic fertilizer from livestock waste will be implemented for 44,000,000 cattle to serve sustainable agricultural production.

Based on available data and assumptions, the mitigation potentials and costs per tCO2eq for the 15 different options can be calculated and compared to the BAU scenario. Table 4.2 and Table 4.3 presents the potential and cost for each of mitigation options in the agricultural sector in case of the national funding (Table 4.2) and with international supports (Table 4.3), respectively.

For the national funding by 2030, the greatest potential mitigation action is A2. Mid-seasonal water withdrawal (3.2 million tons CO_2eq), followed by A4 and A3. The

total reduction potential by the national funding in 2030 is about 6.8 million tons CO_2eq and accumulative potential from 2021 to 2030 is 37.9 million tons.

Table 4.2. GHG emission reduction in the agriculture sector implemented by the national funding (NDC 2020)

Options	**Reduction potential** *(Mil. tons CO_2eq)*		**Cost**	**Financial need** (2021-2030)
	2021-2030	**2030**	*(USD/tCO_2eq)*	*Mil. USD*
A1. Alternate wetting and drying and System of rice intensification (SRI) in areas with adequate infrastruture	5.2	0.9	39.6	181.1
A2. Mid-seasonal water withdrawal	17.6	3.2	30.0	1,027.3
A3. Converting rice - rice cultivation land to rice - aquaculture land	7.2	1.3	-293.2	181.8
A4. Converting rice cultivation land into upland crops.	7.9	1.4	-0.1	0.036
Total	**37.9**	**6.8**		**1,390.2**

For the options which needs international supports, the greatest potential mitigation action is A15 (reuse livestock wastes as organic fertilizers), followed by A11 (replace urea fertilizer by slow-soluble nitrogen) and A13 (alternate wetting and drying irrigation and System of Rice Intensification). The total reduction potential with international supports in 2030 is about 25.8 million tons CO_2eq and accumulative potential from 2021 to 2030 is 146.6 million tons.

Table 4.3. GHG emission reduction in the agriculture sector implemented with international support (NDC 2020)

Option	Reduction potential *(Mil. tons CO_2eq)*		Cost	Financial need (2021-2030)
	2021-2030	**2030**	*(USD/tCO_2eq)*	*Mil USD*
A5. Improve the quality of dairy cow diets.	0.5	0.1	89.0	5.5
A6. Improve dietary quality for beef cattle.	6.4	0.3	89.0	27.3
A7. Improve diet quality for buffalo	1.7	0.1	89.0	6.8
A8. Reuse of agricultural residues	0.7	0.1	63.2	30.0
A9. Integrated Crop Management (ICM) for rice.	2.75	0.5	20.0	9.1
A10. Integrated crop management (ICM) for upland crops.	1.8	0.3	25.0	9.1
A11. Replace urea fertilizer with slow-soluble nitrogen.	30.8	5.6	30.0	15.9
A12. Alternate wetting and drying (AWD) and System of rice intensification (SRI) in areas with medium infrastructure	25.7	4.7	65.0	795.5
A13. Alternate wetting and drying (AWD) and System of rice intensification (SRI) in areas with low infrastructure	25.7	4.9	94.9	2,075.0
A14. Drip irrigation combined with fertilizing for coffee.	9.4	1.7	124.2	1,227.3
A15. Improving technology to reuse livestock wastes as organic fertilizers.	37.4	7.5	94.9	2.0
Total	**146.6**	**25.8**		**4,203.5**

4.2. Selection of priority policy to pilot tracking progress of NDC implementation for the mitigation in agriculture sector

Identifying potential mitigation activities is considered as the first step for the implementation of Vietnam's NDC. The process of consulting stakeholders on basis of valuation aims to determine the priority of mitigation activities in the NDC is vital. Besides that, rural development is also one of the tasks of the Ministry of Agriculture and Rural Development. Therefore, the "double benefit" must be given priority over the benefits of GHG mitigation emissions, namely raising income, products with higher quality and safety, and stable output and productivity, reducing environmental pollution, reducing labor burden, etc. (MARD, 2016; MONRE, 2018).

The selection, evaluation of priority policies for mitigation activities for the Agriculture sector of NDC is conducted with the participation of stakeholders both nationally and internationally. In general, the selection of priority mitigation actions is carried out according to the following general criteria:

- Consistent with the policy's priority orientation,
- Economic efficiency,
- The effect of GHG mitigation emissions,
- Ease of application / operation,
- Economic / Social / Environmental Impacts and Applicability in the Vietnamese context.
- Contribution to the improvement of food security and agricultural productivity (which is a sector specific criterion)

During the developing process of criteria and prioritization, the Evaluation Team collaborated with stakeholders in consultation with officials from MONRE and relevant ministries to propose a common set of criteria in general and for agriculture sector in particular.

Table 4.5: Common set of criteria for prioritizing activities

Criteria	Content

Economic efficiency	Examine the economic impact of implementation process such as initial expense, operating and life cycle cost.
The potential of GHG mitigation emissions	Evaluate the impact of emission reductions on the reference value that can be found from pre-existing technical descriptions, studies or norms, taking into account the emission reduction scenario.
Ease of application/ operation	Evaluate the ease of operation maintenance feature, easy to install
Other environmental impacts	Check for any negative impacts on environment (such as F-gas refrigerant from energy-saving appliances).
Vietnam context	Confirm the conditions for technical reception such as the current distribution system and service center

Table 4.6: Criteria for selecting priority activities for the Agriculture sector

Criteria	Evaluating basis	Index	Evaluation
Consistent with the policy priority	Existing policy documents	High	Law / Decree / Planning
		Average	Only strategic documents
		Low	No policy documents
Economic efficiency	Expense (Mitigation cost)	High	Group 1/3 highest (cheaper)
		Average	Group 1/3 average
		Low	Group 1/3 highest
GHG mitigation emission effect	Mitigation emission potential (Value of GHG reduction reference in the short list)	High	Group 1/3 highest
		Average	Group 1/3 average
		Low	Group 1/3 lowest

Ease of operation	The level of technical ease for operation	High	Can purchase all resources/ materials in Vietnam
		Average	Can purchase a part of resources/ materials in Vietnam
		Low	Hard to buys resources/ materials in Vietnam
	Operation and maintenance system	High	Can use existing system; can withstand the entire maintenance expenses
		Average	Need some small adjustments; can withstand a part of maintenance expenses
		Low	Need major upgrades such as changing the production lines; can not tolerate maintenance costs
Other social and environmental impacts	Economic	High	Increase income for beneficiaries
		Average	No change in income for beneficiaries
		Low	Reduce income for beneficiaries
	Society	High	Strengthen linkages
		Average	Strengthen social linkage at low level
		Low	No change in social linkages

	Environment	High	Contribution in reducing environmental pollution (soil, rivers, sea, air)
		Average	Contribute some parts in reducing environmental pollution (soil, rivers, sea, air)
		Low	No contribution in reducing environmental pollution (soil, rivers, sea, air)
Ease of application	Ease of application of technological features	High	Need less time to train and master the technology
		Average	Need moderate time to train and master the technology
		Low	Need a lot of time to train and master the technology
Contribution to improve food security	Agricultural production costs, Changes in revenue source use.		Increase/decrease in agricultural production costs, ways of using revenue source (separated into food costs, education costs, etc.) or more easily by reducing agricultural production costs or increasing incomes).
The level of contribution to agricultural productivity	Changes in revenue source use.		Increase/decrease in revenue source (the beneficiary's livelihood improves if productivity increase goes along with income increase).

The following is a summary results of the assessment of the mitigation activities in the agriculture sector using the above mentioned criteria groups. The classification however, can be changed as new policies may arrise.

Table 4.7: Classification of priority policy and actions for the mitigation

Order	NDC order	Plan	Ranking priority	Evaluation
1	A1	Alternate wetting and drying and System of rice intensification in areas with adequate infrastruture	A	This can be implemented if barriers, such as establishing a water management association or water management company are overcome
2	A2	Mid-seasonal water withdrawal	A	This can be implemented if barriers, such as establishing a water management association or water management company, are removed.
3	A4	Converting rice cultivation land into upland crops.	A	This can be done when rice production can be assured by higher productivities from other areas
4	A8	Reuse of agricultural residues	A	Contribute to reducing agricultural production costs and protecting the environment (reducing chemical fertilizers, increasing organic fertilizers)
5	A10	Integrated crop management (ICM) for upland crops.	A	High priority for the deployment of this technology because it will reduce agricultural production costs.

6	A3	Converting rice - rice cultivation land to rice - aquaculture land	B	It can be implemented in certain areas with suitable conditions.
7	A5, A6, A7,	Improve the quality of dairy cow, beef cattle and buffalo diets	B	It can be implemented if barriers, such as establishing a cooperative purchasing system for associations and farmer groups to reduce raw material purchasing costs, are removed.
8	A11	Replace urea fertilizer with slow-soluble nitrogen.	B	Can be implemented if barriers, such as establishing an operational management system for maintenance, are removed.
9	A12, A13,	Alternate wetting and drying (AWD) and System of rice intensification (SRI) in areas with medium and low infrastructure.	B	This can be implemented if barriers, such as water management associations or water management companies, are removed. The current capacity of these groups and companies maybe need to be improved.
10	A14	Improve drip irrigation system combined with fertilizing for coffee.	B	This can be implemented if barriers, such as enabling farmers to plan appropriate irrigation cycles, including maintenance, are removed.
11	A15	Improving technology to reuse livestock wastes as organic fertilizers.	B	Can be implemented if barriers, such as an operational system for maintenance, are removed. The using of organic fertilizer should be promoted.

- *A: Mitigation activities are given higher priority and recommended early implementation;*
- *B: The activity can be implemented after removing barriers through partial preparation of a favorable deployment environment;*

- *C: The activity takes a long time to implement technology because of the need for an appropriate environment;*

4.3. Needs and gap assessment for the MRV system in the agriculture sector of Vietnam

4.3.1. Assessment for the gaps

The establishment and implementation of the national and the Agriculture sector MRV system are parts of the implementation of national mitigation activities as well as the Agriculture sector. Only when responsibilities, roles, tasks and implementation instructions of the coordinating unit as well as the unit implementing the NDC are clearly assigned, then the development of the MRV system can be clearly defined.

One of the top identified challenges was the establishment of a competent organizational structure has resources to manage and coordinate the implementation of the NDC plan.

While Vietnam is conducting a review of the NDC plan, the institutional structure and assignment of tasks clearly plays a key role to well implemented the plan.

In many countries, this is done based on the current institutional structure that is being applied to the implementation of climate change related policies. In Vietnam, consider the arrangement of the current system to implement action plans related to climate change and the current organizational structure of the Ministry of Agriculture and Rural Development in responding to climate change, reviewing and harmonizing the division of responsibilities of the units is essential to strengthen coordination and cooperation.

The United Nations Development Program recommends that, in the implementation process, the capacity and resources of leading climate change research institutes should be improved to develop and implement policies and chapters. This process also aims to guide units under ministries, sectors and encourage close stakeholders to participate in the implementation of the NDC plan in agriculture (UNDP, 2013).

The resources involved in implementing the current MRV system are not sufficient to meet the implementation of NDC plan on a national scale. There are only a few

agencies within the Ministry of Agriculture and Rural Development that carry out tasks related to the implementation of the MRV system in the agricultural sector, but their resources do not yet meet the Requirements for each specific task, especially ensuring transparency and compliance with the United Nations Framework Convention on Climate Change for the MRV system.

Pursuant to the Prime Minister's Decision No. 2053 / QD-TTg of October 28, 2016, the Government assigned the Ministry of Agriculture and Rural Development to assume the prime responsibility and coordinate with the concerned ministries and agencies in implementing the NDC plan on agriculture. The Department of Science, Technology and Environment under the Ministry of Agriculture and Rural Development is assigned as the focal point to develop NDC implementation plans for various fields, including cultivation (Department of Crop Production), irrigation (General Department of Irrigation), LULUCF (General Department of Forestry), husbandry (Department of Livestock Production), and fisheries (General Department of Fisheries). The above diagram depicts the current organizational structure of MARD in the implementation of climate change projects and programs in the agricultural sector. However, at present there are not any specialized agencies or agencies involved in the implementation of the NDC agricultural plan.

Official Letter No. 7208 / BNN-KHCN of the Ministry of Agriculture and Rural Development to the Ministry of Natural Resources and Environment prescribing the elaboration of an action plan for the expected nationally determined contribution in the field of agriculture, of which MARD has assigned this task to subordinate departments and divisions, however, there is a lack of mechanism for steering, coordination, supervision, reporting and verification.

In addition, the roles and responsibilities of the Steering Committee of Climate Change Adaptation Action Program in Agriculture and Rural Development and the Standing Office (OCCA) have not been specifically and clearly defined activities related to NDC.

For this reason, the Ministry of Agriculture and Rural Development should consider appointing the Steering Committee for Climate Change Adaptation Action Program of Agriculture and Rural Development as the coordinating agency for the implementation of the NDC plan, along with that is detailing the functions and duties of this agency. According to the medium-term reporting periods and annual plans,

OCCA needs to summarize the NDC implementation plan of sectors and fields, and develop a ministerial plan to identify activities and allocate budget from state budget as well as mobilization of external resources.

The NDC Action Plan needs to clearly identify the funding sources from the state budget to the external resources. Clarifying the implementation of the NDC Action Plan should go along with the budgeting of each activity and the expected resources. Private sector contribution was also estimated when developing the agricultural NDC implementation plan. Despite this, the form of contributions from this sector and the stage of contribution are still not clearly defined. In addition, there is still a lack of guidance in the allocation mechanism budget. For example, the applications of AWD technology to irrigation on a 200,000 hectares' area are assigned to the Department of Crop Production, which will cooperate with relevant agencies to carry out this task. The estimated budget for this activity is 2,000 billion VND, however, however, it is still unclear how and from which Department of Crop Production can disburse funds.

One of the significant challenges faced by the agricultural NDC plan in the implementation process is the deployment of planning from national scale to provincial scale, and from sector level to sub-sector level. Based on the NDC plan on agriculture, the Ministry of Agriculture and Rural Development assigns stakeholders to coordinate with localities to carry out the assigned tasks.

In the document No. 7208 / BNN 2016 about planning to implement the NDC in agriculture, a number of tasks have been assigned specifically to the Ministry's units and carried out in specific localities. For example, the A11 activity - Improving the ration of animal feed, which is assigned by the Department of Livestock Production is carried out in large-scale commodity raising provinces such as Dong Nai, Thanh Hoa, Tien Giang and Long An. However, most of the tasks have no clear instructions on where and how to implement locally.

Similarly, decentralization of activities by sectors and fields also faces many obstacles. For example, the Department of Crop Production is tasked with researching, managing and directing the production of crop fields. As such, the Department can prioritize research activities as well as projects related to climate change adaptation and mitigation such as adaptive varieties, improved farming systems at the level of scientific topics. However, the implementation of NDC

activities as a regular activity of the Department on a large scale will bring challenges to the Department of Crop Production, within the current resources. In order for the Department of Crop Production to carry out NDC activities in the field of crop production (e.g. water-saving irrigation techniques, alternate dry and flood irrigation, and straw treatment technology), there is a need for cooperation with relevant and local units to develop a plan for the above activities. This plan will then be submitted to the Planning Department for review and approval of budget allocations. The Planning Department may refute or reduce the size of NDC activities, depending on which government policies favor the sector, as reflected by how the budget is allocated from the central budget to corresponding field. Therefore, if there is a lack of budget allocation mechanism for NDC, the integration of activities in this plan into the regular plans of MARD units does not guarantee that these activities will be implemented due to the lack of fund allocations. The deployment of activities related to the implementation of the NDC plan faces even more challenges due to the lack of a local planning mechanism. In this respect, it can be seen that there is currently no document directing the People's Committees of localities to develop a plan to implement NDC activities, even guiding the integration of activities related to NDC plan into local socio-economic development plan is still a gap. The NDC plan on agriculture has shown that some regions and localities are pilot sites. For example, improving irrigation techniques for coffee cultivation in the Central Highlands is recommended by the Department of Crop Production with the proposed budget accounting for 60% of the central budget and 40% from the local and external resources. However, detailed information on how to implement has not been developed yet. Detailed information on irrigation technology applied in the Central Highlands: costs, benefits, and trade-offs when applying new techniques; details of local funding contributions (in cash, space, manpower, or in kind); and the appropriate approaches to transferring, guiding and scaling up the application of techniques are still incomplete. At the sectoral level, MARD can develop national projects in each field (cultivation, husbandry, forestry, fisheries, etc.) but needs to review the functions and duties of the Central Project Management Board (Agriculture PMU, Forestry PMU, CPO Irrigation), and to build a mechanism to raise capital for the project. At the local level, NDC activities can be integrated into a plan to implement a green growth strategy or a climate change response plan depending on the degree of similarity between the plans. However, as analyzed above, it is necessary to clarify the mechanism to integrate NDC-related

activities into socio-economic development plans as well as local climate change plans. Stemming from these issues, the government needs to revise harmonious plans and measures, incorporating the implementation of plans from national to local levels.

In general, all legislation, strategies and action plans provide solutions for strengthening the capacity to develop and implement MRV and point out activities to reduce greenhouse gas emissions to environment and to adapt climate change, similar to that proposed in the national NDC and agricultural NDC plans. Nevertheless, all laws, strategies and action plans are primarily nationally oriented, without specific guidance or plans at local or sub-sectoral levels.

The current policy related to climate change, despite its clear responsibilities, is lacking in regulations to guide its implementation. Greenhouse gas reduction activities are mentioned in national strategies and action plans on climate change or green growth, however, there has not been any law document or sub-law documents defining the responsibilities and roles of individuals and organizations that act as greenhouse gas emitters.

Although the Law on Environmental Protection states that governments and local governments at all levels must create favorable conditions to support individuals, organizations and businesses to implement greenhouse gas reductions, incentives to support farmers, organizations engaged in agricultural production and businesses to reduce greenhouse gas emissions into the environment have not yet been established.

Regulations of the legal framework on greenhouse gas emissions limits for each company, province, and low-level sector should also be developed so that sectors and localities have a clear basis for planning. In addition, there are also many overlapping regulations between different laws that confuse or hinder agencies from implementing activities to reduce greenhouse gas emissions. The NDC Action Plan is one of the latest activities on the national scale agenda on climate change, so the present issue is the need to review the National Action Plan for Responding to Climate Change and the National Green Growth Action Plan for all sectors and localities to ensure the synchronized implementation of greenhouse gas reduction and climate change adaptation activities, to achieve the nation's common goal as committed.

4.3.2. Assessment for needs

The Ministry of Natural Resources and Environment will be in charge of developing the national MRV system, so the Ministry of Agriculture and Rural Development plans to assign the Department of Science, Technology and Environment to coordinate with the Ministry of Natural Resources and Environment to develop sector-level MRV systems for agriculture, in line with the content of the national MRV system.

At the same time, technical capacity should be developed and strengthened for the Department of Crop Production, the Department of Livestock Production, the General Department of Fisheries, the General Department of Forestry and other relevant agencies (for example, the Vietnam Administration of Natural Disaster Prevention, General Department of Irrigation) to operate the MRV system. Officials of these units and relevant agencies need to equip basic knowledge on NDC plan, methods of GHG inventory, measurement techniques, making reports on appropriate greenhouse gases in line with international requirements, procedures and procedures. We need to invest in improving and modernizing the infrastructure of the MRV system, especially the measurement system to accurately monitor the amount of greenhouse gas emissions into the environment as well as the reduction process greenhouse gas emissions as a result of industry efforts, and to ensure the reliability of information through monitoring.

Once the development of the MRV system is complete, the Ministry of Agriculture and Rural Development can also use this system to monitor the progress of implementing programs to reduce greenhouse gas emissions of relevant plans such as the Green Growth Plan, Climate Change Response Plan and Sustainable Agriculture Transformation project.

In addition, it is also necessary to invest in improving and modernizing the infrastructure of the MRV system, especially the measurement system to accurately monitor the amount of greenhouse gas emissions into the environment as well as the process of cutting greenhouse gases as a result of industry efforts, and to ensure the reliability of information through monitoring. Once the development of the MRV system is complete, the Ministry of Agriculture and Rural Development can also use this system to monitor the progress of implementing programs to reduce greenhouse gas emissions of relevant plans such as the Green Growth Plan, Climate Change Response Plan and Sustainable Agriculture Transformation project.

The MRV arrangements of several NAMA programs are proposed based on Vietnam's national inventory system and the monitoring procedures required by the Clean Development Mechanism Framework (CDM). The development of MRV will also be in line with the institutional framework for the national MRV system for NAMAs under the joint preparation of IMHEN and GIZ. Specific elements of the proposed NAMA programs include a simplified mechanism to keep input records and output products created as resources. The proposed procedure is applied in parallel with a tool to quantify / measure "co-benefits". Specific details of the NAMA MRV system are proposed to be further developed as one of the pilot phase activities.

In general, all legislation, strategies and action plans provide solutions for strengthening the capacity to develop and implement MRV and point out activities to reduce greenhouse gas emissions to environment and adapt climate change, similar to that proposed in the national NDC and agricultural NDC plans. However, all laws, strategies and action plans are primarily nationally oriented, without specific guidance or plans at the local or sub-sector level.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Regarding the institutional arrangement for tracking implementation progress of significant policies in the NDC, this review points out that in the first NDC officilized in 2016, the institutional arrangement for continuous tracking the implementing progress of NDC was not addressed. There has been no official guideline and regulation for implementation such tracking activities at the national scale.

Regarding the establishment of MRV systems for the state level as well as for the energy and the agriculture sectors, the review points out some significances as the following:

In Vietnam, although the decision No. 2053/QD-TTg requires MRV systems for Vietnam to be established and implemented at different levels such as the state level, as well as provincial and sectorial levels, very limited progress has been done for sucessfull develovement of such MRV systems. Thus this will remain as a very important task of the line ministries in the next couple of years.

In the energy and the agriculture sectors, some projects involving the GHG mitigation have been lunched using ad-hoc approach and different methodologies. These facts therefore have caused different evaluations among mitigation projects.

There is a high requirement for improving interlinked data management systems among line ministries and provincial authorities which may consist of relevant national statistics, the GHG inventory data, information from significant mitigation projects and sustainable develovement progress.

The asessment review on needs and gaps for the transparency systems in the energy and the agriculture sectors points out some important issues:

It is necessary to establish fully-functioned MRV systems for the sector and relevant sub-sectors using adequate institutional arrangements which is supported by comprehensive laws and legal documents; The MRV systems should ba able to meet requirement of the ETF.

A common and unified emission baseline is needed at the state and the sectorial levels because it can help to develop a accurately and transparent foundation for implementation and effectiveness evaluation of relevant mitigation projects;

Capacity building programs including human resources and equipment should be implemented to improve relevant statistical surveys, interlinked data management and GHG inventories at the state and the sectorial levels.

Establish adequate methodologies and guidelines to track implementation progress of significant energy and agriculture policies in the NDC as well as sufficient reporting lines for attracting necessary adjustment from the state.

REFERENCES

INDC (2015). Intended Nationally Determined Contribution of Vietnam (2015). https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/

NDC 2020). Upadated Natinally Determined Contribution of Vietnam (2020). https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/

Ricardo-AEA (2015). Institutional Arrangements: Roles and Responsibilities of Stakeholders.

Luong Quang Huy (2016). Proposing the organizational structure for MRV system for GHG Nationally Appropriate Mitigation Actions (NAMA) at national and sectoral levels. Ministry of Natural Resources and Environment.

ADB (2019). Workshop on "MRV guidelines for projects in energy and transport sectors similar to CTF funded projects in Vietnam". Hanoi, August 15, 2019.

MONRE (2018). The 2014 National GHG Inventory of Viet Nam

MARD (2016). https://www.mard.gov.vn/VanBan/Pages/2450-qd-bnn-khcn.aspx

ADB (2013). The low carbon agricultural support project (LCASP) in Vietnam: carbon balance appraisal with the exante carbon balance tool. http://dspace.agu.edu.vn:8080/handle/AGU_Library/6170

NCs and BURs: National Communication and Bienual Updated Reports (Vietnam). https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Pages/Search.aspx

Nguyen Quang Huy (2018). Research and develop the GHG inventory system of the Industry and Trade sector, Industrial Safety Techniques and Evironment Agency, Ministry of Industry and Trade, 2018.

MONRE (2018). The list of low-carbon technologies – the mitigation activities within Vietnam' NDC and beyond, the SPI-NAMA project, Vietnam

REDD+ (2011). Measurement, Reporting and Verification Framework, Vietnam National REDD+ Action Program, 2011;

MARD (2016). Ministry of Agriculture and Rural Development, Decision 819 / QD-BNN-KHCN dated March 14, 2016 Action plan to respond to climate change

in the agriculture and rural development sector for the period 2016-2020 and a vision to 2050;

UNDP (2013). Measuring, Reporting & Verification (MRV), 5/2013