

**MINISTRY OF NATURAL
RESOURCES AND
ENVIRONMENT OF
VIETNAM**

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SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom – Happiness

Hanoi, November 15, 2022

CIRCULAR

**METHODS FOR MEASUREMENT, REPORTING, APPRAISAL OF REDUCTION
OF GREEN HOUSE GAS (GHG) EMISSIONS AND GHG INVENTORY
DEVELOPMENT IN WASTE MANAGEMENT**

Pursuant to the Law on Environment Protection dated November 17, 2020;

*Pursuant to the Government's Decree No. 68/2022/ND-CP dated September 22, 2022 on
functions, tasks, powers and organizational structure of the Ministry of Natural
Resources and Environment;;*

*Pursuant to the Government's Decree No. 06/2022/ND-CP dated January 07, 2022 on
reduction of GHG emissions and protection of the ozone layer;*

*At the request of the Director of Department of Climate Change (DCC) and the Director
of Legal Department;*

*The Minister of Natural Resources and Environment promulgates a Decree on methods
for measurement, reporting, appraisal of mitigation of green GHG) emissions and GHG
inventory in waste management.*

Chapter I

GENERAL PROVISIONS

Article 1. Scope

This Circular provides for methods for measurement, reporting, appraisal of reduction of green house gas (GHG) emissions and GHG inventory in waste management.

Article 2. Regulated entities

This Circular applies to organizations and individuals involved in the measurement, reporting, appraisal of reduction of GHG emissions and GHG inventory in waste management, and waste treatment facilities.

Article 3. Definitions

1. GHG emission sources are places where there are physical, chemical processes that directly emit GHG or activities using electricity or thermal energy.
2. Activity data are quantitative figures of activities emitting GHG, including quantity of fuel, energy, electricity consumed, materials or land area affected.
3. Base year is the statutory time for collection of activity data, calculation of GHG emissions of a country, sector or facility.
4. Emission baseline is the assumption of total GHG emission in the year of a sector following a Business-As-Usual (BAU) scenario of that sector within a certain period of time.
5. Estimated emission of a facility is the presumptive emission of a facility following a BAU scenario of that facility in a year.

Chapter II

GHG INVENTORY DEVELOPMENT IN WASTE MANAGEMENT

Section 1. SECTOR-LEVEL GHG INVENTORY

Article 4. Process for development of sector-level GHG inventory

1. Identification of method for sector-level GHG inventory development.
2. Selection of sector-level GHG emission factors.
3. Collection of activity data for sector-level GHG inventory development.
4. Calculation of sector-level GHG emission and absorption.
5. Management of sector-level GHG inventory quality.
6. Assurance of sector-level GHG inventory quality.
7. Assessment of uncertainties of sector-level GHG inventories0}
8. Recalculation of sector-level GHG inventories.
9. Preparation of reports serving sector-specific national GHG inventories.

Article 5. Identification of method for sector-level GHG inventory development

The method for sector-level GHG inventory development shall comply with the 2006 IPCC Guidelines for National GHG Inventories (hereinafter referred to as "IPCC 2006") and the 2019 Refinement for the 2006 IPCC Guidelines for National GHG Inventories (hereinafter referred to as "IPCC 2019").

Detailed inventory development methods for each sub-field are specified in Appendix I.1 hereof.

Article 6. Selection of sector-level GHG emission factors

Emission factors used for sector-level GHG inventory shall be applied according to the list of emission factors announced by the Ministry of Natural Resources and Environment.

Article 7. Collection of activity data for sector-level GHG inventory development

Activity data for sector-level GHG inventory are based upon IPCC 2006 and IPCC 2019. Sources of activity data are obtained from General Statistics Office, relevant central and local authorities.

Rules, procedures and set forms for collection of activity data are specified in Appendix I.2 hereof.

Article 8. Calculation of sector-level GHG emission and absorption

Sector-level GHG emissions shall be calculated using the methods for GHG inventory mentioned in Article 5 of this Circular. GHG inventory results shall be calculated and consolidated on the basis of activity data, emission factors, global warming potential values for sources of emission and absorption that undergo GHG inventory.

Article 9. Management of sector-level GHG inventory quality

The process for management of GHG inventory quality is based upon IPCC 2006 and IPCC 2019. Activities in the procedures include:

1. Inspect the comprehensiveness, accuracy and adequacy of data
 - a) Inspect the hypotheses and standards for selection of activity data, emission factors and conversion factors;
 - b) Inspect errors of data input and reference documents;
 - c) Inspect data consolidation;
 - d) Inspect numbering continuity;

dd) Inspect emission trends.

2. Identify and rectify errors and mistakes

a) Inspect the method for GHG inventory development;

b) Inspect the method for writing parameters and units, and use of conversion factors;

c) Inspect uncertainties of emission results.

3. Inspect inventory documentation

a) Inspect the adequacy of inventory documentation;

b) Review archived documents.

Article 10. Assurance of quality of sector-level GHG inventories

The process for assurance of GHG inventory quality is based upon IPCC 2006 and IPCC 2019. Activities in the procedures include. The activities in this process shall be carried by agencies that do not participate in the sector-level GHG inventory development

Article 11. Assessment of uncertainties of sector-level GHG inventories

Uncertainties of sector-level GHG inventory shall be assessed according to IPCC 2006 and IPCC 2019.

1. Identify uncertainties of activity data, emission factors, calculation results during the process of sector-level GHG inventory development.

2. Prepare a datasheet of uncertainties of sector-level GHG inventories.

Article 12. Recalculation of sector-level GHG inventories

Recalculation of sector-level GHG inventories of the previous period shall be carried in the following cases:

1. There are errors in the calculation results of greenhouse gas emissions.

2. There are changes to the method for quantification of GHG, activity data and emission factors.

Article 13. Preparation of reports on sector-level GHG inventories

Reports on sector-level GHG inventories shall be prepared according to Form No. 04 in Appendix II of the Government's Decree No. 06/2022/ND-CP.

Section 2. Development of facility-level GHG inventory

Article 14. Process for facility-level GHG inventory development

Steps of facility-level GHG inventory development:

1. Identification of operational boundaries and method for facility-level GHG inventory development.
2. Selection of facility-level GHG emission factors.
3. Selection and collection of activity data for facility-level GHG inventory development.
4. Calculation of facility-level GHG emissions;
5. Management of facility-level GHG inventory quality.
6. Assessment of uncertainties of facility-level GHG inventories.
7. Recalculation of facility-level GHG inventories.
8. Preparation of facility-level GHG inventory reports.

Article 15. Identification of operational boundaries and selection of method for facility-level GHG inventory development

Operational boundaries shall be determined in accordance with TCVN ISO 14064-1:2011, Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals, including:

- a) Identification of GHG-emitting activities;
- b) Classify sources of GHG emissions into direct emission sources and indirect emission sources.

Article 16. Identification of method for facility-level GHG inventory development

Methods for facility-level GHG inventory development are specified in Appendix II.1 hereof.

Article 17. Selection of facility-level GHG emission factors

Emission factors used for facility-level GHG inventory development shall be used according to the list of emission factors announced by the Minister of Natural Resources and Environment.

Article 18. Selection and collection of activity data for facility-level GHG inventory development

Activity data for each facility-level of GHG emission source shall be selected and collected in accordance with Appendix II.2 hereof.

Article 19. Calculation of facility-level GHG emissions

The calculation of facility-level GHG emissions shall be based upon the methods for GHG inventory development that are selected according to Article 16 of this Circular. Facility-level GHG inventories shall be calculated according to the input data, activity data, emission factors, global warming potential values for all GHG-emitting activities of the facility.

Article 20. Management of facility-level GHG inventory quality

The process for management of facility-level GHG inventory development shall be based upon TCVN ISO 14064-1:2011, Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals, including the following steps:

1. Identification and inspection of responsibility and authority of persons responsible for GHG inventory development.
2. Identification, implementation and review of appropriate training for members of the GHG inventory development team.
3. Identification and review of operational boundaries of the facility.
4. Identification and review of sources of GHG emissions.
5. Selection and inspection of quantification methodologies, including activity data and GHG emission factors.
6. Review of the application of GHG inventory development methods in order to ensure consistency across multiple facilities.
7. Use, maintenance and calibration of measurement equipment.
8. Development and maintenance of the data collection system.
9. Regular accuracy checks.
10. Periodic internal audits and technical reviews.

Article 21. Assessment of uncertainties of facility-level GHG inventories

Assessment of uncertainties of facility-level GHG inventories shall be carried out in accordance with Appendix II.3 hereof.

Article 22. Recalculation of facility-level GHG inventories

1. Recalculation of facility-level GHG inventories shall be carried in the following cases:
 - a) There are changes in operational boundaries that lead to changes in emission sources and activity data of this facility;
 - b) There are changes in GHG emission sources due to changes to the right to ownership, operation of the facility;
 - c) There are errors in the calculation results of greenhouse gas emissions and application of emission factors;
 - d) There are errors in collection, processing of activity data of the facility which lead to a change in GHG emission by more than 10% of the reported result.
2. Recalculated GHG inventories shall be included in the facility-level GHG inventory report of the next period.

Article 23. Preparation of reports on facility-level GHG inventories

1. Reports on facility-level GHG inventories shall be prepared according to Form No. 06 in Appendix II of the Government's Decree No. 06/2022/ND-CP, and submitted to competent authorities of the People's Committees of provinces for appraisal as per regulations.
2. The appraised facility-level GHG inventories shall be sent to the Ministry of Natural Resources and Environment via the online GHG inventory database

Chapter III

MEASUREMENT, REPORTING, APPRAISAL OF GHG EMISSION REDUCTION

Section 1. Guidance on measurement, reporting, appraisal of sector-level GHG emission reduction

Article 24. Basis for measurement, reporting of sector-level GHG emission reduction

1. The measurement of reduction of GHG emissions shall be carried out according to the sector-level GHG emission reduction plan, including the following activities:

- a) Development of an emission baseline for the 2023 – 2030 period;
 - b) Measurement of GHG emission reduction;
 - c) Development of a plan for monitoring, supervision of the plan for GHG emission reduction (hereinafter referred to as "supervision plan").
2. Reports on sector-level GHG emission reduction shall be prepared according to Form No. 01 in Appendix III of the Government's Decree No. 06/2022/ND-CP.
 3. The measurement and reporting of GHG emission reduction shall be expressed in Section IV Supervision Activities of the Plan for Sector-wide GHG Emission Reduction in Form 01 of Appendix IV of the Government's Decree No. 06/2022/ND-CP.

Article 25. Development of an emission baseline in waste management

1. The emission baseline in waste management shall be developed annually over the 2023 - 2030 period for every emission source being inventoried, including:
 - a) Emission from burial of solid wastes;
 - b) Emission from biological treatment of wastes;
 - c) Emission from incineration and open burning of wastes;
 - d) Emission from treatment and discharge of wastewater;
 - dd) Emission from emission reduction activities during treatment and destruction of wastes.
2. Steps of development of emission baseline in waste management:
 - a) Develop a BAU scenario in waste management on the basis of current waste management situation before implementation of GHG emission reduction policies in the 2023 – 2030 period, relevant socio-economic development scenarios that are relevant to waste management in the 2023 – 2030 period and forecasts about the quantity of wastes to be treated in the 2023 – 2030 period;
 - b) The method for calculation of GHG emissions following the BAU scenario shall apply the method for sector-level GHG inventory development in Appendix I.1 hereof;
 - c) Develop emission baseline for each year following the BAU scenario for the emission sources in the 2023 – 2030 period.
3. The emission baseline must be updated every 02 years and included in the sector-level GHG emission reduction report.

Article 26. Method for measurement of sector-level GHG emission reduction

The sector-level GHG emission reduction in 01 year is calculated as follows:

$$ER_{CT} = \sum_d ER_d$$

Where:

ER_{CT} is the emission reduction in waste management in 01 year (tCO_{2td});

ER_d is emission reduction in 01 year of policy d (tCO_{2td});

d is a waste management policy

ER_d is calculated as follows:

$$ER_d = \sum_i (BE_{d,i,k} - PE_{d,i,k})$$

Where:

$BE_{d,i,k}$ is the GHG emission in 01 year following a BAU scenario with k amount of waste from emission source i and treated by measure d (tCO_{2td}). $BE_{d,i}$ is calculated in accordance with regulations on GHG inventory development in Appendix I.1 of this Circular.

$PE_{d,i,k}$ is the GHG emission in 01 year with k amount of waste from emission source i and treated by measure d (tCO_{2td}).

i is the emission source, including: emission from burial of solid wastes; (2) emission from biological treatment of wastes; Emission from incineration and open burning of wastes; Emission from treatment and discharge of wastewater; and Emission from emission reduction activities during treatment and destruction of wastes.

Article 27. Development of sector-level supervision plan

1. A supervision plan has the following primary contents:

- a) Information about the supervision system, roles and responsibilities of organizations in the supervision system, resources and equipment necessary for supervision;
- b) Information about methods for calculation of GHG emission reduction for different policies;
- c) Information about parameters that need measuring, frequency and method of measurement;

- d) Information about the system for management and storage of collected data;
- dd) Information about QA/QC process.

2. The supervision plan must be presented in the sector-level GHG emission reduction report and updated in case of change during the implementation.

Article 28. Preparation of reports on sector-level GHG emission reduction

1. A report on sector-level GHG emission reduction has the following primary contents:

- b) Information about the emission baseline in waste management;
- b) Information about the policies;
- c) Information about methods for measurement and organization of measurement of GHG emission reduction for each policy;
- d) The GHG emission reduction of each policy and the entire sector in the reporting period.

2. The report on sector-level GHG emission reduction shall be completed in accordance with opinions of the appraisal council and submitted to the Ministry of Natural Resources and Environment before January 15 every year from 2024.

Article 29. Appraisal of sector-level GHG emission reduction

- 1. Appraisal of sector-level GHG emission reduction in waste management shall be carried out in accordance with Article 11 of Circular No. 01/2022/TT-BTNMT.
- 2. The appraisal result shall be published on the website of the Minister of Natural Resources and Environment.

Section 2. Guidance on facility-level measurement, reporting of GHG emission reduction

Article 30. Basis for measurement, reporting of facility-level GHG emission reduction

- 1. The measurement of facility-level GHG emission reduction shall be carried out according to the facility-level GHG emission reduction plan, including the following activities:
 - a) Estimation of GHG emissions without application of GHG emission reduction technology or measure (hereinafter referred to as "estimated emission");

- b) Measurement of GHG emission reduction;
 - c) Organizing the monitoring, supervision of implementation of the facility's plan for GHG emission reduction.
2. Reports on facility-level GHG emission reduction shall be prepared according to Form No. 02 in Appendix III of the Government's Decree No. 06/2022/ND-CP.
 3. The estimated emissions, measurement method and supervision plan shall be presented in details in the facility's annual plan for GHG emission reduction and annual report on GHG emission reduction. The plan for GHG emission reduction shall be updated and sent to the Ministry of Natural Resources and Environment in case of change in the supervision plan.

Article 31. Development of facility's estimated emissions

1. A facility's estimated emissions include estimated emissions from all GHG emission sources in each year over implementation period of the plan for GHG emission reduction.
2. Steps of estimating a facility's emissions:
 - a) Develop the facility's BAU scenario;
 - b) Identify of GHG emission sources within the facility's scope of operation;
 - c) Identify the method for calculation of the estimated GHG emissions following the BAU scenario;
 - d) Calculated the estimated GHG emissions following the BAU scenario.
3. In case the facility has not taken any reduction measure when developing the plan for GHG emission reduction, the BAU scenario shall describe the entire process of collection, transport, and treatment of wastes of the facility.
4. In case the facility has not taken any reduction measure when developing the plan for GHG emission reduction, the BAU scenario shall describe the entire process of collection, transport, and treatment of wastes of the facility.
5. Identify of GHG emission sources that are appropriate for the facility's model and scope of operation;
 - a) GHG emissions from the collection and transport of solid wastes: emissions from the use of gasoline, diesel of vehicles during the collection and transport of wastes to the treatment facilities.

b) Emissions from the treatment and destruction of wastes include: Emissions of CH₄ from landfills due to unavailability of a system for collection of gases landfills or low effectiveness of the system leads to leakage of CH₄; Emissions of CH₄ when unused landfill gases or biogas are burned in treatment areas, when solid wastes are destructed causing leakage of CH₄ due to incomplete incineration of landfill gases or biogas; Emission of CO₂ from combustion of fossil fuel during incineration of wastes, consumption of gasoline and diesel in vehicles; Emissions of CO₂ due to electricity consumption during the process of wastes treatment of the facility; Emission of CH₄ from leachate of landfills and waste reservoirs at waste-to-energy (WTE) plants; Emissions of CH₄ from organic wastewater causing anaerobic digestion of wastes; Emission of CO₂ from incineration of wastes; Emission of CH₄ and N₂O from incineration of wastes; Emission of CH₄ from anaerobic digestion of organic materials; Emissions of CH₄ due to leakage during the storage of digesters in anaerobic digestion tanks; Emission of CH₄ and N₂O during composting and treatment of organic wastes.

c) Emission from classification and recycling of garbage;

d) Emissions of CO₂ due to electricity consumption by other activities of a waste treatment facility.

6. Identify the method for calculation of estimated emissions following the BAU scenario:

a) Identify the method for calculation of GHG emissions from each emission source of the facility;

b) Identify the monitoring parameters serving calculation of GHG emissions following the BAU scenario.

Article 32. Method for measurement of GHG emission reduction of facility

1. The GHG emission reduction of a facility in 01 year is calculated as follows:

$$ER = ER_{WCT} + ER_{WT} + ER_{WR}$$

Where:

ER is the emission reduction of the facility in 01 year (tCO_{2td}).

ER_{WCT} is the reduction in emissions from collection and transport of wastes in 01 year (tCO_{2td}).

ER_{WT} is the reduction in emissions from treatment, destruction of wastes in 01 year (tCO_{2td}).

ER_{WR} is the reduction in emissions from waste recycling in 01 year (tCO_{2td}).

2. Reduction in GHG emissions from collection, transport of wastes is calculated as follows:

Reduction in GHG emissions from collection, transport of wastes includes the reduction achieved from replacement of waste collection and transport vehicles powered by gasoline and diesel with electric vehicles and low emission vehicles. Reduction in GHG emissions from transport of wastes is calculated as follows:

$$ER_{WCT} = ER_{BEV} + ER_{BDS}$$

Where:

ER_{BEV} is emission reduction due to replacement of waste collection and transport vehicles powered by gasoline and diesel with electric vehicles in 01 year (tCO_{2td}).

ER_{BDS} is emission reduction due to replacement of waste collection and transport vehicles powered by gasoline and diesel with low emission vehicles in 01 year (tCO_{2td}).

Monitoring parameters and method for calculation of ER_{BEV} and ER_{BDS} are elaborated in Appendix III.2 hereof

3. Reduction in GHG emissions from treatment and destruction of wastes is calculated as follows:

$$ER_{WT} = \sum_d ER_d$$

Where:

ER_{WT} is the reduction in emission from treatment, destruction of wastes in 01 year nãm.

ER_d : is the GHG emission reduction of the facility after having implemented GHG emission reduction measure d for 01 year, (tCO_{2td}/year). ER_d is calculated as follows:

$$ER_d = BE_d - PE_d$$

Where:

BE_d is the estimated emissions of the facility from treatment, destruction of wastes following the BAU scenario in 01 year (tCO_{2td}/year).

PE_d is the GHG emissions of the facility in 01 year (tCO_{2td}/year).

d is the measure for reduction of GHG emissions from treatment, destruction of wastes, including:

Measure for reduction of emissions of CO₂ by recovery of landfill gases, biogas for electricity generation or heat generation from waste incineration; Measure for reduction

of emissions of CO₂ by utilization of landfill gases, biogas or waste incineration and replacement of heat generated by the burning of fossil fuel; Measure for reduction of emissions of CO₂ when biogas created during anaerobic digestion of organic wastes is cleaned and replaces natural gases in natural gas sources; Measure for reduction of emissions of CO₂ from oil refining and replacement of traditional diesel with biological diesel production; Measure for reduction of emissions of CO₂ from manufacture and use of organic fertilizers instead of chemical fertilizers.

Monitoring parameters and method for calculation of BE_d and PE_d are elaborated in Appendix III.1 hereof.

4. Reduction in GHG emissions from waste recycling is calculated as follows:

$$ER_{WR} = ER_{WRPj} + ER_{WRlj}$$

Where:

ER_{WR} is the reduction in emission from waste recycling at the facility (tCO_{2td}/year).

ER_{WRPj} is the reduction in emission from reuse of waste j as materials for production (tCO_{2td}/year).

ER_{WRlj} is the reduction in emission from recycling of waste j instead of incineration or burial (tCO_{2td}/year).

j is the recycled wastes, including paper, plastic, glass, metal.

Monitoring parameters and method for calculation of ER_{WRPj} and ER_{WRlj} are elaborated in Appendix III.2 hereof.

Article 33. Development of supervision plan

1. A supervision plan has the following contents:

- a) Detailed information about the supervision system, roles and responsibilities of individuals and organizations in the supervision system, resources and equipment necessary for supervision;
- b) Information about the methods for measurements of GHG emission reduction for different measures for GHG emission reduction of the facility;
- c) Information about parameters that need measuring, measurement frequency in a reporting period;
- d) Information about the system for management and storage of collected data;

dd) Information about QA/QC process.

2. The supervision plan must be presented in the facility's GHG emission reduction report and updated in case of change during the implementation.

Article 34. Preparation of reports on GHG emission reduction of waste treatment facilities

Steps of preparation of a report on GHG emission reduction of a waste treatment facility:

1. Consolidate the GHG emission reductions calculated during the measurement stage, ensure accuracy and appropriateness of the calculation method and the results.
2. Prepare reports according to Form No. 02 in Appendix III of the Government's Decree No. 06/2022/ND-CP.
3. Send the facility-level GHG emission reduction reports to appraisal units for appraisal.
4. Complete the reports according to the appraisers' opinions, send them to Department of Natural Resources and Environment and the Ministry of Natural Resources and Environment via the online GHG inventory database.

Article 35. Appraisal of facility-level GHG emission reduction

1. Appraisal of facility-level GHG emission reduction of waste treatment facilities shall be carried out in accordance with Article 13 of Circular No. 01/2022/TT-BTNMT.
2. Facilities shall send completed GHG emission reduction reports enclosed with the appraisal reports to Department of Natural Resources and Environment and the Ministry of Natural Resources and Environment.

Chapter IV

IMPLEMENTATION CLAUSES

Article 36. Entry into force

This Circular shall enter into force on February 15, 2023.

Article 37. Organization of implementation

1. The Minister, heads of ministerial-level agencies, Heads of Governmental agencies, Presidents of the People's Committees of provinces, relevant organizations and individuals are responsible for the implementation of this Circular.

2. Department of Climate Change shall be responsible for providing guidance, inspect and supervise the implementation of this Circular.
3. When the legislative documents referred to in this Circular are amended or replaced, the newest regulations shall apply.
4. Difficulties that arise during the implementation of this Circular should be reported to the Ministry of Natural Resources and Environment (via Department of Climate Chang) for consideration and settlement./.

**PP MINISTER
DEPUTY MINISTER**

Le Cong Thanh

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