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UNOPS

REPORT

DETAILED RESULTS OF THE TRIAL PHASE OF A VOLUNTARY CARBON LABELING PROGRAM

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Abbreviations

AOSC	Accreditation Office for Standards Conformity Assessment Capacity
APAC	Asia Pacific Accreditation Cooperation
BoA	Bureau of Accreditation
BEIS	Department for Business, Energy & Industrial Strategy
BSI	British Standards Institution
CBAM	Carbon Border Adjustment Mechanism
CDM	Clean Development Mechanism
CEN	European Committee for Standardization
CFP	Carbon Footprint
CFR	Carbon Footprint Reduction
COP	Conference of the Parties
CPC	Central Product Classification
CRL	Carbon Reduction Label
CTX	Carbon Credit Trading Platform
DCC	Department of Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
EF	Emission Factor
EFDB	Emission Factor Database
EDGAR	Emissions Database for Global Atmospheric Research
EPD	Environmental Product Declaration
EPR	Extended Producer Responsibility
ETS	Emissions Trading Scheme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoV	Government of Vietnam
GPP	Green Public Procurement
HNX	Hanoi Stock Exchange
IAF	International Accreditation Forum
IEA	International Energy Agency
ILAC	International Laboratory Accreditation Cooperation
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
JCM	Joint Crediting Mechanism

JEMAI	Japan Environmental Management Association for Industry
JRC	Joint Research Centre (European Commission)
KEITI	Korea Environmental Industry and Technology Institute
LCA	Life Cycle Assessment
LEFASO	Vietnam Leather, Footwear and Handbag Association
LoA	Letters of Authorization
MAE	Ministry of Agriculture and Environment
M&E	Monitoring & Evaluation
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MOST	Ministry of Science and Technology
MRV	Monitoring, Reporting, and Verification
NDC	Nationally Determined Contributions
PCF	Product Carbon Footprint
PCL	Product Classification List
PCR	Product Category Rules
PME	Program Managing Entity
PVRA	Pre-verification Readiness Assessment
QUATEST	Quality Assurance and Testing Center
REDD+	Reducing Emissions from Deforestation and Forest Degradation Plus
STAMEQ	Directorate for Standards, Metrology and Quality
TGO	Thailand Greenhouse Gas Management Organization
TCVN	Tiêu chuẩn Việt Nam
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
VACI	Vietnam Institute of Accreditation
VASEP	Vietnam Association of Seafood Exporters and Producers
VBs	Verification Bodies
VCLP	Voluntary Carbon Labeling Program
VITAS	Vietnam Textile and Apparel Association
VPPA	Vietnam Pulp and Paper Association
VSA	Vietnam Steel Association
VSQI	Vietnam Standards and Quality Institute
WRI	World Resources Institute
WBCSD	World Business Council for Sustainable Development

Executive Summary

This report presents the detailed results of the trial phase of the Voluntary Carbon Labeling Program (VCLP) implemented in Vietnam between January and April 2026. The trial phase represents a critical step in operationalizing the national carbon labeling framework, providing practical insights into the feasibility, challenges, and scalability of product-level carbon footprint (CFP) assessment in the Vietnamese industrial context.

The trial phase was conducted under the project "Technical Support for the Design and Trial phase of the Voluntary Carbon Labeling Scheme in Vietnam", implemented with the support of the Southeast Asia Energy Transition Partnership (ETP) under the United Nations Office for Project Services (UNOPS), in collaboration with the Ministry of Agriculture and Environment (MAE) and the Department of Climate Change (DCC).

Trial phase scope and implementation

The trial phase focused on three priority sectors namely, (i) food processing, (ii) pulp and paper, and (iii) chemicals, selected based on their emission intensity, export relevance, and readiness for greenhouse gas (GHG) monitoring, reporting, and verification (MRV). A total of 10 enterprises were selected through a structured screening process aligned with sectoral priorities, regulatory requirements, and enterprise readiness.

The trial phase activities included:

- Capacity building and training workshops for enterprises and stakeholders
- Stakeholder consultations were conducted with accreditation and verification bodies
- Development of data collection templates, calculation tools, and draft Product Category Rules (PCRs)
- On-site data collection and validation at participating enterprises
- Calculation of Product Carbon Footprints (PCF) using a standardized methodology
- Preliminary verification and analysis of results

Two training workshops were conducted to raise awareness and strengthen technical capacity among enterprises. The training results indicate that while awareness of climate policies is relatively high, technical capacity for CFP assessment and data management remains limited, particularly in relation to international standards and product-level accounting.

Methodological approach

The PCF assessment methodology applied in the trial phase is based on internationally recognized frameworks, including the GHG Protocol (Product Standard) and International Organization for Standardization (ISO) 14067. It follows a Life Cycle Assessment (LCA) approach with a cradle-to-gate boundary.

The methodology incorporates:

- Definition of system boundaries and functional units
- Use of primary data from enterprises where available

- Application of emission factors from Intergovernmental Panel on Climate Change (IPCC) guidelines and national sources
- Allocation methods for multi-output processes
- Verification and quality assurance procedures

While the methodology is aligned with international standards in principle, the trial phase results highlight that full compliance with ISO 14067 requirements is not yet achievable under current data conditions. Limitations related to system boundary completeness, data availability, and supply chain coverage affect the robustness of results.

Key findings from the trial phase

a. Data availability and quality are the primary constraints

The most significant challenge identified during the trial phase is data availability, granularity, and reliability. Key issues include:

- Difficulty in disaggregating facility-level data to product-level
- Limited availability of primary data for upstream supply chains (Scope 3)
- Inconsistencies across internal data sources (production, accounting, energy)
- Lack of standardized data management systems within enterprises

As a result, the following observations were made:

- Scope 1 and Scope 2 emissions are generally estimated with medium confidence
- Scope 3 emissions are characterized by high uncertainty due to reliance on secondary data and assumptions

These limitations significantly affect the completeness, comparability, and verification readiness of PCF results.

b. Carbon emission hotspots

The analysis of trial phase results identifies several key emission drivers:

- Energy consumption (electricity and fuels) is the dominant source of emissions in most sectors
- Raw material-related emissions represent a significant share of total emissions, particularly in chemicals and food processing
- Process emissions play an important role in certain sectors but are often underreported or insufficiently captured

The findings confirm that emission profiles are highly sector-specific and require tailored methodological approaches, including the development of sector-specific PCRs.

c. Gap between policy awareness and technical readiness

The training and trial phase activities reveal a clear gap between high awareness of climate policies and commitments and limited technical capacity for implementation at the enterprise level.

Enterprises are generally not yet equipped with:
- Robust data management systems
- Clear data ownership and governance structures
- Standardized methodologies for carbon accounting

This gap represents a major barrier to scaling up carbon labeling and integrating it into broader climate policy instruments.

d. Implications for MRV and Emissions Trading Scheme (ETS) readiness

The trial phase findings have important implications for the development of Vietnam's national MRV system and future ETS. While PCF assessment provides valuable insights into emission sources across the value chain, the current limitations in data systems indicate that most enterprises are not yet ETS-ready.

Key gaps include:
- Lack of traceable and auditable data systems
- Limited supply chain data integration
- Insufficient Quality Assurance (QA)/Quality Control (QC) procedures
- Inconsistent methodologies across enterprises

Addressing these gaps will be essential to ensure the credibility and functionality of future carbon market mechanisms.

The trial phase demonstrates that:
- Carbon labeling is technically feasible and relevant in the Vietnamese context
- However, its robustness is constrained by data systems rather than methodology
- Significant improvements are required in data management, standardization, and institutional capacity

Importantly, the trial phase results should be considered as indicative and learning-oriented, rather than fully compliant CFP declarations under international standards.

Recommendations and way forward

Based on the trial phase results, the following priority actions are recommended for implementation of the VCLP:

i. Strengthen enterprise-level data systems and governance
- Establish standardized enterprise-level data collection and management systems with clear departmental responsibilities and internal MRV procedures.
- Designate dedicated coordination functions to oversee carbon-related data management, QA/QC, cross-department coordination, and engagement with external verifiers.
- Improve data consistency, traceability, auditability, and enterprise readiness for carbon labeling, MRV, and future ETS participation.

ii. Develop national databases and digital infrastructure

- Develop Vietnam-specific emission factor databases and centralized digital platforms for reporting, validation, and verification.
- Integrate carbon labeling data systems with national MRV and future ETS infrastructure.
- Define clear roles among ministries, technical agencies, industry associations, verification bodies, and enterprises for methodological development, data governance, QA/QC, and standardized reporting.
- Strengthen system consistency, transparency, scalability, and national carbon market readiness.

iii. Standardize methodologies and PCRs

- Expand and refine sector-specific PCRs
- Ensure consistency in system boundaries, allocation methods, and reporting formats

***iv.* Enhance capacity building**

- Continue targeted training programs focusing on practical implementation
- Support enterprises in transitioning from awareness to operational capability

v. Integrate supply chain data

- Promote data sharing mechanisms with suppliers and logistics providers
- Gradually improve Scope 3 data coverage

***vi.* Adopt a phased implementation approach**

- Start with simplified methodologies and gradually increase requirements
- Align carbon labeling with MRV development and ETS roadmap

Overall conclusion

The trial phase provides a strong and practical starting point for developing a national carbon labeling system in Vietnam. It shows that key tools such as PCF methods, data templates, and draft PCRs are already in place and can be used in priority sectors. However, these tools still need further review and improvement with inputs from industry associations and line ministries to make sure they are practical and easy to use.

The trial phase also shows that data is a major challenge. While companies have started preparing GHG inventory data, they will need technical support and incentives to convert this data into accurate and consistent PCF results. Strengthening company capacity and improving data systems will be important for expanding the program.

Overall, carbon labeling can help improve product labeling transparency and support exports. With further improvements and support, it can also contribute to Vietnam's wider climate goals, including building a strong MRV system and a reliable domestic carbon market.

1 Introduction

1.1 Background

Vietnam has demonstrated a strong commitment to addressing climate change, including its pledge to achieve net-zero Greenhouse Gas (GHG) emissions by 2050, announced at the 26th Conference of the Parties (COP26). To operationalize this commitment, the Government of Vietnam has issued key strategic frameworks, like the National Strategy on Climate Change (2021–2050) and the National Green Growth Strategy (2021–2030, vision to 2050), which emphasize low-carbon development, sustainable production, and enhanced competitiveness in international markets.

In parallel, increasing global market requirements such as the European Union Carbon Border Adjustment Mechanism (EU CBAM) and growing demand for environmental transparency from international buyers are exerting strong pressure on Vietnamese enterprises to quantify and disclose their product-level carbon emissions.

In this context, the project “Technical Support for the Design and Trial phase of the Voluntary Carbon Labeling Scheme in Vietnam” has been implemented with support from the Southeast Asia Energy Transition Partnership (ETP) under the United Nations Office for Project Services (UNOPS), in collaboration with the Ministry of Agriculture and Environment (MAE) and the Department of Climate Change (DCC).

The project aims to design and trial phase a Voluntary Carbon Labeling Program (VCLP) that enables enterprises to measure, verify, and communicate the carbon footprint (CFP) of their products based on internationally recognized standards such as International Organization for Standardization (ISO) 14067 and the GHG Protocol. This initiative serves as an important step toward strengthening Vietnam’s national GHG Monitoring, Reporting, and Verification (MRV) system and supporting the development of a domestic carbon market.

The project has been implemented through a series of structured deliverables, including:

- Assessment of legal frameworks and international experience (Deliverable 2)
- Development of the VCLP design and implementation plan (Deliverable 3)
- Trial phase implementation in selected sectors and preparation of the trial phase results report (Deliverable 4), which refers to this document.

Building on the completed design phase, the trial phase was conducted to test the feasibility, practicality, and effectiveness of the proposed carbon labeling framework under real industry conditions.

1.2 Objectives of the report

This report presents the detailed results of the trial phase of the VCLP implemented in selected sectors in Vietnam. The main objectives of this report are to:

- Document the implementation of the trial phase, including stakeholder engagement, training activities, data collection, and verification processes;

- Present the methodology applied for Product Carbon Footprint (PCF) assessment, including system boundaries, data requirements, emission factors, and calculation approaches;
- Report and analyze the CFP results for selected trial phase products and identify key emission drivers;
- Evaluate the effectiveness of the trial phase implementation, including institutional coordination, enterprise participation, and verification mechanisms;
- Identify key challenges, lessons learned, and areas for improvement to support the refinement and scaling-up of the VCLP at the national level.

The report serves as a critical input for finalizing the VCLP design and provides evidence-based recommendations for the program's start-up phase and future nationwide implementation.

1.3 Scope of the report

This report covers all major activities and outputs implemented during the trial phase of the VCLP, conducted between January and April 2026. The scope of the report includes:

- Implementation of the carbon labeling framework and methodologies developed during the design phase;
- Selection of trial phase sectors and participating enterprises based on defined technical and strategic criteria;
- Organization of training and capacity-building activities for stakeholders, including enterprises, government agencies, and verification bodies;
- Development and application of methodological tools, including data collection templates, calculation models, and draft PCRs;
- Collection, validation, and analysis of activity data through site visits and enterprise engagement;
- Calculation and verification of CFP results for selected products;
- Evaluation of trial phase outcomes, including technical performance, data quality, and institutional readiness.

The trial phase focuses on three priority sectors such as food processing, chemicals, and pulp & paper, selected based on their emission intensity, export relevance, and readiness for MRV implementation.

The findings presented in this report provide practical insights into the applicability of carbon labeling in Vietnam's industrial context and form the basis for refining methodologies, strengthening institutional arrangements, and supporting the national roll-out of the VCLP.

2 Overview of trial phase design

This section presents a comprehensive overview of the trial phase design for the VCLP, integrating key components including stakeholder management, implementation planning, private sector engagement, selection criteria, evaluation and verification processes, and preparation of supporting documents.

The trial phase is developed based on a systematic stakeholder mapping and analysis, identifying all relevant actors such as line ministries, industry associations, research institutions, and conformity assessment bodies including verification and accreditation organizations. In parallel, a review of previous carbon labeling initiatives in Vietnam, including both national programs and international cooperation projects, has been conducted to ensure alignment, avoid duplication, and incorporate existing lessons learned. Stakeholder engagement is maintained throughout the trial phase via structured communication channels such as technical workshops, consultation meetings, and periodic updates. In addition, strategic partnerships with academic institutions and technical experts are being explored to support the development and validation of Product Category Rules (PCRs), while the establishment of a Technical Working Group or Advisory Committee is under consideration to provide continuous technical guidance.

The implementation of the trial phase follows a structured timeline with clearly defined activities and deliverables within a period of four months, from January 2026 to April 2026. Key steps include agreement on sector selection and trial phase implementation plans, organization of training and capacity-building workshops, execution of trial phase activities, and preparation of the final report. The trial phase execution phase includes site visits for primary data collection, validation of activity data, PCF assessment, as well as evaluation and verification processes. Training activities are designed to enhance stakeholder capacity, particularly for enterprises, focusing on carbon labeling methodologies, data management practices, and requirements for verification and certification.

Private sector engagement is a central component of the trial phase. Enterprises participating in the trial phase are selected from priority sectors and are supported through targeted consultations and technical guidance. Standardized tools, including Data Collection Forms and GHG Calculation Templates, are developed to facilitate consistent data reporting. These templates provide detailed instructions on system boundaries, data input requirements, emission factor references, calculation methods, and quality control procedures, ensuring transparency and comparability of PCF results across participating entities.

The trial phase focuses on selected sectors based on criteria such as economic importance, emission intensity, and data availability, with approximately 10 enterprises participating in the initial phase. Selection of enterprises is guided by factors including the availability and reliability of production and energy data, willingness to participate and share information, representativeness of production processes, and potential to demonstrate measurable emission reductions. While the initial scope covers a limited number of sectors, the trial phase is designed to generate practical experience that can support future expansion to other sectors, including those affected by international mechanisms such as CBAM.

To ensure the credibility and robustness of the trial phase results, a comprehensive evaluation and verification framework is being developed. The evaluation process is expected to include document review, data quality assessment, and consistency checks, along with the use of key performance indicators such as timeliness, completeness, and accuracy of reporting. Independent third-party verification by accredited bodies is planned, which may involve detailed data review, site audits where necessary, and confirmation of compliance with PCRs and PCF methodologies. In cases where domestic capacity is limited, international verification support may be considered.

In parallel, a set of key documents is developed to support the standardized implementation of the trial phase. These include data collection templates and GHG calculation tools, technical guidance documents, PCRs for selected products, lists of accredited verifiers, and training materials. Together, these documents establish the technical and operational foundation for the trial phase, ensuring consistency, transparency, and replicability of results. Further detailed methodologies, procedures, and technical specifications are provided in Deliverable 3 (D3).

Detailed outcomes and key inputs from stakeholder consultations conducted during the trial phase are provided in Annex 1.

3 Identification of trial phase sectors and enterprises

Three sectors out of a total of six sectors currently under consideration, were selected for the trial phase carbon labeling program. These six sectors include:

- Beverages
- Chemicals
- Electrical and electronic appliances
- Food processing
- Paper & pulp
- Garment and textiles

From these six sectors, the selection of the three priority sectors was based on the established criteria, including the level of emissions and potential for emissions reduction, export pressure and international market requirements, readiness of data and infrastructure, scalability, consumer recognition and pressure. Choosing these three sectors was intended not only to ensure feasibility during the trial phase but also to maximize real impact on emissions reduction and enable broader replication and adoption in subsequent phases.

3.1 Overview of key points on the six sectors

The analysis covers six key sectors with varying levels of energy intensity, export contribution, and exposure to carbon-related measures. Table 1 outlines the key points of six sectors.

- Beverages: Highly energy-intensive but with no recorded export value; partial carbon labeling is already in practice.

- Chemicals (rubber, fertilizer, paint): Highly energy-intensive, exports valued at USD 7.73 million/year; faces CBAM transition risks (2023–2025) and has partial carbon labeling .

- Electrical and electronic appliances: Major export contributor at USD 57.32 million/year; partial carbon labeling is applied.

- Food processing (seafoods, sugarcane, dairy): Highly energy-intensive with exports of USD 29.55 million/year; partial carbon labeling is in place.

- Paper & pulp: Highly energy-intensive with exports of USD 15.55 million/year; faces CBAM risks from 2026–2030 and has partial carbon labeling .

- Garment and textiles: The largest export contributor at USD 59.86 million/year; subject to CBAM from 2026–2030 and already implements partial carbon labeling.

Table 1. Key points on the six sectors

No.	Sector	Highly energy/ carbon-intensive[1]	High contribution to export (1000 USD)	Risk of impact from CBAM		Partial carbon labeling in practice
				Transition period from 2023 - 2025	From 2026 - 2030	
1	Beverages	x	no export			x[2]
2	Chemicals (rubber, fertilizer, paint),	x	7,730,700	x		x[3]
3	Electrical and electronic appliances		57,325,100			x[4]
4	Food processing (seafoods, sugarcane and dairy).	x	29,554,400			x[5]
5	Paper & pulp	x	15,558,000		x	x[6]
6	Garment and textiles		59,864,300		x	x[7]

Note:

1. "Highly energy/carbon-intensive" sectors were identified based on the presence of national Specific Energy Consumption (SEC) benchmark regulations issued in Vietnam. Existing regulations include: Beverage sector – Circular No. 19/2016/TT-BCT; Chemical sector – Circular No. 02/2004/TT-BCT; Food processing sector (including seafood processing) – Circular No. 52/2018/TT-BCT and sugarcane and dairy processing – Circular No. 39/2019/TT-BCT; and Paper & pulp sector – Circular No. 24/2017/TT-BCT. However, due to differences in production processes and product characteristics, SEC values are not directly comparable across sectors.

2. International references on product carbon intensity indicate that cement/clinker products generally range between approximately 0.6–0.9 tCO_2e per tonne of clinker/cement product[8], pulp and paper

[1] Based on minimum energy performance standards (MEPS) issued by the MOIT (2018)
[2] https://insights.figlobal.com/sustainability/carbon-labelling-on-the-rise-in-food-and-drink
[3] https://www.wri.org/technical-perspectives/chemical-accounting-emissions-transparency#:~:text=The%20most%20prominent%20such%20measure,Sector%20Emissions%20in%20the%20U.S. (last accessed on 20/05/2026).
[4] https://www.ccdp-me.com/en/carbon-labeling (last accessed on 20/05/2026).
[5] https://www.researchgate.net/publication/235989916_Carbon_footprint_of_a_multi-ingredient_seafood_product_from_a_business-to_business_perspective (last accessed on 20/05/2026).
[6] https://www.resourcewise.com/forest-products-blog/navigating-the-future-of-the-pulp-and-paper-industry-sustainability-and-carbon (last accessed on 20/05/2026).
[7] https://carbonvaluechain.com/carbon-emissions/carbon-labeling-promoting-transparency-in-the-fashion-industry/ (last accessed on 20/05/2026).
[8] https://www.iea.org/energy-system/industry/cement (last accessed on 20/05/2026).

products commonly range around 0.6–1.8 tCO_2e per tonne of product[9], while seafood products may range from approximately 1–15 $kgCO_2e$ per kg of product depending on species, production methods, feed inputs, processing technologies, and transportation conditions[10]. These values are presented only as indicative international benchmarks and may vary significantly depending on system boundaries, methodologies, and local production conditions.

3.2 Criteria for sector selection

The assessment was conducted based on six criteria. Criteria 1 to 5 were scored on a scale of 1–5 according to expert experience and judgment, including:

- *Emissions and reduction potential:* The sector's level of GHG emissions and its potential for emission reductions.
- *Export pressure / international requirements:* The requirements, standards, or pressures from export markets and international commitments.
- *Data and infrastructure readiness:* The level of readiness in terms of data and infrastructure for measuring, reporting, and verifying emissions. This criterion reflects data readiness, meaning that the entities or sector's data is complete, transparent, free from major gaps, verified, and suitable for use in calculation, monitoring, or reporting processes. This criterion is distinct from the willingness of each sector to participate in the pilot program. Therefore, even if a sector is fully prepared in terms of data availability and quality, it may still be considered not ready for implementation if there is no agreement, commitment, or intention to participate in the pilot program.
- *Scalability:* The practical potential to replicate and expand the carbon labeling model across the broader sector over time. This criterion was assessed qualitatively based on several sector characteristics, including the number and diversity of enterprises in the sector, availability of sector-level data and industry coordination mechanisms, similarity of production technologies across firms, and the potential for developing common Product Category Rules (PCRs). The assessment considered not only market concentration, but also the practical feasibility of standardizing methodologies, coordinating data collection, and replicating the carbon labeling framework across enterprises within each sector. For example, sectors such as paper and pulp were considered relatively scalable due to the moderate number of enterprises, relatively similar production processes, and existing energy monitoring practices, which support more manageable implementation during the trial phase. In contrast, sectors such as food processing demonstrate strong long-term scaling potential because of their large market presence and consumer visibility, although implementation may be more complex due to greater diversity in products and production systems.
- *Public awareness and consumer pressure:* The level of public awareness and market or customer pressure regarding carbon issues.

[9] https://bioresources.cnr.ncsu.edu/resources/life-cycle-carbon-footprint-analysis-of-pulp-and-paper-grades-in-the-united-states-using-production-line-based-data-and-integration (last accessed on 20/05/2026).
[10] https://www.frdc.com.au/fish-vol-30-2/calculating-seafoods-carbon-footprint (last accessed on 20/05/2026).

The sixth criterion, readiness to participate in the trial phase, was assessed based on the survey results in Deliverable 2 (D2), which presents the readiness of enterprises to join the carbon labeling trial phase program. This criterion was also scored on a scale of 1–5. Table 2 outlines the criteria for sector selection.

Table 2. Criteria for sector selection

No	Sector	Criteria (On-scale of 1-5)						
		Emissions and reduction potential	Export pressure / international requirements	Data and infrastructure readiness	Scalability	Public awareness and consumer pressure	Readiness to participate in the trial phase	Total
1	Beverages	3	2	3	3	5	5	21
2	Chemicals (rubber, fertilizer, paint)	5	4	4	3	2	5	23
3	Electrical and electronic appliances	3	5	4	4	2	4	22
4	Food processing (seafoods, sugarcane and dairy).	3	3	3	5	5	5	24
5	Paper & pulp	5	4	3	3	3	4	22
6	Garment and textiles	4	5	4	5	4	4	26

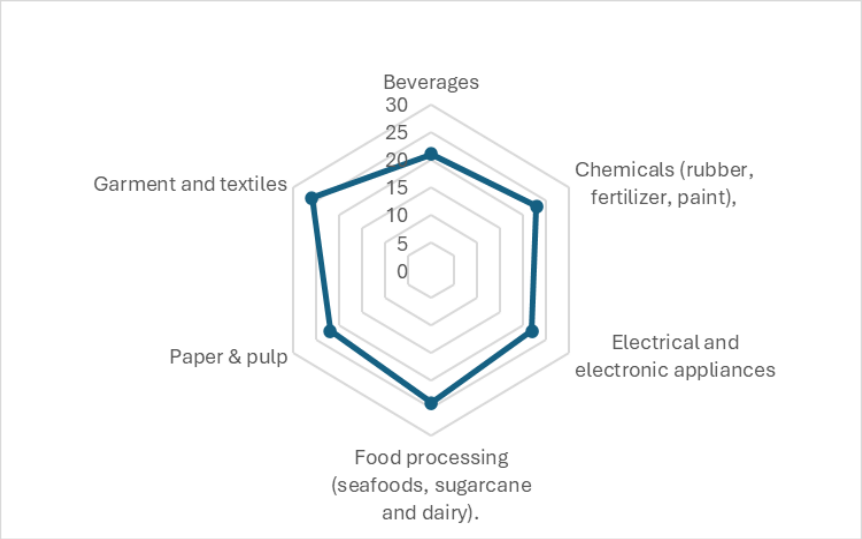


Figure 1. Scoring of sectors against each criterion

The six sectors vary in their consumer connection, environmental impact, export pressures, and data readiness. Beverages and food processing have strong consumer visibility, while chemicals and electronics face higher export demands but lower public awareness. Paper & pulp and garment & textiles show high energy and water use, with garments benefiting from strong industry associations and existing data from efficiency and LCA programs.

Based on both quantitative and qualitative analysis, the three sectors prioritized for the trial phase are:

- **Chemicals:** Characterized by high emission intensity and increasing international pressure, with industry readiness for cooperation. Although communication with end consumers may be challenging, this sector is well-suited for developing standard models for heavy industries.

- **Food Processing:** Popular consumer products with high communication potential, a significant presence of small and medium enterprises (SME), and opportunities to improve production processes and packaging, thereby reducing emissions across the entire value chain.

- **Paper & Pulp:** Notable for significant emissions and high resource consumption, with growing market pressure. The moderate number of enterprises facilitates effective initial management, and there is potential to expand into consumer paper products.

The textile and garment sector has the highest total score, but was not selected because the program aims to trial phase across sectors with varying levels of readiness, rather than focusing only on those that are most favorable. The paper sector was prioritized to represent a medium level of readiness, thereby enabling clearer identification of challenges in PCF calculation, data collection, and the practical implementation of carbon labeling.

3.3 Selection of trial phase enterprises

3.3.1 Overview of the enterprise selection process

Based on the results of the D2 survey and in alignment with the selected trial phase sectors - Chemicals, Food Processing, and Paper & Pulp, ten enterprises were selected to participate in the trial phase carbon labeling program. The selection process was guided by a structured set of criteria to ensure sectoral relevance, export significance, regulatory alignment, and readiness for GHG management. The objective was to identify enterprises that not only operate within priority sectors but also demonstrate practical capacity and strategic motivation to implement PCF assessment and carbon labeling.

The selection criteria included the following:

- Willingness to participate in the trial phase program, as indicated through responses to the D2 survey;
- Product eligibility, with products belonging to one of the three selected trial phase sectors: Chemicals, Food Processing, or Paper & Pulp;

- Target market orientation, particularly products serving export or export–import markets;
- Total exported production volume, reflecting the scale and potential market impact of carbon labeling implementation;
- Regulatory status, specifically whether the enterprise is listed as a Key Energy User under Decision No. 1011/QD-TTg and/or as a facility required to conduct a GHG inventory under Decision No. 13/2024/QD-TTg;
- Commitment to GHG mitigation, including the existence of quantitative emission reduction targets and/or formal plans for GHG emission reduction.

Together, these criteria ensured that the selected enterprises are representative of priority sectors, actively engaged in export markets, aligned with national regulatory frameworks, and institutionally prepared to participate in the trial phase of the carbon labeling program.

3.3.2 List of enterprises selected for the trial phase.

Through the screening process based on the results of the D2 report, ten enterprises were selected. Table 3 outlines the list of enterprises selected for the trial phase and facility identification details are kept confidential and not disclosed in this report.

Detailed information on company product types, annual production, etc., is provided in Table 3.

Table 3. List of enterprises selected for the trial phase

No	Enterprise Name	Sectors
1	CL1	Food Processing
2	CL2	Food Processing
3	CL3	Food Processing
4	CL4	Pulp and Paper
5	CL5	Pulp and Paper
6	CL6	Pulp and Paper
7	CL7	Pulp and Paper
8	CL8	Chemicals
9	CL9	Chemicals
10	CL10	Chemicals

4 Capacity building and training activities

4.1 Training needs assessment

A rapid assessment survey was conducted to identify key sectors and enterprises relevant to carbon labeling implementation in Vietnam. As part of this process, a desk review and market analysis were undertaken using publicly available data from sources such as the General Statistics Office (GSO) and the General Department of Vietnam Customs to understand major products in the Vietnamese market and their import and export destinations. The review identified key export-oriented sectors including iron & steel, cement, fertilizers, seafood, electrical and electronic appliances, beverages, paper & pulp, textiles, chemicals, paints, and aluminium.

Based on the market review and preliminary screening, sectors were shortlisted considering several criteria, including: (i) sectors identified as highly energy/carbon-intensive in previous programs and studies; (ii) sectors with high export volume and value; (iii) sectors potentially affected by the EU Carbon Border Adjustment Mechanism (CBAM); and (iv) sectors where carbon labeling practices are already partially in place. Following the screening process, more than 500 enterprises across the sectors of Beverages, Chemicals (rubber, fertilizer, paint), Electrical and Electronic Appliances, Food Processing (seafood, sugarcane, and dairy), Paper & Pulp, Plastics, and Garment and Textiles were identified for participation in the survey.

The survey was conducted using both electronic (Google Form) and printed questionnaire formats to accommodate enterprise preferences and improve accessibility. In addition, a dedicated technical support team was available throughout the survey period to assist enterprises, respond to queries, and support accurate completion of the questionnaires. A total of 500 enterprises were invited to participate in the survey, from which 96 responses were successfully collected and analyzed.

Based on the findings of the D2 report, the survey results provide a clear picture of enterprises' current awareness, existing knowledge gaps, and capacity needs. These findings serve as an important foundation for identifying priority areas for training and capacity building to support the implementation of carbon labeling in Vietnam.

The survey shows that Vietnamese enterprises have reached a relatively high level of general awareness of national climate change policies. Almost all respondents, accounting for 99%, have heard about Vietnam's commitments and strategic directions. Among them, 76% are aware of the net-zero emissions target by 2050, which is one of the country's most important international commitments. In addition, 90.6% of enterprises are aware of the requirement to conduct annual GHG inventories, indicating that this regulation has been widely communicated. However, the fact that 1% of enterprises have never accessed any climate-related information suggests that gaps in communication still exist, especially among smaller enterprises or those with limited access to official information. Furthermore, although 63.5% of enterprises have started to engage with trends such as the circular economy, green economy, and digital transformation, a significant

proportion have not yet taken action, reflecting the need for more structured support to turn awareness into implementation.

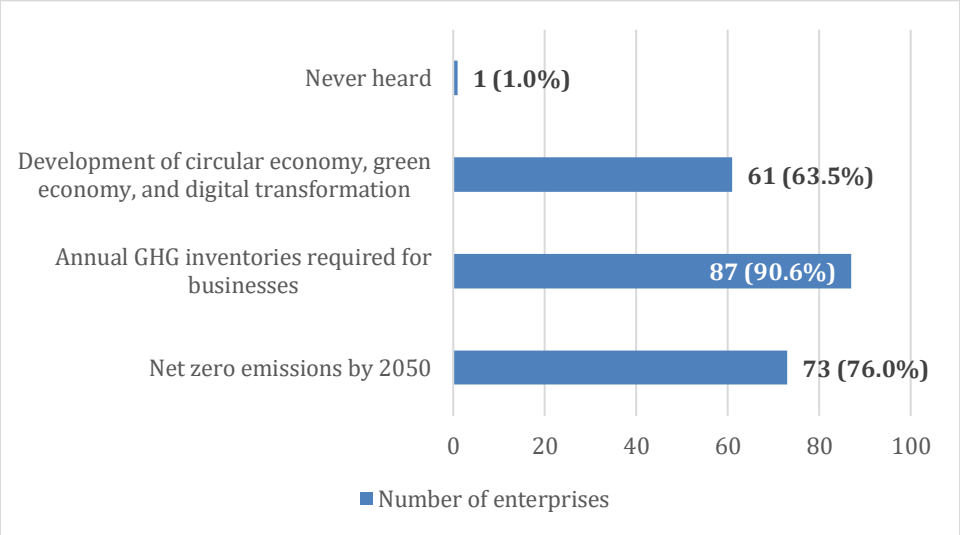


Figure 2. Enterprises' understanding of government climate change-related activities

When moving from general awareness to technical understanding, the results reveal considerable variation and highlight clear training needs. While the concept of GHG inventory is well understood by 97.9% of enterprises due to its mandatory nature, other important concepts are less consistently understood. Only 58.3% of enterprises are familiar with the concept of carbon footprint, and 61.5% understand carbon labeling. Similarly, 64.6% are aware of the carbon market, but knowledge of more complex mechanisms such as the Carbon Border Adjustment Mechanism (CBAM) remains limited at 27.1%. This gap is particularly important because such mechanisms are expected to directly affect export-oriented sectors in the near future. The uneven level of understanding indicates that many enterprises are not yet fully prepared to respond to international climate-related requirements, thereby creating a strong demand for targeted technical training.

The situation is even more evident when considering international standards and methodologies for emissions measurement. Only 45.8% of enterprises are familiar with standards such as ISO 14067, PAS 2050, and the GHG Protocol, which are essential for conducting carbon footprint assessments. LCA reaches only 31.3%, while knowledge of ESG standards is at 37.5%. In addition, 2.1% of enterprises have no exposure to any of these concepts. These figures demonstrate that although enterprises may be aware of policies, they often lack the technical knowledge and tools needed to implement carbon measurement and reporting in practice. This represents a critical gap that can only be addressed through systematic and practical training programs.

Table 4. Enterprises' understanding of climate change-related concepts issued by the government

	Number of enterprises	Proportion (%)
Carbon Footprint	56	58.3
Carbon Labeling	59	61.5
GHG Inventory	94	97.9
Carbon Market	62	64.6
CBAM	26	27.1
Emission standards and certifications (ISO 14067, PAS 2050, GHG Protocol, etc.)	44	45.8
LCA	30	31.3
ESG standards and strategies in the enterprise	36	37.5
Never heard	2	2.1
Total	**409**	

The analysis of information sources further reinforces the need for capacity building. More than half of enterprises, 51%, obtain information from government policies and plans, showing the key role of public institutions. At the same time, 30.2% rely on parent companies or customers, which suggests that supply chain pressure is becoming an important driver of awareness. Certification bodies and industry associations also contribute, but to a lesser extent. Notably, informal channels such as media, workshops, or peer exchanges play a limited role. A particularly important finding is that up to 25% of enterprises have never accessed any information related to carbon footprint or carbon labeling. This highlights not only a lack of awareness but also limitations in the accessibility and effectiveness of current communication and training activities.

Overall, the survey results clearly show a gap between policy awareness and practical implementation capacity. Enterprises are generally aware of climate commitments and regulations, but their understanding of technical concepts, standards, and tools remains limited and uneven. This gap creates a strong and urgent need for structured training programs that focus on practical skills, standardized methodologies, and emerging international requirements.

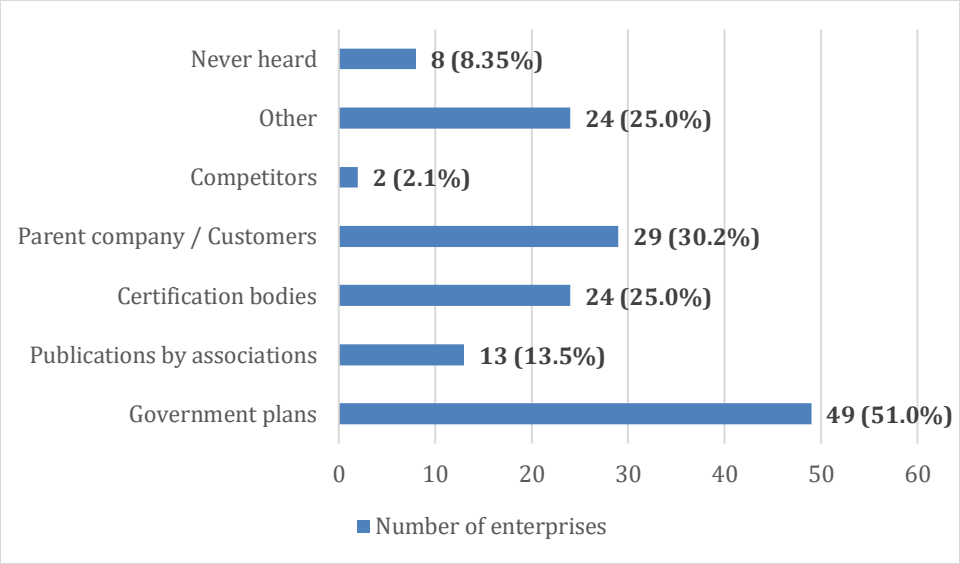


Figure 3. Sources of Information on carbon footprint or carbon labeling for enterprises

The internal governance and management frameworks for carbon labeling

In addition to technical knowledge gaps, the trial phase assessment also identified important limitations related to internal governance and management frameworks for carbon labeling implementation within enterprises. These institutional and organizational factors have a significant influence on the ability of enterprises to effectively conduct CFP assessment and maintain reliable carbon labeling systems.

The trial phase findings indicate that responsibility for carbon-related activities is currently distributed unevenly across enterprises. In most cases, implementation was led by environmental, energy management, or technical departments, while some enterprises relied on production planning or quality management teams to coordinate data collection. Only a limited number of participating enterprises had dedicated sustainability or ESG-related functions responsible for carbon management activities. Legal and compliance departments were generally involved only when export requirements or customer requests were directly related to carbon disclosure obligations.

Based on these findings, the following sections develop a set of training topics designed to address the identified gaps and to support enterprises in effectively implementing carbon labeling and related climate actions.

4.2 Development of training topics

The development of training topics for the Trial phase Program on Voluntary Carbon Labeling in Vietnam was carefully designed to align closely with national policy directions, international climate commitments, and the practical realities faced by Vietnamese enterprises. This initiative, led by DCC under MAE (formerly Ministry of Natural Resources and Environment (MONRE)), aims to build foundational awareness and technical capabilities among businesses, particularly those in high-emission and export-oriented sectors. By focusing on GHG accounting, CFP management, and voluntary carbon labeling application, the training content addresses the

growing pressures from global markets, such as the EU's CBAM and demands for transparent sustainability reporting, while supporting Vietnam's broader goals of emission reduction, green transformation, and enhanced competitiveness.

4.2.1 List of proposed and approved training topics

Based on the gaps identified from the D2 assessment, particularly the limited technical readiness of enterprises in GHG accounting and CFP application, the training topics were defined in strict alignment with the official agenda. The selection of topics prioritizes key technical competencies required for enterprises to move from awareness to implementation.

The finalized and approved training topics include:

- Introduction to the trial phase program objectives, training goals, and expected outcomes
- Introduction to the voluntary carbon labeling trial phase labeling program: scope, participation requirements, and roles of stakeholders
- Practical overview of corporate GHG inventory: data requirements, system boundaries, and calculation steps
- Application of CFP results for voluntary carbon labeling
- Optimizing CFP: From energy transition to carbon labeling recognition

The topics were reviewed and validated through stakeholder consultations to ensure that they are technically relevant, practically applicable, and aligned with enterprise needs in the trial phase.

4.2.2 Key contents of each training topic

The detailed contents of each training topic are designed to ensure that enterprises can move beyond general awareness toward practical implementation. Each topic focuses on specific technical competencies required for participating in the voluntary carbon labeling trial phase program.

Introduction to the trial phase program objectives, training goals, and expected outcomes

This topic focuses on clarifying the expected technical outputs of the training. Enterprises are guided to understand the overall implementation pathway, from conducting a GHG inventory to generating CFP results and applying them in carbon labeling. The content emphasizes the competencies that participants are expected to achieve, including the ability to interpret technical requirements and assess their own readiness for implementation.

Introduction to the voluntary carbon labeling trial phase program: scope, participation requirements, and roles of stakeholders

The content of this topic translates the program framework into practical requirements. It explains how the defined scope affects product eligibility, how participation requirements relate to data preparation and reporting obligations, and how stakeholder roles influence coordination during

implementation. The focus is on helping enterprises understand their specific technical responsibilities within the system.

Practical overview of corporate GHG inventory: data requirements, system boundaries, and calculation steps

This topic provides detailed technical guidance on how to establish and operate a GHG inventory system. It covers the definition of system boundaries, identification of emission sources across different scopes, and the development of data collection processes. The calculation methodology based on activity data and emission factors is explained in a step-by-step manner, with attention to common technical issues such as missing data, inconsistent records, and boundary selection challenges.

Application of carbon footprint results for voluntary carbon labeling

It covers examples of international carbon labeling schemes and related incentives, and explains how enterprises can use CFP results to participate in such programs. In addition, the section highlights the potential market advantages for exporters, including improved transparency in carbon performance and alignment with green supply chains. It also outlines possible linkages with green finance and climate-related investment mechanisms, supporting broader sustainability and competitiveness objectives.

Optimizing carbon footprints: From energy transition to carbon labeling recognition

This topic emphasizes practical technical solutions for reducing emissions based on CFP results. It introduces approaches such as improving energy efficiency, adopting cleaner energy sources, and optimizing production processes. The content highlights how these measures contribute to improving carbon performance and support the recognition of carbon labels, particularly in response to increasing market requirements.

Overall, the training content is structured to strengthen technical capacity step by step, enabling enterprises to understand requirements, perform calculations, and apply results in practice. This approach directly addresses the gaps identified in the survey, particularly the need for improved technical knowledge and implementation capability in GHG accounting and CFP management.

4.3 Organization of training and capacity-building workshops

The training was delivered through a targeted half-day intensive workshop format to accommodate busy enterprise schedules while delivering high-impact content. This event served as a key capacity-building component of the trial phase program, directly supporting enterprises in preparing for voluntary participation.

The primary workshop was organized with close coordination between the DCC, international technical partners (e.g., ETP, UNOPS-supported consultants), and local experts to ensure content quality, relevance, and alignment with ongoing program design efforts.

4.3.1 Composition and number of participants

Approximately 80 participants attended, representing a strategic cross-section of the carbon labeling ecosystem to maximize impact and foster multi-stakeholder dialogue.

Key participant groups included:

- *Enterprises from priority high-emission and export-oriented sectors:* Iron and steel, cement, chemicals (fertilizers, paints, rubber), aluminum. These are core focus areas due to their emissions intensity and CBAM exposure.
- *Additional sectors with rising international requirements:* Paper, plastics, textiles, food processing, and seafood processing. Recognizing supply chain pressures and export dependencies.
- *Government representatives from relevant agencies:* To align policy insights and program implementation.
- *Consulting organizations and technical experts:* Providing ongoing support and verification expertise.

This diversity promoted rich knowledge exchange, cross-sector learning, and strengthened coordination for the trial phase's success.

4.3.2 Training delivery methods and formats

To ensure maximum effectiveness, the workshop combined multiple delivery approaches:

- *Expert-led presentations:* Structured slides with visuals, data tables, flowcharts, and Vietnamese-translated international standards for clear knowledge transfer.
- *Practical examples and case studies:* Real or anonymized Vietnamese enterprise scenarios to illustrate concepts (e.g., a cement plant's boundary setting or a textile firm's Scope 3 challenges).
- *Interactive elements:* Q&A throughout, dedicated open discussion, and small-group brainstorming during breaks.
- *Materials:* This included presentations, reference links, and contact points for post-workshop support.

4.4 Outcomes of training workshops

The training workshop conducted under the trial phase contributed significantly to raising awareness and strengthening the technical capacity of participating stakeholders, particularly private sector enterprises.

Firstly, the workshop improved participants' understanding of key concepts related to GHG emissions, CFP (both corporate and product-level), and voluntary carbon labeling. Enterprises gained clearer insights into the relevance of carbon management in the context of global market

trends, including increasing requirements related to sustainability, Environmental, Social, and Governance (ESG), and carbon disclosure.

Secondly, the training activities enhanced the technical capacity of enterprises to initiate basic GHG accounting and PCF assessment. Through case-based discussions, participants were introduced to key elements such as system boundaries, data requirements, calculation approaches, and common data-related challenges. This helped enterprises better understand the steps required to participate in the trial phase carbon labeling program and to prepare for future MRV-related requirements.

In addition, the workshop facilitated active engagement and dialogue between enterprises, technical experts, and relevant stakeholders. The discussions and interactive sessions provided a platform for participants to share practical challenges, particularly regarding data availability, data quality, and internal coordination within enterprises. These discussions generated valuable feedback for refining the trial phase methodology and identifying key barriers to implementation.

Importantly, the training also supported enterprises in identifying potential GHG reduction opportunities and introduced practical solutions, including energy efficiency improvements, renewable energy adoption, and process optimization. Enterprises were encouraged to consider both emission reduction measures and carbon offset options as part of their longer-term carbon management strategies.

Furthermore, participating enterprises developed initial action plans outlining potential next steps for engaging in carbon labeling and improving their internal data systems. These action plans provide an important foundation for continued engagement in the trial phase and future program scale-up.

Overall, the training workshop demonstrated strong interest from the private sector and highlighted both the opportunities and challenges associated with implementing carbon labeling in Vietnam. While awareness and motivation have increased, the results also confirm the need for continued capacity building, more standardized tools and guidance, and stronger support mechanisms to enable enterprises to effectively participate in carbon labeling and future carbon market mechanisms.

Detailed information on the training workshops is provided in Annex 2, covering sessions held on April 10, 2026, in Hanoi and April 22, 2026, in Ho Chi Minh City.

5 Methodology for carbon labeling

5.1 Methodological framework

5.1.1 Life cycle assessment scope

Measuring a product's CFP requires understanding Scope 1, Scope 2, and Scope 3 GHG emissions.

- Scope 1: Direct emissions from sources owned or controlled by the company, such as fuel combustion in boilers, furnaces, generators, company vehicles, and process-related emissions occurring within the facility boundary.

- Scope 2: Indirect emissions from the generation of purchased electricity, steam, heat, or cooling consumed by the company. These emissions occur at the energy generation facility but are attributed to the organization consuming the energy.

- Scope 3: All other indirect emissions across the value chain, both upstream and downstream. Upstream emissions include raw material extraction, processing, and transportation, while downstream emissions may include distribution, product use, and end-of-life treatment.

In a cradle-to-gate product CFP assessment (Figure 2), emissions are measured from raw material extraction ("cradle") to the point where the product leaves the manufacturing facility ("gate"). This system boundary includes:

- Scope 1 direct emissions from on-site fuel combustion and production processes
- Scope 2 indirect emissions from purchased energy (electricity, steam, etc.), and
- Upstream Scope 3 indirect emissions such as raw material production and transport.

Downstream Scope 3 emissions associated with product distribution, use phase, and end-of-life treatment are excluded from the current assessment boundary.

For Vietnam's VCLP, the system boundary is set to cradle-to-gate. This boundary covers emissions associated with:

- Extraction and processing of raw materials
- Upstream transportation and logistics
- Manufacturing and on-site production processes
- Energy consumption within the facility

The cradle-to-gate approach is generally aligned with international product carbon accounting practices, including methodologies commonly applied under the EU Carbon Border Adjustment Mechanism (CBAM) and ISO 14067, as it focuses on emissions generated up to the point the product leaves the manufacturing facility. Under the current CBAM framework, reporting primarily focuses on direct emissions (Scope 1) and, for certain sectors, indirect emissions from electricity consumption (Scope 2) generated during production processes. The cradle-to-gate boundary is

therefore considered suitable for supporting product-level carbon transparency and facilitating future integration with international carbon reporting and trade-related requirements.

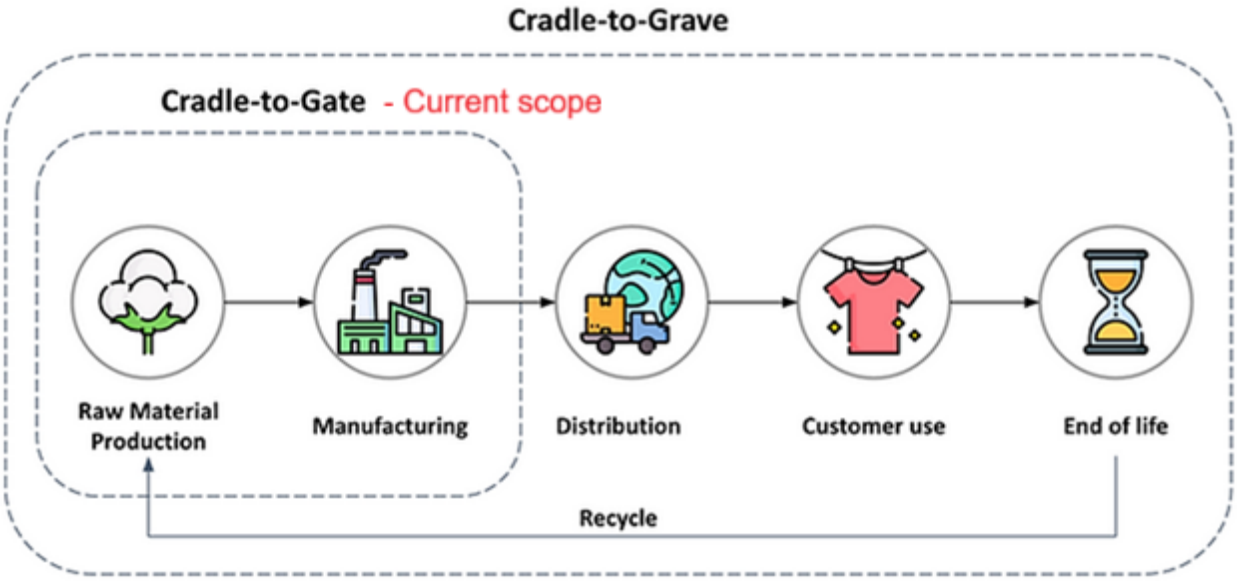


Figure 4. Product LCA model & proposed emission scope

The functional unit is defined as the production of one unit of finished product, expressed in physical terms (e.g., kg, ton, or unit depending on product category). All emissions are normalized to this functional unit to ensure comparability across products and facilities.

The cradle-to-grave approach was not selected for the current phase of the program. While it provides a more comprehensive life-cycle perspective, it requires extensive data collection across the entire value chain, including downstream use and end-of-life stages. At this stage, limited data availability may introduce higher uncertainty and reduce result reliability.

As the program evolves and data availability, digital monitoring systems, and enterprise capacity improve, the system boundary for CFP assessment may be expanded to include downstream life-cycle stages, enabling the adoption of a cradle-to-grave approach in future program phases.

For detailed information on the methodological framework, refer to the D3 report.

5.1.2 Methodological basis for carbon labeling

The carbon labeling methodology is primarily based on internationally recognized standards, including:

- GHG Protocol – Product Life Cycle Accounting and Reporting Standard
- ISO 14067: GHG – CFP of products – Requirements and guidelines for quantification

The GHG Protocol provides a widely accepted framework for quantifying and reporting GHG emissions across the product life cycle. It defines accounting principles such as relevance,

completeness, consistency, transparency, and accuracy, ensuring that GHG inventories are credible and comparable across organizations and products.

ISO 14067 builds upon LCA standards (ISO 14040 and ISO 14044) and establishes specific principles, requirements, and guidelines for the quantification and communication of PCF. The standard provides guidance on:

- Defining system boundaries and functional units
- Identifying emission sources across the life cycle
- Applying allocation methods for multi-output processes
- Ensuring data quality and representativeness
- Reporting and communicating CFP results

Together, these standards form the core methodological foundation for the carbon labeling framework under the program. They ensure that PCF calculations are conducted using internationally recognized methodologies and that results are transparent, verifiable, and comparable across products and sectors.

To further strengthen methodological robustness, the program applies the following implementation principles, which are aligned with and derived from the methodological requirements and guidance provided in the GHG Protocol and ISO 14067:

- **Primary data priority:** Facility-specific operational data (energy use, material consumption, production output) are prioritized whenever available.
- **Secondary data use:** When primary data are unavailable, recognized databases and literature sources may be used as secondary data.
- **Allocation rules:** Where processes produce multiple products, emissions are allocated based on appropriate physical or economic relationships.
- **Data quality assessment:** Data sources are evaluated based on representativeness, completeness, and reliability.
- **Independent verification:** CFP results are subject to verification procedures to ensure accuracy and credibility before carbon label issuance.

The GHG Protocol is currently revising its Scope 2 guidance, with increasing emphasis on location-based emission factors and more granular hourly electricity reporting where feasible[11]. In parallel, the GHG Protocol and ISO are collaborating to develop a joint international standard for product-level GHG accounting to improve methodological harmonization and comparability across markets and industries[12]. While these developments are still ongoing, the VCLP trial phase considered their potential implications. In practice, most participating enterprises were able to provide annual or monthly electricity consumption data, while only limited facilities could collect hourly electricity data through advanced monitoring systems. As a result, future alignment with

[11] https://ghgprotocol.org/ghg-protocol-public-consultations
[12] https://ghgprotocol.org/blog/announcement-iso-and-ghg-protocol-finalize-joint-working-group-develop-product-level?apcid=0065e0d4750950bb6e6dff02

evolving international requirements may require additional investment in digital energy monitoring infrastructure, data management systems, and enterprise-level technical capacity.

5.1.3 Data collection and emission factors

This section provides methodological guidance on data collection and emission factors. Accurate CFP assessment requires reliable data on material flows, energy consumption, and production outputs. Under the VCLP, data collection follows a structured approach to ensure transparency, traceability, and consistency across participating enterprises.

Primary data

Primary data are collected directly from the manufacturing facility and represent the most accurate source of information for calculating PCF. These data typically include:

- Quantity of raw materials and auxiliary materials used in production
- Energy consumption (electricity, fuels, steam, heating, cooling)
- Production output corresponding to the defined functional unit
- Transportation distances and modes for incoming raw materials
- Process-related emissions, where applicable

Primary data should ideally cover at least one full year of operation to capture seasonal variations and operational fluctuations. In practice, most participating enterprises are currently able to provide annual and monthly activity data based on utility bills, production logs, and internal monitoring records, while only some enterprises have the capacity to collect hourly data through advanced energy monitoring systems. Where direct hourly activity data are not available, enterprises may use equipment operating schedules or hourly load profiles to estimate hourly electricity consumption. Enterprises participating in the program are encouraged to provide metered or documented data from energy monitoring systems, invoices, production logs, and internal records.

Secondary data

When primary data are not available, secondary data may be used. Secondary data refer to generic or industry-average datasets obtained from recognized databases, scientific literature, or publicly available sources.

Typical sources of secondary data may include:

- International LCA databases (e.g., Ecoinvent, GaBi, or similar datasets)
- National emission factor databases
- IPCC guidelines and emission factor references
- Peer-reviewed studies or sector-specific reports

Secondary data should be selected based on their geographical, technological, and temporal representativeness, ensuring that they reasonably reflect the conditions of the product system being assessed.

Emission factors

Emission factors are used to convert activity data (e.g., energy consumption or material use) into GHG emissions. Where country-specific emission factors are available, they should be used in preference to global averages to improve calculation accuracy. For Vietnam, the electricity grid emission factor is referenced from Official Letter No. 1726/BĐKH-PTCBT (2024)[13], while emission factors for other fuels and production processes are referenced from Decision No. 2626/QĐ-BNNMT (2022) issued by MAE[14]. If country-specific emission factors are not available, emission factors from authoritative and internationally recognized sources are used, such as:

- IPCC Guidelines for National GHG Inventories
- LCA databases consistent with ISO standards

Data quality considerations

To ensure reliability of results, data used in the CFP assessment should be evaluated according to several quality criteria, including:

- Completeness: Coverage of all relevant emission sources within the system boundary
- Accuracy: Degree to which data reflect actual operational conditions
- Consistency: Use of consistent methodologies and assumptions across the assessment
- Representativeness: Alignment with geographic, technological, and temporal conditions

Enterprises participating in the program may be required to provide supporting documentation to validate reported data during the verification process.

5.1.4 Calculation methodology for PCF

The PCF is calculated by quantifying all GHG emissions associated with the defined life cycle stages within the system boundary and allocating them to the functional unit.

General calculation principle

The CFP of a product is calculated using the following general formula:

$$PCF = \sum(Activity\ D \times Emission\ Factor)$$

Where:

[13] https://thuvienphapluat.vn/cong-van/Tai-nguyen-Moi-truong/Cong-van-1726-BDKH-PTCBT-2024-cong-bo-ket-qua-tinh-toan-he-so-phat-thai-luoi-dien-2023-697510.aspx
[14] https://thuvienphapluat.vn/van-ban/Tai-nguyen-Moi-truong/Quyet-dinh-2626-QD-BTNMT-2022-cong-bo-he-so-phat-thai-phuc-vu-kiem-ke-khi-nha-kinh-532253.aspx

- Activity Data (AD): Measured quantities of materials, fuels, electricity, or transport activities associated with the product system
- Emission Factor (EF): Amount of GHG emissions released per unit of activity data
- PCF: Total GHG emissions associated with the functional unit of the product

The resulting emissions are expressed in kilograms of carbon dioxide equivalent (kg CO_2e).

GHG coverage

The CFP calculation includes the main GHGs defined under international climate frameworks, including:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF_6)
- Nitrogen trifluoride (NF_3)

These gases are converted into CO_2-equivalent emissions (CO_2e) using Global Warming Potential (GWP) values published by the IPCC.

Aggregation across life cycle stages

Total emissions are calculated by summing emissions across all included life cycle stages within the system boundary, such as:

- Raw material extraction and processing
- Upstream transportation
- Manufacturing and production processes
- Energy consumption within the facility

Each emission source is calculated separately and then aggregated to determine the total PCF per functional unit.

Allocation Rules

In cases where a production process generates multiple products or co-products, emissions must be allocated among outputs using appropriate allocation methods. Allocation may be based on:

- Physical relationships (e.g., mass or energy content)
- Economic value of the outputs

The allocation method selected should reflect the underlying causal relationship between the process and the outputs and should be clearly documented to ensure transparency.

Reporting of Results

The final PCF result should be reported as: ***kg CO_2e per functional unit of product.***

The report should also provide a breakdown of emissions by life cycle stage, where possible, to identify key emission sources and potential opportunities for emission reduction.

This approach enables enterprises to better understand their carbon hotspots and supports the development of targeted decarbonization strategies within their production systems.

5.1.5 Verification and quality assurance

To ensure the credibility, transparency, and reliability of PCF results, the VCLP establishes a robust Verification and Quality Assurance (QA/QC) framework aligned with international standards, including ISO 14064-3 and ISO 14067.

Verification approach

All PCF results submitted under the program are subject to independent verification prior to carbon label issuance. The verification process aims to:

- Confirm the accuracy and completeness of reported data
- Ensure compliance with the defined methodological requirements
- Assess the appropriateness of assumptions, emission factors, and allocation methods
- Identify any material misstatements or inconsistencies

Verification is conducted by qualified third-party verifiers with expertise in GHG accounting, LCA, and sector-specific processes.

Verification scope

The verification process typically covers:

- System boundary definition and consistency with program requirements
- Selection and application of functional unit
- Data collection methods and supporting evidence
- Use of emission factors and calculation methodology
- Allocation approaches for multi-output processes
- Final PCF calculation and reporting

Quality Assurance and Quality Control (QA/QC)

Enterprises are required to implement internal QA/QC procedures to ensure data integrity before submission. Recommended QA/QC practices include:

- Cross-checking activity data (e.g., energy consumption vs. production output, mass balance)
- Ensuring consistency of units and conversion factors
- Maintaining traceable records and documentation (e.g., invoices, meter readings, logs)

- Assigning clear data ownership and responsibilities across departments (production, energy, environment, finance)

Materiality and uncertainty

Verification follows a risk-based approach, focusing on emission sources that significantly influence total results. Materiality thresholds may be defined to assess whether discrepancies could affect decision-making.

Uncertainty associated with data and assumptions should be qualitatively or quantitatively assessed where feasible, particularly for key emission sources.

Verification outcome

Upon successful verification, a verification statement is issued confirming that the PCF results:

- Are prepared in accordance with the program methodology
- Are free from material misstatements
- Can be used for carbon labeling purposes

5.1.6 Carbon label communication

Carbon label communication

Once verified, the CFP result must be communicated through a carbon label displayed on the product or associated materials. The carbon label communication shall align with the requirements of ISO 14026:2017.

A footprint communication shall include:
- A clear indication of the area of concern addressed
- The functional unit or declared unit to which the footprint communication refers
- Identification of the life cycle stages covered by the footprint communication
- An unambiguous indication (e.g., web link or QR code) on how to access supporting information

The footprint communication shall:

- Be presented in a manner that clearly links the information to the carbon footprint metric
- Be of reasonable size and in close proximity to the metric
- Avoid the use of words, numbers, or graphics that could be misinterpreted as part of the footprint communication

Where applicable:

- A quantification of the difference between the product under study and a baseline product shall be provided (for performance tracking)
- Explanatory statements shall be included where there is a risk of misunderstanding

Principles for communication

Carbon label communication should follow key principles:

- Transparency: Clearly disclose methodology and assumptions
- Accuracy: Ensure consistency with verified results
- Comparability: Enable comparison across similar products
- Clarity: Use simple and understandable formats for end-users

This approach ensures that carbon labeling supports informed decision-making and promotes low-carbon consumption and production.

5.2 Data requirements and assumptions

This section outlines the specific implementation requirements, assumptions, and data hierarchy applied for PCF assessment under the VCLP. It further defines the minimum data requirements, methodological considerations, and key assumptions used in the calculation and reporting of PCF results.

5.2.1 Data requirements

To ensure consistency and comparability across participating enterprises, the following data are required:

Activity data

- Quantity of raw materials and inputs per functional unit
- Energy consumption (electricity, fuels, steam, etc.)
- Production output corresponding to the reporting period
- Transportation data (distance, mode, and volume) for upstream logistics
- Process-specific data for direct emissions, where applicable

Supporting documentation

Enterprises must provide evidence to support reported data, such as:

- Utility bills and energy invoices
- Production logs and material balance records
- Procurement records for raw materials
- Transport documentation (contracts, delivery notes)

Temporal coverage

Data should represent a continuous 12-month period to ensure representativeness and consistency.

5.2.2 Assumptions

Where data gaps exist, reasonable assumptions may be applied, provided they are:

- Clearly documented
- Consistent with recognized methodologies
- Conservative (i.e., avoiding underestimation of emissions)

Common assumptions may include:

- Use of average emission factors where supplier-specific data are unavailable
- Estimation of transport distances based on typical supply routes
- Use of proxy data for similar materials or processes

Data hierarchy

The program applies a data hierarchy approach, prioritizing data sources as follows:

- Primary data (measured or site-specific data)
- Supplier-specific data
- Secondary data from recognized databases
- Default or conservative assumptions

This hierarchy ensures that the most accurate and representative data are used wherever possible.

Limitations and uncertainty

All PCF assessments are subject to certain limitations, including:

- Data availability and quality constraints
- Variability in emission factors
- Simplifications in modeling complex processes

These limitations should be transparently reported, and their potential impact on results should be qualitatively assessed.

Reference sources and application of assumptions

The assumptions applied during the trial phase were primarily derived from internationally recognized methodologies and publicly available technical references. Key reference sources included the IPCC 2006 Guidelines for National GHG Inventories, ISO 14067 guidance, national emission factor publications, sector-specific literature, and recognized LCA databases.

In cases where enterprise-specific data were unavailable, conservative assumptions were developed using representative sector data or average values from similar production systems. For example, upstream transportation distances were estimated based on typical supplier

locations and standard logistics routes identified during enterprise consultations. Similarly, average emission factors from recognized databases were applied when supplier-specific emission factors could not be obtained.

For electricity-related emissions, the Vietnam national grid emission factor published under Official Letter No. 1726/BĐKH-PTCBT (2024) was consistently applied across enterprises. In several food processing and paper sector cases, default moisture content and biomass NCV values referenced from IPCC guidance and national technical documents were used where direct measurements were not available.

All assumptions, data sources, and reference documents used during the calculations were documented within the calculation templates to ensure transparency, consistency, and traceability of the CFP assessment process.

6 Data collection and site visits

6.1 Data collection approach

The data collection methodology was implemented through on-site surveys conducted directly at the participating enterprises. This approach aimed to ensure the quality, consistency, and sufficiency of input data required for PCF calculation. During the site visits, detailed operational data were collected, including activity data related to raw material consumption, energy use, production output, and process-specific inputs. In addition, information on fuel characteristics, such as net calorific values (NCV), was gathered to ensure consistency in emission calculations. Where available, enterprise-specific emission factors were also collected and reviewed for methodological compatibility.

To ensure alignment with national and international standards, emission factors were compiled and applied in accordance with Decision No. 2626/2022/BTNMT and the 2006 IPCC Guidelines for National GHG Inventories. This dual reference framework helps ensure methodological consistency with Vietnam's regulatory requirements while maintaining international comparability. The combination of enterprise-level primary data and standardized emission factors enhances the reliability and credibility of CFP assessment results.

The on-site survey plan for the ten selected enterprises was developed in a structured and systematic manner, clearly defining the scope of data collection, responsible personnel, required documentation, and expected outputs for each visit. The detailed implementation schedule for the field surveys at the ten enterprises is presented as follows:

Table 5. Working time with 10 trial phase enterprises

No	Enterprise Name	Sectors	Working time
1	CL1	Food Processing	January 28, 2026 – from 9:00 AM to 4:00 PM
2	CL2	Food Processing	January 29, 2026 – from 9:00 AM to 4:00 PM
3	CL3	Food Processing	January 27, 2026 – from 9:00 AM to 4:00 PM
4	CL4	Pulp and Paper	November 06, 2025 – from 9:00 AM to 4:00 PM
5	CL5	Pulp and Paper	March 11, 2026 – from 9:00 AM to 4:00 PM
6	CL6	Pulp and Paper	March 20, 2026 – from 9:00 AM to 4:00 PM
7	CL7	Pulp and Paper	March 22, 2026 – from 9:00 AM to 4:00 PM
8	CL8	Chemicals	November 07, 2025 – from 9:00 AM to 4:00 PM
9	CL9	Chemicals	January 26, 2026 – from 9:00 AM to 4:00 PM
10	CL10	Chemicals	March 24, 2026 – from 9:00 AM to 4:00 PM

6.2 Site visits and inspections

An overview of the enterprise is presented in the table below:

Table 6. Company information overview

No.	Industry & Overview	Main Products	Key Capacity	Current Status & Energy Profile	Readiness for Carbon Labeling Trial phase	Selected Trial phase Product	VSIC code
CL1	Farming, processing & exporting pangasius (Basa) fish	Pangasius fillet, fishmeal, fish feed	150 tons of raw material/day; 30 ha farming area	Highly integrated circular model; uses rice husk biomass boiler; high electricity consumption for refrigeration	Very High – Strong interest	Pangasius Fillet	10201
CL2	Seafood processing & ready-to-eat products	Shrimp, squid, octopus, sushi, dumplings, spring rolls	20 tons of finished products/day ; 25 tons/day freezing capacity	~7 million kWh/year electricity (Scope 2 >80%); uses LPG/diesel for heat	Very High – Strategic long-term vision	Sushi products	10201
CL3	Vertically integrated pangasius farming & processing	Pangasius fillet, value-added products, fishmeal & fish oil	Fillet: 21,000 tons/year; Fishmeal: 24,000 tons/year; 300 ha farming	Rice husk biomass boiler; high electricity consumption for refrigeration & processing	Very High	Frozen Pangasius Fillet	10201

No.	Industry & Overview	Main Products	Key Capacity	Current Status & Energy Profile	Readiness for Carbon Labeling Trial phase	Selected Trial phase Product	VSIC code
CL4	Production of packaging paper from recycled materials	Testliner, Medium, Kraftliner	Large-scale (not specified in detail)	Biomass + coal boilers; high electricity consumption for pulping & drying	High – Has Net Zero target by 2035	Testliner Paper	17022
CL5	Recycled packaging paper production	Testliner, Medium, Kraftliner	240,000 tons of paper/year; 50,000 tons of pulp/year	Biomass (rice husk, sawdust); grid electricity + 950 kWp rooftop solar	Very High	Kraftliner Paper	17022
CL6	Tissue paper from recycled paper	Jumbo roll tissue (toilet paper, napkins)	Medium scale (~15,567 tons in 2024)	Biomass (wood, sawdust) for steam; electricity for machinery	High	Jumbo Tissue Paper	17022
CL7	Tissue and packaging paper	Tissue products & carton board / Testliner	Large scale	Recycled OCC main raw material; biomass/electricity for drying	High	Testliner / Packaging Paper	17022
CL8	Phosphate & compound fertilizer production	Fused Magnesium Phosphate (FMP), Nitrogen, Phosphorous and Potassium (NPK)	FMP: 300,000 tons/year; NPK: 200,000 tons/year	Coal-fired blast furnace + electricity; process emissions	High	Fused Magnesium Phosphate (FMP)	10120

No.	Industry & Overview	Main Products	Key Capacity	Current Status & Energy Profile	Readiness for Carbon Labeling Trial phase	Selected Trial phase Product	VSIC code
CL9	Nitrogen fertilizer production	Urea (prilled / /granular), NPK, organic fertilizers	Urea: 966,000 tons/year	Natural gas as feedstock & fuel; highly energy efficient	High (data is aggregated)	Prilled Urea	10120
CL10	Nitrogen fertilizer & chemicals	Urea, Ammonia, NPK	Urea: ~800,000 tons/year; Ammonia: ~450,000 tons/year	Natural gas feedstock; integrated CO_2 reuse	High	Urea	10120

Detailed reports of the implementation plan at the facility and site visits conducted at the participating enterprises are provided Training workshop report for reference.

6.3 Data validation

Data validation was conducted to confirm the quality and coherence of the activity data used for PCF calculation during the trial phase. This step is critical to maintain the credibility of carbon labeling results and to align with international standards such as ISO 14067 and the GHG Protocol.

6.3.1 Validation approach

The validation process followed a structured multi-step approach:

- Data completeness check: Verification that all required data fields (e.g., energy consumption, material inputs, production volume, emission factors) were fully reported in accordance with the defined system boundary and functional unit.
- Consistency check: Cross-checking data across different sources (e.g., production logs, energy bills, internal reports) to ensure consistency in values, units, and reporting periods.
- Plausibility check: Comparison of collected data against:
  - Historical data of the enterprise,
  - Sector benchmarks (e.g., SEC – kWh/ton),
  - Expected ranges based on similar production processes.
- Boundary alignment check: Ensuring that all data correspond to the defined life cycle scope (cradle-to-gate in most trial phase cases), avoiding emissions or double counting across processes.

Several validation methods were applied during the trial phase:

- Document review: Review of supporting documents such as:
  - Electricity bills, fuel purchase records,
  - Production reports,
  - Raw material consumption logs.
- Cross-checking and reconciliation:
  - Mass balance checks (input materials vs output products),
  - Energy balance checks (total electricity vs equipment level consumption),
  - Comparison between accounting data and operational data.
- On-site verification support: Site visits were conducted to:
  - Verify data collection practices,
  - Confirm measurement points and metering systems,
  - Assess data management procedures at the enterprise level.
- Recalculation and spot checks: Independent recalculation of selected data points and emission sources to verify the correctness of input data and calculation logic.

6.3.2 Key data quality issues identified

During the trial phase, several common data-related challenges were identified:

- Incomplete or missing data for certain processes (especially upstream inputs);
- Inconsistencies between different internal data sources (e.g., production vs accounting records);

- Lack of standardized units and conversion factors;
- Limited availability of Vietnam-specific emission factors;
- Weak internal data management systems and unclear assignment of data ownership across departments.

These issues highlight the need for improved data governance and standardized reporting practices at the enterprise level.

6.3.3 Quality assurance and quality control (QA/QC)

To address the above challenges, the following QA/QC measures were applied:
- Standardized data collection templates and guidance;
- Clear definition of system boundaries, functional units, and data requirements;
- Cross-functional validation involving departments such as production, energy management, and environment;
- Documentation of assumptions, data sources, and emission factors used;
- Version control and traceability of datasets used in PCF calculations.

Enterprises were also encouraged to establish internal QA/QC procedures to ensure consistency of future reporting.

6.3.4 Data quality and uncertainty considerations

Due to limitations in data availability and the reliance on partial primary data and secondary datasets, the overall data quality of the trial phase assessments can be considered as medium to low confidence, particularly for upstream (Scope 3) emissions.

Uncertainty is primarily associated with:
- Use of generic emission factors
- Lack of supplier-specific data
- Allocation assumptions in multi-product systems.

6.3.5 Implications for verification and scaling-up

The data validation results provide important insights for future implementation of the VCLP:
- High-quality data is a prerequisite for credible third-party verification and certification;
- Strengthening enterprise-level MRV systems is essential for scaling up carbon labeling;
- Development of national databases (e.g., emission factors, LCA datasets) will significantly improve data reliability;
- Clear allocation of data ownership and responsibilities within enterprises is critical to reduce validation risks.

Overall, the trial phase demonstrates that while data validation is technically feasible, significant challenges remain in the practical collection and quality of input data. In particular, the level of data granularity required for product level CFP assessment, especially the need to disaggregate

data for a specific selected product, proved to be difficult for most enterprises under current data management practices. As a result, data availability and accuracy are not yet fully ensured.

In addition, enterprises are generally able to provide data only within their operational boundary (i.e., at the facility level, gate to gate), while upstream data related to raw material suppliers (Cradle) and downstream transport activities remain largely unavailable and beyond their control. These limitations highlight the need for further improvements in enterprise level data systems, clearer data governance, and the development of standardized methodologies and national databases to support reliable and scalable implementation of the carbon labeling program.

6.3.6 Implications for national MRV and ETS readiness

The findings from the trial phase highlight important implications for the development of Vietnam's national GHG MRV system and the readiness for the upcoming Emissions Trading System (ETS). While product-level PCF assessment provides valuable insights into emission sources along the value chain, the current limitations in data availability, granularity, and traceability indicate that most enterprises are not yet fully equipped to meet the data requirements of an ETS-compliant MRV system.

In particular, the difficulty in disaggregating facility-level data to product-level, combined with limited access to upstream and downstream data across the supply chain, poses challenges for ensuring data completeness, consistency, and auditability of key requirements for MRV and carbon market participation. Without standardized data collection systems, clear data ownership, and robust QA/QC procedures, there is a risk that reported emissions may not meet the level of accuracy and verification required for regulatory compliance and allowance allocation.

These findings suggest that a phased and pragmatic approach is necessary for aligning carbon labeling with national MRV and ETS development. Priority actions should include strengthening enterprise level data management systems, developing standardized methodologies and digital reporting tools, establishing national databases for emission factors and life cycle data, and progressively integrating supply chain data. Industry associations and business organizations such as the VCCI could also play an important supporting role in standardizing carbon accounting and reporting approaches within and across sectors. These organizations can help disseminate technical guidance, facilitate sector-specific training, support the development of standardized data collection templates and PCRs, and promote consistency in methodologies among enterprises. In addition, industry associations may serve as an important coordination platform for data sharing, supply chain engagement, and alignment of sector-specific practices with national MRV and ETS requirements. Their involvement could significantly enhance scalability, comparability, and practical implementation of carbon labeling and broader carbon management frameworks in Vietnam. Such efforts will be critical to ensure that carbon labeling not only supports product transparency but also contributes effectively to the integrity and functionality of Vietnam's future carbon market.

7 Carbon labeling calculation and results

7.1 Calculation model

The calculation model is developed to quantify PCF, supporting the implementation of carbon labeling mechanisms in trial phase sectors including food processing, fertilizers, and paper & pulp industries. The model is designed as a set of calculation tools on the MS Excel platform, with a standardized structure across sectors to ensure methodological consistency, while still allowing flexibility to reflect the specific characteristics of each production process.

The model adopts an LCA approach under a “cradle-to-gate” system boundary, in which all emission sources associated with the production process are identified and quantified, from raw material inputs to the finished product at the factory gate. The main emission sources considered include raw material consumption, energy use (electricity and fuels), emissions from internal production processes, and transportation activities within the supply chain.

The model enables users to input actual activity data from production facilities, which are then combined with pre-integrated emission factors within the tool to calculate the corresponding emissions. The results are aggregated by emission source and production stage, and finally normalized based on the product’s functional unit, forming the basis for carbon labeling.

Although three separate Excel tools are developed for each sector, the overall structure of the model remains consistent, including key functional components such as data input, emission factor database, calculation tables, and result summary. The primary differences lie in the level of detail of input data and the sector-specific calculation logic, such as chemical reaction emissions in fertilizer production or energy-intensive processes in the paper & pulp industry. Figure 3 provides a sample tool for calculating CFP of fertilizer products.

PRODUCT DATA ON FERTILIZER INDUSTRY

	Please fill the blue cells as applicable
	No inputs required. White cells have embedded formulas that will help return summary results based on your inputs
	Cells with constant values/data
	Cells with dropdown list data. Need to select the data manually.

Based on the above-mentioned color code, kindly fill in the data required for emission calculation.

B. Product output

Please fill in the blue-colored cells in the table below. If additional products exist, kindly add extra rows as needed.

Product	Unit	Product output/Quantity												Total Annual
		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	
Fused Magnesium Phosphate	tonnes													0
NPK Fertilizer	tonnes													0
3-Colour NPK	tonnes													0
Total	tonnes	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 5. A tool for calculating CFP of fertilizer products

Annex 5 provides the sample carbon labeling calculation tool model.

7.1.1 Carbon labeling calculation model (MS Excel)

The calculation tools are developed as dedicated MS Excel workbooks for each specific industry, yet they maintain a highly standardized logical structure. Each tool is organized into functional sheet groups that directly reflect the data processing and emission quantification workflow.

Data Input Modules (Input Sheets)

The interface is designed for systematic data entry, where users input specific production activity data. These modules are categorized into primary emission source groups: raw material consumption, electricity usage, fuel combustion, and auxiliary activities. Each data entry line captures essential parameters, including activity type, unit of measurement, consumption volume, and, where applicable, specific fuel or energy source selections.

Emission Factor Management and Integration

A critical feature of this architecture is the complete decoupling of activity data from emission factors (EFs). Users are restricted from manual EF entry; instead, they select the corresponding activity or fuel type. The relevant emission factors are centralized in dedicated reference sheets (Database Sheets), ensuring compliance with standardized sources:

- Emission Factor (EF): Integrated in accordance with Decision No. 2626/QD-BTNMT and Official Letter No. 1726/BĐKH-PTCBT (2024).
- If country-specific emission factors are not available, emission factors from authoritative and internationally recognized sources are used: Sourced from IPCC guidelines and relevant ISO standards.

Utilizing automated lookup functions, the appropriate EFs are dynamically linked to each line of input data. This mechanism ensures:

- Data Integrity: Users cannot inadvertently alter fixed emission factors.
- Regulatory Consistency: All calculations remain synchronized with officially recognized benchmarks.
- Error Mitigation: Minimizes manual entry risks throughout the quantification process.

Automated Calculation and Reporting (Summary/Results)

The calculation sheets feature integrated formulas at the line-item level, automatically converting activity data into carbon dioxide equivalent (CO_2e) values. Finally, the outputs are consolidated into a Summary Report, providing two primary metrics:

- Total GHG Emissions: The absolute CFP of the facility or production line.
- Product Carbon Intensity: Emissions quantified per functional unit of product.

This streamlined structure ensures data transparency for verification purposes and provides a direct output format for carbon labeling approval.

7.1.2 Structure and calculation logic

The calculation model is engineered based on a linear data flow principle, establishing a seamless and robust link from raw input parameters to final emission outputs. This architecture optimizes data processing within MS Excel while ensuring full transparency and traceability throughout the inventory process.

Data integration and query mechanism

The processing sequence originates in the Activity Data modules. Here, raw technical inputs are standardized and dynamically linked to the EF database through a system of lookup functions. This mechanism ensures that every emission source is accurately mapped to its regulated factor, effectively eliminating cross-entry errors associated with manual data handling at multiple touchpoints.

Calculation algorithms and unit standardization

Within the intermediary calculation modules, emission volumes are determined based on the core methodology of GHG accounting:

$$E = AD \times EF$$

Where:

- E: Total emissions (CO_2e).
- AD: Activity data.
- EF: Emission factor.

The model integrates automated unit-of-measurement controls, ensuring mathematical consistency between activity data and emission factors prior to integration. Emissions are then categorized and aggregated by specific scopes or source groups.

Aggregation and carbon intensity analysis

Component emission values are forwarded to the Summary Sheets, where the model executes two primary functions:

- Total CFP quantification: Consolidating emissions from all stages within the defined system boundaries.
- Carbon intensity calculation: Normalizing total emissions against the output product volume. This serves as the key metric for carbon labeling assessment and certification.

System flexibility and integrity control

A defining feature of the model's logic is its "open-ended table structure." This design allows users to scale data volume or append new operational lines without disrupting established formula links

or the overarching calculation logic. By utilizing direct cell referencing between sheets rather than static entries, the model maintains high data integrity and facilitates streamlined third-party verification.

7.1.3 Embed ISO 14067

The methodological framework used in this trial phase generally follows the principles and requirements of ISO 14067. This includes key aspects such as life cycle thinking, defining system boundaries, setting functional units, and using activity data and emission factors for calculations.

However, due to practical challenges during implementation, some elements could not be fully applied as per the standard. These include incomplete system boundaries (especially for upstream and downstream processes), limited availability of primary data across the value chain, and the use of secondary data and assumptions where supplier-specific data was not available. There were also limitations related to data representativeness and full supply chain coverage.

As a result, the PCF results from this trial phase should be considered indicative and mainly suitable for testing and learning purposes, rather than fully compliant CFP results under ISO 14067. The trial phase has helped identify key gaps and areas for improvement, which will support better alignment with the standard in future implementation phases .

7.2 Estimation of carbon footprint for trial phase products

7.2.1 Data quality and uncertainty assessment

The quality of data used in the PCF calculations was assessed based on key criteria, including completeness, accuracy, consistency, and representativeness, in line with international carbon accounting practices.

Overall, the data quality of the trial phase assessments can be characterized as medium confidence for Scope 1 and Scope 2 emissions, where primary data were generally available at the facility level, and low confidence for upstream Scope 3 emissions, where reliance on secondary data and assumptions was necessary. The main sources of uncertainty include:

- Limited availability of supplier-specific data for raw materials and upstream processes
- Use of generic or international emission factors not fully representative of Vietnam-specific conditions
- Allocation assumptions in multi-product production systems
- Data disaggregation challenges when allocating facility-level data to specific products

Due to these factors, the overall uncertainty of the PCF results is considered moderate to high, particularly for value chain emissions.

For future implementation, it is recommended to introduce structured data quality assessment tools (e.g., data quality indicators or pedigree matrices), develop national emission factor

databases, and strengthen enterprise-level data management systems to improve the robustness and reliability of PCF results.

7.2.2 Estimation of CFP for trial phase products

The PCF for selected trial phase products was calculated using the standardized Excel-based calculation tools developed under the VCLP framework. The results are expressed in kilograms of carbon dioxide equivalent (kg CO_2e) per functional unit of product.

Across the three trial phase sectors - food processing, pulp and paper, and chemicals, the calculated PCF values show significant variation depending on production processes, energy intensity, and material inputs.

In general:

- Products from the chemical sector exhibited relatively higher carbon intensities, primarily due to energy-intensive processes and process-related emissions.
- The pulp and paper sector showed substantial emissions associated with both energy consumption and raw material processing.
- The food processing sector demonstrated more variability, with emissions influenced by raw material origin, processing intensity, and energy use.

The PCF results also indicate that emissions are typically distributed across three main stages:

- Upstream processes (raw materials and transport)
- Core manufacturing processes
- Energy consumption within the facility

While the calculation results provide a useful indication of emission levels and hotspots, they should be interpreted with caution due to data limitations and uncertainties identified during the trial phase.

7.3 Analysis of results

7.3.1 Comparative analysis of emission profiles across trial sectors

A comparative analysis across the three trial phase sectors reveals several important patterns:

- Energy consumption is a dominant emission source in most cases, particularly for sectors with high thermal or electrical demand, such as chemicals and pulp and paper.
- Material-related emissions (upstream Scope 3) represent a significant share of total emissions, especially in sectors relying on carbon-intensive raw materials. However, these emissions are also the least reliable due to limited data availability.
- The food processing sector shows high variability, reflecting differences in product types, supply chains, and processing technologies.

These findings confirm that emission profiles are highly sector-specific and that standardized methodologies must be complemented by sector-specific guidance (e.g., PCRs) to ensure meaningful and comparable results.

7.3.2 Identification of key factors influencing emission levels

The trial phase results highlight several key factors that influence PCF levels:

i. Energy intensity of production processes: High energy consumption, particularly from fossil fuels and grid electricity, is a primary driver of emissions across all sectors.
ii. Carbon intensity of raw materials: Upstream emissions associated with raw material extraction and processing significantly affect total PCF, particularly in the chemical and food sectors.
iii. Data availability and quality: The level of detail and accuracy of input data has a direct impact on the reliability of PCF results. Limited data availability leads to higher uncertainty and reliance on assumptions.
iv. Production scale and efficiency: Facilities with higher production efficiency (lower energy consumption per unit of output) tend to have lower carbon intensity.
v. System boundary definition and allocation methods: Differences in boundary setting and allocation approaches can lead to variations in results, highlighting the importance of standardized methodological guidance.

Overall, the PCF calculation is technically feasible; the accuracy and comparability of results depend heavily on data quality, methodological consistency, and sector-specific characteristics.

Limitations of PCF results

The PCF results under the trial phase are subject to several limitations, including restricted system boundaries, limited supply chain data, and reliance on secondary emission factors. These constraints may affect the completeness and comparability of results, particularly across products and sectors.

8 Product Category Rules (PCRs) for selected products

In line with the trial phase sector selection framework, draft PCRs have been prepared for three sectors, namely Fertilizers, Paper and paper-based products, and Processed fish and seafood products, during the trial phase of the VCLP.

These draft PCRs are based on initial data collected from companies, along with basic definitions of system boundaries, functional units, and calculation approaches. They are still in draft form and are being tested during the trial phase. The PCRs will be reviewed and updated based on feedback, latest technical inputs, and any new requirements. They will also be improved and expanded to more sectors in the full implementation phase.

Regulatory compliance and objectives

The development of these PCRs adheres strictly to international and national standards, ensuring scientific rigor and cross-border transparency:

- International Standards: ISO 14025, ISO 14067, and ISO 14040/44.
- National Alignment: Vietnam Standard Industrial Classification (VSIC 2018)

Objective: To establish a standardized methodology for quantifying cradle-to-gate GHG emissions per Declared Unit. The quantified CFP serves as a benchmark for environmental communication, internal process optimization, and long-term corporate carbon management.

Scope of application

To prevent ambiguity, the scope of each PCR is strictly mapped to VSIC 2018 classification codes:

Table 7. Product Categories and Corresponding VSIC 2018 Classifications

Product category	VSIC 2018 classification	Scope highlights
Fertilizers	Section C; Group 201	Manufacture of nitrogen compounds and related mining activities.
Paper products	Section C; Group 170	Pulp, paperboard, and corrugated paper containers.
Processed seafood	Section C; Group 102	Fishing, aquaculture, and industrial preservation/processing.

Note: *Specialized products, such as specific organic fertilizers or non-industrially processed seafood, are explicitly excluded to maintain the integrity of the trial phase evaluation.*

Methodological framework: The three PCRs utilize a harmonized structure to ensure comparability while accounting for sector-specific technical nuances.

Declared unit and system boundaries

The Declared Unit (DU) is defined as 1 kg or 1 tonne of finished product at the factory gate. The evaluation follows a cradle-to-gate boundary, partitioned into three modules:

i. Upstream processes: Raw material acquisition and inbound logistics.
ii. Core processes: Manufacturing, refining, and processing.
iii. Gate-related processes: Packaging, storage, and internal handling up to the factory exit.

Administrative activities, R&D, personnel commuting, downstream distribution, and capital goods manufacturing are excluded across all sectors.

Allocation and cut-off criteria

- Allocation hierarchy: Methodological preference is given to subdivision. If unavoidable, physical allocation (mass/volume) is the default. Economic allocation is permitted only when significant market value fluctuations are justified.
- Recycling policy: A "zero-burden" approach is applied to recycled inputs; upstream emissions from the original life cycle are excluded, while collection and reprocessing emissions are included.
- Cut-off rules: A minimum of 95% of total mass, energy, and GHG emissions must be included. Any exclusion must be documented and proven to have a negligible impact (<5%) on the final CFP.

Data quality and inventory requirements

Data collection mandates the use of the most recent production year. The program enforces a strict data hierarchy:

i. Primary data: Site-specific measurements (Highest priority).
ii. Secondary data: Verified Life Cycle Inventory (LCI) databases or national emission factors.
iii. Proxy data: Used only in the absence of higher-tier data, subject to uncertainty justification.

For Seafood products, specific emphasis is placed on fuel consumption for wild-catch vessels and feed conversion ratios in aquaculture. For Chemical/Fertilizer production, direct process emissions (e.g., CO_2 from ammonia synthesis or N_2O from nitric acid) are mandatory inventory items.

Reporting and transparency

Final CFP values must be reported in g or kg CO_{2e} using three significant digits.

- Aggregation: If a product is manufactured at multiple sites, a weighted average CFP is required.

- Verification: Reports must include verifier identification and validity periods.
- Digital integration: The use of QR codes linking to full, verified digital reports is encouraged to enhance consumer and enterprise transparency.

Detailed PCRs for the products are presented in Annex 6.

9 Conclusion and recommendation

9.1 Conclusion

The trial phase of the VCLP provides a comprehensive and practical assessment of the feasibility of implementing product level PCF methodologies in Vietnam's industrial context.

The results demonstrate that CFP calculation is technically feasible across multiple sectors, including food processing, pulp and paper, and chemicals. The application of standardized methodologies based on LCA principles, combined with structured data collection templates and calculation tools, enabled participating enterprises to quantify emissions at the product level and identify key emission sources.

However, the trial phase also reveals that the primary constraint is not methodological, but data-related. Consistent with findings from enterprise practices, the main challenges include fragmented data systems, lack of product-level data disaggregation, unclear system boundaries, and absence of robust QA/QC procedures. These limitations significantly affect the accuracy, completeness, and reliability of PCF results.

In particular:

- Enterprises are generally able to provide data only at the facility level, while product-level allocation remains challenging;
- Upstream (Scope 3) data related to raw materials and transport is largely unavailable and beyond the control of enterprises;
- Data inconsistencies across departments (production, accounting, environment) reduce traceability and auditability;
- The lack of standardized data management systems limits comparability across enterprises and sectors.

As a result, while Scope 1 and Scope 2 emissions can be estimated with moderate confidence, Scope 3 emissions remain highly uncertain. Consequently, the PCF results generated under this trial phase should be considered indicative and suitable for learning and testing purposes, rather than fully compliant CFP declarations under international standards such as ISO 14067.

The trial phase further highlights a structural gap between policy awareness and technical readiness. While enterprises demonstrate strong awareness of climate commitments and increasing market pressure (e.g., CBAM, ESG requirements), their capacity to implement carbon accounting and labeling remains limited.

Importantly, the findings confirm that data readiness rather than calculation methodology is the critical bottleneck. Without significant improvements in data systems, governance, and standardization, large-scale implementation of carbon labeling will face substantial challenges.

9.2 Recommendation

Based on the trial phase results, the following key recommendations are proposed to strengthen the implementation and scalability of the VCLP:

i. **Strengthen enterprise-level data systems and governance**

- Establish standardized data collection and management systems at the enterprise level
- Define clear roles and responsibilities for data ownership across departments (production, energy, environment, accounting)
- Develop internal MRV systems to ensure data consistency, traceability, and auditability
- Implement mandatory QA/QC procedures, including cross-checking, benchmarking, and documentation

Enterprises should also designate a dedicated internal coordination function or focal point responsible for overseeing carbon-related data management and coordinating implementation activities across departments. This function should serve as the central contact point for collecting, consolidating, reviewing, and validating data from production, energy management, procurement, accounting, environment, and sustainability teams. Responsibilities should include ensuring consistency of methodologies and reporting boundaries, maintaining supporting documentation and traceability of data sources, coordinating internal QA/QC procedures, supporting communication with external verifiers or consultants, and monitoring progress of CFP assessment and reporting activities. Establishing such a coordination role would help improve data reliability, strengthen internal governance, and enhance the long-term readiness of enterprises for carbon labeling, MRV, and future ETS participation.

ii. **Develop national databases and digital infrastructure**

Priority actions should include establishing Vietnam-specific emission factor databases to reduce reliance on international proxy data, developing centralized digital platforms for data reporting, validation, and verification, and progressively integrating carbon labeling data systems with the national MRV infrastructure.

Clear roles and responsibilities should also be defined among relevant stakeholders to ensure effective implementation and long-term governance of the system. Relevant ministries and government agencies, particularly MAE/DCC, should lead the development of methodological frameworks, database governance, and integration with national MRV and ETS systems. Sectoral ministries and technical agencies should support sector-specific data collection, methodological harmonization, and development of emission factors and PCRs. Industry associations and organizations could support dissemination of guidance, sector coordination, enterprise engagement, and standardization of reporting practices across industries. Verification and accreditation bodies should contribute to data quality assurance, verification procedures, and conformity assessment, while enterprises should be responsible for primary data collection, internal QA/QC, and reporting in accordance with program requirements.

Such coordination mechanisms would help improve consistency, transparency, and scalability of the carbon labeling system while strengthening Vietnam's broader MRV and carbon market readiness.

iii. **Standardize methodologies and PCRs**
- Expand and refine sector-specific PCRs to ensure consistency and comparability of PCF results
- Standardize system boundaries, allocation methods, and reporting formats
- Develop simplified methodological tiers for enterprises with different levels of data readiness

iv. **Enhance technical capacity and implementation support**
- Continue targeted capacity-building programs focusing on practical implementation (not only awareness)
- Provide hands-on technical guidance and tools for enterprises
- Develop sector-specific guidance documents and case studies

v. **Improve supply chain data integration (Scope 3)**
- Promote collaboration between enterprises and suppliers to improve data availability
- Develop guidance for the use of secondary data and proxy approaches where primary data is unavailable
- Gradually expand system boundaries from cradle-to-gate to more comprehensive life cycle coverage

vi. **Adopt a phased and pragmatic implementation approach**
- Start with simplified methodologies focusing on Scope 1 and Scope 2 emissions
- Gradually increase requirements as data systems and capacity improve
- Align carbon labeling requirements with enterprise readiness and sector characteristics

9.3 Way forward

Building on the trial phase results, the next phase of the VCLP should focus on transitioning from trial phase implementation to scaled and institutionalized application. A phased roadmap is recommended:

i. Phase 1: Short-term
- Refine methodologies, tools, and PCRs based on trial phase lessons learned
- Strengthen training programs and technical guidance
- Improve data collection templates and QA/QC procedures

ii. Phase 2: Medium-term
- Expand the program to additional sectors, particularly export-oriented industries affected by international carbon requirements (e.g., CBAM sectors)
- Increase the number of participating enterprises
- Strengthen national databases and digital reporting systems

iii. Phase 3: Long-term

- Integrate carbon labeling with the national MRV system
- Align PCF methodologies with ETS requirements, including verification and registry systems
- Enable the use of CFP data for policy instruments such as carbon pricing, green finance, and sustainable procurement

Annex 1. Stakeholder Consultation

1. Meeting with TUV NORD

Stakeholder Name and Designation: Ms. Tam

Organization: TUV NORD

Email ID: lstrung@tuv-nord.com, ngutam@tuv-nord.com

Date: 24 March 2026 (Tuesday)

Time: 8.00 to 10.00 AM IST

Quick note:

The meeting discussed the United Nations Office for Project Services (UNOPS)-funded carbon labeling trial phase project in Vietnam, focusing on food processing, paper, and fertilizer sectors. Key points included the development of PCR, data collection templates and GHG JSC calculation models, the importance of ISO standards (14037, 14064-3, 14065, 17029), and the need for capacity building and industry training. The project aims to start trial phase in June, with final PCRs to be launched by the government. Individual verifiers must have at least three to five years of relevant experience. The validity period for verifiers' certification is typically two to three years. The discussion also highlighted the need for clear cut-off rules and data quality assessment.

Summary of discussion:

Project context and objectives

- UNOPS-funded project to develop a national framework for product carbon labeling in Vietnam.
- Current focus is on designing the pathway: framework, draft PCRs, data templates, and calculation model; trial phase to start from June.

Trial phase scope and sectors

- The trial phase will initially cover food products, textiles, paper, and fertilizer.
- Rationale: high-emission, trade-exposed sectors (export/import) and relatively easier engagement in the voluntary phase.
- Current methodological scope: cradle to gate (up to factory gate).

Technical tools and references

- RCEE team has drafted:
  - PCRs for food, paper, and fertilizer.
  - Data collection templates and a GHG calculation model to support enterprises.
  - Draft PCRs are adapted from existing PCRs, especially from Thailand, and also reference examples from Japan and Korea.
  - General expectation that PCRs and footprinting will align with ISO-based approaches (e.g., ISO 14037, 14026/14067, 14064 series).

Current practice and experience in Vietnam

- TUV NORD organization is already working on carbon footprint verification for fabricated metals and other products, and has experience with EPD and LCA projects.
- Emphasis that Vietnamese practice generally follows ISO standards for:
  - PCR development,
  - Product carbon footprinting (PCF),
  - Communication of carbon information.

Verification requirements – organizations

- For organizational verifiers (VVBs), highlighted the need to conform to:
  - ISO 17029 (validation and verification bodies – international requirements),
  - ISO 14065 (requirements for bodies validating/verifying environmental information),
  - ISO 14064-3 (verification process and assurance rules for GHG).
- These ensure independence, competence, consistency and impartiality of verification activities.

Verification requirements – individuals

- Discussion on allowing individual verifiers (as done in Thailand) in the early, voluntary phase.
- Suggested minimum criteria for individual verifiers:
  - 3–5 years relevant professional experience (GHG accounting, LCA, environmental/carbon footprinting).
  - Strong knowledge of LCA principles, carbon communications and relevant ISO standards (especially ISO 14064-3).
  - Ability to qualify as lead verifier with adequate technical competence.

Validity period for verifiers

- The typical validity of verifier certification is discussed as 2–3 years.
- Around 2 years is more common for carbon labeling verifiers and around 3 years for broader GHG verification roles.
- Final choice may depend on the accreditation body's rules.

Accreditation and current status in Vietnam

- At present, there is no formal national accreditation scheme specifically for product carbon footprint verifiers in Vietnam.
- TUV NORD is currently acting as a second-party verifier for PCF.
- The expectation is that, as the voluntary carbon labeling scheme matures, the government and accreditation body will develop a framework for third-party verification and accreditation.

Capacity building and stakeholder engagement

- RCEE and the ministry will organize capacity-building workshops for industries and stakeholders to:
  - Introduce the government's plan on carbon labeling,
  - Explain PCRs, data requirements, and verification,
  - Gather feedback for refining the framework and tools.
- First workshop date confirmed as 10 April.

Key technical considerations highlighted by Khai

- For robust PCRs and product carbon footprints, particular attention is needed to:
  - Allocation rules (e.g., for electricity, recycling, waste),
  - System boundary definition,
  - Cut-off rules,
  - Data quality requirements and methods to assess/control data quality.
- Over time, Vietnam should consider moving from cradle to gate to full life-cycle (cradle to grave) coverage for some products, especially for export markets.

Next steps and collaboration

- RCEE will share Draft PCRs, Sample data collection templates and calculation model with TUV NORD by email for stakeholder review and provide comments and expert feedback by email.
- These inputs will feed into the refinement of PCRs and tools, and preparation for the April 10 capacity-building workshop and subsequent piloting from June.

Key Takeaways:

Key lessons learned from TUV NORD that can be applied to Vietnam's carbon labeling program:

1. **Follow a step-by-step approach:** Start with a trial phase and improve the system before expanding.
2. **Focus on key sectors first:** Target food, textiles, paper, and fertilizer as they are high-impact and easier to start with.
3. **Use international standards:** Align with ISO standards to ensure the system is credible and accepted globally.
4. **Learn from other countries:** Use existing PCRs from Thailand, Japan, and Korea to save time and ensure good quality.
5. **Use existing expertise in Vietnam:** Build on current experience in LCA, EPD, and carbon footprinting.
6. **Set clear rules for verification:** Follow ISO standards to ensure verification is reliable and consistent.
7. **Allow individual experts initially:** Use qualified individual verifiers in the early phase to address capacity gaps.
8. **Develop an accreditation system over time:** Move from current second-party verification to a formal third-party system in the future.
9. **Ensure good data and methods:** Clearly define system boundaries, data quality, and calculation rules.
10. **Focus on training and feedback:** Conduct workshops and use trial phase feedback to improve the system before scaling up.

2. Meeting with BoA

Stakeholder Name and Designation: Mr. Nguyễn Quốc Dũng, Lead assessor of accreditation of the Verification body

Organization: Bureau of Accreditation (BoA)

Email ID: ngdzung82@gmail.com

Date: 27 March 2026 (Friday)

Time: 8.30 to 10.30 AM IST

Quick note:

The meeting focused on gaining insights into the accreditation of GHG verification bodies, including relevant international standards and normative documents, and practices followed by global verification bodies. The discussion was led by a lead assessor with 13 years of experience in accrediting conformity assessment bodies including GHG verification bodies.

Key topics covered included institutional arrangements, the accreditation scheme and accreditation process for GHG verification bodies, and the eligibility criteria for both individuals (i.e., verifiers) and organizations (i.e., verification bodies). These discussions were particularly relevant to the design phase report being developed for the trial phase of the Vietnam Voluntary Carbon Labeling Program (VCLP). Valuable expert insights were obtained on all these aspects.

Summary of discussion:

1. PowerPoint presentation shared by the stakeholder

A. Conformity assessment and conformity assessment body

- Conformity assessment ensures that specified requirements are fulfilled (ISO/IEC 17000:2020 definition).
- Main components:
  - Testing →Laboratory
  - Inspection →Inspection Body
  - Certification →Certification Body
  - Validation →Validation Body
  - Verification →Verification Body

B. Validation vs Verification

- Validation: Confirming future use (ISO/IEC 17029:2019 3.2)
- Verification: Confirming historical truth (ISO/IEC 17029:2019 3.3)

C. How can we rely on the verification opinion?

- Accreditation ensures the competence, impartiality, and credibility of verification bodies.

- Key principles:
  - Impartial attestation – Accreditation bodies are independent of verification bodies and their clients, ensuring objective competence assessment.
  - Non-profit operation – Operate in a non-profit distributing manner, removing financial conflicts of interest
  - Standards compliance – Ensure conformity assessment bodies meet relevant international standards and normative documents

D. International standards and documents for accreditation of GHG verification bodies

- **Key Standards**
  1. ISO/IEC 17029:2019 - General principles for validation & verification bodies establishing a foundational framework for competence and impartiality
  2. ISO 14065:2020 - Competence requirements for GHG validation & verification bodies, specific to climate-related conformity assessment
  3. ISO 14064-3:2019 - Verification principles and requirements for GHG assertions, providing detailed guidance on verification methodology
  4. ISO 14066:2023 – Competence requirements for GHG validation & verification teams, focusing on individual assessor capabilities
  5. IAF MD6:2023 – IAF Mandatory Document for accreditation of GHG validation & verification bodies, ensuring global consistency.

E. Vietnam Accreditation Bodies

- Bureau of Accreditation (BoA)
  - The only accreditation body authorized to provide assessment and accreditation of validation /verification bodies
  - Recognized under IAF MLA signatory for validation/verification, which means their accreditation granted to GHG verification bodies is internationally recognized accreditation
- Accreditation Office for Standards Conformity Assessment Capacity (AOSC)
- Vietnam Institute of Accreditation (VACI)
- AOSC and VACI – these accreditation bodies provide accreditation services for other entities like certification bodies, testing laboratories and inspection bodies.

F. Accreditation process for GHG verification bodies

1. Application
   a. Scopes applied for accreditation: what activities (validation or verification or both), what sectors
   b. Submit documentation (manual, procedures)

2. Resource review
   a. Review the application
   b. Accept or refuse the application

3. Preparation for assessment
   a. Scopes applied for accreditation: what activities (validation or verification or both)
   b. Submit documentation

4. Review of documented information
   a. Review the submitted documentation
   b. Proceed with the assessment or not

5. Conduct the assessment
   a. Conduct the office assessment (visit to office) and witness assessment (visit to factory site and verification bodies conduct verification)
   b. Review the corrective actions for any non-conformities (if any)

6. Making accreditation decisions
   a. Grant or refuse accreditation
   b. Accreditation scope (activity and sectors), cycle: 5 years

7. Maintaining of accreditation
   a. Annual surveillance and reaccreditation at the end of the cycle
   b. Extending, reducing, suspending, withdrawing of accreditation

G. Sector classification for purpose of accreditation

- Covered sectors are
  - Power generation and electric power transactions
  - General manufacturing (physical or chemical transformation of materials or substances into new products)
  - Oil and gas exploration, extraction, production and refining, and pipeline distribution including petrochemicals
  - Metals production
  - Aluminum production
  - Mining and mineral production
  - Pulp, paper and print
  - Chemical production
  - Carbon Capture Storage
  - Transport
  - Waste handling and disposal
  - Agriculture, Forestry and Other Land Use (AFOLU)
  - Others

H. Some concerns

- Knowledge of verification body personnel about the relevant international standards
  - Understanding of relevant standards such as ISO 17029, 14065, 14064-3, 14066
- Competence of verifiers
  - Verification was misunderstood as a re-inventory process.
  - Many verifiers are competent in GHG inventory preparation but lack expertise in verification, and vice versa.
- No accreditation scheme for carbon footprint
  - Currently, BoA provides accreditation for GHG validation and verification under ISO 14065 (Part 1 & 2).
  - However, there is no specific accreditation scheme for CFP in Vietnam.
  - As an accreditation body, BoA can only grant accreditation for verification bodies, not for individual verifiers, and is actively involved in training and capacity-building programs.
  - There are approximately 16–17 accredited GHG verification bodies in Vietnam, but none specifically for carbon footprint verification.
  - It was noted that BoA could initiate an accreditation scheme for CFP if there is sufficient demand from verification bodies and other interested parties.

I. International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory member[15]

- It includes around 90 recognized accreditation bodies globally, including BoA.
- These accreditation bodies provide internationally recognized accreditation across multiple scopes, including:
  - Certification of persons
  - Management systems certification
  - Product certification
  - Validation and verification (aligned with relevant ISO standards)

2. Key Suggestions from Design Phase Discussion

- It was suggested to replace the “certification group” with relevant ministries, namely MAE, MOST, and MOIT.
- The term “accredited verifier” should be revised to “approved verifier”.

[15] https://iaf.nu/en/home/

- AOSC and VACI should be removed from the accreditation group, and instead, any accreditation body that is an IAF MLA signatory member for verification should be considered.

Accreditation Group – Proposed Roles:

- Assess and accredit verification bodies
- Provide verifier training programs
- Define criteria for approving individual verifiers

Approved Individual Verifiers – Key Points:

- Individuals should have experience in 1–2 projects related to LCA/CFP with 1–2 years of relevant sector-specific experience (e.g., paper, fertilizer, food).
- Individuals should complete relevant training before applying and undergo additional training during the trial phase, organized by the government.

Listing of Approved Verifiers:

- It was proposed to list approved individual verifiers under the program.
- This would provide visibility and opportunities for individuals.
- Organizations can select verifiers from the published list as needed.

Key Takeaways:

Key lessons learned from BoA that can be applied to Vietnam's carbon labeling program:

1. **Strengthen Accreditation Framework:** Establish a clear accreditation structure aligned with international standards, leveraging the role of BoA as the central accreditation body for validation and verification.
2. **Align with International Standards:** Ensure the carbon labeling program is built on key standards such as ISO/IEC 17029, ISO 14065, ISO 14064-3, and ISO 14066 to maintain credibility and global acceptance.
3. **Address Competence Gaps:** Enhance the technical capacity of verification bodies and personnel, particularly in bridging gaps between GHG inventory preparation and verification expertise.
4. **Develop Carbon Footprint Accreditation Scheme:** Consider initiating a dedicated accreditation scheme for carbon footprint verification, as currently no such scheme exists in Vietnam.
5. **Focus on Training and Capacity Building:** Prioritize structured training programs for both organizations and individual verifiers, including trial phase training led by the government.
6. **Introduce Approved Verifier System:** Shift from “accredited verifier” to an “approved verifier” system for individuals, with clearly defined eligibility criteria, training requirements, and sector-specific experience.
7. **Ensure Transparency through Verifier Listing:** Develop and publish a list of approved verifiers to improve transparency and enable organizations to identify qualified experts easily.

8. **Leverage International Recognition (IAF MLA):** Utilize the recognition framework of the IAF MLA to identify and select internationally recognized accreditation bodies, ensuring credibility and global acceptance of the program.
9. **Adopt a Phased and Demand-Driven Approach:** Begin with existing GHG accreditation frameworks and expand towards CFP accreditation based on market demand and readiness of verification bodies.

Annex 2. Implementation plan at the facility

For each facility, the preliminary work plan of the working group during facility site visit and data collection is as follows:

Table A 1. Detailed implementation plan at the facility (1 day at the facility)

Content	Time	Notes (participants from the factory)
Welcome and Kick-off meeting - Introduction of the working group and the objectives of the trial phase program - Agreement on the content, scope, and work plan for the day - Understanding the aspirations and strategic direction of the Facility's Management on sustainable development, energy saving, and efficiency - Discussion on potential product categories for GHG emission calculation according to the facility's product life cycle	8:30 – 9:00	- Facility leadership representative - Safety, environment, and production officer - Officers in charge of energy and technical matters - Technical officer in technology - Project expert team
Overview exchange on the facility - Introduction of the type of production, scale, and product structure - Preliminary presentation of the technological process and main energy systems (electricity, steam, compressed air, water, etc.)	9:00 – 9:30	- Safety, environment, and production officer - Officers in charge of energy and technical matters - Technical officer in technology - Project expert team
Data collection and technical interview - Collection of data on energy consumption, raw materials, production output, water, waste, and emissions	9:30 – 10:30	- Safety, environment, and production officer - Officers in charge of energy and technical matters - Technical officer in technology - Project expert team

Content	Time	Notes (participants from the factory)
- Clarification of necessary information for GHG emission calculation - Determination of the data sources and data management methods of the factory		
On-site survey of the production line - Direct observation of the technological process from input to output **Determination of the system and product boundaries** - Record the location of the main energy consuming devices	10:30 – 12:00	- Officers in charge of energy and technical matters - Technical officer in technology - Project expert team
Lunch break	12:00 – 13:30	-
Data collection and technical interview (Continuation) - Collection of data on energy consumption, raw materials, production output, water, waste, and emissions - Clarification of necessary information for GHG emission calculation - Determination of the data sources and data management methods of the factory	13:30 – 15:30	- Safety, environment, and production officer - Officers in charge of energy and technical matters - Technical officer in technology - Project expert team
Discussion – Information confirmation and next steps - Preliminary synthesis of collected information - Agreement on the target product and the scope of carbon labeling - Identification of supplementary data needed and the key contact person	15:30 – 16:30	- Safety, environment, and production officer - Officers in charge of energy and technical matters - Technical officer in technology - Project expert team

Content	Time	Notes (participants from the factory)
Closing meeting - Summary of survey results - Recording the enterprise's feedback - Agreement on the point of contact for exchange and the timeframe for the next data update	16:30 - 17:00	- Representative of grassroots leaders - Safety, environment, and production officer - Officers in charge of energy and technical matters - Technical officer in technology - Project expert team

Annex 3. Carbon Labeling Calculation Model (MS Excel)

PRODUCT DATA SHEET FOR FERTILIZER INDUSTRY

Please fill the blue cells as applicable

No inputs required. White cells have embedded formulas that will help return summary results based on your inputs

Cells with constant values/data

Cells with dropdown list data. Need to select the data manually.

A. COMPANY INFORMATION

Company name:	
Facility/location:	
Contact person:	
Designation:	
Phone number/Email:	
Year:	

Company info | Fertilizer product info | Upstream process | Production process | FMP Result | NPK Result | 3-NPK Result | EF | GWP

PRODUCT DATA ON FERTILIZER INDUSTRY

Color	Meaning
Blue	Please fill the blue cells as applicable
White	No inputs required. White cells have embedded formulas that will help return summary results based on your inputs
Yellow	Cells with constant values/data
Orange	Cells with dropdown list data. Need to select the data manually.

Based on the above-mentioned color code, kindly fill in the data required for emission calculation.

B. Product output

Please fill in the blue-colored cells in the table below. If additional products exist, kindly add extra rows as needed.

Product	Unit	Product output/Quantity												Total/ Annual
		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	
Fused Magnesium Phosphate	tonnes													0
NPK Fertilizer	tonnes													0
3-Colour NPK	tonnes													0
Total	tonnes	0	0	0	0	0	0	0	0	0	0	0	0	0

Choose allocation method:	Physical allocation

Allocation: When more than one product or process shares the same resource or activity, allocation helps decide how much of the total impact or

Product	Unit	Rate											
		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Fused Magnesium Phosphate	%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
NPK Fertilizer	%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3-Colour NPK	%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total	tonnes	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Company info | Fertilizer product info | Upstream process | Production process | FMP Result | NPK Result | 3-NPK Res

INPUT DATA PHASE 1: TRANSPORTATION OF RAW MATERIALS

Please fill in the blue-colored cells and select the appropriate mode of transport from the dropdown list in the table below. If additional raw materials, chemicals and mode of transport are exist, kindly

Fused Magnesium Phosphate

Apatite Ore

Mode of transport	EF CO_2 ($kgCO_2$/tonnes-km)		Distance travelled and GHG emissions												Total
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
		Amount of raw materials transported (tonnes)													-
	#N/A	Distance travelled (km)													-
		Emission (tCO2eq)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
		Amount of raw materials transported (tonnes)													-
	#N/A	Distance travelled (km)													-
		Emission (tCO2eq)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
		Amount of raw materials transported (tonnes)													-
	#N/A	Distance travelled (km)													-
		Emission (tCO2eq)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
		Amount of raw materials transported (tonnes)													-
	#N/A	Distance travelled (km)													-
		Emission (tCO2eq)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total emissions			#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Summary

Note: Emissions for anthracite coal transportation will be reflected after filling up the phase 2 sheet

FMP

Sl.No	Raw material	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	Apatite Ore	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2	Serpentine Ore	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3	Sandstone ore	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4	Anthracite Coal	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

NPK

Sl.No	Raw material	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	Nitrogen	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2	Potassium	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3	Phosphate	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4	Additives	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5	Anthracite Coal	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

3-Colour NPK

Sl.No	Raw material	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	Nitrogen	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2	Potassium	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3	Phosphate	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
4	Additives	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Company info | Fertilizer product info | Upstream process | Production process | FMP Result | NPK Result | 3-NPK Result | EF | GWP | MCF values | Vietnam EF | So

INPUT DATA PHASE 2 : PRODUCT PRODUCTION

Please fill in the blue-colored cells and select the appropriate activities from the dropdown list in the table below. If additional process or data in dropdown list exists, kindly add extra rows as needed.

1. Direct Emission - Scope 1

1.1 Production Activities

Fused Magnesium Phosphate

Fuel	Usage area	NCV (TJ/tonne)	EF CO_2 (kg CO_2/TJ)	EF CH_4 (kg CH_4/TJ)	EF N_2O (kg N_2O/TJ)		Fuel consumption and GHG emissions from production activities Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Anthracite coal	Blast furnace		98.300	10	1.5	Fuel consumption (tonnes)													
						Emission (tCO_2eq)	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthracite coal	Blast stove		98.300	10	1.5	Fuel consumption (tonnes)													0
						Emission (tCO_2eq)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total emissions							0	0	0	0	0	0	0	0	0	0	0	0	0

2. Indirect emissions – Scope 2

2.1 Electricity

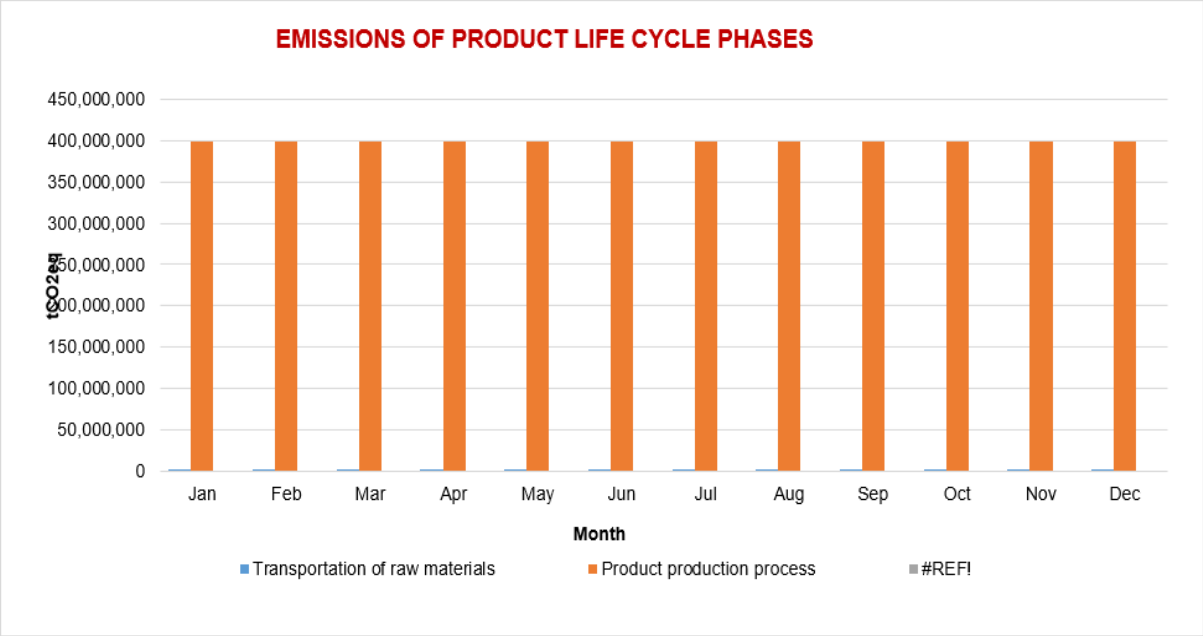
Fuel / source	Vietnam Grid emission factor (tCO_2/MWh)		Consumption and GHG emissions from electricity Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Electricity	0.603	Electricity consumption (kWh)													-
		Share of electricity used for FMP production (%)													#DIV/0!
		Emission (tCO_2eq)	0	0	0	0	0	0	0	0	0	0	0	0	0
		Share of electricity used for NPK production (%)													#DIV/0!
		Emission (tCO_2eq)	0	0	0	0	0	0	0	0	0	0	0	0	-
		Share of electricity used for 3-Colour NPK production (%)													#DIV/0!
		Emission (tCO_2eq)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total emissions			0	0	0	0	0	0	0	0	0	0	0	0	0

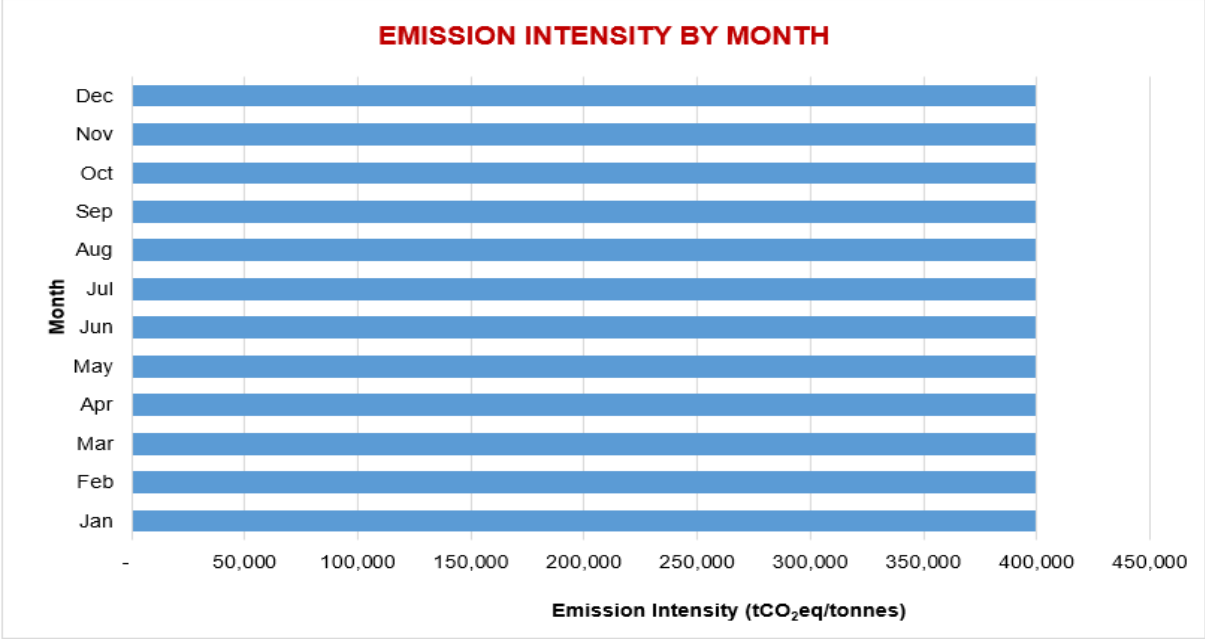
SUMMARY

FMP

Sl.No	Product process emission	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	Production activities	tCO_2eq	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Stationary Combustion Sources	tCO_2eq	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
3	Mobile combustion sources	tCO_2eq	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	Waste management and treatment	tCO_2eq	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
5	Refrigerants	tCO_2eq	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	Fire extinguisher	tCO_2eq	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
7	Electricity consumption	tCO_2eq	0	0	0	0	0	0	0	0	0	0	0	0	0
Total emissions		tCO_2eq	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

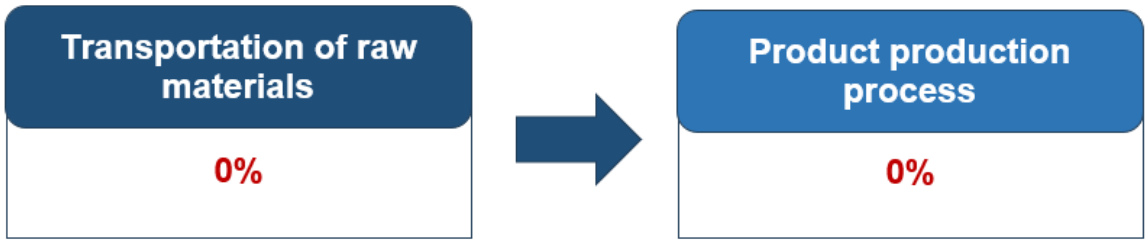
Company info | Fertilizer product info | Upstream process | Production process | FMP Result | NPK Result | 3-NPK Result | EF | GWP | MCF values | Vietnam EF | Sources | Instructions | +


EMISSIONS OF PRODUCT LIFE CYCLE PHASES
450,000,000
400,000,000
350,000,000
300,000,000
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
tCO2eq
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Transportation of raw materials
Product production process
#REF!


EMISSION INTENSITY BY MONTH
Dec
Nov
Oct
Sep
Aug
Jul
Jun
May
Apr
Mar
Feb
Jan
Month
-
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
Emission Intensity (tCO2eq/tonnes)

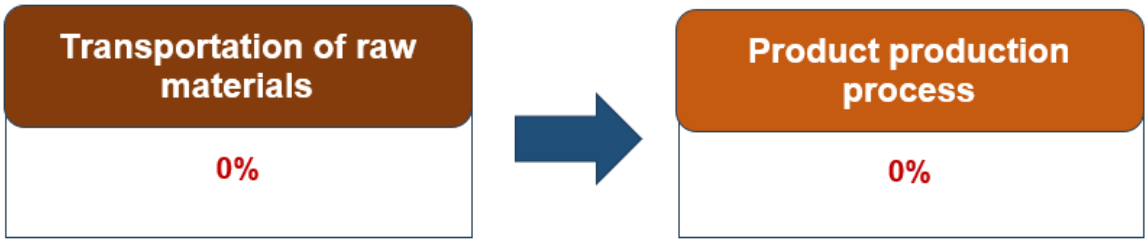
TOTAL EMISSIONS BY PHASES

Unit: tons of CO_2eq



EMISSION STRUCTURE BY PHASES

Unit: %



Annex 4. Product Category Rule

A. PCR for Paper and Paper-based Products

General Information

Product Name:	Paper and Paper-based Products
Programme:	Voluntary Carbon Labeling Program (VCLP)
Programme Operator:	
Date of publication:	
Date of last revision:	
Valid until:	
Renewal schedule:	

Product Category Rules (PCRs)

No.	Section	Content (to be filled in)
1	**Introduction**	This PCRs outlines the rules, requirements, and guidelines for calculating the CFP of paper and paper-based products. This PCR is developed in accordance with ISO 14025, 14067 and 14040/44, and the overall CFP guidance note.
2	**Goal of the Study**	The objective of this CFP study is to quantify GHG emissions associated with paper and paper-based products for purposes including CFP communication, carbon labeling, internal improvement, and performance tracking, in accordance with this PCR.
3	**Scope of the Document**	This product-specific specification for CFP assessment is developed for VCLP, which is managed and operated by the Ministry of Agriculture and Environment (MAE). This PCR applies to all paper and paper-based products covered under the defined system boundary. **Product classification codes:** Relevant national or international classification codes (e.g., HS codes, Vietnam Standard Industrial Classification) shall be specified. This PCR covers the product group paper, which is defined by the Vietnam Standard Industrial Classification of Economic Activities (2018).

<table>
<tr><th>No.</th><th>Section</th><th>Content (to be filled in)</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Section</th><th>Division</th><th>Group</th><th>Class</th><th>Sub-class</th><th>Description</th></tr>
<tr><td>C</td><td></td><td></td><td></td><td></td><td>MANUFACTURING</td></tr>
<tr><td></td><td>17</td><td>170</td><td></td><td></td><td>Manufacture of paper and paper products</td></tr>
<tr><td></td><td></td><td></td><td>1701</td><td>17010</td><td>Manufacture of pulp, paper and paperboard</td></tr>
<tr><td></td><td></td><td></td><td>1702</td><td></td><td>Manufacture of corrugated paper and paperboard and of containers of paper and paperboard</td></tr>
<tr><td></td><td></td><td></td><td></td><td>17021</td><td>Manufacture of containers of paper and paperboard</td></tr>
<tr><td></td><td></td><td></td><td></td><td>17022</td><td>Manufacture of corrugated paper and paperboard</td></tr>
</table>
Covered products include,
● Testliner paper (Face layer paper)
● Medium paper (Glued corrugated paper)
● Kraftliner paper
Products not listed under the covered products are excluded from this PCR.
</td></tr>
<tr><td>4</td><td>Product Description</td><td>Product details shall describe the physical structure and technical characteristics of the paper product. Where applicable (e.g., multi-ply board), this may include the composition of the top, middle, and bottom layers.
The product description shall also include other details necessary to clearly identify and classify the product, such as the form in which the product is sold, the standard weight expressed in grams per square meter (g/m²), paper size specified as width × length or in accordance with international paper size standards, the product type or category, package size, and net weight or volume.</td></tr>
<tr><td>5</td><td>Reference Documents</td><td>(a) Thailand PCR of paper and paper-based products
(b) TCVN standards</td></tr>
</table>

No.	Section	Content (to be filled in)
		(c) Vietnam Standard Industrial Classification (2018) (d) ISO standards (14025, 14067, 14040/44) (e) Overall technical standard/guidance for VCLP, which provides the overarching framework and general requirements applicable to all products (To be developed under program)
6	**Terms and Definitions**	**Virgin Pulp** Virgin pulp is pulp made from fibers that have not previously been used to produce paper. The fibers may originate from: ● Softwoods (e.g., pine) ● Hardwoods ● non-wood plants (e.g., bamboo, jute, hemp) **Recycled Pulp** Recycled pulp is pulp produced from post-consumer paper and paper-based products, including dry and wet waste paper generated during manufacturing processes. It is made from 100% recovered paper fibers. **Kraft Paper** Paper suitable for: ● Wrapping ● Bag making ● Corrugated box production **Corrugated Paper** Paper used for manufacturing corrugated cardboard packaging.
7	**Scope of Evaluation**	
7.1	Declared unit	For paper and paper-based products covered under this PCR, the carbon footprint shall be reported using a Declared Unit (DU). The declared unit means a specific amount of a clearly defined product at the factory gate, and it is used as the reference for reporting GHG emissions. As applicable, the declared unit description shall include: ● The type of product (for example, copy paper, kraft linerboard, or tissue roll) ● The paper weight (grammage, g/m²) for sheet or board products ● The size or format of the product (for example, A4 sheets, roll length, or number of sheets per roll)

No.	Section	Content (to be filled in)
		• The product structure, where relevant (for example, number of plies, coated or uncoated paper, or type of corrugation) • The packaging details, if the declared unit refers to a packaged item (for example, number of rolls or sheets per pack) When a product unit or packaged unit is used, the average product weight shall be stated. The declared unit for paper and paper-based products may be expressed as one of the following, provided that the product is clearly specified: • 1 kilogram (kg) of a specified finished paper or paper-based product • 1 tonne (t) of a specified finished paper or paper-based product • One product unit, such as one ream of A4 copy paper (80 g/m²), one notebook, one carton, or one paper bag of defined size and weight • 1 square meter (m²) of paper or paperboard with specified grammage and type • One packaging unit offered for sale, such as one roll, one bundle, or one pack, with the quantity and specifications of the contents clearly stated
7.2	Steps throughout the product's life cycle.	The scope of this PCR and CFP studies conducted under it is cradle-to-gate, covering processes from raw material acquisition to the factory gate.
7.3	System boundary and excluded process	For the purpose of defining the system boundary, the product life cycle is divided into the following stages: • Upstream processes (raw material acquisition) • Core processes (manufacturing and converting) • Gate-related processes (packaging, storage, handling and transport until factory gate)

No.	Section	Content (to be filled in)

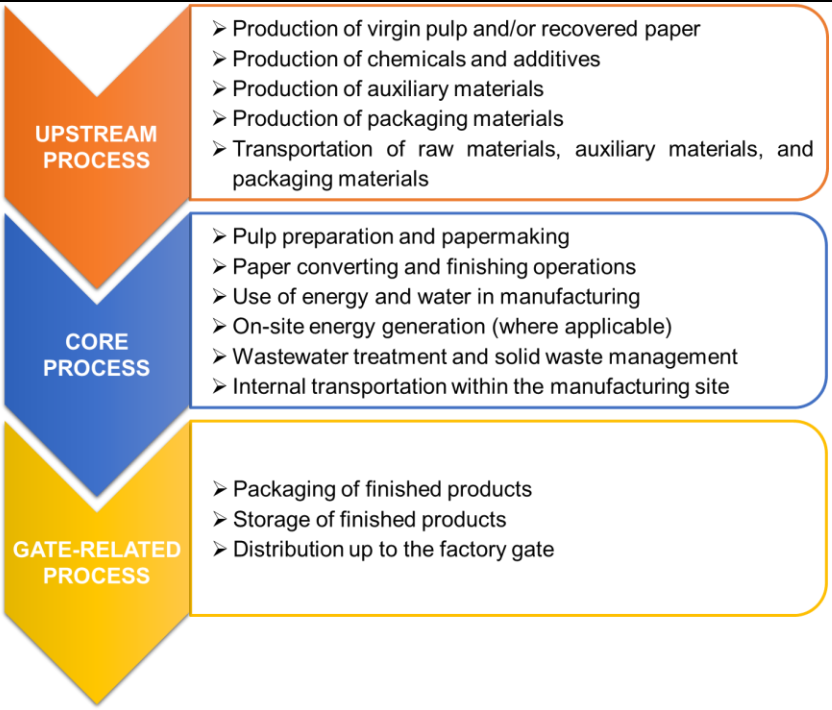


Figure A 23. System diagram illustrating the processes that are included in the product system, divided into upstream, core and gate-related processes

This PCR adopts a cradle-to-gate system boundary. Accordingly, the following processes shall be included in the CFP assessment:

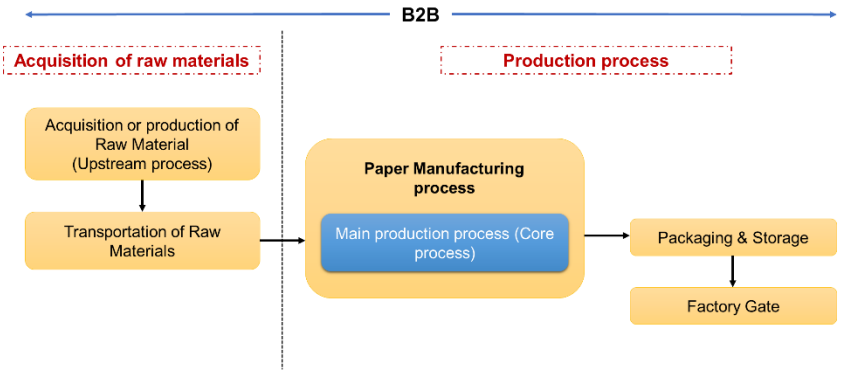
- Raw material acquisition, including fiber sources, chemicals, auxiliary materials, and associated transportation
- Production processes, including pulping, papermaking, converting, and finishing
- Packaging, storage, and distribution activities up to the factory gate, including movement and handling of materials within the factory before dispatch from the manufacturing site.
- Transportation between all included life cycle stages (inbound raw materials and internal transport)
- Waste management at the manufacturing site, including treatment and disposal of production waste

All relevant manufacturing processes and the production of raw and intermediate materials shall be included within the system boundary, unless otherwise specified in this PCR.

Excluded Processes

The following processes shall be excluded from the technical system boundary:

- Office activities within the factory
- Sales office activities at locations other than the factory
- Research and development activities

No.	Section	Content (to be filled in)
		• New product trial or trial phase production activities • Workers' travel to and from the factory • Consumer travel to points of sale • Distribution of the final product from distribution center to users • Product use phase • Manufacturing of production equipment, buildings and other capital goods • Business travel of personnel
7.4	Product Life Cycle Diagram	A product life cycle diagram (Figure A24) shall be provided to illustrate the main life cycle stages and processes included in the cradle-to-gate assessment. The diagram shall present the sequence of upstream, core, and gate-related processes covered under this PCR.  **Figure A24. Cradle-to-gate life cycle approach of paper product**
8	**Allocation**	The following stepwise procedure shall be applied for multifunctional processes and multiproduct systems: 1. Allocation shall be avoided, where feasible, by subdividing the unit process into separate sub-processes and collecting specific environmental data for each sub-process. 2. Where allocation cannot be avoided, inputs and outputs shall be partitioned among products or functions based on underlying physical relationships (e.g., mass or energy content), reflecting how inputs and emissions change with variations in product output. 3. If physical relationships cannot be established or are not appropriate, another relevant allocation method (e.g., economic value) may be applied. The selected method shall be clearly justified and consistently documented. For paper and paper-based products covered under this PCR, physical allocation based on production quantity (e.g., mass or output volume) shall be applied as the default method. **Allocation for Recycled and Reused Materials:**

No.	Section	Content (to be filled in)
		When recycled or reused materials are used as inputs, GHG emissions from their collection and transportation shall be included. Emissions from any remanufacturing or preparation processes required before reuse shall also be considered. However, emissions from the original production of these materials shall not be included. Under this approach, recycled or reused raw materials are considered to have zero upstream production impact.
9	**Cut-off criteria**	Cut-off criteria shall ensure that at least 95% of the total mass, energy use, and GHG emissions of the product system are included. Inputs or outputs may be excluded only if their combined contribution is less than 5%. Where specific data are not available, appropriate assumptions or secondary data shall be used instead of omitting the process. All exclusions shall be clearly documented and justified, demonstrating that the 95% coverage requirement is met and that the overall CFP results are not significantly affected.
10	**Data and data quality requirements**	
10.1	Data collection period	Data shall be collected from the most recent annual production or the most recent production period. If data for a period of less than one year are used, the reasons and necessity shall be clearly explained, including justification of the representativeness of the data.
10.2	Data hierarchy and data types	Data shall be selected and applied in the following order of preference: • **Primary data (site-specific data):** Primary data shall be used wherever available and shall represent the actual processes and operating conditions of the product system under study. Primary data shall be collected directly from the manufacturing site(s) involved in producing the paper or paper-based product. • **Secondary data (selected generic data):** These come from widely used sources such as commercial or public databases. They must meet defined quality requirements for accuracy, completeness, and relevance. Secondary data may be used where primary data are not available or not feasible to collect. Secondary data shall be obtained from recognized, credible, and publicly available sources, such as: ➢ National or regional life cycle inventory (LCI) databases ➢ Government-published emission factors (e.g., national grid emission factors) ➢ Peer-reviewed scientific literature

No.	Section	Content (to be filled in)
		➢ Official databases referenced by the programme operator • **Proxy data:** These are also taken from common databases, but do not fully meet all the quality requirements of selected generic data. They should only be used when better data are not available. As a general principle, specific (primary) data should always be used whenever available, and their quality should be checked before use.
10.3	Data quality requirements	The data quality requirements defined in this PCR address the data quality aspects specified in ISO standards, including coverage, precision, completeness, representativeness, consistency, reproducibility, data sources, and uncertainty. For generic data to qualify as selected generic data, they shall meet the following criteria: • **Time representativeness:** The reference year of the data shall be as recent as possible and appropriate for the period of the CFP study. • **Geographical representativeness:** The data shall reflect the geographical context relevant to the product system under study (e.g., national, regional, or global), or be justified as a suitable proxy. • **Technological representativeness:** The data shall reflect the technology or production processes relevant to the product system, or be based on representative industry-average technologies. • **Completeness and coverage:** The data set shall cover all relevant processes and elementary flows and account for at least 95% of total mass, energy use, and GHG emissions within the defined system boundary. • **Consistency and reproducibility:** Data shall be applied consistently throughout the CFP study and documented in a manner that allows independent review and reproducibility. • **Precision and uncertainty:** Where relevant, data uncertainty shall be considered and qualitatively described, particularly for key contributing processes.
10.4	Assessment of energy and resource consumption	Energy and resource consumption shall be assessed for all production activities and support systems involved in the manufacture of paper and paper-based products. This includes electricity, steam, thermal energy, fuel, water, and other auxiliary resources. Energy data collection for products shall be carried out in the following order of priority: 1) Actual measurements: Use energy consumption data measured directly from the production process (electricity, steam, fuel, etc.).

No.	Section	Content (to be filled in)
		2) Technical specifications of machinery: If actual measurements are not possible, use technical data such as the rated power of equipment and estimated operating hours. 3) Allocation of overall data: If neither actual measurements nor technical data are available, use allocation based on available data at the factory or facility level. 4) On-site energy generation: • If electricity or steam is generated within the factory, data on the type and quantity of fuel used must be collected. • GHG emissions from electricity and steam generation must be calculated based on actual fuel consumption, considering the efficiency of electricity/steam generation. • If electricity is purchased from the national grid or another supplier, the most recent official national grid emission factor shall be used.
10.5	Transportation information	For transportation included within the system boundary, the following data shall be collected: **Activity data** ● Transport distance ● Transport mode (truck, ship, rail, etc.) ● Vehicle type and load capacity ● Load factor ● Fuel type or tonne-kilometres transported **Emission factor data** ● Fuel emission factors ● Mode-specific transport emission factors
11	**Collecting data at each stage throughout the life cycle of the target product**	
11.1	**Raw material acquisition process**	
11.1.1	Scope of data	The scope of data collection for the raw material acquisition stage of paper and paper-based products shall include the amount of GHG emissions arising from the following activities: • Acquisition of main raw materials, including virgin pulp, recycled paper, and waste paper (post-consumer and pre-consumer) • Acquisition of chemicals used in pulp production • Acquisition of chemicals used in paper production • Acquisition of auxiliary materials used in fiber preparation and water treatment • Acquisition of packaging and product-wrapping materials

No.	Section	Content (to be filled in)
		• Transportation of raw materials and auxiliary materials from suppliers to the production site Where externally sourced intermediate material inputs are used, their upstream cradle-to-gate emissions and allocation approaches shall be included and documented. Recycled and reused materials shall be modelled in accordance with the allocation rules specified in Section 8. Where primary data from raw material producers are required and multiple suppliers exist, data shall be collected from all producers and weighted according to the proportion supplied. If this is not feasible, data shall be collected from a statistically representative sample or from the largest suppliers. Where complete data collection is not possible, the reasons, methodology, scope, and justification for representativeness shall be clearly documented. All data collected shall be consistent with the defined system boundary, declared unit, and life cycle scope of the CFP assessment. Where primary data are not available, secondary data may be applied.
11.1.2	List of data to be collected	The following quantitative data shall be collected: • Amounts of virgin pulp, recycled paper, and waste paper • Amounts of pulping and papermaking chemicals • Amounts of auxiliary materials • Amounts of packaging and wrapping materials • Associated GHG emission factors Transportation-related data shall be collected in accordance with the transportation data requirements specified in Section 10.
11.2	**Production stage**	
11.2.1	Scope of data	The scope of data collection includes the amount of GHG emissions arising from production activities and production support activities for paper and paper-based products, as follows: • Storage of raw materials prior to production • Pulp preparation, papermaking, converting, and finishing • Packaging and storage of finished products • Operation of lighting, maintenance, and cleaning systems • Use of chemicals in production • Water supply and wastewater treatment • Solid waste management • On-site energy generation and energy use

No.	Section	Content (to be filled in)
		• Internal transportation and transport of intermediate products within the product system
11.2.2	List of data to be collected	The following quantitative data shall be collected: • Raw and intermediate materials consumed • Finished products and by-products produced • Electricity, fuels, steam, and thermal energy consumed • Water consumption • Chemicals and additives used • Packaging materials used during production • Wastewater generated and treated • Solid waste generated and managed • On-site energy produced, where applicable • Associated GHG emission factors Transportation and energy-related data shall be collected in accordance with the data requirements specified in Section 10.
12	**CFP Reporting**	
12.1	Style, position, and size of the mark	CFP information shall be displayed using three significant digits, expressed in g or kg CO_2e, and in accordance with the applicable criteria and conditions for use of the CFP mark. If the CFP is cradle-to-gate, the communication shall clearly state “cradle-to-gate” system boundary. Where the same product is manufactured by multiple manufacturers, the weighted average CFP shall be reported.
12.2	Additional information and content	Display additional information that is a guideline for consumers to help reduce their CFP or information to create awareness of their participation in reducing their CFP. Optional information that may be displayed alongside the label includes: • Product details (product type, emission reduction measures, standard used, company commitment, verification frequency, and official website link); • Reference to the accredited verifier and validity period of certification; • QR code or digital link providing access to the detailed certification report and supporting documents, thereby enhancing transparency and traceability.

GHG emission factors associated with a product.

Table A 2. GHG emissions values

Sequence number	list	unit	GHG emissions ($kgCO_2$ eq./unit)	Source of EF	Update date
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Note: The GHG emission values in Table A4 should be verified against the current values announced by the ********** Organization.

B. PCR for Fertilizer Products

General Information

Product Name:	Fertilizer Products
Programme:	Voluntary Carbon Labeling Program (VCLP)
Programme Operator:	
Date of publication:	
Date of last revision:	
Valid until:	
Renewal schedule:	

PCR for Fertilizer products

<table>
<tr><th>No.</th><th>Section</th><th>Content (to be filled in)</th></tr>
<tr><td>1</td><td>Introduction</td><td>This PCRs outlines the rules, requirements, and guidelines for calculating the carbon footprint (CFP) of fertilizer products.

This PCR is developed in accordance with ISO 14025, 14067, 14040/44, and the overall CFP guidance note.</td></tr>
<tr><td>2</td><td>Goal of the Study</td><td>The objective of this CFP study is to quantify GHG emissions associated with fertilizer products for purposes including CFP communication, carbon labeling, internal improvement, and performance tracking, in accordance with this PCR.</td></tr>
<tr><td>3</td><td>Scope of the Document</td><td>This product-specific specification for CFP assessment is developed for VCLP, which is managed and operated by the Ministry of Agriculture and Environment (MAE). This PCR applies to all fertilizer products classified under VSIC 2018 Class 20120, regardless of production technology, raw material origin, or nutrient composition.

Product classification codes: Relevant national or international classification codes (e.g., HS codes, Vietnam Standard Industrial Classification) shall be specified. This PCR covers the product group fertilizer, which is defined by the Vietnam Standard Industrial Classification of Economic Activities (2018).
<table>
<tr><th>Section</th><th>Division</th><th>Group</th><th>Class</th><th>Sub-class</th><th>Description</th></tr>
<tr><td>B</td><td></td><td></td><td></td><td></td><td>MINING AND QUARRYING</td></tr>
<tr><td></td><td>05</td><td></td><td></td><td></td><td>Mining of hard coal and lignite</td></tr>
<tr><td></td><td></td><td>051</td><td>0510</td><td>05100</td><td>Mining and gathering of hard coal</td></tr>
<tr><td></td><td>06</td><td></td><td></td><td></td><td>Extraction of crude petroleum and natural gas</td></tr>
<tr><td></td><td></td><td>062</td><td>0620</td><td>06200</td><td>Extraction of natural gas</td></tr>
<tr><td></td><td>08</td><td></td><td></td><td></td><td>Other mining and quarrying</td></tr>
</table>
</td></tr>
</table>

No.	Section	Content (to be filled in)

		089			Mining and quarrying n.e.c (not elsewhere classified)
			0891	08910	Mining of chemical and fertilizer minerals
C					MANUFACTURING
	20				Manufacture of chemicals and chemical products
		201			Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms
			2012	20120	Manufacture of fertilizer and nitrogen compounds

Covered products include:

- Nitrogen fertilizers (e.g., urea, ammonium nitrate, ammonium sulfate, calcium ammonium nitrate, urea ammonium nitrate solutions)
- Phosphate fertilizers (e.g., single superphosphate, triple superphosphate, monoammonium phosphate (MAP), diammonium phosphate (DAP)
- Potassium fertilizers (e.g., potassium chloride (MOP), potassium sulfate (SOP), potassium nitrate)
- Compound and complex fertilizers containing two or more primary nutrients (e.g., NPK, NP, NK fertilizers)
- Blended fertilizers produced by physical mixing of different fertilizer materials
- Organic fertilizers derived from plant, animal, or microbial materials (e.g., compost, manure-based fertilizers, digestate-based products)

Excluded products:

Products not listed under the covered products are excluded from this PCR.

No.	Section	Content (to be filled in)
4	**Product Description**	The product description shall clearly define the fertilizer product covered under the CFP assessment. Product details shall describe the physical form, nutrient composition, and key technical characteristics of the fertilizer. The description shall include the following information: ● Fertilizer type (e.g., urea, NPK, FMP, etc.) ● Nutrient content, expressed as percentage of nitrogen (N), phosphorus (P_2O_5), potassium (K_2O), and other nutrients where applicable ● Physical form (e.g., granular, powder, liquid) ● Moisture content, where relevant ● Additives or coatings, such as urease inhibitors, nitrification inhibitors, or slow-release coatings ● Packaging type, package size, and net weight (excluding packaging weight)
5	**Reference Documents**	(a) Thailand PCR of fertilizer (b) TCVN standards (c) Vietnam Standard Industrial Classification (2018) (d) ISO standards (14025, 14067, 14040/44) (e) Overall technical standard/guidance for VCLP, which provides the overarching framework and general requirements applicable to all products (To be developed under program
6	**Terms and Definitions**	1. Nitrogen fertilizer – Fertilizer supplying nitrogen as the primary nutrient. 2. Phosphate fertilizer – Fertilizer supplying phosphorus. 3. Potassium fertilizer – Fertilizer supplying potassium. 4. Compound fertilizer – Chemically reacted fertilizer containing at least two primary nutrients. 5. Blended fertilizer – Physical mixture of separate fertilizer materials. 6. Organic fertilizer – Nutrient source derived from plant or animal materials.
7	**Scope of Evaluation**	

No.	Section	Content (to be filled in)
7.1	Declared unit	For fertilizer products covered under this PCR, the CFP shall be reported using a Declared Unit (DU). The declared unit means a specific amount of a clearly defined product at the factory gate, and it is used as the reference for reporting GHG emissions. The DU shall include: ● Fertilizer type ● Nutrient grade (e.g., NPK 16-16-8) ● Physical form ● Packaging description (if relevant) The declared unit may be expressed as: ● 1 tonne of fertilizer product ● 1 kg of fertilizer product ● One packaged unit (e.g., one 50 kg bag of NPK 15-15-15) Comparisons between fertilizer products with different nutrient compositions or grades shall not be made unless functional equivalence is demonstrated. The selected declared unit shall be applied consistently throughout the CFP assessment and clearly stated in all reporting and communication materials.
7.2	Steps throughout the product's life cycle.	The scope of this PCR and CFP study is cradle-to-gate, covering processes from raw material acquisition to the factory gate.
7.3	System boundary and excluded process	For the purpose of defining the system boundary, the product life cycle is divided into the following stages: ● Upstream processes (raw material acquisition) ● Core processes (processing and manufacturing) ● Gate-related processes (packaging, storage, handling and transport until factory gate)

No.	Section	Content (to be filled in)

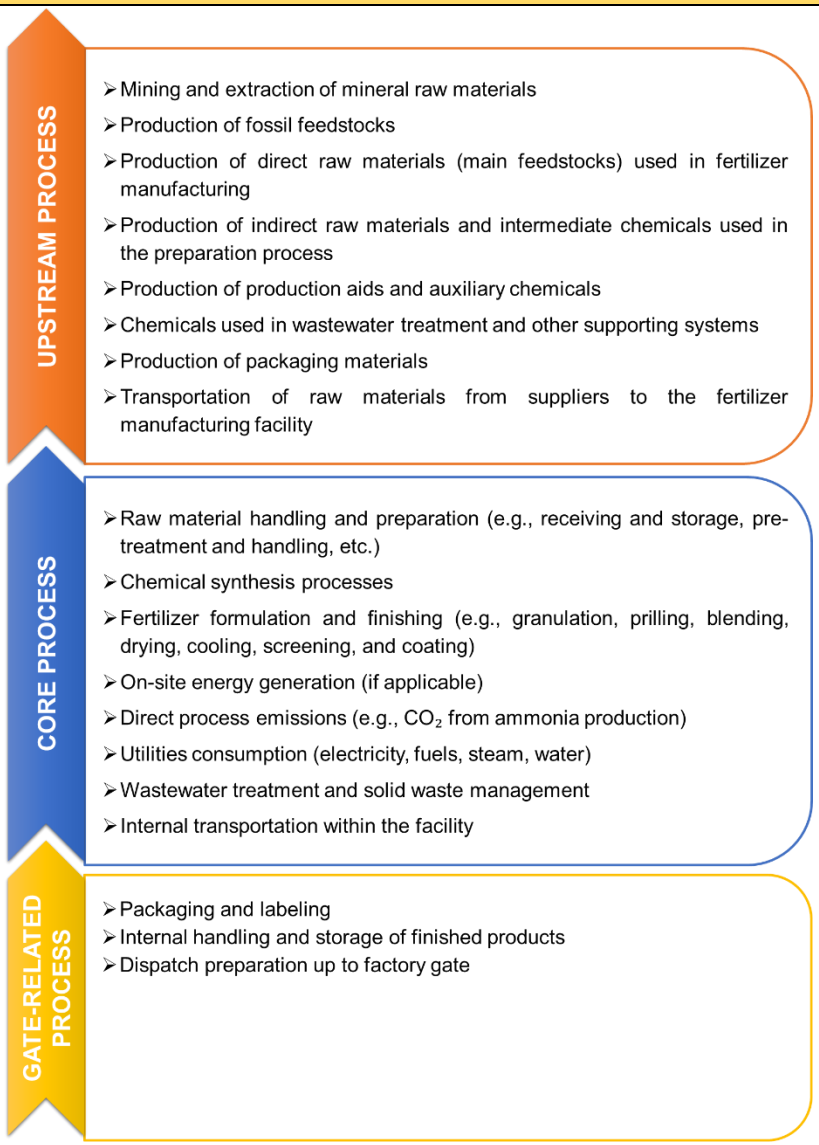
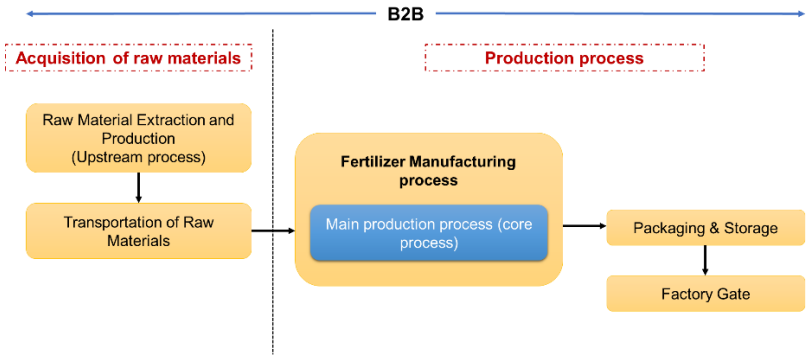


Figure A25. System diagram illustrating the processes that are included in the product system, divided into upstream, core and gate-related processes

This PCR adopts a cradle-to-gate system boundary. Accordingly, the following processes shall be included in the CFP assessment:

- **Raw material acquisition**, including extraction and production of fossil feedstocks (e.g., natural gas, coal), mineral raw materials (e.g., phosphate rock, potash, sulfur), intermediate chemicals (e.g., ammonia, nitric acid, phosphoric acid), additives, auxiliary materials, packaging materials, and associated transportation to the fertilizer manufacturing facility.

No.	Section	Content (to be filled in)
		● **Processing and manufacturing activities**, including raw material receiving and storage, chemical synthesis (e.g., ammonia production, nitric acid production, urea synthesis), neutralization reactions, granulation, prilling, blending, drying, cooling, screening, coating, and liquid fertilizer formulation (where applicable). ● **Packaging, storage, and handling** of finished fertilizer products up to the factory gate. ● **Transportation** between included life cycle stages, including inbound transportation of raw materials and internal transportation within the facility. ● **Energy and utility consumption**, including electricity, fuels, steam, heat energy, compressed air, and water supply. ● **Waste management at the manufacturing site**, including wastewater treatment, air emission control systems, and solid waste handling and disposal. All relevant processing activities and the production of raw and intermediate materials shall be included within the defined system boundary unless otherwise specified in this PCR. **Excluded Processes** The following processes shall be excluded from the technical system boundary: ● Office activities within the factory ● Sales office activities at locations other than the factory ● Research and development activities ● New product trial or trial phase production activities ● Workers' travel to and from the factory ● Consumer travels to points of sale ● Distribution of the final product from the distribution center to users ● Product use phase ● Manufacturing of production equipment, buildings and other capital goods ● Business travel of personnel
7.4	Product Life Cycle Diagram	A product life cycle diagram (Figure A26) shall be provided to illustrate the main life cycle stages and processes included in the

No.	Section	Content (to be filled in)
		cradle-to-gate assessment. The diagram shall present the sequence of upstream, core, and gate-related processes covered under this PCR.  ***Figure A26. Cradle-to-gate life cycle approach of fertilizer products***
8	**Allocation**	The following stepwise procedure shall be applied for multifunctional processes and multiproduct systems: ● Allocation shall be avoided, where feasible, by subdividing the unit process into separate sub-processes and collecting specific environmental data for each sub-process. ● Where allocation cannot be avoided, inputs and outputs shall be partitioned among products or functions based on underlying physical relationships (e.g., mass or energy content), reflecting how inputs and emissions change with variations in product output. ● If physical relationships cannot be established or are not appropriate, another relevant allocation method (e.g., economic value) may be applied. The selected method shall be clearly justified and consistently documented. For fertilizer products covered under this PCR, physical allocation based on production quantity (e.g., mass or output volume) shall be applied as the default method. If by-products have very different market values and using mass-based allocation would give unfair or misleading results, economic allocation (based on product value) may be used, with clear explanation and justification. **Allocation for Recycled and Reused Materials:** When recycled or reused materials are used as inputs, GHG emissions from their collection and transportation shall be included. Emissions from any remanufacturing or preparation processes required before reuse shall also be considered. However, emissions from the original production of these materials shall not be included. Under this approach, recycled or

No.	Section	Content (to be filled in)
		reused raw materials are considered to have zero upstream production impact.
9	**Cut-off criteria**	Cut-off criteria shall ensure that at least 95% of the total mass, energy use, and GHG emissions of the product system are included. Inputs or outputs may be excluded only if their combined contribution is less than 5%. Where specific data are not available, appropriate assumptions or secondary data shall be used instead of omitting the process. All exclusions shall be clearly documented and justified, demonstrating that the 95% coverage requirement is met and that the overall CFP results are not significantly affected.
10	**Data and data quality requirements**	
10.1	Data collection period	Data shall be collected from the most recent annual production or the most recent production period. If data for a period of less than one year are used, the reasons and necessity shall be clearly explained, including justification of the representativeness of the data.
10.2	Data hierarchy and data types	Data shall be selected and applied in the following order of preference: ● **Primary data (site-specific data):** Primary data shall be used wherever available and shall represent the actual processes and operating conditions of the product system under study. Primary data shall be collected directly from the manufacturing site(s) involved in producing the fertilizer product. ● **Secondary data (selected generic data):** These come from widely used sources such as commercial or public databases. They must meet defined quality requirements for accuracy, completeness, and relevance. Secondary data may be used where primary data are not available or not feasible to collect. Secondary data shall be obtained from recognized, credible, and publicly available sources, such as: ➢ National or regional life cycle inventory (LCI) databases ➢ Government-published emission factors (e.g., national grid emission factors) ➢ Peer-reviewed scientific literature ➢ Official databases referenced by the programme operator ● **Proxy data:** These are also taken from common databases, but do not fully meet all the quality requirements of selected generic data. They should only be used when better data are not available.

No.	Section	Content (to be filled in)
		As a general principle, specific (primary) data should always be used whenever available, and their quality should be checked before use.
10.3	Data quality requirements	The data quality requirements defined in this PCR address the data quality aspects specified in ISO standards, including coverage, precision, completeness, representativeness, consistency, reproducibility, data sources, and uncertainty. For generic data to qualify as selected generic data, they shall meet the following criteria: ➢ **Time representativeness:** The reference year of the data shall be as recent as possible and appropriate for the period of the CFP study. ➢ **Geographical representativeness:** The data shall reflect the geographical context relevant to the product system under study (e.g., national, regional, or global), or be justified as a suitable proxy. ➢ **Technological representativeness:** The data shall reflect the technology or production processes relevant to the product system, or be based on representative industry-average technologies. ➢ **Completeness and coverage:** The data set shall cover all relevant processes and elementary flows and shall account for at least 95% of total GHG emissions within the defined system boundary. ➢ **Consistency and reproducibility:** Data shall be applied consistently throughout the CFP study and documented in a manner that allows independent review and reproducibility. ➢ **Precision and uncertainty:** Where relevant, data uncertainty shall be considered and qualitatively described, particularly for key contributing processes.
10.4	Assessment of energy and resource consumption	Energy and resource consumption shall be assessed for all production activities and support systems involved in the manufacture of fertilizer products. This includes electricity, steam, thermal energy, fuel, refrigeration energy, water, ice, and other auxiliary resources. Energy data collection for products shall be carried out in the following order of priority: 1) Actual measurements: Use energy and resource consumption data measured directly from the processing operations (electricity, steam, fuel, refrigeration energy, water, etc.). 2) Technical specifications of machinery: If actual measurements are not possible, use technical data such as the rated power of equipment, operating hours, production capacity, and manufacturer specifications.

No.	Section	Content (to be filled in)
		3) Allocation of overall data: If neither actual measurements nor technical data are available, use allocation based on available data at the factory or facility level (e.g., production volume or operating time). The allocation method shall be justified and documented. 4) On-site energy generation: ➢ If electricity or steam is generated within the factory, data on the type and quantity of fuel used shall be collected. ➢ GHG emissions from electricity and steam generation shall be calculated based on how much fuel is actually used and how efficiently electricity or steam is produced. ➢ If electricity is purchased from the national grid or another supplier, the most recent official national grid emission factor shall be used.
10.5	Transportation information	For transportation included within the system boundary, the following data shall be collected: **Activity data** ● Transport distance ● Transport mode (truck, ship, rail, etc.) ● Vehicle type and load capacity ● Load factor ● Fuel type or tonne-kilometres transported **Emission factor data** ● Fuel emission factors ● Mode-specific transport emission factors
11	**Collecting data at each stage throughout the life cycle of the target product**	
11.1	**Raw material acquisition process**	
11.1.1	Scope of data	The scope of data collection for the raw material acquisition stage of fertilizer products shall include GHG emissions arising from the following activities: 1) Acquisition and upstream processing of main raw materials, including extraction, mining, beneficiation, and preparation. 2) Acquisition of intermediate chemical materials used in fertilizer production, including their upstream manufacturing emissions. 3) Acquisition of additives and auxiliary materials. 4) Acquisition of process chemicals and utilities used in raw material preparation.

No.	Section	Content (to be filled in)
		5) Acquisition of packaging materials, such as plastic bags, laminated sacks, bulk bags (Flexible Intermediate Bulk Containers – FIBC), pallets, and wrapping materials. 6) Transportation of all inputs, including: ● Transport of mineral raw materials and fossil feedstocks ● Transport between upstream processing stages where relevant ● Delivery of intermediate chemicals, additives, and packaging materials to the fertilizer production site Where externally sourced intermediate material inputs are used, their upstream cradle-to-gate emissions and allocation approaches shall be included and documented. Recycled and reused materials shall be modelled in accordance with the allocation rules specified in Section 8. Where primary data from raw material producers are required and multiple suppliers exist, data shall be collected from all producers and weighted according to the proportion supplied. If this is not feasible, data shall be collected from a statistically representative sample or from the largest suppliers. Where complete data collection is not possible, the reasons, methodology, scope, and justification for representativeness shall be clearly documented. All collected data shall be consistent with the defined system boundary, declared unit, and life cycle scope of the carbon footprint assessment. Where primary data are not available, appropriate secondary data may be used.
11.1.2	List of data to be collected	The following quantitative data shall be collected: ● **Raw Material Inputs** ➢ Quantity of primary raw materials used ➢ Quantity of externally sourced intermediate materials ➢ Source and origin of raw materials (domestic/imported, supplier information where available) ● **Upstream Processing Data (where available)** ➢ Energy consumption associated with extraction, mining, or processing of raw materials (if supplier-specific data are available) ➢ Material losses or beneficiation yields (for mineral raw materials) ● **Additives and Auxiliary Materials** ➢ Quantity of fillers, micronutrients, and additives used (kg)

No.	Section	Content (to be filled in)
		➢ Coating materials, inhibitors, anti-caking agents, and binders (kg) ➢ Process chemicals used for gas cleaning, neutralization, or water treatment (kg) ● Quantity and type of packaging materials ● Transportation data for all inputs (distance, mode, vehicle type, load factor) ● Associated GHG emission factors for all materials and transport activities All data shall be consistent with the declared unit and system boundary defined in this PCR. Where primary data are not available, appropriate secondary data sources shall be applied in accordance with the data hierarchy requirements.
11.2	**Production stage**	
11.2.1	Scope of data	The scope of data collection for the production stage of fertilizer products shall include GHG emissions arising from all manufacturing activities under the operational control of the fertilizer producer. This shall include emissions from the following activities: ● Storage and handling of raw materials, including bulk storage, tank storage, and silo systems ● Raw material preparation and pre-treatment processes ● Chemical synthesis processes ● Granulation, prilling, blending, drying, cooling, screening, coating, and conditioning processes ● Packaging, labeling, palletizing, and storage of finished products up to the factory gate ● Use of electricity, fuels, steam, thermal energy, compressed air, and water ● On-site energy generation (where applicable) ● Direct process emissions (e.g., CO_2 from ammonia production, N_2O from nitric acid production) ● Fugitive emissions (where applicable) ● Air emission control systems and gas scrubbing operations ● Wastewater treatment activities, including potential CH_4 and N_2O emissions (where applicable)

No.	Section	Content (to be filled in)
		• Solid waste management and by-product handling (e.g., dust, off-spec material) • Internal transportation and material handling within the facility • All data collected shall be consistent with the defined system boundary, declared unit, and cradle-to-gate life cycle scope of the CFP assessment. • Where multiple products or co-products are generated, production yield and mass balance shall be documented to ensure appropriate allocation of emissions in accordance with Section 8 of this PCR. • Where primary data are not available, secondary data may be applied in accordance with the data hierarchy requirements of this PCR.
11.2.2	List of data to be collected	The following quantitative data shall be collected: • Raw materials entering production (kg or tonnes) • Finished fertilizer products and co-products/by-products produced (kg or tonnes) • Production yield (input-output ratio) • Electricity consumption (kWh) • Fuel consumption (by fuel type and quantity) • Steam and thermal energy consumption • On-site energy generation data (if applicable) • Direct process emissions (CO_2, N_2O and other relevant GHGs) • Fugitive emissions data (where applicable) • Water consumption (m^3) • Process chemicals used during production • Packaging materials used during production • Wastewater volume and treatment method • Direct emissions from wastewater treatment (CH_4, N_2O where applicable) • Solid waste and by-products generated and treatment method • Internal transportation data (if significant) • Associated GHG emission factors Transportation and energy-related data shall be collected in accordance with the data requirements specified in Section 10.

No.	Section	Content (to be filled in)
12	**CFP Reporting**	
12.1	Style, position, and size of the mark	CFP information shall be displayed using three significant digits, expressed in g or kg CO_2e, and in accordance with the applicable criteria and conditions for use of the CFP mark. If the CFP is cradle-to-gate, the communication shall clearly state "cradle-to-gate" system boundary. Where the same product is manufactured by multiple manufacturers, the weighted average CFP shall be reported.
12.2	Additional information and content	Display additional information that is a guideline for consumers to help reduce their CFP or information to create awareness of their participation in reducing their CFP. Optional information that may be displayed alongside the label includes: ● Product details (product type, emission reduction measures, standard used, company commitment, verification frequency, and official website link); ● Reference to the accredited verifier and validity period of certification; ● QR code or digital link providing access to the detailed certification report and supporting documents, thereby enhancing transparency and traceability.

GHG emission factors associated with a product.

Table A 3. GHG emissions values

Sequence number	list	unit	GHG emissions ($kgCO_2$ eq./unit)	Source of EF	Update date
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Note: The GHG emission values in Table A5 should be verified against the current values announced by the ********** Organization.

C. PCR for Processed Fish and Seafood Products

General Information

Product Name:	Processed Fish and Seafood Products
Programme:	Voluntary Carbon Labeling Program (VCLP)
Programme Operator:	
Date of publication:	
Date of last revision:	
Valid until:	
Renewal schedule:	

Product Category Rules (PCRs)

<table>
<tr><th>No.</th><th>Section</th><th>Content (to be filled in)</th></tr>
<tr><td>1</td><td>Introduction</td><td>This PCRs outlines the rules, requirements, and guidelines for calculating the CFP of processed fish and seafood products.

This PCR is developed in accordance with ISO 14025, 14067 and 14040/44, and the overall CFP guidance note.</td></tr>
<tr><td>2</td><td>Goal of the Study</td><td>The objective of this CFP study is to quantify GHG emissions associated with processed fish and seafood products for purposes including CFP communication, carbon labeling, internal improvement, and performance tracking, in accordance with this PCR.</td></tr>
<tr><td>3</td><td>Scope of the Document</td><td>This product-specific specification for CFP assessment is developed for VCLP, which is managed and operated by the Ministry of Agriculture and Environment (MAE). This PCR applies to processed fish and seafood products processed at industrial food processing facilities, including frozen raw products and value-added processed products.

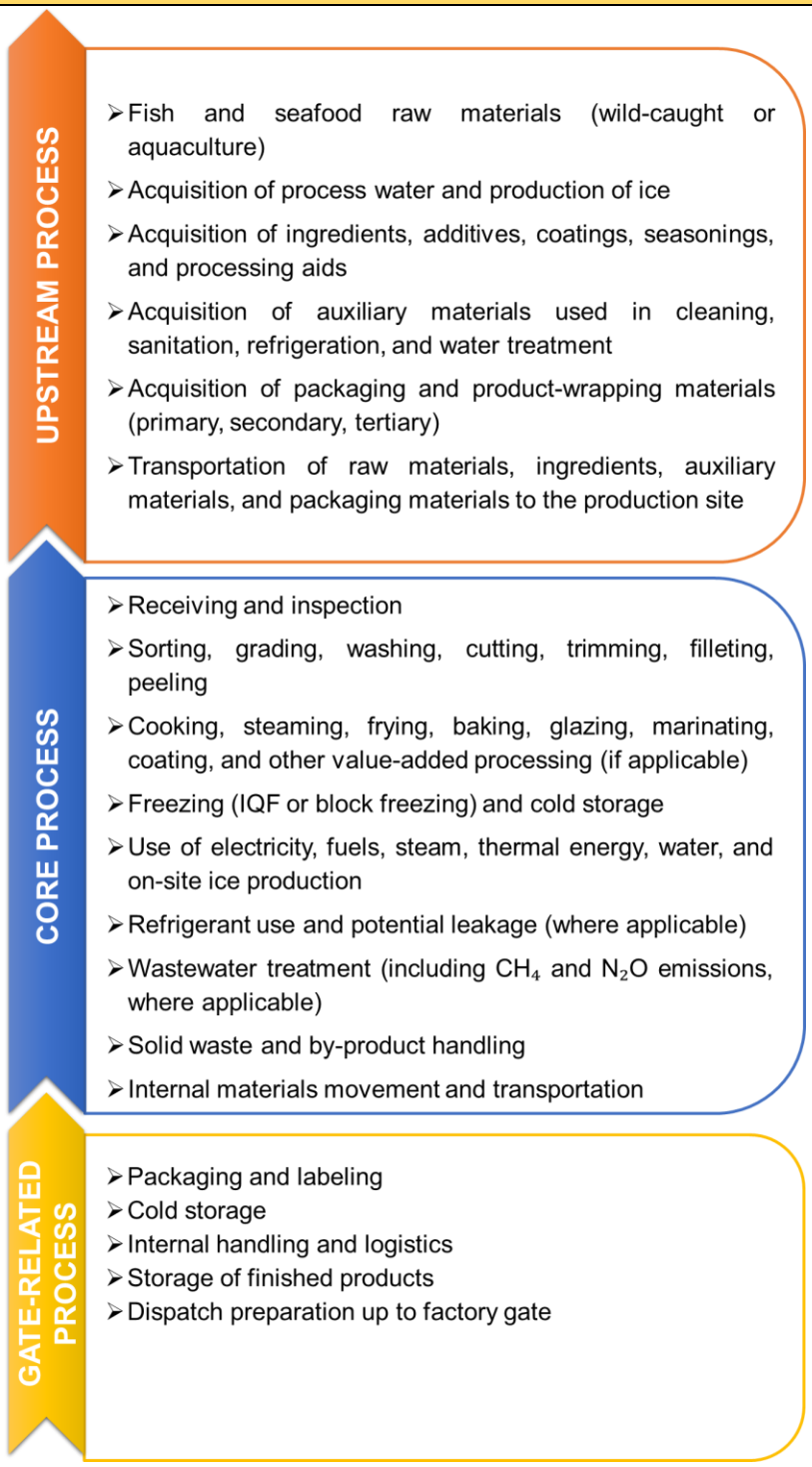
Product classification codes: Relevant national or international classification codes (e.g., HS codes, Vietnam Standard Industrial Classification) shall be specified. This PCR covers the product group food, which is defined by the Vietnam Standard Industrial Classification of Economic Activities (2018).
<table>
<tr><th>Section</th><th>Division</th><th>Group</th><th>Class</th><th>Sub-class</th><th>Description</th></tr>
<tr><td>C</td><td></td><td></td><td></td><td></td><td>AGRICULTURE, FORESTRY AND FISHING</td></tr>
<tr><td></td><td>03</td><td></td><td></td><td></td><td>Fishing and aquaculture</td></tr>
<tr><td></td><td></td><td>031</td><td></td><td></td><td>Fishing</td></tr>
</table>
</td></tr>
</table>

No.	Section	Content (to be filled in)					
					0311	03110	Marine fishing
					0312	03120	Inland fishing
				032			Aquaculture
					0321		Marine aquaculture
						03211	Fish farming
						03212	Shrimp farming
						03213	Farming of other fisheries
						03214	Breeding of marine fisheries
					0322		Inland aquaculture
						03221	Fish farming
						03222	Shrimp farming
						03223	Farming of other fisheries
						03224	Breeding of inland fisheries
		C					MANUFACTURING
			10				Manufacture of food products
				102	1020		Processing and preserving of fisheries and fishery products
						10201	Processing and preserving of frozen fisheries
						10202	Processing and preserving of dried fisheries
						10209	Processing and preserving of other fishery products

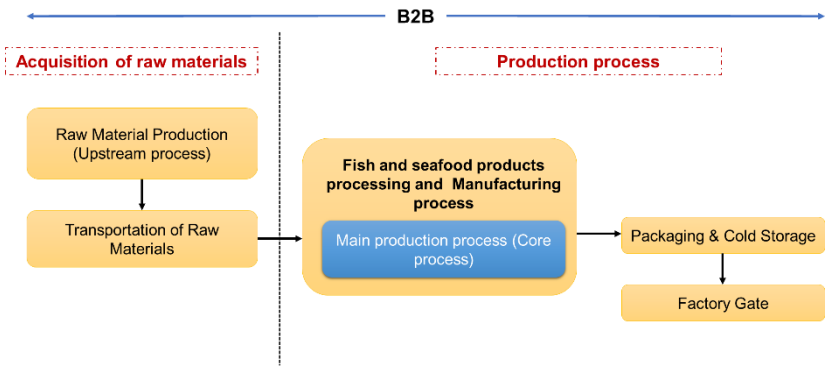
No.	Section	Content (to be filled in)
		Covered products include: ● Frozen fish and fish fillets (e.g., pangasius, basa) ● Frozen shrimp, octopus, and other seafood ● Value-added seafood (marinated, coated, fried, steamed, baked, or ready-to-eat seafood products) ● By-products (e.g., fish skin used as raw material for collagen and gelatin production) **Excluded products:** Products that are not mentioned in the covered products are excluded from this PCR.
4	**Product Description**	The product description shall clearly identify and characterize the processed fish or seafood product, including: ● Species and product name ● Physical form (whole, fillet, peeled, battered, cooked, etc.) ● Processing method (raw frozen, cooked frozen, fried, steamed, baked) ● Preservation method (IQF, block frozen) ● Packaging type and net weight excluding packaging weight and also refer to the Stock Keeping Unit (SKU) such as "Ready-to-eat fish snack brand [brand name missing]". Where applicable, the description shall also include product variants and by-products generated during processing.
5	**Product Grouping**	Products that differ only in packaging size can be grouped together. If the same product is packed in different types of packaging, the impact of the packaging on the carbon footprint must be checked. When the difference in the total product carbon footprint is 5% or less, the products can be combined into one group. If the difference is more than 5%, they must be treated and reported as separate product groups. The justification for grouping shall be clearly documented in the CFP report.
6	**Reference Documents**	a) Thailand PCR of fishery products, fish snacks, etc. b) TCVN standards c) Vietnam Standard Industrial Classification (2018) d) ISO standards (14025, 14067, 14040/44) e) Overall technical standard/guidance for VCLP, which provides the overarching framework and general

No.	Section	Content (to be filled in)
		requirements applicable to all products (To be developed under program)**.**
7	**Terms and Definitions**	**Fish and Seafood Products:** Products derived from marine or freshwater organisms that are processed for human consumption. **Individually Quick Frozen (IQF):** A freezing technology that freezes individual product pieces rapidly to preserve quality and structure. **Value-added Products:** Seafood products that undergo additional processing such as cooking, seasoning, coating, or shaping. **By-products:** Secondary outputs from processing such as fish skin, bones, heads, or shells.
8	**Scope of Evaluation**	
8.1	Declared unit	For processed fish and seafood products covered under this PCR, the carbon footprint shall be reported using a Declared Unit (DU). The declared unit means a specific amount of a clearly defined product at the factory gate, and it is used as the reference for reporting GHG emissions. For fish and seafood products covered under this PCR, the declared unit shall be: *1 kilogram (1 kg) of finished product at the factory gate (packed product ready for distribution).* The declared unit description should clearly state, where relevant: ● The type of product (for example, frozen fish fillet, shrimp, or breaded seafood) ● The species (if applicable) ● How the product is processed (such as raw frozen, cooked, battered, IQF, or block frozen) ● The net weight of the product ● The packaging format, if applicable (such as bulk cartons or retail packs) If glazing is applied, the declared unit shall refer to net weight excluding glazing, unless otherwise specified and clearly justified.
8.2	Steps throughout the product's life cycle.	The scope of this PCR and CFP study is cradle-to-gate, covering processes from raw material acquisition to the factory gate.

No.	Section	Content (to be filled in)
8.3	System boundary and excluded process	For the purpose of defining the system boundary, the product life cycle is divided into the following stages: ● Upstream processes (raw material acquisition) ● Core processes (processing and manufacturing) ● Gate-related processes (packaging, storage, handling and transport until factory gate)

No.	Section	Content (to be filled in)
		 ***Figure A27. System diagram illustrating the processes that are included in the product system, divided into upstream, core and gate-related processes*** This PCR adopts a cradle-to-gate system boundary. Accordingly, the following processes shall be included in the CFP assessment:

No.	Section	Content (to be filled in)
		• **Raw material acquisition**, including fish and seafood raw materials, water, ingredients, additives, auxiliary materials, packaging materials, and associated transportation to the processing facility. • **Processing and manufacturing activities**, including receiving, sorting, washing, cutting, peeling, filleting, trimming, cooking (where applicable), freezing (e.g., IQF or block freezing), glazing, and other value-added processing steps • **Packaging, cold storage, and handling of finished products** up to the factory gate • **Transportation** between all included life cycle stages, including inbound transportation of raw materials and internal transport within the factory • **Energy and utility use**, including electricity, fuels, steam, refrigeration, water supply, and wastewater treatment • **Waste management at the manufacturing site**, including treatment and disposal of wastewater, solid waste, and by-products generated during processing All relevant processing activities and the production of raw and intermediate materials shall be included within the system boundary, unless otherwise specified in this PCR. **Excluded Processes** The following processes shall be excluded from the technical system boundary: • Office activities within the factory • Sales office activities at locations other than the factory • Research and development activities • New product trial or trial phase production activities • Workers' travel to and from the factory • Consumer travel to points of sale • Distribution of the final product from distribution center to users • Product use phase • Manufacturing of production equipment, buildings and other capital goods • Business travel of personnel
8.4	Product Life Cycle Diagram	A product life cycle diagram (Figure A28) shall be provided to illustrate the main life cycle stages and processes included in the cradle-to-gate assessment. The diagram shall present the

No.	Section	Content (to be filled in)
		sequence of upstream, core, and gate-related processes covered under this PCR.  ***Figure A28. Cradle-to-gate life cycle approach of processed fish and seafood products***
9	**Allocation**	The following stepwise procedure shall be applied for multifunctional processes and multiproduct systems: • Allocation shall be avoided, where feasible, by subdividing the unit process into separate sub-processes and collecting specific environmental data for each sub-process. • Where allocation cannot be avoided, inputs and outputs shall be partitioned among products or functions based on underlying physical relationships (e.g., mass or energy content), reflecting how inputs and emissions change with variations in product output. • If physical relationships cannot be established or are not appropriate, another relevant allocation method (e.g., economic value) may be applied. The selected method shall be clearly justified and consistently documented. For processed fish and seafood products covered under this PCR, physical allocation based on production quantity (e.g., mass or output volume) shall be applied as the default method. If by-products have very different market values and using mass-based allocation would give unfair or misleading results, economic allocation (based on product value) may be used, with clear explanation and justification. **Allocation for Recycled and Reused Materials:** When recycled or reused materials are used as inputs, GHG emissions from their collection and transportation shall be included. Emissions from any remanufacturing or preparation processes required before reuse shall also be considered.

No.	Section	Content (to be filled in)
		However, emissions from the original production of these materials shall not be included. Under this approach, recycled or reused raw materials are considered to have zero upstream production impact.
10	**Cut-off criteria**	Cut-off criteria shall ensure that at least 95% of the total mass, energy use, and GHG emissions of the product system are included. Inputs or outputs may be excluded only if their combined contribution is less than 5%. Where specific data are not available, appropriate assumptions or secondary data shall be used instead of omitting the process. All exclusions shall be clearly documented and justified, demonstrating that the 95% coverage requirement is met and that the overall CFP results are not significantly affected.
11	**Data and data quality requirements**	
11.1	Data collection period	Data shall be collected from the most recent annual production or the most recent production period. If data for a period of less than one year are used, the reasons and necessity shall be clearly explained, including justification of the representativeness of the data.
11.2	Data hierarchy and data types	Data shall be selected and applied in the following order of preference: ● **Primary data (site-specific data):** Primary data shall be used wherever available and shall represent the actual processes and operating conditions of the product system under study. Primary data shall be collected directly from the manufacturing site(s) involved in producing the processed fish and seafood product. ● **Secondary data (selected generic data):** These come from widely used sources such as commercial or public databases. They must meet defined quality requirements for accuracy, completeness, and relevance. Secondary data may be used where primary data are not available or not feasible to collect. Secondary data shall be obtained from recognized, credible, and publicly available sources, such as: ➢ National or regional life cycle inventory (LCI) databases ➢ Government-published emission factors (e.g., national grid emission factors) ➢ Peer-reviewed scientific literature ➢ Official databases referenced by the programme operator ● **Proxy data:** These are also taken from common databases but do not fully meet all the quality requirements of selected

No.	Section	Content (to be filled in)
		generic data. They should only be used when better data are not available. As a general principle, specific (primary) data should always be used whenever available, and their quality should be checked before use.
11.3	Data quality requirements	The data quality requirements defined in this PCR address the data quality aspects specified in ISO standards, including coverage, precision, completeness, representativeness, consistency, reproducibility, data sources, and uncertainty. For generic data to qualify as selected generic data, they shall meet the following criteria: ➢ **Time representativeness:** The reference year of the data shall be as recent as possible and appropriate for the period of the CFP study. ➢ **Geographical representativeness:** The data shall reflect the geographical context relevant to the product system under study (e.g., national, regional, or global), or be justified as a suitable proxy. ➢ **Technological representativeness:** The data shall reflect the technology or production processes relevant to the product system, or be based on representative industry-average technologies. ➢ **Completeness and coverage:** The data set shall cover all relevant processes and elementary flows and shall account for at least 95% of total GHG emissions within the defined system boundary. ➢ **Consistency and reproducibility:** Data shall be applied consistently throughout the CFP study and documented in a manner that allows independent review and reproducibility. ➢ **Precision and uncertainty:** Where relevant, data uncertainty shall be considered and qualitatively described, particularly for key contributing processes.
11.4	Assessment of energy and resource consumption	Energy and resource consumption shall be assessed for all production activities and support systems involved in the manufacture of fish and seafood products. This includes electricity, steam, thermal energy, fuel, refrigeration energy, water, ice, and other auxiliary resources. Energy data collection for products shall be carried out in the following order of priority: 1) Actual measurements: Use energy and resource consumption data measured directly from the processing operations (electricity, steam, fuel, refrigeration energy, water, etc.). 2) Technical specifications of machinery: If actual measurements are not possible, use technical data such as

No.	Section	Content (to be filled in)
		the rated power of equipment, operating hours, production capacity, and manufacturer specifications. 3) Allocation of overall data: If neither actual measurements nor technical data are available, use allocation based on available data at the factory or facility level (e.g., production volume or operating time). The allocation method shall be justified and documented. 4) On-site energy generation: ➢ If electricity or steam is generated within the factory, data on the type and quantity of fuel used shall be collected. ➢ GHG emissions from electricity and steam generation shall be calculated based on how much fuel is actually used and how efficiently electricity or steam is produced. ➢ If electricity is purchased from the national grid or another supplier, the most recent official national grid emission factor shall be used.
11.5	Transportation information	For transportation included within the system boundary, the following data shall be collected: **Activity data** ● Transport distance ● Transport mode (truck, ship, rail, etc.) ● Vehicle type and load capacity ● Load factor ● Fuel type or tonne-kilometres transported **Emission factor data** ● Fuel emission factors ● Mode-specific transport emission factors
12	**Collecting data at each stage throughout the life cycle of the target product**	
12.1	**Raw material acquisition process**	
12.1.1	Scope of data	The scope of data collection for the raw material acquisition stage of processed fish and seafood products shall include the amount of GHG emissions arising from the following activities: ➢ Acquisition of main raw materials, including fish and seafood (e.g., fish, shrimp, octopus, and other marine or freshwater species). Where applicable, this shall include fuel consumption from fishing vessels (for wild-caught seafood[16])

[16] Wild-caught seafood: Seafood harvested directly from natural marine or freshwater environments using fishing vessels, rather than produced through aquaculture.

No.	Section	Content (to be filled in)
		and feed production and farm-level energy use (for aquaculture products). ➢ Acquisition of process water and production of ice used during handling and preservation of raw materials ➢ Acquisition of ingredients, additives, coatings, seasonings, and processing aids (where applicable) ➢ Acquisition of auxiliary materials used in cleaning, sanitation, refrigeration systems, and water treatment ➢ Acquisition of packaging and product-wrapping materials (primary, secondary, and tertiary packaging) ➢ Transportation of raw materials, ingredients and packaging materials from suppliers to the production site Where externally sourced intermediate material inputs are used, their upstream cradle-to-gate emissions and allocation approaches shall be included and documented. Recycled and reused materials shall be modelled in accordance with the allocation rules specified in Section 9. Where primary data from raw material producers are required and multiple suppliers exist, data shall be collected from all producers and weighted according to the proportion supplied. If this is not feasible, data shall be collected from a statistically representative sample or from the largest suppliers. Where complete data collection is not possible, the reasons, methodology, scope, and justification for representativeness shall be clearly documented. All data collected shall be consistent with the defined system boundary, declared unit, and life cycle scope of the CFP assessment. Where primary data are not available, secondary data may be applied in accordance with the data hierarchy requirements of this PCR.
12.1.2	List of data to be collected	The following quantitative data shall be collected: ● Amounts of fish and seafood raw materials (kg) ● Origin of seafood (wild-caught or aquaculture) ● For wild-caught seafood: ➢ Fuel consumption of fishing vessels (by fuel type) ➢ On-board refrigeration or ice use (where applicable) ● For aquaculture products: ➢ Quantity of feed used ➢ Energy consumption at farm level (if available) ➢ Relevant farm input data (where applicable)

No.	Section	Content (to be filled in)
		● Amounts of process water and ice used ● Amounts of ingredients, additives, coatings, and processing aids ● Amounts of auxiliary materials (cleaning agents, sanitation chemicals, water treatment chemicals) ● Amounts of packaging materials (primary, secondary, tertiary) ● Transportation data for all inputs (distance, mode, vehicle type, load factor) ● Associated GHG emission factors for all materials and transport activities All data shall be consistent with the declared unit and system boundary defined in this PCR.
12.2	**Production stage**	
12.2.1	Scope of data	The scope of data collection for the production stage of processed fish and seafood products shall include the amount of GHG emissions arising from the following activities: ● Storage and handling of raw materials, including chilled and frozen storage ● Receiving, sorting, grading, washing, cutting, peeling, filleting, trimming, and other preparation processes ● Cooking, steaming, frying, baking, marinating, coating, breading, glazing, or other value-added processing activities (where applicable) ● Freezing processes (e.g., IQF or block freezing), cold storage, and refrigerated handling of intermediate and finished products, including refrigerant use and potential leakage (where applicable) ● Packaging, labeling, palletizing, and storage of finished products up to the factory gate ● Use of electricity, fuels, steam, thermal energy, refrigeration energy, water, and other utilities ● On-site energy generation (where applicable) ● Wastewater treatment activities, including potential methane (CH_4) and nitrous oxide (N_2O) emissions (where applicable) ● Solid waste management and by-product handling (e.g., skin, bones, heads, shells) ● Internal transportation and movement of materials and products within the facility

No.	Section	Content (to be filled in)
		All data collected shall be consistent with the defined system boundary, declared unit, and cradle-to-gate life cycle scope of the CFP assessment. Production yield (input-output ratio) shall be documented to ensure appropriate allocation of emissions between main products and by-products in accordance with Section 8. Where primary data are not available, secondary data may be applied in accordance with the data hierarchy requirements of this PCR.
12.2.2	List of data to be collected	The following quantitative data shall be collected: ● Raw materials entering production (kg) ● Finished products and by-products produced (kg) ● Production yield (input-output ratio) ● Electricity consumption (kWh) ● Fuel consumption (by fuel type) ● Steam and thermal energy consumption ● Refrigeration and freezing energy consumption ● Refrigerant type and leakage rate (where applicable) ● Water consumption (m^3) ● Ice production and consumption (if produced on-site) ● Ingredients, additives, and processing chemicals used ● Packaging materials used during production ● Wastewater volume and treatment method ● Direct emissions from wastewater treatment (CH_4, N_2O where applicable) ● Solid waste and by-products generated and treatment method ● On-site energy generation data (if applicable) ● Internal transportation data (if significant) ● Associated GHG emission factors Transportation and energy-related data shall be collected in accordance with the data requirements specified in Section 11.
13	**CFP Reporting**	
13.1	Style, position, and size of the mark	CFP information shall be displayed using three significant digits, expressed in g or kg CO_2e, and in accordance with the applicable criteria and conditions for use of the CFP mark.

No.	Section	Content (to be filled in)
		If the CFP is cradle-to-gate, the communication shall clearly state "cradle-to-gate" system boundary. Where the same product is manufactured by multiple manufacturers, the weighted average CFP shall be reported.
13.2	Additional information and content	Display additional information that is a guideline for consumers to help reduce their CFP or information to create awareness of their participation in reducing their CFP. Optional information that may be displayed alongside the label includes: ● Product details (product type, emission reduction measures, standard used, company commitment, verification frequency, and official website link); ● Reference to the accredited verifier and validity period of certification; ● QR code or digital link providing access to the detailed certification report and supporting documents, thereby enhancing transparency and traceability.

GHG emission factors associated with a product.

Table A 4. GHG emissions values

Sequence number	list	unit	GHG emissions ($kgCO_2$ eq./unit)	Source of EF	Update date
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Note: The GHG emission values in Table A6 should be verified against the current values announced by the ********** Organization.

ENERGY TRANSITION PARTNERSHIP
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