

Guidelines for Quantifying GHG emission
reductions of goods or services through Global
Value Chain

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Ministry of Economy, Trade and Industry

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Introduction

The Ministry of Economy, Trade and Industry (METI) launched the “Long-term Global Warming Countermeasures Platform” in 2016, toward the reduction of Greenhouse Gas (GHG) emissions on a long-term basis beyond 2030, by bringing together experts from the government, industries, and academia. Compiling the report in April, 2017, METI’s report stipulates “three arrows” which are game changers as countermeasures against global warming: “International contributions”, “Global value chain reductions by industries and companies” and “Innovation”. In order to reduce global GHG emissions further, it is important for industries to take drastic steps to contribute to reducing GHG emissions through the dissemination of environmentally-friendly goods or services.

Quantifying and clarifying contributions to global GHG reductions provides motivation for success, so “visualization” of contributions to reducing emissions of GHGs is important. As one effort towards this goal, Japanese industries have applied a system called “pledge and review” – in which companies pledge their own GHG reduction targets, implementing actual measures to achieve the targets, reviewing the measures and taking advanced global warming countermeasures- and the system has contributed to reductions of GHG emissions. “Contribution through low-carbon goods or services” and “international contributions” have already been included in and are now regarded as one of the important pillars in the Japan Business Federation’s “Commitment to a Low-Carbon Society”. Some industries in Japan are taking initiatives to quantify their reductions of GHG emissions, called avoided emissions.

Globally, the International Council of Chemical Associations (ICCA) and the World Business Council for Sustainable Development (WBCSD) have published global guidelines and recorded the practices of contribution efforts and published lists of these. Also, the International Electrotechnical Commission (IEC) published “IEC TR 62726” which is the guidance on quantifying GHG emission reductions for electrical and electronic products and systems.

Each industry, company and other organization has developed its own methodologies for calculating avoided emissions, with different explanations and definitions, calculating and reporting. Consequently, METI established “the Study Group for Greenhouse Gas Emission Reduction Contribution through the Global Value Chain” in 2017, aiming at further clarification of industrial and corporate activities to both create

and calculate avoided emissions, as well as at further expansion of these efforts. The study group referred to existing quantification methodologies and guidelines, and developed these guidelines. These guidelines introduce the basic concepts for quantifying and clarifying each organization's avoided emissions through the dissemination of goods or services through the value chain. It is expected to be referred to when organizations quantify contributions of their goods or services and explain their contributions and efforts to stakeholders. These Guidelines prepare the basic methodologies for calculation of avoided emissions and can be used both domestically and internationally.

1 Use of the Guidelines

The Guidelines have been formulated to introduce the fundamental principles and framework for quantifying avoided emissions through disseminating environmentally-friendly goods or services through the value chain. Based on these Guidelines, organizations are expected to quantify and clarify avoided emissions, to communicate with stakeholders and to make further contributions to building a low-carbon society.

2 Framework for calculation

2.1 Greenhouse gases applicable for calculation

Greenhouse gases in these guidelines include the following:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Hydrofluorocarbons (HFCs)
- Perfluorinated carbons (PFCs)
- Sulfur hexafluoride (SF₆)
- Nitrogen trifluoride (NF₃)

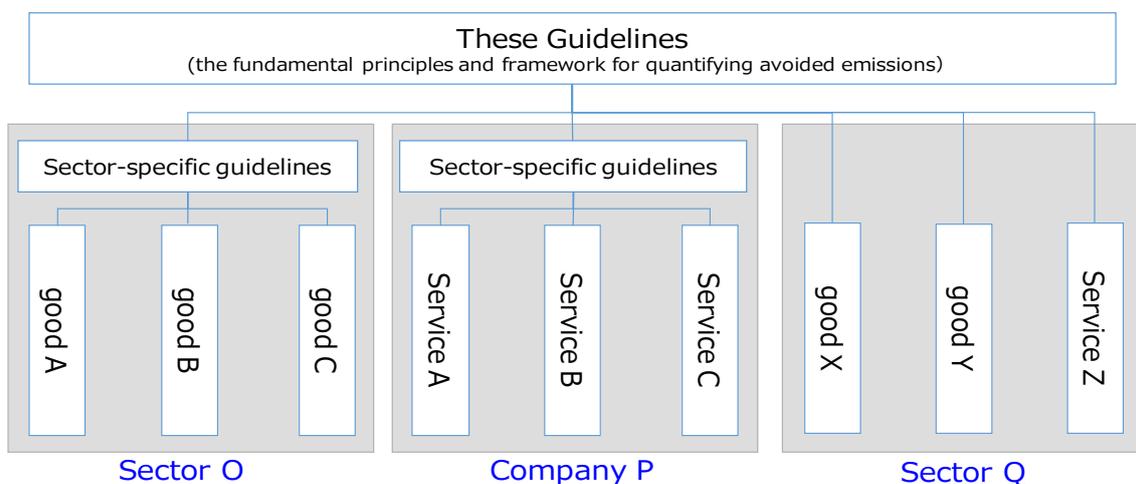
They were specified in the 17th session of the UNFCCC Conference of the Parties (COP17) and the 7th session of the Conference of the Parties serving as the Meeting of the Parties (CMP7).

2.2 Scope of these Guidelines

These Guidelines introduce the fundamental principles and framework for calculating avoided emissions through which organizations can be recognized for reducing GHG emissions with their own goods or services at each life cycle stage (from raw material acquisition, production, use, through end-of-life).

Sector-specific guidelines, which reflect each sector's particular features, could be placed under these Guidelines.

Figure 1. Relationship between These Guidelines and Sector-specific guidelines



2.3 Application of these Guidelines

These guidelines can be applied when organizations quantify avoided emissions not only on the goods / services level but also on the organizational level. When it comes to quantifying avoided emissions on the organizational level, the quantification can be achieved by aggregating each individual amount of avoided emissions for every good or service within that organization. Organizations are recommended to refer to these Guidelines when they quantify and clarify avoided emissions.

Box 1. Example of application

Organizations are expected to refer to these guidelines when they explain avoided emissions to stakeholders (e.g. informing public policies, demonstrating the environmental performances of goods or services to consumers).

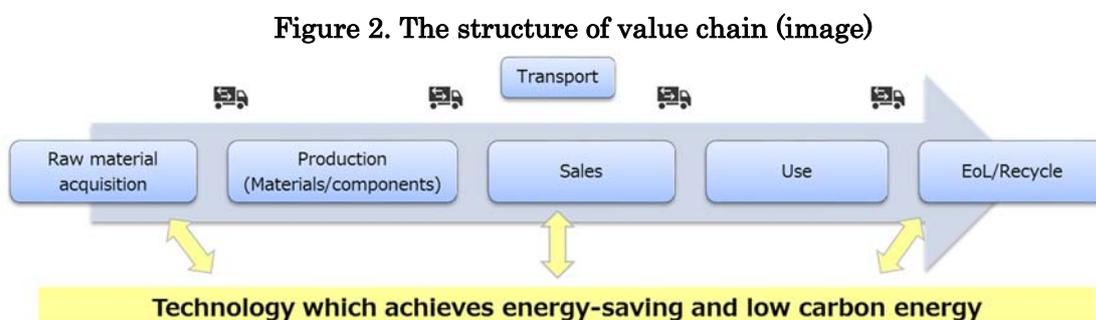
3 Terms and definitions

Organization

A company, corporation, firm, enterprise, authority or institution regardless of whether incorporated or not, public or private.

Value chain

The sum of values associated with individual steps in business operations from raw material acquisition through production, sales, use and end-of-life of goods or services, visualized as a chain.



Goods or services

This term refers to final products, components, materials and services.

The amount of greenhouse gas emissions

It refers to the total weights of GHGs released into the atmosphere during a certain time period (e.g. 1 year) estimated in CO₂ equivalent. In order to calculate the amount of GHG emissions, the weight of the seven GHGs above are multiplied by Global Warming Potential (GWP), converted into CO₂ equivalent, and aggregated.

Avoided emissions (see Chapter 5)

Assessed goods or services

The goods or services which organizations will use to quantify avoided emissions.

Baseline scenario

Hypothetical scenario that is most likely to occur case when assessed goods or services would not be produced or in use.

Baseline emissions

The estimated value of the amount of GHG emissions released from the baseline scenario

Flow Base Approach (see Chapter 5.5)

Stock Base Approach (see Chapter 5.5)

Quantity of goods/services in use

The amount of assessed goods or services that has been sold and used within a specified time period

Specified time period when the assessed goods or services are in use

The period of time intended for quantification of avoided emissions for assessed goods or services after consumers begin using them.

Assessment documents for avoided emissions

Documents developed by organizations that are used to quantify avoided emissions and communicate with their stakeholders.

4 Principles

These Guidelines shall be based on the following principles. Those principles will guide organizations in making decisions when they have flexibility and discretion in quantification and calculation of avoided emissions. Also, when specific requirements are not satisfied under certain circumstances, they should refer to this principles.

【 Relevance】

- Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.

【 Completeness】

- Account for and report on all GHG emission sources and activities within the chosen inventory boundary.
- Disclose and justify any specific exclusions.

【 Consistency】

- Use consistent methodologies to allow for meaningful comparisons of emissions over time.
- Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

【 Transparency】

- Address all relevant issues in a factual and coherent manner, based on a clear audit trail.
- Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

【 Accuracy】

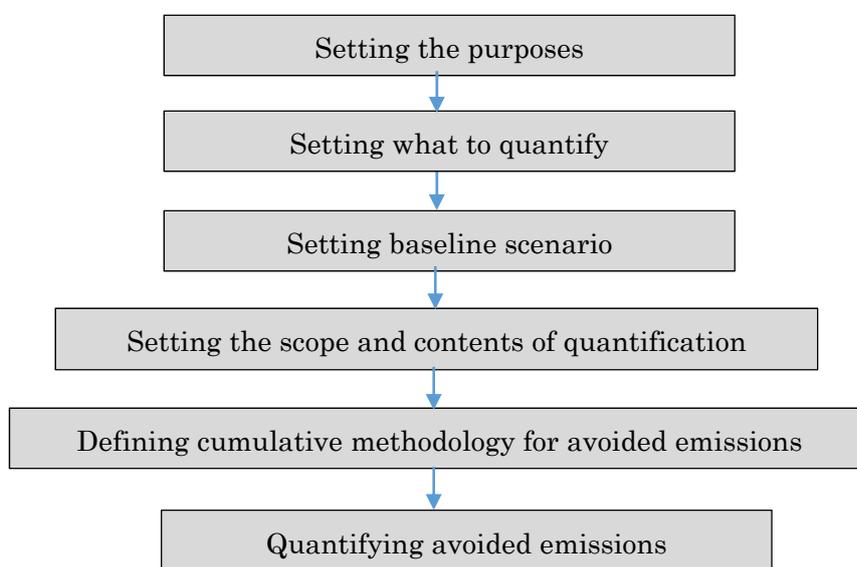
- Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable.
- Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

5 Definition of “Avoided Emissions” and steps for quantification

In these Guidelines, the “avoided emissions” are defined as the “quantified contribution to the GHG emission reductions which are estimated throughout the life cycle GHG inventory of environmentally-friendly goods or services in comparison to goods or services that represent what is most likely to occur in the absence of assessed goods or services(baseline scenario)”.

Basic steps for quantifying avoided emissions:

Figure 3. Basic steps for quantifying avoided emissions



5.1 Setting the purposes

The purposes for quantifying avoided emissions shall be clarified. The target audience and reporting method should also be clarified.

5.2 Setting what to quantify

Assessed goods or services are final products or intermediate products such as components or materials which are functional components of final products. Regardless, the functions or content of assessed goods or services shall be clarified. Avoided emissions are the sum of reduction effects of assessed goods or services throughout their life cycle. If assessed goods or services are from intermediate products, a description of the final products incorporating those products may be helpful in relevant explanations.

5.3 Setting baseline scenario

The baseline scenario shall be clarified to ensure credibility for adopting the scenario. The baseline scenario can be described as follows, for example:

- Goods or services which already exist in the market
- Standard values that are determined based on current legislations or regulations
- Average values of goods or services of industries

5.4 Scope and content of quantification

1) The stages in the scope

The scope of quantification generally includes all stages in the life-cycle of assessed goods or services and their cumulative baseline emissions.

In the following cases, the scope of the quantification could be limited to specific stages of the life-cycle. For reporting, however, the selected life-cycle stages and the reasons why the scope was selected shall be clarified.

- Some stages in the life cycle are very similar or nearly identical to goods or services in the baseline scenario.
- The GHG emissions from a certain stage is significantly larger (e.g. the use stage of energy-intensive products) to the degree that other stages are negligible in comparison and can be ignored.
- Data collection at certain life-cycle stages is difficult and the lack of data would not significantly affect the results.

2) Greenhouse gases in the scope

If only some of the seven specified GHGs are selected in the quantification scope, the reasons shall be clarified.

3) Clarifying the system boundary for quantification and calculation

The system boundary for quantification should be clarified by providing flow diagrams of life cycles of assessed goods or services and baseline scenario.

If assessed goods or services are intermediate products and they achieve reduction effects through their use in final products, the final products, as they pertain to the activities of the company, shall be included in the scope of quantification (system boundary).

If a significant amount of GHG emissions is assumed to occur outside the boundary despite the reduction of GHG emissions within the boundary, the influence should also be clarified.

5.5 Methodology for calculation

Organizations can choose either methodology stated below depending on the use goals of avoided emissions, but they should clarify which methodology they have adopted.

When organizations quantify avoided emissions for a certain purpose, in principle they shall adopt the same calculation methods for all calculations. If assessment documents for avoided emissions contain results based on numerous different calculation methods, the fact should be clearly stated and the reasons explained.

- (1) Flow Base Approach: the case focusing on avoided emissions of assessed goods or services during the entire product lifetime (incorporates the entire life-cycle of the goods or services)

This methodology calculates cumulative amounts of emissions avoided by using the assessed goods or services manufactured or sold within the assessment period (e.g. for one year), assuming that they are used until the end of their life cycle.

- (2) Stock Base Approach: the case focusing on avoided emissions of assessed goods or services during an assessment period (focus on the period of the assessment)

This methodology calculates amounts of avoided emissions for all the assessed goods or services that are produced, sold or used during a specific assessment period including past sales.

5.6 Fundamental steps for quantification

Avoided emissions can be calculated by the formula below.

1) Flow Base Approach

Avoided emissions per assessed good/service are calculated with the following formula. This formula provides the environmental performance of the assessed good/service.

$$\textcircled{1} \text{ Avoided emissions (per good/service unit)} \\ = \textcircled{3} \text{ Baseline emissions} - \textcircled{2} \text{ Emissions using assessed goods or services}$$

- ① Amount of emissions avoided per unit of good/service
- ② The amount of GHG emissions of assessed goods or services during the lifetime
- ③ The amount of GHG emissions of goods or services in a baseline scenario during the lifetime

Avoided emissions for the entire organization is quantified by multiplying “① Avoided emissions (per good/service unit)” by “the amount of good/service in use”. The formula provides the potential effect of assessed goods or services during an assessment period.

$$\textcircled{4} \text{ Avoided emissions (organization unit of Flow Base Approach)} \\ = \sum (\textcircled{1}_i \text{ Avoided emissions (per good/service unit)} \\ \times \textcircled{5}_i \text{ The quantity of good/service in use})$$

- ④ Avoided emissions as a unit of organization (Flow Base Approach)
- ⑤ The amount of assessed goods or services in use during an assessment period

“i” represents assessed goods or services within the scope of quantification.

2) Stock Base Approach

Avoided emissions per unit of organization are quantified with the following formula.

$$\textcircled{1} \text{ Avoided emissions (the entire organization unit of Stock Base Approach)} \\ = \textcircled{3} \text{ Baseline emissions} - \textcircled{2} \text{ Assessed goods or services emissions}$$

- ① Avoided emissions for the entire organization (Stock Base Approach)
- ② Assessed goods or services emissions during an assessment period
- ③ Baseline emissions during an assessment period

“② assessed goods or services emissions during an assessment period” is calculated with the following formula (the same formula is adopted for calculating ③).

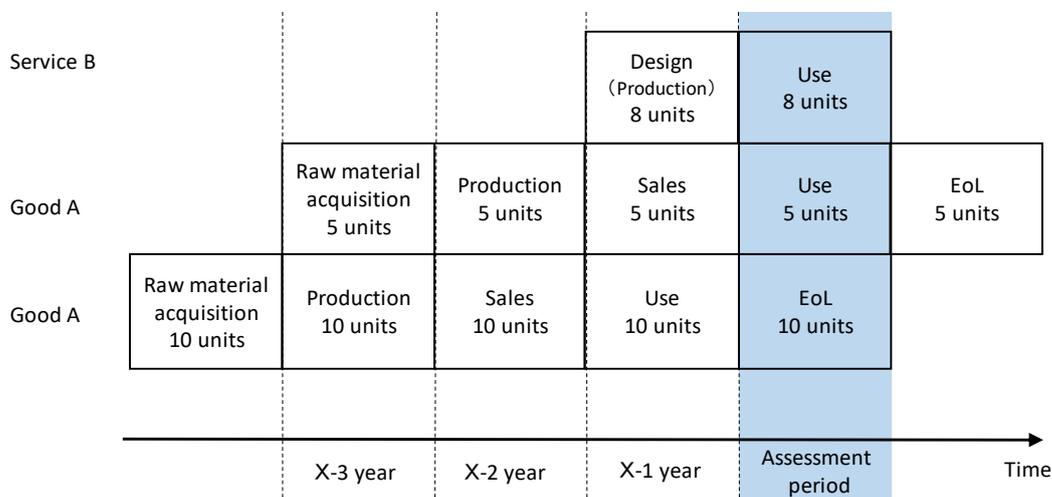
$$\textcircled{2} \text{ Assessed goods or services emissions} \\ = \sum (\textcircled{4}_i \text{ Emissions at each life-cycle stage} \\ \times \textcircled{5}_i \text{ Number of goods or services at each life-cycle stage})$$

- ④ GHG emissions that occurred at each life-cycle stage of assessed goods or services during an assessment period (If a certain life-cycle stage is selected in the scope, it refers to the GHG emissions at the stage).
- ⑤ The number of assessed goods or services at each life-cycle stage during an assessment period (e.g. If the use stage is selected in the scope, it is the number of goods or services used during the assessment period).

“i” represents each life-cycle stage of assessed goods or services in the scope of quantification.

The formula provides the performance of avoided emissions in the organization during an assessment period.

Figure 4. An example of quantification using the Stock Base Approach



The amount of GHG emissions of Good A and Service B based on Stock Base Approach during the assessment period
 = 1 unit of good A emissions at use stage × 5 + 1 unit of Production A emissions at EoL × 10
 + 1 unit of Service B emissions at use stage × 8

5.7 Identifying the amount of goods or services in use

The reduction of GHG emissions is performed when the assessed goods or services are in use. Therefore, the amount of assessed goods or services in use during a specified time period should be verified for calculation.

If it is difficult to acquire data on the amount of goods or services in use, other data such as the production or shipped volume may be substituted.

5.8 Defining the data quality and underlying assumptions

Quantifying avoided emissions requires collecting a variety of data and developing scenarios with specific assumptions. These facts should be noted to ensure both the transparency of the data and the quality of data and scenarios used.

Generally, assessed goods or services and the baseline scenario should share the same assumptions to the extent possible, and organizations adopt data with similar levels of credibility.

6 Verification

The assessment documents for avoided emissions should be verified including internal verification. If the verification is performed, the verifiers and contents of verification should be clarified.

7 Reporting

The following items shall be included in reports to communicate with stakeholders in the assessment documents for avoided emissions.

- Purposes for calculation
- Features and content of assessed goods or services
- Baseline scenario including its definition
- Scope of quantification (life-cycle stages, GHG in the scope, system boundary of quantification)
- Results of avoided emissions calculations

The following items should be included depending on the purposes in the assessment documents for avoided emissions.

- The target audience and reporting methods
- Calculation methodologies of avoided emissions
- Quality of data and underlying assumptions
- Implementation of verification (If implemented, include verifiers and verification contents)
- Other notes

Box 2. For enhancing credibility of reporting

When organizations claim their avoided emissions, they can enhance the credibility by reporting the organization's GHG inventory including scope 1, 2 and 3.

References

The following international standards and existing guidelines were referred to in developing the Guidelines.

- ISO14040 : Environmental management ~ Life Cycle Assessment ~ Principles and framework (2006)
- ISO14044 : Environmental management ~ Life Cycle Assessment ~ Requirements and guidelines (2006)
- IEC TR62726 : Guidance on quantifying greenhouse gas emission reductions from the baseline for electrical and electronic products and systems (2014)
- World Business Council for Sustainable Development / World Resource Institute, The GHG Protocol for Project Accounting (2005)
- ISO14064-1 : Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals (2006)
- Guidelines for Assessing the Contribution of Products to Avoided Greenhouse Gas Emissions (The Institute of Life Cycle Assessment, Japan)
- Guidelines for Accounting CO₂ Avoided Emissions (Japan Chemical Industry Association)
- Addressing the Avoided Emissions Challenge (ICCA : International Council of Chemical Associations / WBCSD Chemicals)