PACT
PARTNERSHIP FOR CARBON TRANSPARENCY

Calculating the carbon footprint of your products

A simple how-to guide for those beginning their product carbon footprint journey

PACT, April 2025

Powered by WBCSD World Business Council for Sustainable Development

This guide is meant to help you begin your Product Carbon Footprint (PCF) journey

This guide in brief

Why? Getting started with product-level carbon accounting can seem daunting – this guide hopes to answer common questions and make users feel empowered to get started

What? This guide is a simple introduction to PCF calculation in accordance with the PACT Methodology and how it can be used

For whom? Any company wanting to calculate PCFs for the first time but unsure how to get started

How to use this guide

This guide has **three sections**:

1. **Introduction:** introduces the key concepts around PCFs and contextualizes them
2. **The PCF Journey:** main section – describes step-by-step approach to calculating a PCF from scratch
3. **Levelling Up:** explains how you can take your PCF to the next level and unlock its full potential

Throughout the guide you will find **deep-dives and exercises** so you can learn more about specific concepts and test your newly acquired knowledge.

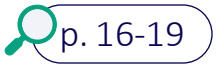
You can jump back and forth between sections to review concepts at any point

Note: How-to-guide content will be updated accordingly once updated versions of the PACT Methodology are released or when additional clarity is needed based on users' feedback. A *table* in the updated versions of the PACT Methodology will be available to understand what changed from previous versions.

This guide assumes no prior knowledge of the PACT Methodology or PCFs – however, more advanced users might still find it valuable

If you are…	…this guide can help you	Start with…
Beginning: You have never calculated a product carbon footprint before, and are not familiar with the PACT Methodology	**Understand:** Understand the key concepts and steps needed during a PCF calculation	Introduction
Intermediate: You have started calculating PCFs using the PACT Methodology but may still have specific questions	**Review:** Review specific methodological questions that frequently come up	The PCF journey
Advanced: You have already calculated many PCFs and know the PACT Methodology inside-out	**Find inspiration:** Find inspiration on how you can leverage PCFs to unlock value for your organization	Levelling Up

Structure of the document

Part 1: Introduction	Understanding the why, what, and how of Product Carbon Footprints
Part 2: The PCF Journey	A step-by-step guide to calculating a PACT Methodology-PCFs from scratch
Part 3: Levelling up	Taking your PCF journey to the next level
Glossary	Useful definitions
	When this logo appears, it means that the item is a specific PACT requirement
	This will give you relevant pages in the PACT Methodology

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Part 1: Introduction

Understanding the why, what, and how of Product Carbon Footprints

Jump to

Part 1: Introduction
Part 2: The PCF Journey
Part 3: Levelling Up

To achieve granular emissions data, companies need to measure GHG emissions associated to purchased products, also known as PCFs

What is PCF

A Product Carbon Footprint (PCF)

- Measures the **total GHG emissions** of a product in CO_2e
- Includes emissions generated during **different life cycle stages** of a product
- Can be **calculated for any product** – no matter how complex the product is

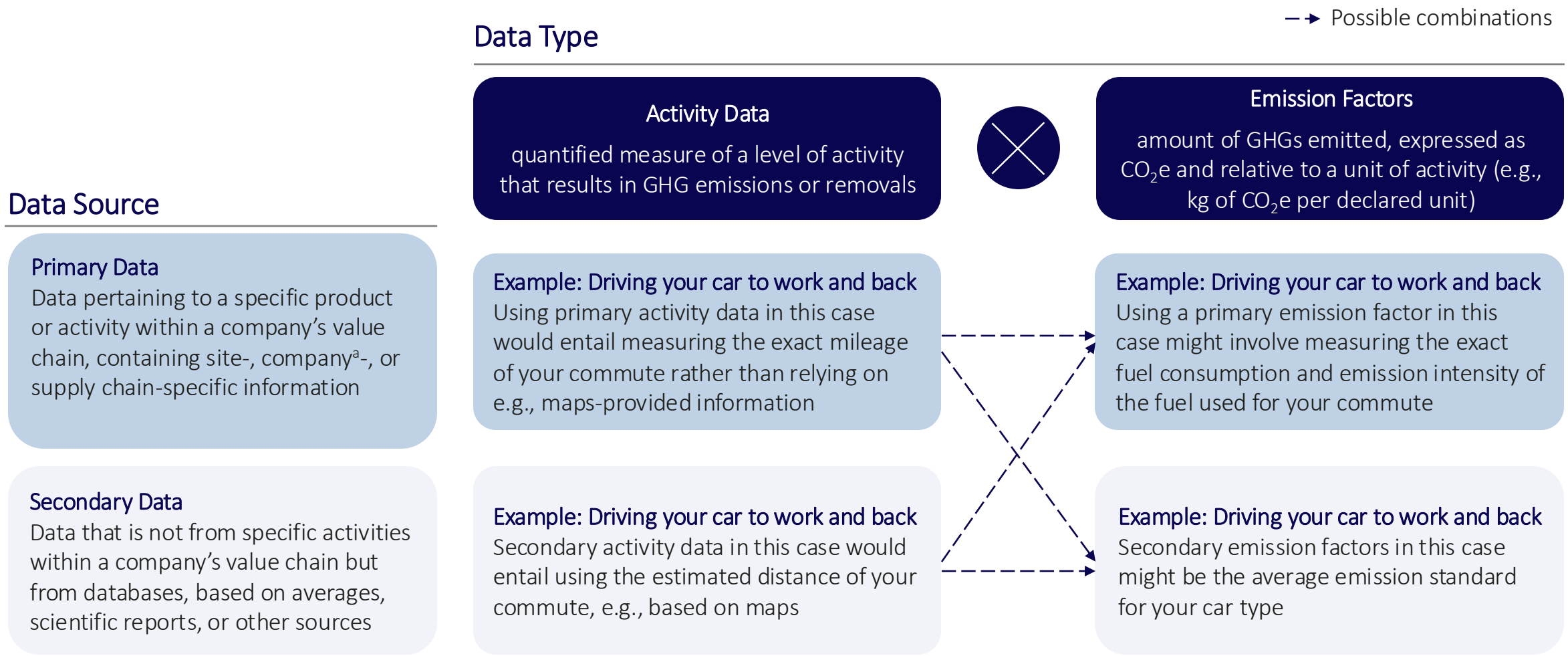
Common characteristics of a PCF

Relative metric: PCFs reflect the emissions intensity of any given product – a PCF is thus expressed as kg CO_2e per declared unit of the product

Targeted scope: A PCF focuses on GHG emissions – it is therefore less comprehensive and more targeted than a full life-cycle assessment (LCA)

Multiple uses: A PCF can be used for many purposes – these include tracking decarbonization measures as well as marketing

A PCF has two main “ingredients” – activity data and emission factors – both of which can be collected from primary or secondary sources



a. If there are multiple sites for the same product

PCFs can have several different boundaries depending on the activities related to the product manufacturing included by the company

Possible boundaries for a PCF

Gate-to-gate:

- A gate-to-gate PCF includes only the emissions resulting from activities within a reporting company's own facilities, not their value-chain

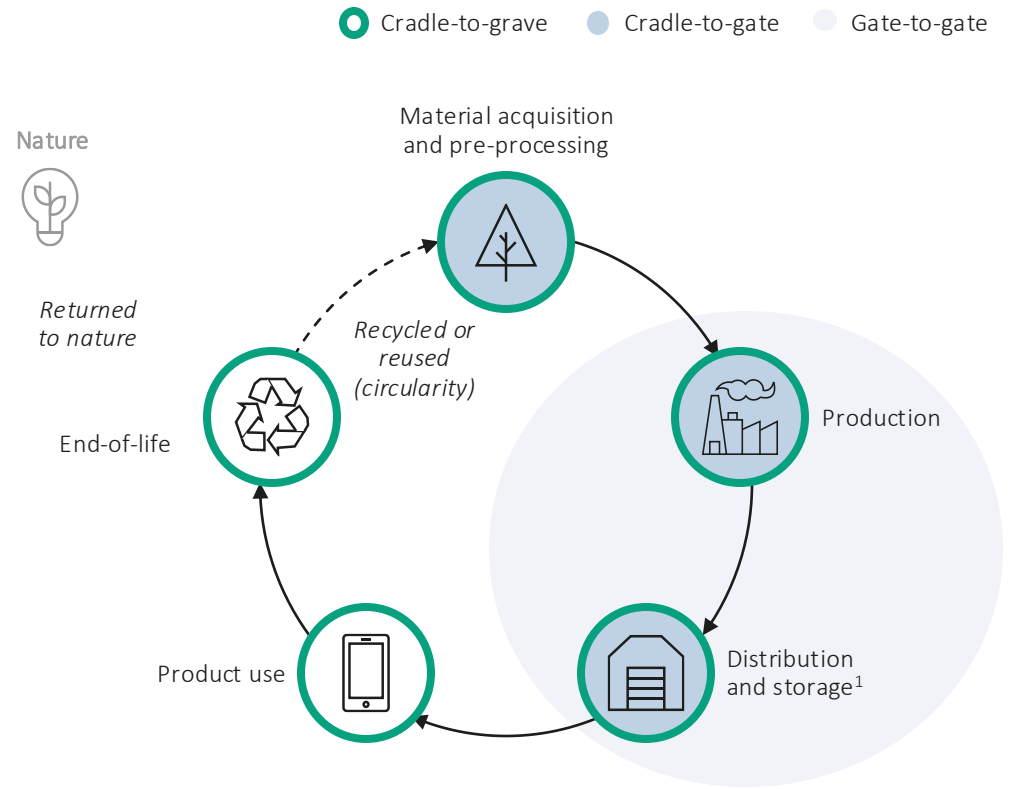
Cradle-to-gate:

- A cradle-to-gate PCF includes all emissions resulting from activities upstream of the reporting company as well as within the company. PACT conformant PCFs are cradle-to-gate PCFs (highlighted in green on the right)

Cradle-to-Grave:

- A cradle-to-grave PCF includes emissions from all processes associated with the product, including downstream processes (e.g., use and end-of life), after the product has left the company's control

Lifecycle stages and boundaries



1. Contains product storage and shipping processes, including transportation within and between these life cycle stages. Outbound transportation and storage should be calculated and reported separately up to the point where another company takes over responsibility for the product (i.e., owns or pays for outbound logistics).

Deep-Dive: Understanding the definition of a “gate”

Context

There are **different ways** to define the “gate” in “cradle-to-gate”

In particular, you may have three questions:

- **Whose gate** is the gate in question?
- To what extent are **steps after** a product leaves the company’s gate included?
- To what extent may the definition of a gate **vary by context** (e.g., industry)?

Explanation

Whose gate?

The gate refers to the **exit gate of the reporting company,** i.e., the gate as the product leaves the reporting company’s direct control.

It does **not refer** to the customer’s gate.

Are any steps included after the product leaves the company’s gates?

If a reporting company **directly transports and stores a product at its own facility or pays a 3rd Party to do so**, this transportation and storage is calculated and reported separately from the cradle-to-gate PCF (see visual explanation here)

If another company manages transportation and storage, it is not calculated and reported by the reporting company.

Does the definition of gate depend on context?

Depending on the industry and business model of the company, it may be that **specific steps should be included** in a cradle-to-gate PCF even after a product has left the company’s gate.

The PACT Methodology is PACT's industry-agnostic emissions accounting methodology, which was launched in April 2025 (v3)

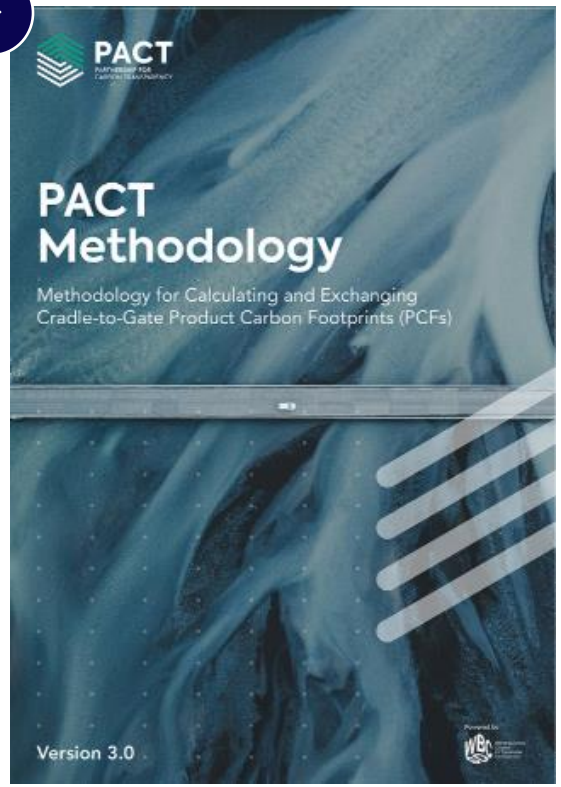
Context

Why?

Harmonization: diverse and diverging approaches to product-level accounting

Consistency: too much flexibility in current accounting methodologies

Ambition: Encouraging companies to get started and providing pathways to improve



Building blocks

Emissions accounting

- Existing methods and standards
- Scope and boundary
- Calculating PCFs

Data integrity

- Data sources and hierarchy
- Primary data share calculation
- Data quality assessment

Verification

- Verification roadmap

Data Exchange

- Data attributes for data exchange
- Integrating PCFs into Scope 3 inventories

Download the PACT Methodology here

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Part 2: The PCF journey

A step-by-step guide to calculating a PACT Methodology-aligned PCFs from scratch

Jump to

Part 1: Introduction | Part 2: The PCF Journey | Part 3: Levelling Up

Moving to product level can seem challenging – which is why starting with key material products and suppliers is essential

Key challenges

- **Large product portfolios** making it difficult to calculate individual PCFs for all of them
- **Data gaps** meaning not all relevant information will be easily available
- **Significant resources required** to get started, and even more to scale product-level carbon accounting
- **Reliance on external stakeholders** when working with supply-chains emissions – a company cannot calculate a PCF on its own

Our proposed approach

- **Top-Down:** As you begin your PCF journey, focus on most material purchased products
- **Strategic:** Improve data quality and availability where it matters most
- **Iterative:** Begin small (i.e., key material products and suppliers) to learn by doing and establish processes
- **Collaborative:** Invite suppliers to be part of the journey, upskill, and share knowledge with each other

Your PCF-journey, from start to finish, involves 8 steps

Back to this step slide

1 Selecting a product

Overview: Choosing a product to calculate the PCF to get the most value out of the data

2 Choosing a calculation basis

Overview: Picking the calculation standard best suited to your products and requirements

3 Understanding your data needs

Overview: Mapping the value chain of your product enables you to gather the right data

4 Collecting data

Overview: Gathering activity & emissions data for all activities associated with your product

5 Calculating the PCF

Overview: Calculating the PCF and taking additional steps as needed, e.g., allocation, biogenic emissions

6 Assessing data reliability

Overview: Assessing data reliability using quantitative and qualitative metrics

7 Verifying your PCF

Overview: Ensuring data reliability through third-party verification

8 Exchanging your data

Overview: Consolidating all information around your PCF and sharing it with other stakeholders

Each step includes **key explanations, content deep-dives, examples and exercises** for you to test your understanding

1 Selecting a product: Choosing the right data inputs can increase the value of your PCF Calculation - three considerations for strategic product selection

Overview

Before deciding which products to focus on, you should consider these three dimensions:

- **Stakeholders:** Have key stakeholders (e.g., a customer) requested this information?
- **Capability:** Which internal and supplier capabilities can be leveraged to obtain a PCF?
- **Strategy:** Which PCF data will be most important in your strategy?

Detail/Explanation

By considering these three aspects in a **materiality assessment**, you can compile a **list of prioritized products** to obtain PCFs from:

Stakeholder Focus

Focusing on products that meet the **reporting needs of key stakeholders**, e.g., customers, regulators or investors

Capability Focus

Focusing on products for which the **greatest capabilities already exist**, e.g., due to past LCA or in depth understanding of product

Strategy Focus

Focusing on products which are **strategically** the most important, e.g., from a financial, decarbonization, climate related risk or branding perspective

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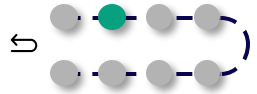
2 Choosing a calculation basis: Your chosen calculation standard will determine how you approach the calculation – it should fulfill three criteria

Overview

In the context of PCFs, calculation standards provide guidance regarding boundary of a PCF, calculation steps and data requirements as well as data quality considerations. Standards seek to achieve consistency and comparability of PCFs.

Detail/Explanation



When choosing a calculation standard, you should consider these three criteria to determine whether a standard is suitable for your PCF:

Granular: Your chosen calculation standard needs to be on the appropriate level of granularity for a PCF, i.e., the product-level

Specific: Your chosen calculation standard ideally is specific to your particular product – this will give you more guidance when conducting the calculation

Aligned: Your chosen calculation standard should be aligned with the PACT Methodology, industry expectations and regulatory requirements

2 Specificity & Alignment: Companies can conduct a screening exercise to determine which standard or PCR is the most relevant for their context

Screening order →

Criteria order ↓

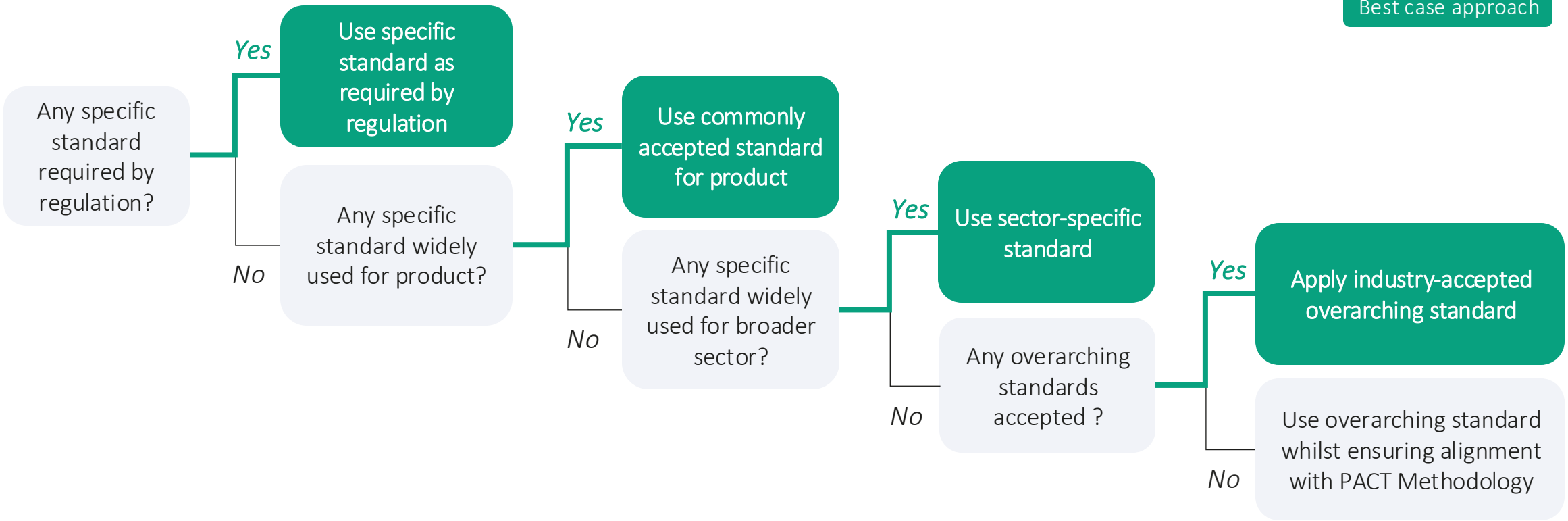
Screening Criteria	Product-specific rules	Sector-specific rules	Cross-sectoral standards
	Example: PCRs for basic chemicals	*Example: Guidance by TfS*	*Example: ISO14067 in conjunction with PACT Methodology*
Regulation	Does any **applicable regulation** mandate the use of a particular PCR? (e.g., upcoming EU Battery Regulation)	Does any **applicable regulation** mandate the use of a particular industry standard?	Does any **applicable regulation** mandate the use of a particular standard?
Acceptance by industry	Does an industry body **maintain a list of accepted PCRs?**	Is the standard **accepted across the industry** or are the divergent standards?	Is the standard **accepted by the industry** of the underlying product?
Geography	Are there any PCRs accepted specifically for the **geography of production or marketing?**	Is the standard **accepted in the region** of the production and marketing of the product?	Is the standard **accepted in the region** of the production and marketing of the product?
Acceptance globally	Are there any PCRs that are **widely used globally?**	Is the standard **widely used globally?**	Is the standard **widely used globally?**

Note: screening order represents desired level for specificity, but ultimate choice will depend on company's strategy and needs

2 Specificity & Alignment: Companies should always aim to use the most specific standards for their products, as these will increase consistency and granularity of PCFs

Use regulation driven product-specific rules | Use product category rules | Use industry-accepted standard | Use accepted overarching standards

Best case approach



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3 Understanding your data needs: The PACT Methodology focuses on three stages of a product's lifecycle, resulting in cradle-to-gate product carbon footprints

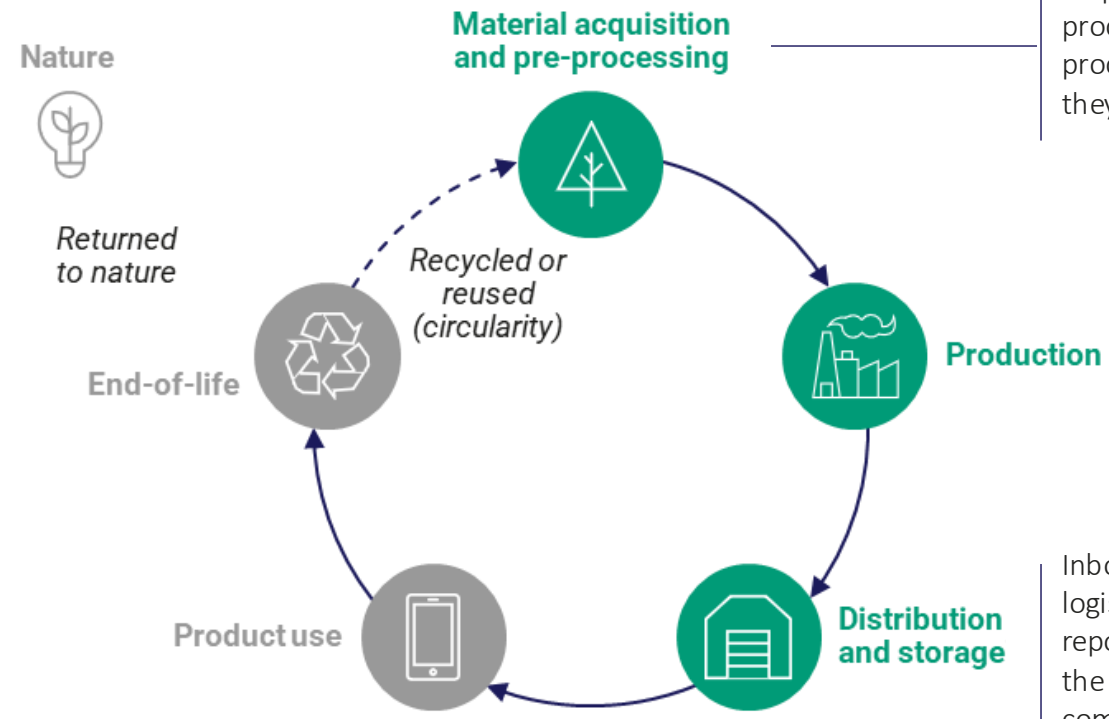
Overview

Understanding your value chain for a PCF involves understanding three steps of a product's life-cycle:

- Material acquisition and pre-processing: Input of raw materials and intermediate goods and processes around the initial processing of such inputs
- Production: Activities related to transforming the inputs into final product (at that step of supply-chain)
- Distribution and storage: Product storage and shipping processes, including transportation within and between these life cycle stages

Note: carbon credits/offsets are out of scope

Detail/Explanation



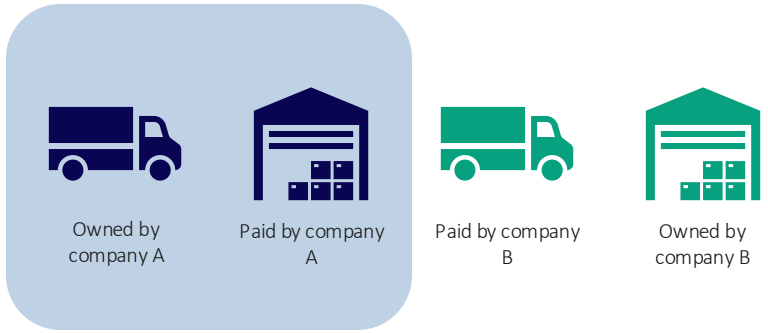
All processes related to procurement of inputs and processing of inputs before they enter production

All activities directly related to transforming the raw inputs into final product (at that step of supply-chain)

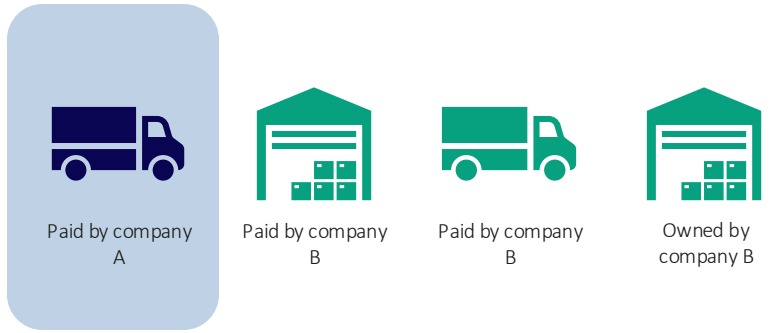
Inbound logistics. Outbound logistics calculated and reported separately up to the point where another company takes over responsibility for the product

3 Deep-Dive: Transportation to and storage are calculated and separately reported up to the point where another company takes over responsibility for the product

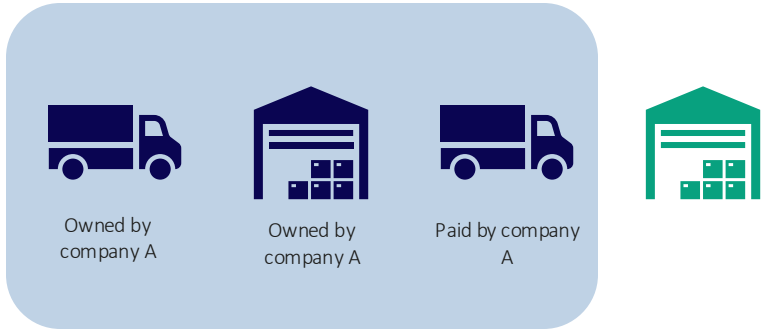
Scenario 1



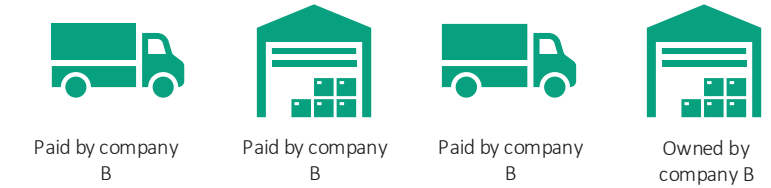
Scenario 2

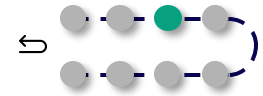


Scenario 3



Scenario 4





Transportation and storage

Owned, managed or paid for by Company A

Owned, managed or paid for by Company B

Calculated and separately reported by Company A

Assumptions:

- Company A produces a product supplied to Company B
- Start of transport from Company A “production” gate

3 Deep-Dive: Recycling and energy recovery follow the “recycled content” or cut-off method

What is the “recycled content” or cut-off method and why it is recommended?

WHAT

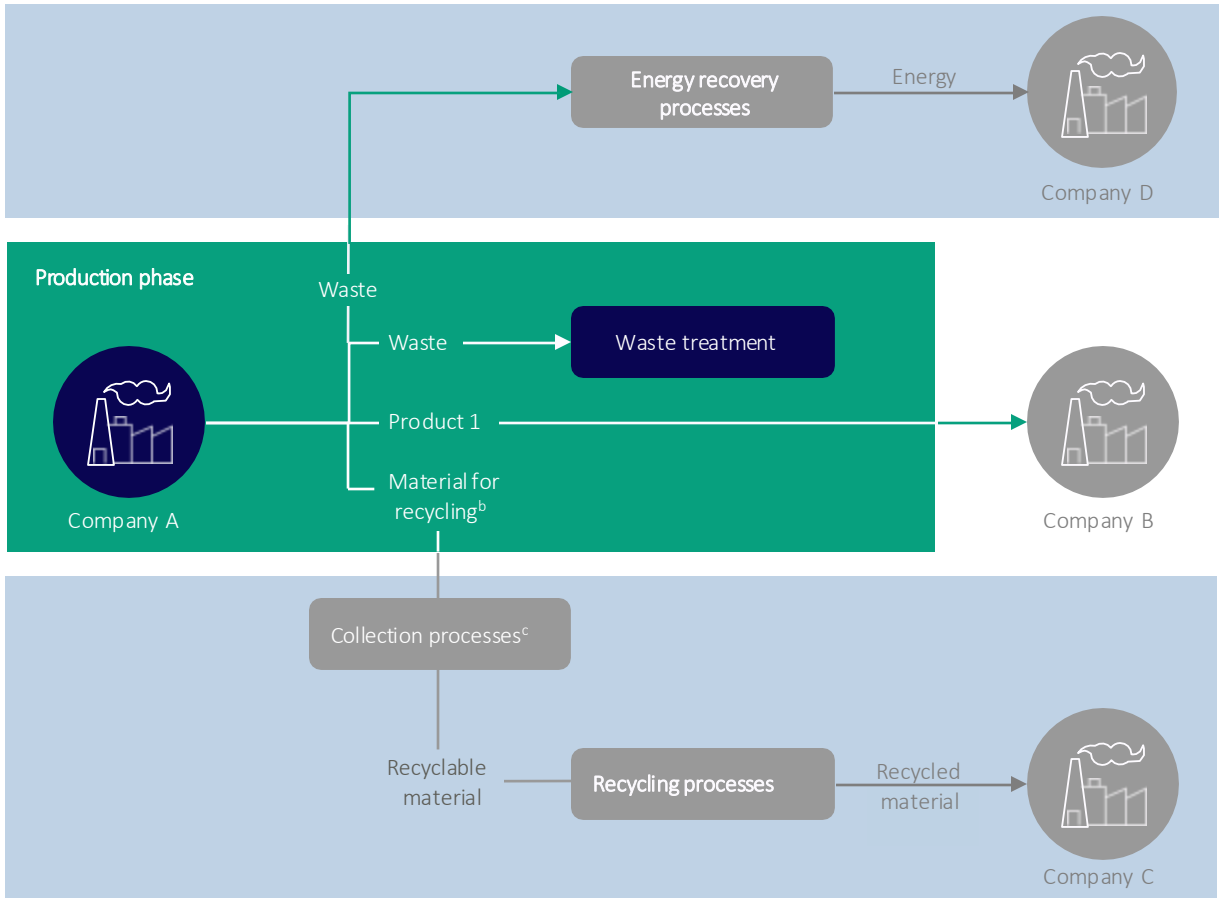
- Method stipulates that **companies using recycled material** as an input in their production **shall account for the emissions from the recycling stage as well as any collection, sorting and pre-processing (e.g., shredding),** and not for initial production emissions

WHY

- **Cradle-to-gate scope**, i.e., not including the end-of-life stage

Note: carbon credits/offsets are out of scope

Detail/Explanation



- Emissions from material flows within production phase included in PCF of Product 1[a]
- Emissions included in subsequent life cycle stage

a. Waste and recyclable material streams are not burdened by production impacts (exit burden-free). Direct emissions should be only allocated to main products and by-products (Product 1).
b. Material that would otherwise have been considered waste.
c. Can include collection, sorting and preprocessing.

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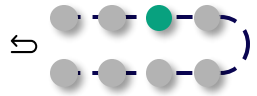
3 Deep-Dive: Activities can be excluded from a PCF conformant to the PACT Methodology based on two criteria



1 Boundary-based exclusion

Activities that do not fall within the cradle-to-gate boundaries for the reporting company need to be excluded.

For example, since Chocolate Corp. is a chocolate manufacturer, emissions resulting from the consumption of chocolate are not included since the PACT Methodology's boundary is cradle-to-gate.

Other examples might include end-of-life treatment of the product, or transportation to retailers (if paid for by customer).

Note: carbon credits/offsets are out of scope

2 Our proposed approach

The **total exclusion of individual processes cannot exceed 3% of the overall PCF**.

For Chocolate Corp., this might include activities such as specific ingredients needed in very small quantities.

Example: Case study demonstrating a justified exclusion

Consider a process for which no primary or secondary data is available on material inputs X and Y. The company estimates that even if materials X and Y have the highest possible GHG intensities based on conservative proxy data, their aggregate impact, based on the total amount present in the product, does not exceed 3% of the total product carbon emissions impact. Therefore, the material inputs X and Y are justified exclusions. If, in aggregate, their emissions resulted in more than 3% of the total PCF, companies shall ensure at least one of the materials is assessed and included to avoid surpassing the 3% exemption rule. .

4 Collecting data: Collecting data is informed by the process maps of the previous steps, as well as the calculation guidance used

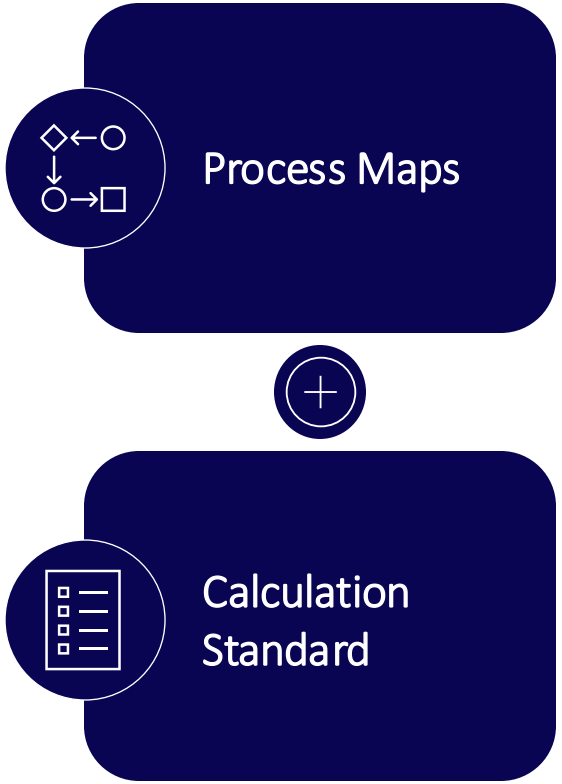
Overview

Gathering data is a central process of any PCF calculation

The process involves three steps:

1. Create **full list of attributable processes and data points** linked to them
2. **Add data sources and data owner** to each data point
3. **Make a data collection plan** with clear responsibilities and timelines

Data collection should be guided by two components



- Understand all **attributable processes** that need to be included in the calculation
- Understand all **underlying data linked to the processes** and **break down each process into the most strategic granular data point**

- Understand all **specific requirements around which processes** need to be included and how
- Understand which **data sources are permissible** under the Methodology (e.g. primary vs. secondary)

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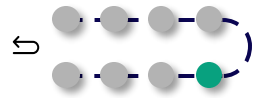
5 Calculating the PCF: A PCF calculation involves three steps



Overview

Once all data has been gathered, the PCF calculation involves three steps:

1. **Multiplying** each activity with the relevant emission factor
2. **Summing** emissions from all processes attributable to the product
3. **Allocating** emissions which are split between products

The PCF calculation steps

The actual PCF calculation is oftentimes simple and requires no specific expertise:

The emissions for each activity A are…	Activity A X Emission Factor A = $Emissions_A$ (CO_2e)
The total PCF for a product containing components A, B and C is…	$Emissions_A$ (CO_2e) + $Emissions_B$ (CO_2e) + $Emissions_C$ (CO_2e) = PCF (CO_2e)
Allocation of emissions depends on the specific product	Allocation should be avoided whenever possible – if it cannot be avoided, the PACT Methodology proposes a clear hierarchy of allocation approaches

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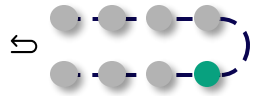
5 Deep Dive: Allocating emissions might be necessary when emissions are shared between outputs of a particular process



What is allocation

Allocation refers splitting multi-input/output processes into single output unit processes by using physical, economic, or other criteria to partition the emissions between the product system being studied (also known as the studied product) and one or more other product systems (also known as co-products).

Allocation is **not usually the preferred approach** but is oftentimes **unavoidable.**

When choosing an allocation approach, you should **prioritize sector-specific guidance** which is oftentimes able to provide more granular guidance on how to conduct an allocation

How does the PACT Methodology implement allocation?

The PACT Methodology builds on existing hierarchies of allocation approaches to develop a decision-making tree that will ensure consistent allocation approaches across suppliers:

Avoiding allocation: Whenever possible, try to avoid allocation by using process sub-division or system expansion

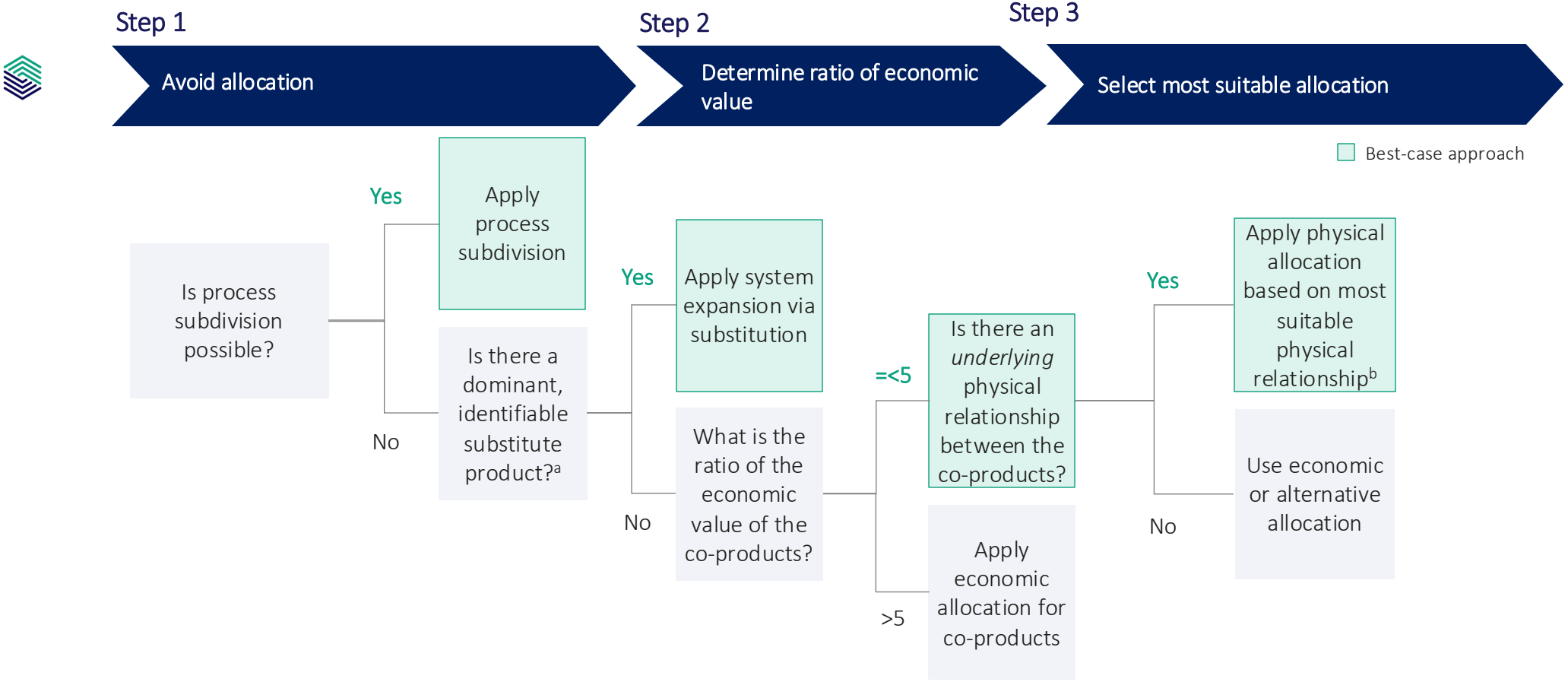
Physical allocation: Allocating the inputs and emissions of the system based on an underlying physical relationship between product quantities

Economic allocation: Allocating the inputs and emissions to the product and co-product(s) based on the market value of each when exiting the common process

Other relationships: Using other underlying relationships between products and co-products to allocate emissions

1. To determine if the output of the process is a co-product or a waste, please follow the EU Waste Directive 2008/98/EC

5 Deep Dive: When considering allocation approaches, you should follow this best-practice hierarchy of approaches



a. System expansion via substitution should only be used if there is a dominant, identifiable displaced product and production path for the displaced product based on sector consensus.

b. In doubt, mass allocation should be prioritized, but there are instances where other allocation factors may be more suitable (e.g., liters for liquids, energy content for energy).

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5 Deep-dive: Calculation of biogenic and land sector related emissions is mandatory

Overview

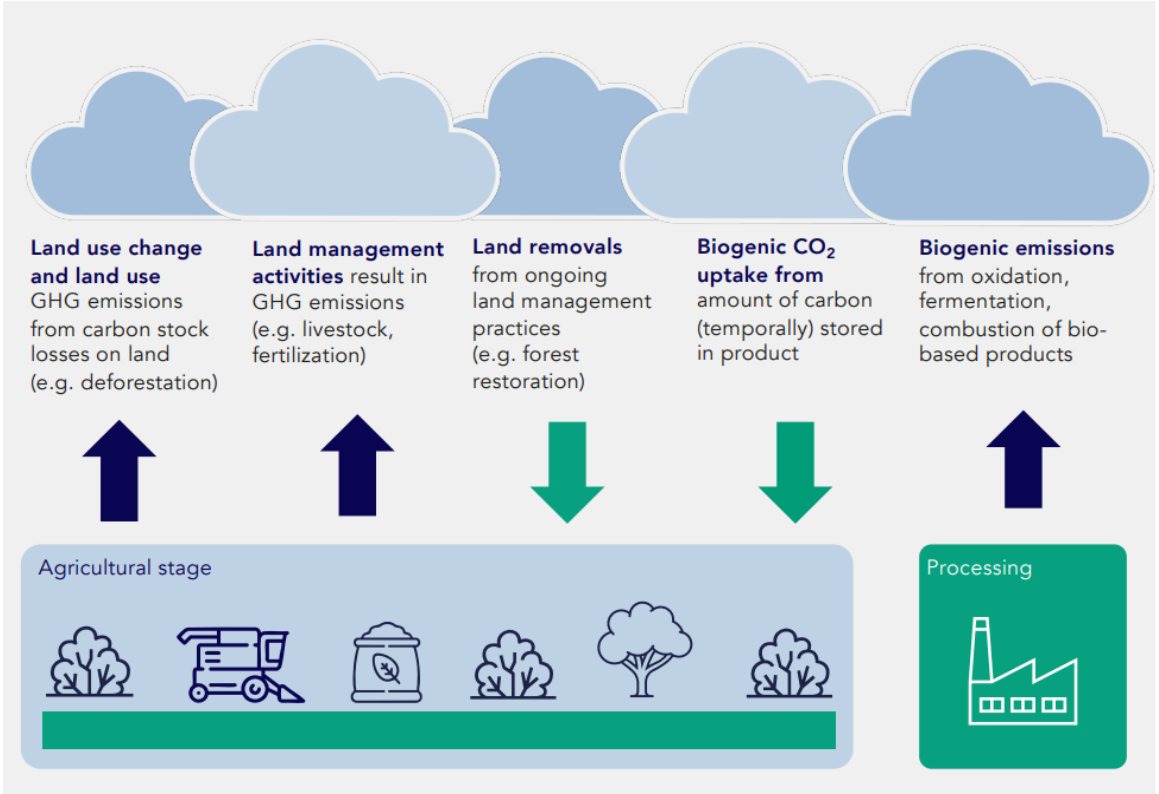
- Land sector emissions (including agriculture, forestry and other land use) are responsible of approximately 22% of global annual net GHG emissions[1]

- Biogenic and land sector related emissions mandatory for calculation
  - Can only be excluded if:
    - Biogenic carbon content of product <5%

    OR

    - Biogenic and land related emissions are below <3% contribution to total cradle-to-gate PCF

Included emissions and removals



[1]IPCC, 2023. Climate Change 2023: Synthesis Report (Summary for Policymakers).

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6 Assessing data reliability: There are two ways to assess and monitor data reliability after a PCF has been calculated

Overview

Assessing data reliability is a **central component** of the PACT Methodology.

Data reliability is implemented through two metrics in the PACT Methodology:

- Primary Data Share assess the extent of primary data in the PCF calculation
- Data Quality Indicators assess the quality of the underlying data regarding several characteristics

The two data reliability metrics in the PACT Methodology

1

Primary Data Share (PDS)

Percentage of PCF emissions that were **calculated** using **primary** activity and emissions **data**

Can be used to gradually **increase use of primary data**

2

Data quality ratings (DQRs)

Quantitative score for three **data quality** indicators based on data quality matrix

Can be used to monitor and understand **data quality hotspots**

The PACT Methodology requires companies to **calculate and report PDS along a PCF**, while companies should calculate and report **DQRs, it is only required by end of 2027** (i.e., 31.12.2027)

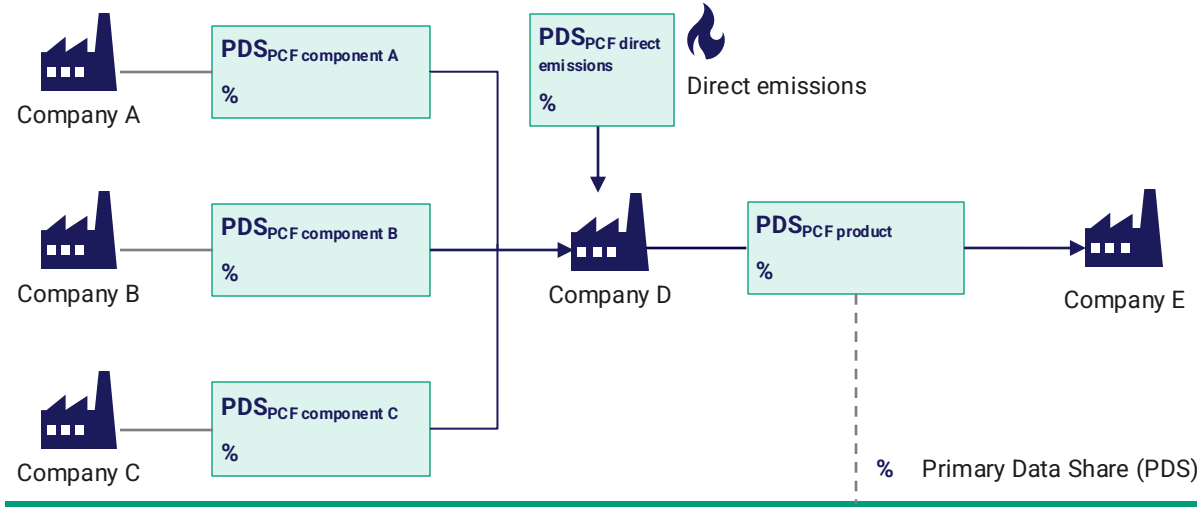
Notes:
- PDS and DQRs are assessed based on the absolute PCF excluding biogenic CO_2 uptake
- If PDS not available, assume 0% (worse case); if DQRs not available, assume 5 (worse case)

6 Deep-Dive: The Primary Data Share (PDS) can be used to track the percentage of a PCF that is based on primary data

What is the PDS?

The PDS is a **weighted average** of the primary data shares of the components of the PCF calculation (**both activity and emission factors**), i.e., the percentage of PCF emissions that were calculated using **primary activity and primary emissions data**.

The weights are given by a **component's contribution** to the overall PCF



Formula to calculate $PDS_{PCF\ product}$

$$\frac{|PCF_{component\ A}| * PDSc_{component\ A} + |PCF_{component\ B}| * PDS_{component\ B} + |PCF_{component\ C}| * PDSc_{component\ C} + |PCF_{direct\ emissions}| * PDSd_{direct\ emissions}}{|PCF_{component\ A}| + |PCF_{component\ B}| + |PCF_{component\ C}| + |PCF_{direct\ emissions}|}$$

How is the PDS calculated?

Component	Data input	Activity data source	Emission factor	Emission factor source	$\lvert PCF_i \rvert$ $kgCO_2e$	% PCF	PDS_i	Total PDS
$PDS_{PCF\ component\ A}$	1,000 kg	Primary	0.8	Primary & Secondary	800	19%	36%	7%
$PDS_{PCF\ component\ B}$	2,000 kg	Secondary	1.2	Primary & Secondary	2,400	56%	0%	0%
$PDS_{PCF\ component\ C}$	500 kWh	Primary	0.18	Secondary	90	2%	0%	0%
$PDS_{PCF\ direct\ emissions}$	5,000 GJ	Primary	0.2	Primary	1000	23%	100%	23%
				$\lvert PCF_{product} \rvert$	4,290	$PDS_{PCF\ product}$		30%

Note: For the purpose of this example, please note that direct emissions are considered to have a PDS of 100%, since both the activity data and emission factor data come from primary sources, while component B and C are considered to have a PDS of 0%, since activity data and emission factors data respectively come from secondary sources.

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6 Deep-dive: The Data Quality Ratings (DQRs) track qualitative dimensions of data quality through a quantitative score

What are the DQRs?

Data quality ratings are **quantitative indicators measuring 3 data quality indicators (DQIs).**

Each of the 3 dimensions is assessed against a **common matrix** defining data quality (from 1 (best score) to 5 (worst score)), and include:

- **Technological representativeness**
- **Geographical representativeness**
- **Temporal / Time representativeness**

An overall DQR for a PCF is a **weighted average** of data quality indicators for a particular component, where the weight is given by **component's contribution** to the overall PCF.

DQRs assess emission factors and direct emissions data.

How are the DQRs calculated?

Formula:

$$DQR_{indicator\ PCF\ product} = \Sigma \frac{(|PCF_i| * DQR_{indicator\ i})}{\Sigma |PCF_i|}$$

Example calculation:

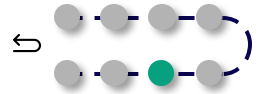
Data Quality Indicators (DQIs)	Component 1	Component 2	Component 3	Total DQR
GHG contribution to absolute PCF	**25%**	**30%**	**45%**	**100%**
Technological representativeness	2	2	1	1.55
Geographical representativeness	2	2	3	2.45
Temporal / Time representativeness	1	5	2	2.65

Example of calculation

Total Technological representativeness DQR: a weighted average based on each component's emissions contribution to the absolute PCF

= 2 * 0.25 + 2 * 0.30 + 1 * 0.45 = 1.55

6 Deep-Dive:The three dimensions of data quality are meant to provide an indication of how likely the data represent the actual activity and associated processes



Technological representativeness

1	2	3	4	5
The dataset has been created based on data reflecting the exact technology employed (i.e. plant specific process/equipment data for the plant/equipment where the product has been manufactured) Note: this quality score can be achieved only in case of use of primary data	The dataset has been created based on data reflecting the company-specific and same technology to the one employed for the actual manufacturing (i.e. same technology, the company/site specific but not necessarily plant specific – it could be an average if several company/site specific data are available) Note: can only be achieved using primary data	The dataset has been created based on data reflecting an average for an equivalent technology to the one employed for the actual manufacturing (i.e. same technology, but not company specific) Note: this is the maximum score achievable with secondary data	The dataset has been created based on data reflecting a technological proxy (i.e. similar but not same technology, irrespectively if based on averages or supplier specific data)	The dataset has been created based on different or unknown technology vs technology actually employed

Geographical representativeness

1	2	3	4	5
The dataset has been created based on data reflecting the country subdivision (if applicable) or country in which the product has been manufactured Country subdivision list: States in the USA, Provinces in Canada, Federative units in Brazil, Provinces in Argentina, States in Mexico, Republics in Russia, States in India, Provinces in China, States in Australia	The dataset has been created based on data pertaining the country, in which the product has been manufactured. The area where the dataset is generated is valid for the geographical area where the site is located *Example: The site is in California and the dataset is a US average*	The dataset has been created based on data pertaining to the geographical region (e.g. Europe, Asia, North America), in which the product has been manufactured The area where the dataset is generated is valid for the geographical area where the site is located *Example: The site is in Spain and the dataset is a European average*	The dataset has been created based on global averages *Example: The site is in Japan and the dataset is a global average*	The dataset has been created based on data with a geographical scope which is either unknown or pertaining a country, or region not including the site in which the product has been manufactured *Example: In absence of a global average, the dataset geographical applicability is unknown.*

Temporal / Time representativeness

1	2	3	4	5
The difference between "Reference Period End" of the dataset and "Reference Period End" of the PCF is ≤1 year (i.e., 366d (to count for leap year))	The difference between "Reference Period End" of the dataset and "Reference Period End" of the PCF is >1 year and ≤2 years (i.e., 731d)	The difference between "Reference Period End" of the dataset and "Reference Period End" of the PCF >2 years and ≤3 years (i.e., 1096d)	The difference between "Reference Period End" of the dataset and "Reference Period End" of the PCF is >3 years and ≤4 years (i.e., 1461d)	The difference between "Reference Period End" of the dataset and "Reference Period End" of the PCF is >4 years or unknown

DQIs definitions:

- **Technological representativeness:** The degree to which the data reflects the actual technology / technologies used in the process
- **Geographical representativeness:** The degree to which the data reflects the actual geographic location of the processes within the inventory boundary (e.g., country or region)
- **Temporal / Time representativeness:** The degree to which the data reflects the actual time (e.g., year) or age of the process.

7 Verifying your PCF: Verification ensure data integrity through the external validation of PCF results

Overview

Verification:

Entails **evaluation** of PCF accuracy according to standard used and provision of **opinion** on reported data

Rationale:

Central element of PACT Methodology, increasing **reliability** of and **trust** in PCF data

Roadmap approach:

Increasingly ambitious assurance and verification requirements over time – allowing companies to prepare in advance and improve over time

Note: PACT states the "what" and assurers the "how" of the assurance and verification process

The PACT Methodology requirements around verification

Dimension	2025-2030	2030 onwards
1 Coverage	PCF Calculation Model	PCF program
2 Conformance to reporting	PCR or sector-specific guidance, if followed, in addition to PACT Methodology	PCR or sector-specific guidance, if followed, in addition to PACT Methodology
3 Boundary	Cradle-to-Gate	Cradle-to-gate
4 Verification Level	Limited Assurance	Certification
5 Provider	Independent Third Party	Independent Third Party
6 Process Cycle	3 years or PCF variance >10%	3 years or PCF variance >10%
7 Companies covered	Phased-in approach for SMEs All requirements above identically apply to SMEs but with a two-year time lag to allow for capacity building	

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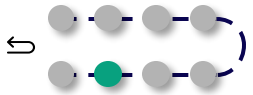
7 Deep-dive: Getting started on verification requirements involves three steps



Step		Input	Evidence Consolidation Elements
1	**Understanding requirements:** Checking roadmap and understanding verification requirements and choose a to verify PCF Calculation model or certify PCF Program	PACT Verification Roadmap	
2	**Gather evidence:** Using Table 14 and Table 15, and Table 16 to meet the verification requirements to start the process	PACT Methodology v3	
3	**Conducting assurance:** Engaging third-party assurance provider to undergo verification process per Step 1	PACT Methodology + Third-Party Assurer	

Dimension	Evidence Consolidation Elements
Data	List of all primary and secondary data sources Data reliability assessments (PDS or DQRs) Inventory of all GHG sources and sites
Method	List of all calculation steps and results List of all standard requirements and assumptions Details of allocation approach followed
Governance	Map of data governance approach to PCF Risk Management processes Disclosure of internal capacity, expertise and quality control

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8 Deep dive: The PACT Technical Specifications enable the interoperable exchange of Product Carbon Footprints across PACT Conformant Solutions

PACT Technical Specifications V3

Technical Specifications for PCF Data Exchange (3.0.0-20250428)

Living Document

Latest published version:
https://docs.carbon-transparency.org/spec/3.0.0/

Previous Versions:
https://docs.carbon-transparency.org/spec/2.3.1/

Feedback:
pact@wbcsd.org with subject line "[data-exchange-protocol] … *message topic* …"
GitHub

Abstract

This document specifies a data model for GHG emission data at product level based on the PACT Methodology (previously Pathfinder Framework) Version 3, and a protocol for interoperable exchange of GHG emission data at product level.

§ 1. Introduction

This document is a work in progress and should not be used for conformance testing. Please refer to the latest stable version of the Technical Specifications for this.

For an overview of changes since the last version (2.3), see the Appendix A: Changelog.

This document contains the necessary technical foundation for the PACT Network, an open and global network for emission data exchange.

The goal of this document is to enable the interoperable exchange of Product Carbon Footprints across conforming host systems.

The methodological foundation of the specification is the PACT Methodology Version 3.0, see [PACT-METHODOLOGY].

Building blocks

Data Model

The data model specifies:

- Set of attributes, attribute definitions, and syntax
- Data model available as an open API schema

API Specification

Specifies a standard technical language for solutions to send, request, and receive PCF information over the internet

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Part 3: Levelling Up

Taking your PCF journey to the next level

Jump to

Part 1: Introduction | Part 2: The PCF Journey | Part 3: Levelling Up

From insight to action: what happens after you have calculated and exchanged a PCF

Overview

Congratulations!

Calculating your first PCFs is a great achievement!
With the insights generated from the PCF, you are now ready to connect your PCF back to the bigger picture
This section will highlight which steps you can take to unlock the full value of carbon transparency

What's next?

Leveraging the insights from your PCF across **three dimensions** will help ensure that the accuracy and granularity a PCF provides permeates through the organization:

Management: The PCF can become a management tool used to improve data quality, corporate GHG accounting, procurement decisions and product portfolios

Strategy: The PCF can become a strategy tool used to steer product portfolios, inform R&D and design processes, market entry and sustainability targets

Engagement: The PCF can become an effective tool for engagement, including marketing, supplier engagement, policy advocacy

Deep-Dive: Unlocking the full value of your PCF involves three dimensions – management, strategy and engagement

Management

The PCF can become a management tool used to **track and manage performance**

Examples might include tracking data quality, tracking emissions performance of suppliers, improving corporate accounting or managing climate risk

Strategy

The PCF can become a strategy tool if it is used to **inform strategic decisions**

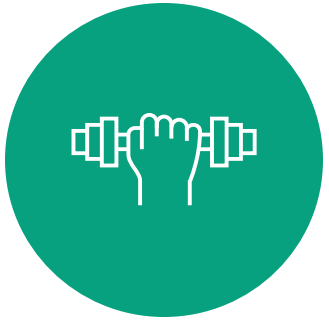
Such decisions might include product portfolio steering, innovation programs, supply chain decisions, or broader sustainability objectives

Engagement

The PCF can be the basis for **targeted engagement with key stakeholders**

Such stakeholders might include consumers, sustainability-conscious investors, regulators and suppliers

Reflections on the PCF journey and looking ahead



Challenge accepted!

Beginning your PCF journey can seem daunting at first – however, we encourage you to embrace the challenge

After all, **the most important step is to get started!**

You're not alone!

Collaborating with peers, sharing your learnings as well as learning from others, **will make your journey that much easier** and more enjoyable

Improving carbon transparency is a team sport!

Onwards and upwards!

As you move ahead on your PCF journey, it is important to remember that the **quality of calculations and data is expected to improve over the years** – no one is expecting perfection from the beginning, and you won't be penalized for providing more accurate data over time!

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Thank you

For more information and resources, please check the PACT resources page

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Glossary

Glossary

- Attributable Processes: Those processes that consists of all service, material and energy flows that become, make and carry a product throughout its life cycle.
- Co-product: A product from a multioutput process that is not deliberately produced in a production process and is not a waste (following the EU Waste Directive 2008/98/EC).
- CO_2e: "Carbon dioxide equivalent" or "CO_2e" is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.
- Cradle-to-gate: Refers to the lifecycle stages of a product, including all processes up to the point where a product leaves the reporting company's facilities.
- Declared unit: Unit of analysis chosen for PCF, which serves as the reference to which the inputs (materials and energy) and outputs (such as products, co-products, waste) are quantified.
- Life Cycle Assessment (LCA): Compilation and evaluation of the inputs, outputs and potential environmental impacts of a product throughout its entire life cycle.
- Limited Assurance: A level of assurance expressed as a negative opinion whereby the assurer did not find evidence for material misstatements in a report that is being assured.
- Product Carbon Footprint (PCF): Total GHG emissions generated during the life cycle of a product, measured in CO_2e. Within the boundary of the PACT Methodology, only material acquisition, pre- processing, production, distribution and storage are included in the PCF.
- Product Environmental Footprint Category Rules or Product Category Rules: A set of specific rules, requirements and guidelines for calculating PCFs (among other things) and developing environmental declarations for one or more product categories according to BS EN ISO 14040:2006
- Representative Product: A product of a reporting company's overall product portfolio which has characteristics making it representative of other products in the same portfolio. For example, for a chocolate manufacturer, a milk chocolate bar might be representative of other milk-chocolate based products.