Former issues of this standard: no former version available

1. Scope and field of application:

This EUWA standard defines guidelines and requirements for environmental impact assessment of manufacturing and other associated processes, with a particular focus on the product carbon footprint (PCF). This standard does not relate to the process of determining an organization's carbon footprint.

The aim of the document is to ensure a uniform and comparable product carbon footprint assessment within the wheel manufacturing process in accordance with available standards, scientific knowledge and the expectations of stakeholders.

2. General requirements

It is the goal of this ES to achieve better and safer products by providing a harmonised and generic wheel manufacturing specific PCF calculation scheme. This should be used by to assure an always traceable PCF standard for the entire wheel manufacturer industry.

More details can be viewed in EUWA ES 1.14 "Recycled Content Definition" as cross reference.

3. References

3.1 Definition

- **LCA** (Life Cycle Assessment) - process of evaluating the impacts that a product has on the environment during the specified or entire period of its life cycle
- **PCF** (product carbon footprint) the calculation of all the greenhouse gas (GHG) emissions generated in the supply chain of a specific product, expressed with a carbon dioxide equivalent intensity
- **Cradle-to-gate** - is an assessment of a partial product life cycle from resource extraction (cradle) to the factory gate (i.e. before it is transported to the consumer)
- **GHG** (Green House Gas) A gas that contributes to the greenhouse effect by absorbing infrared radiation, such as carbon dioxide or chlorofluorocarbons.
- **GWP –** (Global Warming Potential) an index expressing the ability of a substance to cause and contribute to the greenhouse effect.
- **CO_2 equivalent** expression of the GWP-100, the effect over a period of 100 years on the climate change potential of all included substances through the equivalent of carbon dioxide
- **Secondary material** – Secondary raw materials are recycled materials that can be used in manufacturing processes instead of or alongside virgin raw materials.
- **Pre-Consumer Material**, which is separated from the waste stream during the manufacturing process meeting the ISO 14021 definition. Material can be generated internally e.g. in the form of chips in aluminium process or can be obtained externally, outside the assessed system.

- **Post-Consumer Material** is Material generated by households or by commercial industrial and institutional facilities in their role as end-users of the product which can no longer be used for intended purposes. This includes returns or collection of material from the distribution chain.
- **Assessed system.** A system that is subject to calculation of the carbon footprint of a product within a defined scope. Typically comprising a manufacturing plant with its energy inputs and associated supply chain of input materials.
- **GO or GoO - Guarantee of Origin** is for verifying the renewable source of electricity across Europe.
- **IRECs** A REC International Renewable Energy Certificate - represents the environmental and social attributes associated with the generation of renewable energy
- **REGO -** Renewable Energy Guarantee of Origin - electronic certificate system enables producers of renewable-sourced electricity that is eligible under the EU Renewables Directive to be issued with evidence (guarantees) that their electricity is indeed renewable.
- **(PPA) P**ower **P**urchase **A**greements, are contract structures that enable organisations to procure renewable energy directly from generation facilities.
- **AIB A**ssociation of **I**ssuing **B**odies
- **Carbon Offsetting** (compensation) is a method of compensating for CO2 emissions based on the principle of global climate balance.

3.2 Standards

- **EN ISO 14040** Environmental management – Life Cycle Assessment – principles and framework
- **EN ISO 14044**, Environmental management - Life cycle assessment -
- Requirements and instructions
- **ISO 14067:2018** Greenhouse gases — **Carbon footprint of products** — Requirements and guidelines for quantification

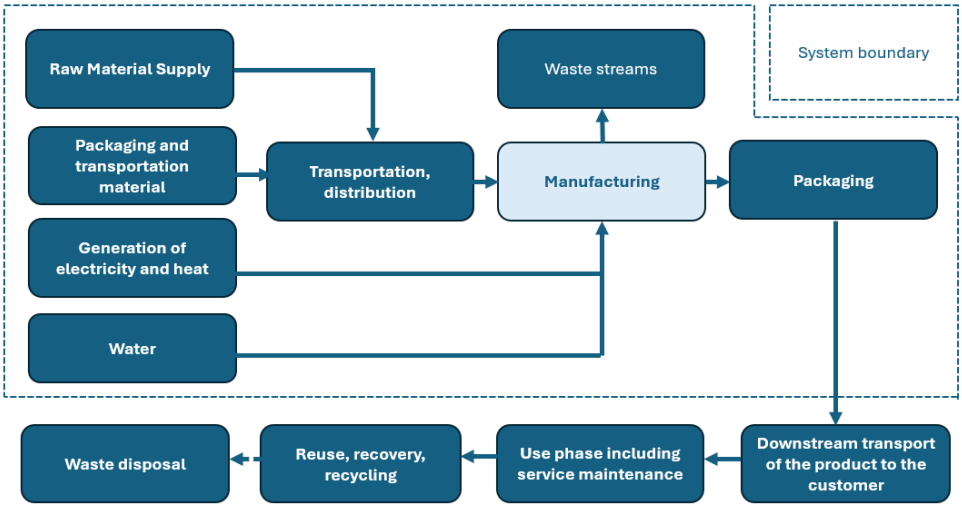
4. Requirements on wheel Carbon Footprint product impact assessment

4.1. System boundaries:

- The boundary of the system considered in the analysis of environmental impact in the wheel production is the **“Cradle to Gate”** range. Cradle to gate is per definition always the gate of the manufacturer, e.g. definition EU: A partial product supply chain, from the extraction of raw materials (cradle) up to the manufacturer’s “gate”. The distribution, storage, called downstream transport, use stage and end-of-life stages of the supply chain are omitted. This range is further specified below.

  This system range is determined by the idea that the environmental impact of the product is under control of the wheel manufacturer. Its expansion for other purposes is not limited, however, it is already affected by factors associated with the use of the product within the vehicle system.

- This „Cradle to gate“ system includes at minimum:
  - Raw materials acquisition and upstream transport
  - Further processing of raw materials,
  - Production operations,
  - Energy and water consumption,
  - Waste management of the production waste,
  - Packaging of the final product for delivery,
  - Includes at minimum manufacturers gate
- The system does not include:
  - EoL of packaging
  - Installation - Tyre assembly/ Wheel assembly to vehicle
  - Use phase of the wheel
  - Maintenance, repair of the product post supply
  - Production facility construction and maintenance
  - EoL of the wheel and possible recycling potential
  - Downstream Transport
- Cut-off rules:
  for the assessment to be considered reliable in the scope defined by this document, at least 95% of all factors contributing to emissions contained within the defined system must be included.



Sketch showing the PCF System Boundaries

4.2. Functional Unit:

- 1 kg of the final product is defined as the functional unit for assessment scope
- Kilogram CO_2 equivalent GWP-100 of the final product per kilogram of final product is the defined unit for expressing the product carbon emissions.
- To ensure a comparable evaluation process, the total weight of the final product is not considered, however this can be another important indicator of the environmental

impact of the product manufacturing process and should not be neglected in other evaluation processes.

- The PCF assessment can be extended by including elements that are assembled within the assessed system boundaries and become an integral part of the wheel. This is an optional extension and depends on the specific definition of the product to be delivered to the customer. If the assessment is extended to include additional elements that are not an integrated part of the wheel, this information must be included in the PCF report. The carbon footprint of these additional elements is declared separately next to the wheel PCF value.
- The bare wheel PCF (finished wheels ready to use) will be declared as “W” if additional parts will be assembled such like inserts, wheel covers etc. The delivered wheel PCF shall be declared as “DW”

4.3. Raw Material inputs (PCF)

- Only third party verified supplier-based evidence can be used as a calculation input for steel and light metal alloys and carbon. This also applies to external recycled alloy material used as production input.
- If the external recycled alloy material is in the form of collected end-of-life products, the value from the verified database is acceptable
- For other materials with a Carbon Footprint impact on the final product lower than 10%, data from verified third party databases can be used (such as Eco invent, Sphera) as an alternative source of the data (Secondary data to be included).

4.4. Energy Inputs (PCF)

Electricity Emission Factors

- Supplier specific electricity emission factors shall be used when the contractual instrument with the supplier aligns with the requirements from ISO 14 067. The following hierarchy of emission factor would apply:
- Energy certificates (GOs, RECs, REGO etc.) and contracts (PPA etc.) aligned with the criteria from ISO 14 067 (section 6.4.9.4.4).
- Residual mix (e.g., provided by AIB for Europe)
- Any other regional or national production mix when residual mix is not available.

Calculation of GHG Emissions from Electricity Use

- Companies must determine the GHG emissions resulting from electricity consumption in relevant process steps within system boundaries. Generation-specific emission factors must be used, considering upstream, direct, and downstream emissions.
- Emissions vary by electricity generation method. If electricity comes from multiple sources, they must be proportionally accounted for.

Electricity from a Directly Connected Generator

- Electricity from a directly connected source used for internal consumption must be included in the CO_2 footprint calculation.

- For on-site generated electricity, the consumed amount (kWh) and the corresponding emission factor must be used, provided the electricity is not sold to third parties.
- If no specific emission factor is available, the country-specific residual grid mix must be used.
- Proof of own electricity generation requires an installation certificate and a meter reading that matches the consumption period and amount.

Examples: Photovoltaic system or in-house fossil fuel power plants.

Electricity from a Utility Provider or Contract Instruments

- Regarding the statement “No energy mix has real impacts = 0 under what circumstances is it allowed to count 0”.
- When accounting for energy inputs, companies shall account for emissions resulting from direct emissions from the combustion of fuel to generate electricity as well as upstream emissions. Renewables or nuclear power generation does not involve combustion but have indeed upstream emissions (e.g., extraction, refining and transport of fuel to the electricity generator, growing of biomass for use as a fuel). It is allowed to count as “0” if the supplier specific electricity EF reviewed by a third party is equal to “0”.
- For emission values of other energy types, database values of verified third parties, valid at the time of assessment, may be used (excluding electricity and natural gas)

4.5. Data collection period

- Data for processing should be collected and representative for a defined period of a serial production. This period is 1 year of operation typically.
- Collected data should not be older than 3 years
- In case of process or production improvements, the actual input data can be modified accordingly while maintaining the condition, see the first bullet.
- A special type of assessment is the calculation of PCF for a future product-production, for which the relevant production inputs does not yet exist. In this case, it is a simulation of the expected carbon footprint. Such an assessment is possible on the condition, that this information is provided in the resulting PCF report, summarising the inputs for which the estimated values were used.

4.6. Assessment outcome validity (PCF)

- The evaluation result is valid until the end of the following year or in the event of a change in the production process or input factors leading to a change in the result of more than +/-10%.
- The basic input data shall be updated at least with a revaluation.

4.7. Calculation methodology

- The methodology for evaluating the product’s carbon footprint must comply with the ISO 140 67 standard

4.8. Recycled material approach

- Cut-of emissions allocation approach (also known as “polluter pays principle”) is applied for all raw material waste streams. This means that all emissions related to the production of the material are allocated to the final product - impacts belong to the first life cycle of the product. Therefore, if there are any waste or other streams from the production process, they leave the assessed system with zero emissions.
- Chips generated by the production process of aluminium wheels, intended for subsequent remelting and undergoing additional processes to make them capable of being remelted are classified as pre-consumer recycled material in accordance with ISO 140 21 methodology.

More details can be viewed in EUWA ES 1.14 “Recycled Content Definition” as cross reference

4.9. Mass balancing

Modelling the specific product carbon footprint of a product through mass-balancing (non-linear allocation) is possible provided the following conditions are met:

- Double counting is demonstrably avoided.
- To avoid green washing, materials and energy used in a nonlinear allocated process are not allowed to be accounted for the rest of the production.
- Nonlinear allocation is only possible within one comprehensive production unit and cannot be applied between separate operations.

4.10. Methodology for accounting for waste, or end of life products

- No benefit is accounted for any kind of production waste. In no way can you reduce your production carbon footprint by accounting the waste.

4.11. Packaging

- For returnable packaging material such as EWPS pallets and plastic interlayers, a proportional part of the material emissions according to the number of cycles is accounted. Data for the steel components are already covered and fixed in EU CBAM values. The relevant CN HS Code for those parts is 7326.90.40 and the direct default value is 1,89 - the indirect default value is 0,32. Evidence provided by the packaging manufacturer may result in different values.
- For disposable packaging materials, the total contribution is incorporated according to the evidence provided by the packaging manufacturer.

4.12. Carbon Offsetting (compensation)

- Only emissions within the assessed system boundaries may be included in the Product Carbon Footprint (PCF) calculation as defined in this document.

- Offsetting greenhouse gas (GHG) emissions is not allowed. This includes external compensation measures such as afforestation or investments in renewable energy, which must not be used to lower a product's calculated carbon footprint.
- If your calculations rely on third-party climate data, ensure their results do not include offsets.
- Carbon offsetting refers to emission reductions outside the assessed system that are used to balance emissions within it—such as purchasing carbon credits from reforestation projects.
- It is not permitted to label a product as "climate-neutral" based on offsetting. The life cycle assessment (LCA) must reflect actual emissions from cradle to gate.
- Allowed are direct emission reductions within the company's own operations, for example, through more efficient processes, use of renewable energy, or sustainable materials.
- Rationale: The PCF must objectively and transparently represent a product's environmental impact. Offsetting can obscure real emissions and delay meaningful reductions at the source. The focus should always be on direct reduction measures.

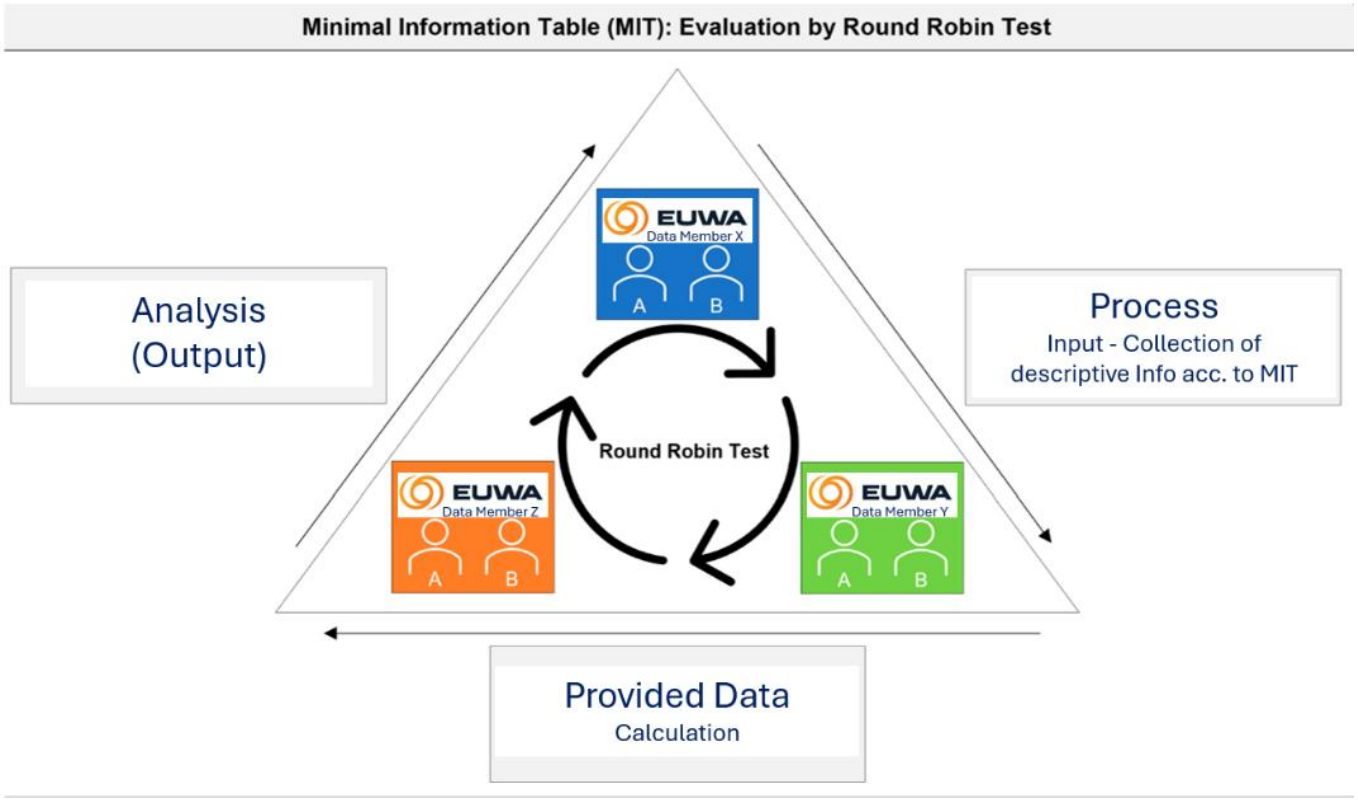
4.13. PCF Report

- Minimum content of the product carbon footprint calculation is:
  - Basic product description, wheel type, material
  - Organisation name and contact details
  - Data collection period
  - Result of PCF expressed in kg CO2 eq./kg of finished wheel
  - Result of PCF expressed in kg CO2 eq./kg of additional components (if it's part of product delivered)
  - Data source for material and energy inputs at minimum
  - Calculation methodology

4.14. Calculation calibration process

- To ensure a uniform and consistent process for PCF assessment, EUWA will define a procedure for verifying the consistency of the calculation process between individual EUWA members. This procedure will guarantee full compliance to the European Competition Guidelines.
- This procedure for verifying consistency, consists of generating uniform values for the main contributing inputs of the assessed system and will be part of the process of issuing this guideline (these values are theoretical and will be provided by EUWA). Individual members will then be encouraged to carry out the calculation in accordance with the minimum requirements defined in this document.
- The result will then be submitted to EUWA, which will compare the result and in the event of deviations greater than 20%.

Typical Round Robin Scheme as relevant method for the calibration



5. Further applicable documents

- **BSI:PAS 2050** Greenhouse Gas Protocol Standard
- **ISO 9000:2005**
- **EN ISO 9000:2005-12 (EN ISO 9000:2015-11)**
- **ISO 14004:2004**
- **EN ISO 14020**, Environmental labels and declarations - General principles
- **EN ISO 14021**, Environmental labels and declarations - Environmental supplier declarations (environmental label type II)
- **EN ISO 14025**, Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- **EN ISO 14031**, Environmental management - Environmental performance assessment – Guidelines
- **EN ISO 14044**, Environmental management - Life cycle assessment - Requirements and instructions
- **EN ISO 14050**, Environmental management – Terms
- **ISO/TR 14062** technical report ISO/TR 14062

- **EN ISO 14063**, Environmental management - Environmental communication - Guidelines and examples
- **EN ISO 14064-1**, Greenhouse gases - Part 1: Specification with guidance for the quantitative determination and reporting of greenhouse gas emissions and removal of Greenhouse gases at organizational level
- **EN ISO 14064-2**, Greenhouse gases - Part 2: Specification with guidance for quantitative determination, monitoring and reporting of reductions in greenhouse gas emissions or increases in removals of greenhouse gases at project level
- **EN ISO 14064-3**, Greenhouse gases - Part 3: Specification with guidance for validation and verification of greenhouse gas declarations
- **ISO/TR 14062**, Environmental management - Integration of environmental aspects in product design and development
- **ISO Guide 64**, Guide for the inclusion of environmental aspects in product standards
- **ISO 14004:2005-07**, Environmental management systems - General guide to principles, systems and supporting methods (ISO 14004:2004)
- **ISO 22095: 2020** Chain of custody – General terminology and models
- **EN 45557** - 2020-09 General method for assessing the proportion of recycled Material content in energy-related products