PRODUCT CATEGORY RULES (PCR)
PUBLICATION DATE 2026-04-09

EPD
INTERNATIONAL EPD SYSTEM

BUSINESS JETS

PRODUCT CATEGORY CLASSIFICATION: UN CPC 49623

PCR 2018:09
VERSION 2.0.0

VALID UNTIL 2030-04-09

BUSINESS JETS
PRODUCT CATEGORY CLASSIFICATION: UN CPC 49623

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1 INTRODUCTION

This document constitutes Product Category Rules (PCR) developed in the framework of the International EPD System: a programme for Environmental Product Declarations (EPD)[1] according to ISO 14025:2006, ISO 14040:2006, ISO 14044:2006, and product-specific standards, such as EN 15804 and ISO 21930 for construction products.[2] EPDs are voluntary documents for a company or an industry association to present transparent, consistent, and verifiable information about the environmental performance of their products (goods or services).

The General Programme Instructions (GPI), publicly available on www.environdec.com, includes the rules for the overall administration and operation of the programme and the basic rules for developing EPDs registered in the programme. A PCR complements the GPI and the normative standards by providing specific rules, and guidelines for developing an EPD for one or more specific product categories (see Figure 1), thereby enabling the generation of consistent EPDs within a product category. A PCR should not repeat the rules and guidelines of the GPI, but include additions, specifications and deviations to the rules set in the GPI. As such, a PCR shall be used together with the GPI.

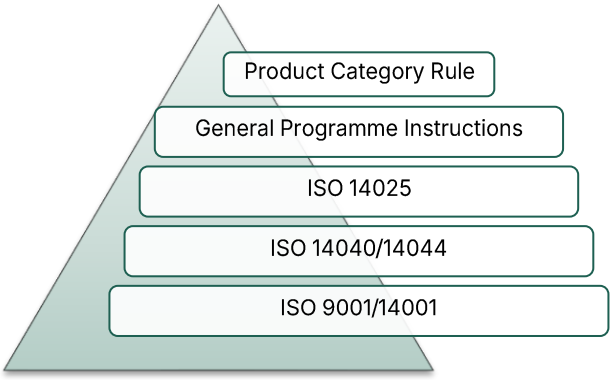

Figure 1. The hierarchy between PCRs, standards, and other documents.

The present PCR uses the following terminology:

- The term "shall" is used to indicate what is obligatory, i.e., a requirement.
- The term "should" is used to indicate a recommendation. Any deviation from a recommendation shall be justified in the EPD development process.
- The terms "may" or "can" are used to indicate an option that is permissible.

For definitions of other terms used in the document, see the GPI and normative standards.

Any references to this PCR shall include the PCR registration number, name, and version number.

The programme operator maintains the copyright of the PCR to ensure that it is possible to publish, update, and make it available to all organisations to develop and register EPDs. Stakeholders participating in PCR development should be acknowledged in the final document and on the website.

[1] Termed type III environmental declarations in ISO 14025.

[2] When standards are referred to in this document, the version listed in Section 8 is intended unless otherwise stated.

2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	Business Jets
Registration number and version:	PCR 2018:09, Version 2.0.0
Programme:	EPD INTERNATIONAL EPD SYSTEM
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: support@environdec.com
PCR Moderator:	**Veronika MAMAIEVSKA** Product Sustainability Engineering | Aircraft Innovation BOMBARDIER veronika.mamaievska@aero.bombardier.com
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Publication date:	2026-04-09 See Section 10 for a version history of the PCR.
Valid until:	2030-04-09 The validity may change. See www.environdec.com for the latest version of the PCR and the latest information on its validity and transition periods between versions.

Development and updates:	The PCR has been developed following ISO/TS 14027, including public consultation and review. The rules for the development and updating processes are described in Section 9 of the GPI. The PCR is valid for a pre-determined time period to ensure that it is updated at regular intervals. When the PCR is about to expire, the PCR Moderator shall initiate a discussion with the Secretariat on if and how to proceed with updating the PCR and renewing its validity. A PCR may be updated before it expires, based on changes in normative standards or provided significant and well-justified proposals for changes or amendments are presented. When there has been an update of the PCR, the new version should be used to develop EPDs. For small updates (change of third-digit version number), the previous version is normally immediately removed from the PCR library on www.environdec.com and there is no transition period. For medium updates (change of second-digit version number), the previous version of the PCR is valid in parallel during a transition period of at least 90 days, but not exceeding its previously set validity period. For large updates (change of first-digit version number), the previous version is valid in parallel during a transition period of at least 180 days, but not exceeding its previously set validity period. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR may be sent directly to the PCR Moderator and/or the Secretariat during its development or during its period of validity.
Standards and documents conformance:	General Programme Instructions of the International EPD System, version 5.0.1, based on ISO 14025 and ISO 14040/14044.
PCR language(s):	At the time of publication, this PCR was available in English. If the PCR is available in several languages, these are available on www.environdec.com. In case of translated versions, the English version takes precedence in case of any discrepancies.

2.2 SCOPE OF PCR

2.2.1 PRODUCT CATEGORY DEFINITION AND DESCRIPTION

This document provides Product Category Rules (PCR) for the assessment of the environmental performance of Business jets and the declaration of this performance by an EPD. The product category corresponds to UN CPC 49623: "Aeroplanes and other powered aircraft of an unladen weight exceeding 2 000 kg" (Table 1)

Table 1 UN CPC Classification Hierarchy

United Nations Central Product Classification		**UN CPC 49623**
Section:	4 -	Metal products, machinery and equipment
Division:	49 -	Transport equipment
Group:	496 -	Aircraft and spacecraft, and parts thereof
Class:	4962 -	Aeroplanes and helicopters
Subclass:	49623 -	Aeroplanes and other powered aircraft of an unladen weight exceeding 2 000 kg

For additional information, please refer to https://unstats.un.org/unsd/classifications/Econ/Structure/Detail/EN/1074/49623

However, UN CPC 49623 category applies to products which have different functions and cannot be covered with only one PCR. Therefore, this PCR will only focus on Business jets propelled by jet engines and not by turboprops nor piston powered engines. Equally, this PCR neither will focus on business-converted airliners nor missionized configurations like:

Transportation of cargo, parts and mail	Agricultural applications	Airborne research and development
Medical and emergency transport	Game tracking and control	Pipeline and utility monitoring
Mapping and surveying	Security and law enforcement	Weather monitoring and reporting
Aerial photography	Newsgathering	Humanitarian missions

The product category shall be declared in the EPD (Business Jet).

2.2.2 GEOGRAPHICAL SCOPE

This PCR may be used globally.

2.2.3 EPD VALIDITY

An EPD becomes valid as of its version date (see Section 8.4.5 of the GPI). When an EPD is originally published, the validity period is normally five years starting from the version date or until the EPD has been de-registered from the International EPD System. Shorter validity periods are also accepted, for example if decided by the EPD owner.

For rules on when an EPD shall be updated and re-verified during its validity, see Section 6.8.1 of the GPI. For validity periods in case of updates of EPDs, see Section 6.8 of the GPI.

The version date and the period of validity shall be stated in the EPD.

Publication of a new version of the PCR or the GPI does not affect the validity of already published EPDs.

3 REVIEW AND BACKGROUND INFORMATION

This PCR was developed in accordance with the PCR development process described in the GPI of the International EPD System, including open consultation and review.

3.1 OPEN CONSULTATION

3.1.1 VERSION 1.0.0

Version 1.0.0 of this PCR was available for open consultation from 2018-06-12 until 2018-08-07, during which any stakeholder was able to provide comments by contacting the PCR Moderator and/or the Secretariat.

Stakeholders were invited via e-mail or other means to take part in the open consultation and were encouraged to forward the invitation to other relevant stakeholders. The following stakeholders provided comments during the open consultation and agreed to be listed as contributors in the PCR and on www.environdec.com:

- *Asociación Española de Tecnologías de Defensa, Aeronáutica y Espacio (TEDAE)*

3.1.2 VERSION 2.0.0

This PCR was available for open consultation from 2025-08-07 until 2025-10-14, during which any stakeholder was able to provide comments by contacting the PCR Moderator and/or the Secretariat.

Stakeholders were invited via e-mail or other means to take part in the open consultation and were encouraged to forward the invitation to other relevant stakeholders. No stakeholders provided comments during the open consultation and agreed to be listed as contributors in the PCR and at www.environdec.com.

3.2 PCR REVIEW

3.2.1 VERSION 1.0

PCR review panel:	The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com. The review panel may be contacted via support@environdec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR Committee, and if there were conflicts of interest they were excused from the review.
Chair of the PCR review:	Adriana Del Borghi
Review dates:	2018-09-28 until 2018-11-14

3.2.2 VERSION 2.0.0

PCR review panel:	The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com. The review panel may be contacted via support@envriondec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR Committee, and if there were conflicts of interest they were excused from the review.

Chair of the PCR review:	Claudia A. Peña
Review dates:	2026-01-28 until 2026-03-17

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs and other internationally standardised methods that could potentially act as PCRs were considered to avoid unnecessary overlaps in scope and to ensure harmonisation with established methods of relevance for the product category. The existence of such documents was checked among the following EPD programmes and international standardisation bodies:

- Canadian Standards Association – Canada
- Carbon Footprint Label – Korea
- Carbon Footprint of Products – Japan
- Carbon Leadership Forum PCRs – USA
- Chinese EPD program – China
- Earth Sure – USA
- Eco-Leaf – Japan
- Environmental Declaration of Products (EDP) – Korea
- EPD Denmark – Danemark
- EPD-Norway- Norway
- GlobalEPD – Spain
- International EPD System www.environdec.com
- NSF International National Center for Sustainability Standards EPD – USA
- PAS 2050 – UK
- Product Life Cycle Accounting and Reporting Standard – USA
- SCS Global Services – USA
- SM Transparency Report Program – USA
- Taiwan EPA Carbon Label – Taiwan
- UL Environment EPD – USA

No existing PCRs with overlapping scope were identified.

3.4 REASONING FOR DEVELOPMENT OF PCR

This PCR was developed to enable publication of EPDs for the product category defined in Section 2.2.1 based on ISO 14025 ISO 14040 /14044 and other relevant standards to be used in different applications and target audiences. The PCR enables different practitioners to generate consistent results when assessing the environmental impact of products of the same product category, and thereby it supports comparability of products within a product category.

3.5 UNDERLYING STUDIES USED FOR PCR DEVELOPMENT

The methodological choices made during the development of this PCR (declared/functional unit, system boundary, allocation methods, impact categories, data quality rules, etc.) were primarily based on the following underlying studies:

- Emission methodology considerations for Business Jet: International Civil Aviation Organization (ICAO), Annexe 16 to the convention of international civil aviation, Environmental Protection, Volume II – Aircraft Engine Emissions
- Noise methodology evaluation for Business Jet: International Civil Aviation Organization (ICAO), Annex 16 to the convention of international civil aviation, Environmental Protection, Volume I – Aircraft Noise
- Doc 9501, Environmental Technical Manual: International Civil Aviation Organization (ICAO), Volume I, Procedures for the Noise Certification of Aircraft
- Recyclability and recoverability Calculation method used to develop Business Jet's End-of-Life calculations: ISO 22628, Road Vehicles-Recyclability and recoverability-Calculation method, 2002
- Best Management Practice (BMP) for Management of Used Aircraft Parts and Assemblies and for Recycling of Aircraft Materials: Aircraft Fleet Recycling Association (AFRA), 2020
- Bombardier Global 7500 Environmental Product Declaration[3]

[3] https://bombardier.com/en/sustainability/resources-and-publications#bba-pdp-section-1

4 LCA METHOD

This section provides rules for the LCA method used to develop an EPD for the product category as defined in Section 2.2.1. The basic rules of the LCA method are set in Annex A of the GPI, and this section only includes additions, specifications and deviations to the rules set in the GPI. Guidance and examples of applying the LCA method are also available on www.environdec.com/methodology.

4.1 MODELLING APPROACH

See Section A.1 of the GPI.

4.2 FUNCTIONAL UNIT

The functional unit for the different types of Business jet shall be used to scale the considered inputs, outputs and environmental impacts of the product system studied.

The main function of a business jet is the transport of a given volume of accommodation space for leisure or business purposes over a distance as per specific conditions outlined in Appendix A.

The total accommodation volume shall include all pressurized areas accessible to both crew and passengers at all cruise altitudes and without any limitations, with the following boundaries:

- Forward and aft boundaries shall be respectively the cockpit divider and the rear pressure bulkhead
- Cabin peripheral boundary shall be the cabin unfinished cross-section, limited to the furnishable area

The unfinished cross-sectional furnishable area is the cross-sectional area inside the frames and above the floor.

The functional unit chosen to quantify the main function is transport one cubic meter of accommodation space for leisure or business purposes over 100 km for a given typical mission length. (Appendix A: Mission selection in the PCR).

The functional unit shall be stated in the EPD. The environmental impact shall be given per functional unit A description of the function of the product should be included in the EPD, if relevant.

4.2.1 PRODUCT LIFESPAN

The number of flights cycles and flight hours that the business jet can perform in its entire life (based on the certification) shall be declared in the product information section of the EPD (see section 6.4.4) Technical specification

4.2.2 TEHCNICAL SPECIFICATION

4.2.2.1 Configuration rules

For the same Business jet, different interior's configurations can be considered. That is why the following parameters shall be declared in the EPD for the selected configuration:

- Complete layout of passenger accommodation space and number of passenger seats
- Cabin volume as per section 4.2
- Standard items and weights (see glossary)
- Operational items and weight (see glossary)

Additionally, to enable a fair environmental comparison, OEM shall declare the number of passengers, crews and flight attendants used for the fuel calculations respecting the loading envelope as recommended by FAA[4]:

[4] https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC120-27E.pdf

- A weight of 102.1 kg (225 lb) shall be considered per passenger as mentioned in FAA Circular 120-27F for winter[5] case scenario including:
  - Standard average adult passenger's weight: 81.2 kg (179 lb)
  - Standard average personal items and carry-on bag's weight: 7.3 kg (16 lb)
  - Standard average baggage's weight:13.6 kg (30 lb)
- A weight of 108.9 kg (240 lb) shall be considered per flight crewmember including baggage.
- A weight of 95.3 kg (210 lb) shall be considered per flight attendant including baggage

All other information regarding configuration may be put in the EPD if found relevant.

4.2.2.2 Range

The range (defined in the glossary) is one of the main drivers of the environmental impact. That is why the following average ranges[6] are defined and shall be used for the LCA calculation (See Appendix A: Mission selection in the PCR for details on why this range has been selected):

- 926.00 km (500 nm) shall be considered for Light Business Jet
- 1 482.00 km (800 nm) shall be considered for Medium Business Jet
- 2 408.00 km (1 300 nm) shall be considered for Large Business Jet

These ranges are ONLY applicable for the Light, Medium and Large categories of Business jets.

Please note that the selected typical mission shall be scaled as per functional unit.

4.2.2.3 Product Specification

The technical specification of the business jet shall be declared in the product information section of the EPD (see section 6.4.4)

Different categories of Business jets can be distinguished[7,8,9] based upon some relevant specifications: cabin volume and flight range, described in the Table 2. These specifications shall be used to define and declare the Business jet category in the EPD.

Table 2 Specifications of the Business Jets

Categories	Cabin volume (m3)	Flight range (km)
Light	8.5 – 19.8 (300 ft^3 – 700 ft^3)	2 182 – 5 741.2 (1 178 nm – 3 100 nm)
Medium	19.8 – 42.5 (700 ft^3 – 1 500 ft^3)	5 741.2 – 9 260 (3 100 nm – 5 000 nm)
Large	42.5 – 85 (1 500 ft^3 – 3 000 ft^3)	> 9 260 (> 5 000 nm)

NOTE: If aircraft categories respective to its flight range and cabin volume do not match, use cabin volume only to categorize the aircraft.

As a first step, this PCR is ONLY applicable to the purpose-built light, medium and large categories of Business jets[11]which shall be declared in the EPD.

[5] To represent the worst-case scenario.

[6] Average ranges presented in SI unit are rounded to the nearest ten.

[7] JETCRAFT, "JETCRAFT 10 Year Market Forecast 2016-2025," 2016

[8] Business Aviation Aircraft Market Research (AMSTAT), "AMSTAT 2017 Business Aviation Market Update Report," 2017.

[9] Bombardier, "Bombardier Business Aircraft 2016-2025 Market Forecast," 2016.

Relevant Type I and Type II environmental labels awarded to the product may be stated; and any claims made about the product must be verifiable.

The EPD shall also define the main specifications of the Business jet declared as reported in **Error! Reference source not found.**.

Table 3 Business jet description

Information	Explanations
Commercial name	n/a
Type Certificate Data Sheet (TCDS) Number	As per certification body database
Date of certification	As per TCDS
Certification body	**FAA, EASA, Transport Canada, JAA, national authorities**
Propulsion system	Jet engines
Engine trade name	As per TCDS
Engine bypass ratio	**As per publicly available engine documentation**
Engine thrust rating	**As per publicly available engine documentation**
Standard accommodation	Baseline configuration
Maximum seating capacity	As per TCDS
Maximum takeoff weight	In kg, as per TCDS
Takeoff field length	At ISA, sea level and Maximum takeoff weight
Maximum Cruising speed	**In km/h and Mach**
Maximum operating altitude	In m and ft, as per TCDS
Maximum range @ Standard accommodation	In km

4.3 SYSTEM BOUNDARY

The scope of this PCR and EPDs based on it is considered as cradle-to-grave.

All environmentally relevant processes from “cradle to grave” shall be included, so that at minimum 95% of the total energy use, mass of product content, and environmental impact is accounted for (see Section 4.5).

4.3.1 LIFE-CYCLE STAGES AND INFORMATION MODULES

Based on the previous PCR version and aviation industry EPDs, the life cycle stages described in the following PCR are different from the ones proposed in the GPI.

Because of different data quality rules and the presentation of results, the product life cycle shall be divided into the following life-cycle stages and information modules:

- Upstream
- Core

- Operation
- End-of-Life

In the EPD, the environmental performance associated with each of the four life-cycle stages above shall be reported separately and in aggregated form. The processes included in the scope of the PCR and belonging to each life cycle stage are described in Sections 4.4

4.3.1.1 Upstream processes

The following unit processes are part of the product system and shall be classified as upstream processes:

- Extraction and production of raw and basic materials composing the Business jet: structure, power plant, systems and all fixed interior equipment.
- Energy production (electricity or fuel for the production/assembly of parts by tier-1 suppliers and/or original equipment manufacturer (excluding final assembly)
- Water consumption for the production/assembly of parts by tier-1 suppliers and/or original equipment manufacturer (excluding final assembly)
- Generation and treatment of waste (liquid and solid) for the production/assembly of parts by tier-1 suppliers and/or original equipment manufacturer (excluding final assembly).
- Transportation of Business jet shipsets from OEM manufacturing and/or sub-assembly facilities to Business jet final assembly plant.
- Transportation of Business jet shipsets from tier-1 suppliers manufacturing facilities to Business jet final assembly plant.

Upstream processes not listed may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

4.3.1.2 Core processes

The following unit processes are part of the product system and shall be classified as core processes:

Core processes not listed may also be included. Manufacturing of a minimum of 99% of the total weight of the declared product shall be included.

- Production and use of energy for final assembly of the aeroplane (e.g. electricity, natural gas, fuel, etc.)
- Production and use of water consumed for final assembly of the aeroplane
- Generation and treatment of waste and wastewater from the final assembly processes
- All aircraft final assembly processes
- Pre-certification flight tests

4.3.1.3 Operation module

The following operation processes are part of the product system and shall be classified as operation module:

- In-flight emissions of engines
- Emissions of Auxiliary Power Unit (APU)

  When the Business jet does not have APU, then energy and/or fuel type and consumption on ground from: external power generator, or pneumatics system shall be declared and used.
- Production of spare parts for maintenance
- Extraction and production of paint used throughout the life of the aeroplane
- Fuel production (Kerosene baseline) and transportation for the operation of the Business jet
- Transportation of maintenance materials and spare parts

4.3.1.4 End-of-Life module

The following end-of-life scenarios are part of the product system and shall be classified as end-of-life module:

- Aircraft dismantling activities
- Landfilling of materials
- Incineration of materials
- Transport to End-of-Life facility (Landfill, Incineration or recycling company)

4.3.1.5 Excluded Processes

Upstream Phase:

- All infrastructure life cycle.
- Production, maintenance, dismantling and disposal of vehicles used for transportation.
- Transportation of raw and basic materials to suppliers' manufacturing plants.
- Production of packaging of parts/sub-assemblies/assemblies sent to final assembly line.
  - The production of packaging is excluded from the LCA due to its insignificance in comparison to manufacturing of other parts, which constitute majority of the aircraft and due to unreliability of data available due to complexity of supply chain.
- Energy and water consumption for the production/assembly of parts by tier 2 and lower tier suppliers shall be excluded except if a significant quantity of an assembly is outsourced. (see Section 4.5)
- Generation and treatment of waste (liquid and solid) for the production/assembly of parts by tier 2 and lower tier suppliers shall be excluded except if a significant quantity of an assembly is outsourced (see Section 4.5).

Core phase:

- All infrastructure life cycle (see A. 3.1.2 "Infrastructure and capital goods" section of the GPI)
- Business travel of personnel
- Travel to and from work by personnel (employee commuting)
- Research and development activities
- Transportation inside manufacturing plants

Operation phase:

- All infrastructures (e.g. airport, ground support equipment, airline operator, maintenance…) life cycle
- Consumables used during operation of the Business jet (air, de-icing, lubricants…)
- Treatment and disposal of waste generated from business jet during operation
- Consumption of consumables during maintenance phase (lubricants, solvents, fuel for engine testing…)
- Production of catering, food, potable water and other standard items for the operation of the Business jet
- Water and energy use in maintenance operations
- Aircraft upgrades/refresh or re-sales upgrades/refresh

End-of-life phase:

- All infrastructure life cycle
- Energy recovery from waste incineration
- Recycling operations

4.3.1.6 Infrastructure and capital goods

See Section A.3.1.2 of the GPI.

4.3.2 OTHER BOUNDARY SETTING RULES

See Section A.3.2 of the GPI for rules on setting boundaries to nature as well as geographical and temporal boundaries. See Section A.4 of the GPI and Section 4.6 for rules on setting boundaries to other product systems.

4.3.2.1 Boundary towards nature

For the general definition on boundary to nature see Section A.3.2 of the GPI rules. Table 4 provides additional boundaries to follow for each process stage.

Table 4 Boundaries towards nature

PROCESS	BOUNDARIES TOWARDS NATURE
UPSTREAM CORE	Boundaries to nature are defined as flows of material and energy resources from nature into the system. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system.
OPERATION	Boundaries to nature are defined as flows of material and energy resources from nature into the system. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system. In-flight emissions to air by engines of carbon dioxide (CO_2) shall be considered for the whole flight and based on the profile presented in Appendix B: Flight profile. Cruising speed as well as cruising altitude(s) considered in the LCA shall be declared. In-flight emissions to air by engines of sulfur oxides (SO_x), nitrogen oxides (NO_x)[10], unburned hydrocarbons (HC) and carbon monoxide (CO) shall be considered for the landing take-off (LTO) cycle as a minimum, based on ICAO methodology[11] and the profile presented in Appendix B: Flight profile. LTO is defined in the glossary of terms. In-flight emissions to air by auxiliary power unit of carbon dioxide shall be considered based on the APU cycle presented on Appendix C: APU cycle description
END-OF-LIFE	Boundaries to nature are defined as flows of material and energy resources from the system into nature. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system.

4.3.2.2 Temporal boundary

See Section A.3.2 of the GPI rules, boundary in time.

4.3.2.3 Geographical boundary

The geographical boundary defines the geographical coverage of the LCA. This shall reflect the physical reality of the product under study, accounting for the representativeness of technology, input materials and energy input.

[10] NO_x are not included at cruise phase as it is not currently a measurable quantity. Work is on-going at ICAO to assess the emissions at cruise phase. NO_x emissions may then be included in next revisions of the PCR.

[11] https://global.ihs.com/doc_detail.cfm?&input_search_filter=ICAO&item_s_key=00142581&item_key_date=760531&input_doc_number=ANNEX%2016%20VOL%20II&input_doc_title=&org_code=ICAO

Table 5 Boundaries towards geography

PROCESS	Geographical boundary
UPSTREAM	LCI data describing the energy and material inputs and outputs shall be representative of the country or the region in which the processes are taking place. In rare cases when no other information is available, global data, e.g. world average values may be used.
CORE	The Life Cycle inventory data shall be representative for the site/region where the Business jet is assembled.
OPERATION	LCI data describing the energy and material inputs and outputs shall be representative of the country or the region in which the processes are taking place. In rare cases when no other information is available, global data, e.g. world average values may be used.
END-OF-LIFE	

4.3.2.4 Boundary towards other technical systems

Boundaries towards other technical systems define the flow of materials and components to/from the product system under study and to/from other product systems. If there is an inflow of recycled material to the product system in the production/manufacturing stage, the transport from the scrapyard/collection site to the recycling plant, the recycling process, and the transportation from the recycling plant to the site where the material is being used shall be included. If there is an outflow of material or component to recycling, the transportation of the material to the scrapyard/collection site shall be included. The material or component going to recycling company is then an outflow from the product system.

See Section 4.6.2 for further guidance.

4.4 PROCESS FLOW DIAGRAM

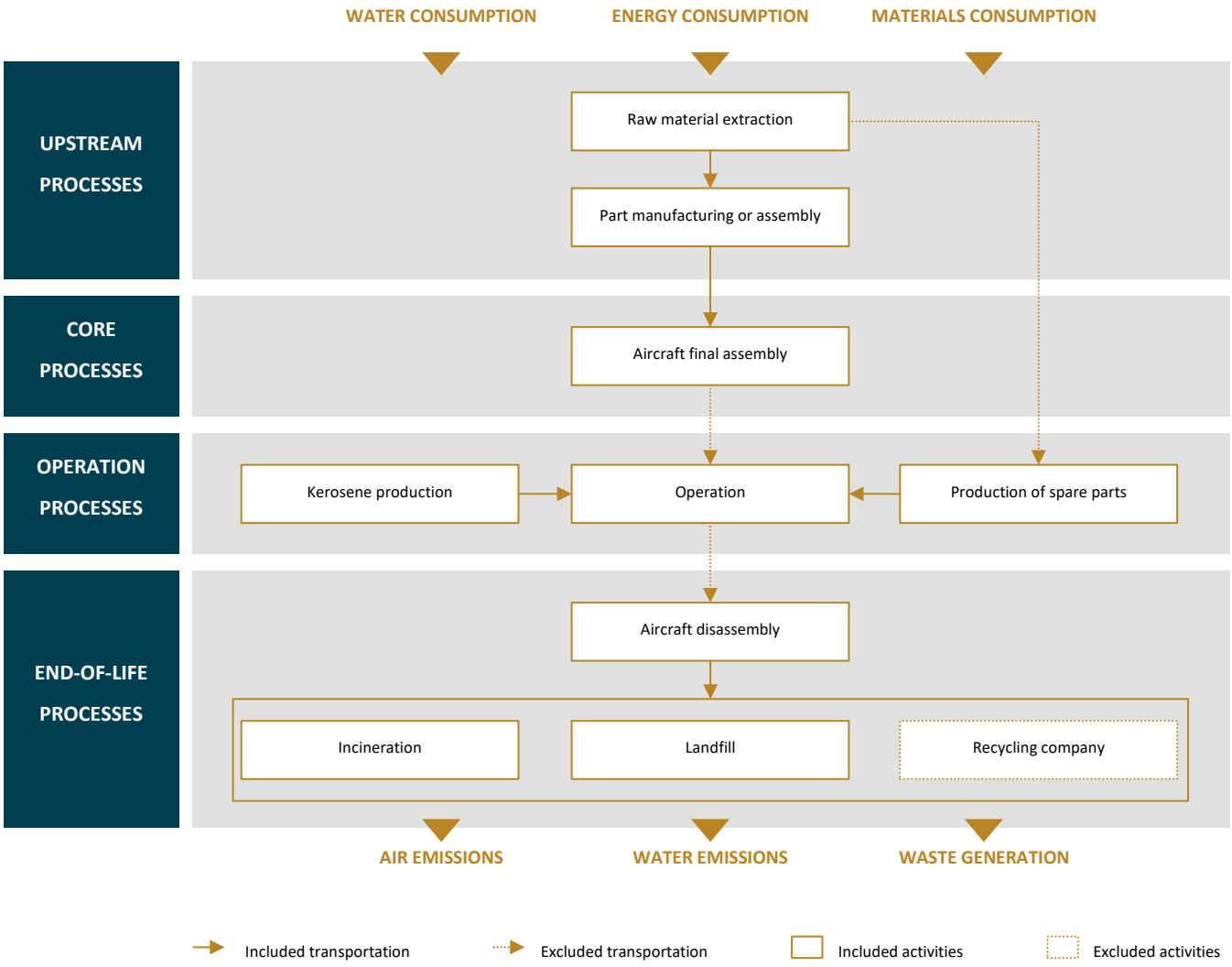

Figure 2. Process flow diagram illustrating the processes that shall be included in the product system, divided into the life-cycle stages.

4.5 CUT-OFF RULES

See Section A.3.3 of the GPI. Table 6 provides additional cut off rules to follow for each process stage.

Table 6 Cut-off rules

PROCESS	CUT-OFF RULES
UPSTREAM	The energy and water consumption, waste generation and treatment from sub-tier-1 suppliers is not mandatory except if more than twenty percent weight ratio (20 % wt/wt) of the total assembly is outsourced and manufactured in one facility. In the case where tier 2 or lower tier supplier data is available it shall be included.

	In case a supplier has several facilities where different parts are manufactured, only the energy from the final assembly facility is accounted. However, the other facilities will become as sub-tier-1 suppliers and thus the above cut-off rule is applicable. The total mass of the materials shall be included in the LCA report (based on delivered weight empty, see glossary).
CORE OPERATION END-OF-LIFE	Data for elementary flows to and from the product system contributing to a minimum of 95% of the declared environmental impacts shall be included (not including processes that are explicitly outside the system boundary as described in Section 4.2.11).

4.6 ALLOCATION RULES

See Section A.4 of the GPI. Table 7 provides additional allocation rules to follow for each process stage.

The principles for allocation of co-products and allocation of waste are described separately in the following subsections

Table 7 Allocation instructions

PROCESS	ALLOCATION INSTRUCTIONS
UPSTREAM CORE	If relevant, the allocation of environmental impacts to co-products should be based on a mass criterion. It is also acceptable to use the number of parts produced as allocation criteria. Any other allocation procedures based on the product's physical or chemical characteristics shall be justified. The use of economic allocation criteria shall be avoided because of its sensitivity to market specific conditions. The allocation procedures shall be documented in the LCA report.
OPERATION	Fuel burn and all related calculations ▪ 100% of fuel burn is attributable to the flight profile (Appendix B: Flight Profile). ▪ Even if fuel reserves shall be considered as per National Business Aviation Association (NBAA) (as shown on Appendix B: Flight profile) making the aircraft heavier, none of this fuel shall be consumed for the purpose of the mission considered in the LCA.

4.6.1 ALLOCATION OF CO-PRODUCTS

See Section A.4.1 of the GPI and Table 7 of the PCR.

4.6.2 ALLOCATION OF WASTE

See Section A.4.2 of the GPI and table 7 of the PCR.

Additionally, recycled materials from a scrapyard where the origin is unknown (e.g., data/statistics on shares of post- and pre-consumer materials are missing for the specific scrapyard or the country of its location), shall be assumed to be waste and allocated accordingly, unless default data provided on www.environdec.com/methodology says otherwise. For consistency, scrap sent to a scrapyard shall be assumed to be waste and allocated accordingly, unless default data provided on www.environdec.com/methodology says otherwise.

4.7 DATA AND DATA QUALITY RULES

See Section A.5 of the GPI for general rules and approach. Section 4.9 of the PCR provides more detail and more specific rules and guidelines.

4.7.1 DATA CATEGORIES

See Section A.5.1 of the GPI.

4.7.2 DATA QUALITY REQUIREMENTS FOR PRIMARY DATA

See Section A.5.2 of the GPI.

Additionally, the reference year of the primary data shall not be more than five years old and shall be representative for the validity period of the EPD (if not, the EPD shall be updated, see Section 2.2.4). The reference year, which does not need to be a calendar year, is the latest year in which the data provider confirmed the data to be representative/valid, i.e., the end year for the most recently set validity period.[12] This means that primary LCI data can have been collected more than five years ago, but the representativeness/validity shall have been reassessed and confirmed by the data provider (the manufacturer/service provider) within the past five years.[13] In such reassessments, it may be that data is confirmed to be conservative compared to fully representative data, for example because it is known that the manufacturing process has improved (e.g., less material losses or lower energy use) but collected data from the past five years is missing. In such cases, the reference year can still be updated, and the data can still qualify as primary data. If this is done, it shall be described and justified in the LCA report.

4.7.3 DATA QUALITY REQUIREMENTS FOR REPRESENTATIVE SECONDARY DATA

See Section A.5.3 of the GPI.

4.7.4 DATA QUALITY ASSESSMENT AND DECLARATION

See Section A.5.4 of the GPI.

4.7.5 EXAMPLES OF DATABASES FOR SECONDARY DATA

Error! Reference source not found.9 lists examples of databases and datasets to be used for secondary data. Note that a data quality assessment shall be performed also for data listed in the table, and that other data that fulfil the data quality requirements may also be used.

Table 9 Examples of databases and datasets to use for secondary data.

MATERIAL/PROCESS	GEOGRAPHICAL SCOPE	DATABASE
Metals, electricity, fuels, chemicals, transport, waste management	Global, Europe	Sphera ELCD (Europe) Ecoinvent
Plastics	Global, Europe	PE Plastics Europe Sphera ELCD (Europe) Ecoinvent
Electronic components	Global, Europe	Sphera ELCD (Europe) Ecoinvent

[12] This definition of “reference year” is a specification and merge of the definitions in EN 15804, EN 15941, ISO 21930 and in the ILCD format.

[13] This reassessment can, for example, be done based on collected metadata, such as information on the type of machinery being used in a manufacturing process. So it can be that some data (LCI and/or meta data) have been collected within five years, while some data are older than five years but has been confirmed to still be representative based on the more recently collected data. An example: the amount of electricity a machinery use and the emissions generated was measured seven years ago, but within the past five years the producer has confirmed the same machine is still in use and has provided updated data on the type of electricity used to run the machine.

4.8 OTHER LCA RULES

See Section A.6 of the GPI.

For specific LCA rules per life-cycle stage, see Section 4.9.

4.8.1 MASS BALANCE

See Section A.6.1 of the GPI.

4.8.2 ELECTRICITY MODELLING

See Section A.6.2 of the GPI.

The following requirement for contractual instruments in the GPI may not be possible to comply with in all markets for contractual instruments: "the contractual instrument shall … be valid for at least the upcoming six months from the publication of the EPD." Therefore, it is replaced with the following: "is produced as close as possible to the period to which the contractual instrument is applied and comprises a corresponding timespan."

4.8.3 BIOGAS MODELLING

See Section A.6.3 of the GPI.

4.9 SPECIFIC RULES PER LIFE-CYCLE STAGE

See Section A.7 of the GPI. The table below provides additional data and data quality rules to follow for each process stage. The sections further provide more specific information on how to approach data collection for each of these stages.

Table 10 Data quality rules

PROCESS	DATA QUALITY RULES
UPSTREAM	Quantification of flows (e.g. The material composition of the whole aircraft, energy and water consumed to manufacture each part of the Business jet and waste generated) shall be acquired from and confirmed by tier-1 suppliers for at least 90% of the total mass of the business jet (based on delivered weight empty, see glossary). The remaining 10% can be acquired from estimation or literature. The transportation of parts shall be accounted for and reflect the latest available information verified by the supply chain specialist or directly by tier-1 supplier. If no direct supplier or supply chain specialist data is available proxy data may be used. Selected generic data representing country or regional averages can be used for cradle to gate material production and energy production processes if specific data is unavailable. It is important to emphasize that – in most cases – all available data shall be used. Using cut-off rules should not give the perceptions of "hiding" information, but rather to facilitate the data collection for practitioners. The EPD® may include an indicator suitable to demonstrate the relevance of specific, selected generic and other generic data.
CORE	Site-specific data shall be used for all core processes including on-site generation of energy if relevant. The electricity mix used in the core processes should be the supplied mix. The energy mix used for electricity generation shall be documented in the LCA report. If such information is not available, the region/country average electricity mix, or energy production shall be used.
OPERATION	Whenever applicable, data on pollutant emissions from the use phase shall be based on internationally recognized documented tests, i.e.:

- LTO emissions of nitrogen oxides (NO_x), hydrocarbons (HC) and carbon monoxide (CO) shall be calculated based on ICAO engine certification if applicable.

The following assumptions are made to calculate the emissions:

- A factor of 3.16 wt./wt. shall be used to derive carbon dioxide emissions from fuel consumption[14].
- Nitrogen oxides (NO_x)[15], unburned hydrocarbons (HC) and carbon monoxide (CO) emissions are considered only during the landing/takeoff cycle as defined by ICAO. Emissions are directly taken from certification document for those substances[16].
- Jet fuel production shall also be integrated in the study. As the aircraft can operate anywhere in the world, a generic global production mix, based on publicly available country-specific statistics from the International Energy Agency (IEA), shall be used. An example of the Jet fuel Production statistics is presented in Table 11. A sensitivity analysis shall be conducted on the production country of Jet fuel.
- Transportation of jet fuel from the refinery to the airport where the aircraft will be operated shall also be considered with a selected 50 km distance.

Table 11: Jet Fuel Production Statistics (2020)[17]

Country	Production	
	Thousand metric tons per capita	% in production mix
France	1 481	1
UK	1 943	2
Australia	2 326	2
Germany	2 519	2
Brazil	2 703	3
Japan	5 045	5
India	*7 077	6
China	*39 713	36
US	47 370	43

* Estimate by the United Nations Statistics Division

- Standard fuel shall be considered in the LCA as per ASTM D1655[18]. Other types of fuels (SAF) may be considered for comparison in the EPD and specified in a respective section (proof of carbon intensity advantage shall be provided to the verifier). The type of fuel used shall be declared in the EPD.
- A kerosene sulfur content of 0.045% shall be considered as measured on average in jet fuel[19] or the following ASTM D1655 requirements for sulfur content[20]. In the case of SAF use, the sulfur content, if any, shall be provided to the verifier.

[14] https://applications.icao.int/icec/Methodology%20ICAO%20Carbon%20Calculator_v11-2018.pdf

[15] NOx are not included at cruise phase as it is not currently a measurable quantity. Work is on-going at ICAO to assess the emissions at cruise phase. NOx emissions may then be included in next revisions of the PCR.

[16] International Civil Aviation Organization (ICAO), "ICAO aircraft engine emissions databank," ICAO, 2017

[17] https://unstats.un.org/unsd/energystats/pubs/yearbook/2020/t20.pdf

[18] ASTM International, "ASTM D1655-18, Standard Specification for Aviation Turbine Fuels,"

[19] Coordinating Research Council (CRC), "Update of the survey of sulfur levels in Commercial jet fuel, Final Report," CRC Project AV-1-10

[20] https://www.astm.org/standards/d1655

	When these tests are not applicable (aircraft with engine whose rated output is lower than 26.7kN or whose date of manufacture is before 1986), emissions data shall be based on third-party verified studies. Whenever applicable, ICAO certification data shall be given in the LCA report.
END-OF-LIFE	The data used for the Business jet end-of-life shall represent the state of technological knowledge within the boundaries in time defined in the section 4.3.2.2

Below are further data quality requirements and other LCA rules per life-cycle stage, of relevance for the product category.

4.9.1 UPSTREAM PROCESSES

- Data referring to processes upstream in a supply chain over which the EPD owner has direct management control shall be specific and collected on site.
- Data referring to processes of a supplier of main parts, packaging, or main auxiliaries should be requested from the supplier as primary data, as well as infrastructure, where relevant.
- Data on transport of main parts and components along the supply chain to a distribution point (e.g. a stockroom or warehouse) where the final delivery to the manufacturer can take place, should be specific and based on the actual transportation mode, distance from the supplier, and vehicle load.
- In case primary data is lacking, representative secondary data may be used. If this is also lacking, proxy data may be used (see Section 4.7.3).
- For upstream processes modelled with primary data, generation of electricity used shall be accounted for in this priority:
    1. Specific electricity mix as generated, or purchased from an electricity supplier, demonstrated by a Guarantee of Origin or similar as provided by the electricity supplier.
    2. Residual electricity mix of the electricity supplier on the market.
    3. Residual electricity mix on the market[21].
    4. Electricity consumption mix on the market[22].

    The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total consumption mix.

    "The market" in the above hierarchy shall be defined as being the (residual or consumption) grid mix of the country where the electricity is used, with exceptions for specified countries for which a sub-national electricity grid mix shall be used: Australia, Brazil, Canada, China, India, and USA.

    The mix of electricity used in upstream processes shall be documented in the EPD, where relevant.

4.9.2 CORE PROCESSES

- Transport from the final delivery point of raw materials, chemicals, main parts, and components (see above regarding upstream processes) to the manufacturing plant/place of service provision should be based on the actual transportation mode, distance from the supplier, and vehicle load, if available.
- Goods: Primary data shall be used for the assembly of the product and for the manufacture of main parts as well as for on-site generation of steam, heat, electricity, etc., where relevant.

[21] The composition of the residual grid mixes on the market are available for all EU countries and a few additional European countries through the Association for Issuing Bodies (AIB) at https://www.aib-net.org/facts/european-residual-mix.

[22] For electricity markets without trade of Guarantees of Origin (or similar), the residual mix will, however, be identical to the consumption mix.

- Services: Primary data shall be used for the consumption of materials, chemicals, steam, heat, electricity, etc., necessary for execution of the service
- For electricity used in the core processes, generation of electricity used shall be accounted for in this priority:
    1. Specific electricity mix as generated, or purchased from an electricity supplier, demonstrated by a Guarantee of Origin or similar as provided by the electricity supplier.
    2. Residual electricity mix of the electricity supplier on the market.
    3. Residual electricity mix on the market[23].
    4. Electricity consumption mix on the market[24]. This option shall not be used for electricity used in processes over which the manufacturer (EPD owner) has direct control, as long as the composition of the residual grid mix has been publicly disclosed[25].

    The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total consumption mix.

    "The market" in the above hierarchy shall be defined as being the (residual or consumption) grid mix of the country where the electricity is used, with exceptions for specified countries for which a sub-national electricity grid mix shall be used: Australia, Brazil, Canada, China, India, and USA.

    The mix of electricity used in the core processes shall be documented in the EPD, where relevant.

    - Waste treatment processes of manufacturing waste should be based on primary data, if available.

4.9.3 OPERATION MODULE

The following requirements apply to the operation module:

- Data for the use stage are usually based on scenarios, but primary data should be used when available and relevant.
- Data on the pollutant emissions from the use stage should be based on documented tests, verified studies in conjunction with average or typical product use, or recommendations concerning suitable product use. Whenever applicable, test methods shall be internationally recognised.
- The transport of spare parts for maintenance to the customer should reflect the actual situation to the best extent possible. The following priority should be used:
    1. Actual transportation distances and types.
    2. Calculated as the average distance of a spare part transported by different means of transport modes.
    3. Calculated as a fixed long transport, such as 1 000 km transport by lorry or truck, or 10 000 km by airplane, according to the spare part.

4.9.4 END-OF-LIFE MODULE

The following requirements apply to the end-of-life module:

- Scenarios for the end-of-life stage shall be technically and economically practicable and compliant with current regulations or best practices (such as AFRA's Best Management Practice guide (BMP)[26]) in the relevant geographical region based on the geographical scope of the EPD. Key assumptions regarding the end-of-life stage scenario shall be documented.

[23] The composition of the residual grid mixes on the market are available for all EU countries and a few additional European countries through the Association for Issuing Bodies (AIB) at https://www.aib-net.org/facts/european-residual-mix.

[24] For electricity markets without trade of Guarantees of Origin (or similar), the residual mix will, however, be identical to the consumption mix.

[25] If the composition of the residual grid mix has not been publicly disclosed, the second or third options in the above hierarchy are not feasible and thus the fourth option is the only remaining option (if the first option is not chosen).

[26] https://afraassociation.org/accreditation/the-afra-bmp/

- The transport end-of-life facilities should reflect the actual scenario to the best possible. The following priority should be used:
    1. Actual transportation distances and types.
    2. Calculated as the average distance of end-of-life parts transported by different means of transport modes.
    3. Calculated as a fixed transport, such as 100 km transport by truck or 1000 km by lorry, according to the part. Note: not circle distance but actual travelled distance.

4.10 ENVIRONMENTAL PERFORMANCE INDICATORS

See Section A.8 of the GPI.

All the results of all performance indicators shall be adjusted to be reported per functional unit.

The potential environmental impact per functional unit for the following environmental impact categories shall be reported in the EPD, divided into core, upstream, operation and end-of-life modules. The characterization of environmental impacts shall follow the latest version of EN 15804 +A2 using the Environmental Footprint (EF) method, ensuring comparability across product categories. Only the following environmental impact indicators shall be declared:

- Global Warming Potential (GWP): Emissions of greenhouse gases (expressed as the sum of global warming potential, GWP, 100 years, in carbon dioxide equivalents, kg CO2 eq.),
- Acidification Potential (AP): Emission of acidifying gases (expressed as the sum of acidification potential expressed as moles of hydrogen ions, mol H+ eq.),
- Photochemical Ozone Creation Potential (POCP): Emission of gases that contribute to the creation of ground-level ozone, “photochemical ozone creation potential” (expressed as the sum of ozone-creating potential, in non-methane volatile organic compounds, kg NMVOC eq.),
- Eutrophication Potential (EP): Emission of substances to water contributing to oxygen depletion, “eutrophication” (emissions to fresh water expressed as phosphorus, kg P eq., emissions to aquatic marine expressed as nitrogen, kg N eq., emissions to land, terrestrial, expressed as moles of nitrogen, mol N eq.).
- Ozone Depletion Potential (ODP): Emissions contributing to the ozone layer depletion (expressed as trichlorofluoromethane, kg CFC-11 eq).
- Abiotic Depletion Potential of minerals and metals (ADP): quantifies the consumption of non-renewable minerals and metal resources (expressed as kilograms of antimony equivalent, kg Sb eq.)
- Water deprivation potential, WDP, (expressed in, m3 eq.).

The results of the WDP indicator shall always be accompanied with the following disclaimer, both in the LCA report and in the EPD: “The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator”[27].

Only the following indicators of resource use shall be declared:

For further details on the impact indicators, see Section 6.4.7.2

- Primary resources – renewables: energy and materials, expressed in MJ.
- Primary resources – non-renewable: energy and materials, expressed in MJ.
- Net use of freshwater, expressed in m^3.

Only the following indicators of waste and output flows shall be declared:

For further details on the impact indicators, see Section 6.4.7.3

[27] https://www.environdec.com/indicators

For total life cycle waste generated:

- Hazardous waste disposed, expressed in kg
- Non-hazardous waste disposed, expressed in kg
- Radioactive waste disposed, expressed in kg

For end-of-life of the product:

- Materials for recycling, expressed as a weight fraction of the entire product weight
- Materials for energy recovery, expressed as weight fraction of entire product weight
- Materials for landfill, expressed as weight fraction of entire product weight

Other environmental information that shall be declared:
For further details on the impact indicators, see Section 6.4.7.4

- Aeroplane fuel consumption, expressed in liters
- Critical Raw Materials

  Critical Raw Materials (CRMs): declaration of presence of critical raw materials shall be provided to the extent that they are identifiable within the underlying LCA databases (e.g., GaBi Professional, Ecoinvent). Reporting is limited to CRM-related input flows included in these databases. Identification shall be performed by referencing a recognized CRM list (e.g., EU CRM list, IEA/UNEP CRM list). Only materials exceeding 1% mass cut-off threshold shall be included in the declaration.
- Noise emissions, expressed as EPNdB

  The noise emissions of the aeroplane shall be declared in accordance with ICAO, Annex 16, Volume I.
- Water vapour emissions during operation phase as part of LTO cycle, expressed in kg

4.11 SPECIFIC RULES PER EPD TYPE

4.11.1 MULTIPLE PRODUCTS FROM THE SAME COMPANY

See Section A.9.1 of the GPI.

4.11.2 SECTOR EPD

See Section A.9.2 of the GPI.

4.11.3 EPD OWNED BY A TRADER

See Section A.9.3 of the GPI.

4.11.4 EPD OF PRODUCT NOT YET ON THE MARKET

See Section A.9.4 of the GPI.

4.11.5 EPD OF PRODUCT RECENTLY ON THE MARKET

See Section A.9.5 of the GPI.

5 CONTENT OF LCA REPORT

Data for verification shall be presented in the form of an LCA report – a systematic and comprehensive summary of the project documentation that supports the verification of an EPD. The LCA report is not part of the public communication.

See Section 8.3.1 of the GPI for rules on the content of the LCA report.

Note that there may be rules on the content of the LCA report elsewhere in the GPI or in this PCR.

6 CONTENT AND FORMAT OF EPD

See Section 7 of the GPI.

6.1 EPD LANGUAGES

See Section 7.1 of the GPI.

6.2 UNITS AND QUANTITIES

See Section 7.2 of the GPI.

6.3 USE OF IMAGES IN EPD

See Section 7.3 of the GPI.

6.4 SECTIONS OF THE EPD

See Section 7.4 of the GPI.

The EPD may include an introduction.

6.4.1 COVER PAGE

See Section 7.4.1 of the GPI.

6.4.2 GENERAL INFORMATION

See Section 7.4.2 of the GPI.

6.4.3 INFORMATION ABOUT EPD OWNER

See Section 7.4.3 of the GPI.

This section may also include a message from the CEO.

6.4.4 PRODUCT INFORMATION

See Section 7.4.4 of the GPI.

In addition to the rules outlined in the GPI, the following shall be included into the EPD:

1. Cabin volume considered in the LCA study
2. Number of flights cycles and flight hours that the aeroplane can perform in its entire life (based on the certification)
3. Complete layout of declared interior configuration considered in the LCA
4. Main specifications of the product (according to Table 3, Section 2.2.2)
5. A simple visual representation or image of the product
6. A description of the technical purpose of the product, including its application/intended use,
7. A description of the background system, including the main technological aspects,
8. Geographical scope of the EPD, i.e., for which geographical location(s) of use and end-of-life the product's performance has been calculated,

9. Functional unit,
10. Reference service life (RSL) and/or technical/actual lifespan, if relevant,
11. Declaration of the year(s) covered by the data used for the LCA calculation and other relevant reference years,
12. Reference to the main database(s) for generic data and LCA software used, if relevant,
13. System diagram of the processes included in the LCA, divided into the life cycle stages,
14. Description if the EPD system boundary is “cradle-to-gate”, “cradle-to-gate with options” or “cradle-to-grave”,

This section may also include:

1. Any additional information about the underlying LCA-based information, such as cut-off rules, data quality, allocation methods, and other methodological choices and assumptions,
2. A description of the material properties of the product with a declaration of relevant physical or chemical product properties, such as density, etc., and
3. If end-of-life treatment is not included, the EPD shall contain a statement that it shall not be used for communicating environmental information to consumers/end users of the product.

Any claim made about the product must be verifiable.

6.4.5 CONTENT DECLARATION

See Section 7.4.5 of the GPI.

In addition to the rules outlined in the GPI, the content declaration of materials (based on the DWE, see glossary in Section 8) shall be declared in the EPD at a minimum of 90 % of one aircraft and shall be classified into the following categories as a minimum, adapted from ISO 22628:

1. Metals
2. Polymers
3. Elastomers
4. Fluids (liquids and gases)
5. Others (Electronics, coating…)

Fibre reinforced polymers materials (carbon fibre reinforced polymer, glass fibre reinforced polymer, aramid) shall be classified as polymers.

A detailed material report shall be part of the LCA report by alloy type.

Content declaration concerning hazardous properties:

Since the aerospace industry is highly regulated by safety and that a declaration of hazardous properties of materials and chemical substances requires the publication of sensitive data from suppliers, it is suggested to disclose only these substances on demand and under a contract or a non-disclosure agreement to the end users. This content declaration shall not be included in the EPD.

6.4.6 LCA INFORMATION

See Section 7.4.6 of the GPI.

6.4.7 ENVIRONMENTAL PERFORMANCE

See Section 7.4.7 of the GPI.

The EPD shall declare the environmental performance indicators listed or referred to in Section 4.10, per functional unit, per life-cycle stage.

Below subsections list the mandatory environmental performance indicators to declare in the EPD.

6.4.7.1 Environmental impacts

The EPD shall declare the environmental impact indicators, per functional unit, per life-cycle stage and in aggregated form, using the default impact categories, impact assessments methods and characterization factors available at www.environdec.com/indicators. The source and version of the impact assessment methods and characterization factors used shall be reported in the EPD. For the full list of environmental impact indicators, and their methodology that shall be reported, see Section 4.10.

Table 12 provides a format guideline on presentation of the environmental impacts.

Table 12. Indicators describing potential environmental impacts	UNIT	UPSTREAM	CORE	OPERATION	END-OF-LIFE	TOTAL
Global warming potential (GWP)	kg CO_2 eq.					
Acidification potential (AP)	mol H+ eq.					
Eutrophication potential (EP)	To fresh water: kg P eq. Aquatic marine: kg N eq. Terrestrial: mol N eq.					
Formation potential of tropospheric ozone (POCP)	kg NMVOCs eq.					
Ozone depletion potential (ODP)	kg CFC 11 eq.					
Abiotic depletion potential of minerals and metals (ADP)	kg of Sb eq.					
Water deprivation potential	m^3 eq.					

6.4.7.2 Use of resources

The EPD shall declare the mandatory, and may declare the optional, indicators for resource use listed at www.environdec.com/indicators per functional unit or declared unit, per life-cycle stage and in aggregated form.

At minimum, the indicators for resource use based on the life cycle inventory (LCI) listed in Table 13 shall be declared per functional unit and per life cycle stage.

Table 13. Indicators describing use of resources		UNIT	UPSTREAM	CORE	OPERATION	END-OF-LIFE	TOTAL
Primary resources – Renewable	Energy	MJ					
	Materials	MJ					
Primary resources – Non-renewable	Energy	MJ					
	Materials	MJ					
Net use of freshwater		m^3					

Notes:

- To identify the primary energy used as an energy carrier (and not used as raw materials), the parameter may be calculated as the difference between the total input of primary energy and the input of energy resources used as raw materials.
- Energy content of biomass used for feed or food purposes shall not be considered.

6.4.7.3 Waste production and output flows

Waste generated throughout the whole life cycle production supply-chains shall be treated following the guidelines provided in the GPI. The EPD may declare the optional indicators for waste production and output flows as listed at www.environdec.com per functional unit, per life-cycle stage and in aggregated form.

When the amount of waste or the output flows is from the life cycle inventory (LCI) are declared, the indicators in
The aerospace industry is actively working toward the development of standards governing aircraft end-of-life processes. In the absence of dedicated standards for aeroplanes, recyclability and recoverability fractions shall be reported in the Environmental Product Declaration (EPD) using the ISO 22628 methodology, which was originally developed for road vehicles.

Table 15 Indicators describing output flows[14] shall be reported per functional unit, and per life cycle stage. In Table 15, per functional unit.

Table 14 Indicators describing waste production

PARAMETER	UNIT	UPSTREAM	CORE	OPERATION	END-OF-LIFE	TOTAL
Hazardous waste disposed	kg					
Non-hazardous waste disposed	kg					
Radioactive waste disposed	kg					

The aerospace industry is actively working toward the development of standards governing aircraft end-of-life processes. In the absence of dedicated standards for aeroplanes, recyclability and recoverability fractions shall be reported in the Environmental Product Declaration (EPD) using the ISO 22628 methodology, which was originally developed for road vehicles.

Table 15 Indicators describing output flows

PARAMETER	UNIT	TOTAL
Materials for recycling	% wt./wt.	
Materials for energy recovery	% wt./wt.	
Materials for landfill	% wt./wt.	

6.4.7.4 Other environmental indicators

- Aeroplane fuel consumption

The block fuel as well as the reserves shall be reported in the EPD and shall be based on the flight profile presented in Appendix A: Mission selection in the PCR. The block fuel shall be reported in Litres per functional unit.

- Critical Raw Materials

Critical Raw Materials (CRMs): declaration of presence of critical raw materials shall be provided to the extent that they are identifiable within the underlying LCA databases (e.g., GaBi Professional, Ecoinvent). Reporting is limited to CRM-related input flows included in these databases. Identification shall be performed by referencing a recognized CRM list (e.g., EU CRM list, IEA/UNEP CRM list). Only materials exceeding 1% mass cut-off threshold shall be included in the declaration.

- Noise emissions

The noise emissions of the aeroplane shall be declared in accordance with ICAO, Annex 16, Volume I at the three following points:

  - Flyover

- Lateral
- Approach

Noise emissions shall be reported in EPNdB units and shall be declared against the relevant noise limit as per certification document. The limit used shall be stated in the EPD.

A database compiling all noise certification data can be found on http://noisedb.stac.aviation-civile.gouv.fr/.[28]

- Water vapour emissions

Water vapour is emitted during the flight and shall be declared in the EPD. Water vapour's quantity can be derived directly from the fuel burned as follows: 1,260 gwater/kgfuelburned[29].

At high altitudes, emitted water vapour can lead to the formation of condensation trails (contrails), which may evolve into contrail-induced cirrus clouds. These phenomena can influence the Earth's radiation balance and contribute to climate change—potentially with both warming and cooling effects, depending on atmospheric conditions.

However, the direct Global Warming Potential (GWP) of in-situ water vapour emissions is highly variable, difficult to isolate, and depends on altitude, location, and meteorological conditions. Due to the current lack of a scientifically robust and consistent methodology, the GWP of water vapour has been excluded from the present PCR.

The EPD shall include the following statement:

"These results are only valid for this range and this configuration. No linear assumption can be made to extrapolate potential environmental impacts for another distance, another configuration or another aeroplane type."

6.4.8 ADDITIONAL ENVIRONMENTAL INFORMATION

See Section 7.4.8 of the GPI.

Any additional information that is identified as an important environmental aspect of the Business jet can be addressed in the EPD, e.g. fuel consumption data for several ranges, configurations or missions. In the case of the addition of other environmental information, the methodology used shall be declared in the EPD and the LCA report.

6.4.9 ADDITIONAL SOCIAL AND ECONOMIC INFORMATION

See Section 7.4.9 of the GPI.

6.4.10 INFORMATION RELATED TO SECTOR EPDS

See Section 7.4.10 of the GPI.

6.4.11 VERSION HISTORY

See Section 7.4.11 of the GPI.

6.4.12 ABBREVIATIONS

See Section 7.4.12 of the GPI.

6.4.13 REFERENCES

See Section 7.4.13 of the GPI.

[28] The following database shall only be used for information purposes

[29] O. Altuntas, "Designation of Environmental Impacts and Damages of Turbojet Engine: A Case Study with GE-J85," Atmosphere, Anadolu

7 LIST OF ABBREVIATIONS

APU	Auxiliary Power Unit
ASTM	American Society for Testing and Materials
ATAG	Air Transport Action Group
BFL	Balanced Field Length
CAAC	Civil Aviation Administration of China
CEO	Chief Executive Officer
CFC	Chlorofluorocarbons
CFRP	Carbon Fiber Reinforced Plastics
CO2	Carbon dioxide
CPC	Central product classification
EPNdB	Effective Perceived Noise (Decibel)
DWE	Delivered Weight Empty
EASA	European Aviation Safety Agency
EMAS	Eco-Management and Audit Scheme
EMD	Emergency Distance
EPD	Environmental Product Declaration
FAA	Federal Aviation Administration
GFRP	Glass Fiber Reinforced Plastics
GPI	General Programme Instructions for environmental product declarations
GWP	Global Warming Potential
HC	Hydrocarbon
ICAO	International Civil Aviation Organization
IEC	International EPD Consortium
ILCD	International reference Life Cycle Data system
ISA	International Standard Atmosphere
ISO	International Standard Organization
kg	kilogram
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LOPA	Layout Passenger Accommodation
LRC	Long Range Cruise
LTO	Landing Take-Off
MTOW	Maximum Take-Off Weight
MWE	Manufacturer's Weight Empty
NBAA	National Business Aviation Association
NOx	Nitrogen Oxides

OWE	Operating Weight Empty
PCR	Product Category Rules
PMI	PCR Module Initiative
PP	Polluter Pays
RSL	Reference service life
SI	The International System of Units
SO2	Sulfur dioxide
TCDS	Type Certificate Data Sheet
TOD	Take-Off Distance
TOFL	Take-Off Field Length
UN	United Nations
UNCPC	United Nations Central Product Classification
VOC	Volatile Organic Compound

8 GLOSSARY

Balanced field length (BFL)	Hypothetical length of runway for which the available take-off distance (TOD) equals the emergency distance available (EMD).
Baseline configuration	Aircraft interior standard configuration offered to customers in the catalogue and excluding optional items.
Basic material	Materials typically used in an aircraft by opposition to raw materials, e.g. aluminium is the basic material made of the bauxite raw material
Cruising speed	Normal operating speed of an aeroplane in level flight at typical cruising altitude.
Delivered Weight Empty (DWE)	The DWE consists of manufacturer's weight empty (MWE), all fixed interior equipment (both standard and optional) and customer options.
Fuel	Any substance burned as a source of heat or power, such as coal, petrol or natural gas.
Landing-Take-off Cycle (LTO)	The operational LTO cycle describes the movements of an aeroplane between ground and 3000 ft.
Manufacturer's weight empty (MWE)	The MWE consists of the weight of the structure, power plant, systems and interior provisions as defined in the type specification. The MWE excludes the engine oil and unusable fuel.
Maximum operating altitude	The maximum flight level at which an aircraft has a near-zero rate of climb at best rate of climb speed and climb power or thrust.
Maximum Take-off Weight (MTOW)	The highest aeroplane loaded weight allowable for the engine power available under the given conditions.
Operating Weight Empty (OWE)	The OWE consists of DWE plus Operating items
Operational items	Personnel, equipment, and supplies necessary for a particular operation but not included in basic empty weight. These items may vary for a particular aircraft and may include, but are not limited to, the following: Crewmembers, supernumeraries, and bags; Manuals and navigation equipment; Passenger service equipment, including pillows, blankets, and magazines; Removable service equipment for cabin, galley, and bar; Food and beverage, including liquor; Usable fluids, other than those in useful load; Required emergency equipment for all flights; Life rafts, life vests, and emergency transmitters; Aircraft unit load devices; Potable water; Drainable unusable fuel; Spare parts normally carried aboard and not accounted for as cargo; and all other equipment considered standard by the operator.
Process outputs.	Set of interrelated or interacting activities that transform inputs into
Range	Operating distance of an aeroplane carrying a given number of passengers with a defined accommodation comfort and fuel, including required reserves. Distance is calculated between take-off and landing (as shown on Appendix A: Mission selection in the PCR)
Standard configuration	Baseline version defined by the manufacturer, including the essential features and equipment needed to meet typical customer needs, while ensuring an optimal balance between performance, comfort, and operational efficiency. The standard configuration should not be seen as a "minimal" version, but rather as a carefully considered setup that reflects market needs and technical constraints. Lastly, certain technical decisions—such as whether an APU (Auxiliary Power Unit) is included—

	are made by the manufacturer during development and cannot be modified by the customer once the aircraft is built.
Standard items	Equipment and fluids not considered an integral part of a particular aircraft and not a variation for the same type of aircraft. These items may include, but are not limited to, the following: Unusable fuel and other unusable fluids; Engine oil; Toilet fluid and chemical; Fire extinguishers, pyrotechnics, and emergency oxygen equipment; Structure in galley, buffet, and bar; and Supplementary electronic equipment.
Tier-1 supplier	Supplier that contracts directly with an Original Equipment Manufacturer (OEM), no matter what it supplies. Sub-tier-1 supplier refers to any supplier in the First-tier Supplier's supply chain.
Turbofan engine	A turbojet engine in which additional propulsive thrust is gained by extending a portion of the compressor or turbine blades outside the inner engine case. The extended blades propel bypass air, which flows along the engine axis but between the inner and outer engine casing. This air is not combusted but does provide additional thrust (30 to 40 percent), caused by the propulsive effect imparted to it by the extended compressor blading.
Turbojet engine	A jet engine incorporating a turbine-driven air compressor to take in and compress the air for the combustion of fuel, the gases of combustion of fuel, being used both to rotate the turbine and to create a thrust-producing jet.

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10 VERSION HISTORY OF PCR

VERSION 1.0, 2018-11-23

Original version published.

VERSION 1.01, 2018-11-23

Editorial corrections.

VERSION 1.02, 2018-11-27

Editorial corrections.

VERSION 1.03, 2019-09-06

- Clarified terms of use
- Editorial changes

VERSION 1.04, 2023-05-16

Validity period extended with 1 year due to the initiation of an updating process.

VERSION 2.0.0, 2026-04-08

New version aligned with GPI 5.01

11 APPENDIX A: MISSION SELECTION IN THE PCR

Type III environmental declarations allow customer to compare the whole life cycle environmental performance of products. Therefore, comparability of EPDs is critical[30].

The scope of this PCR includes light, medium and large Business jet categories. Knowing that the environmental performance depends on the mission selected, the following representative average mission's lengths have been defined and consequently shall be chosen

Table 16 Business Jet categories

Business jet category	Average mission's length
Light	926 km (500 nm)
Medium	1 482 km (800 nm)
Large	2 408 km (1 300 nm)

As stated in paragraph "Additional Information" 6.4.8, the declaration of results for other missions is encouraged and should be carried out if found relevant.

[30] ISO14025,"Environmental labels and declarations-Type III environmental declarations-Principles and procedures," 2006.

12 APPENDIX B: FLIGHT PROFILE

Based on the National Business Aviation Association (NBAA) Management Guide 31, which describes best practices accepted by business aviation community, the Flight Profile shown in Figure 3 shall be considered to calculate the block fuel as well as in-flight emissions in the LCA.

As a minimum input, the block fuel and emissions shall be reported at selected range as per APPENDIX A. Additional values should be provided using always appendix B flight profile, in line with aircraft full capability or to best illustrate aircraft optimum efficiency potential.

Engine emissions shall be measured under normal operation conditions as shown on Figure 3 below:

Segment	Flight Segment
A-B	Taxi-out. All engines idle. (0:10 min)
B-C	Takeoff. Full power. (0:01 min)
C-D	Optimum R/C en route to 1st step cruise.
D-E	Normal cruise power, 1st step cruise.
E-F	Optimum R/C en route to 2nd step cruise.
F-G	Normal cruise power, 2nd step cruise.
G-H	Optimum R/C en route to 3rd step cruise.
H-I	Normal cruise power, 3rd step cruise.
I-J	Descend en route to sea level, 914.14 m/min (3000 fpm) max. and land.
J-K	Taxi-in. (0:05 min)

Conditions
All airport at sea level;
Entire flight at ISA and zero wind;
Maximum of three cruising levels permitted;
Speed in km/h / distances in km;
Fuel density 0.804 kg/l (6.71 lb./US gal)

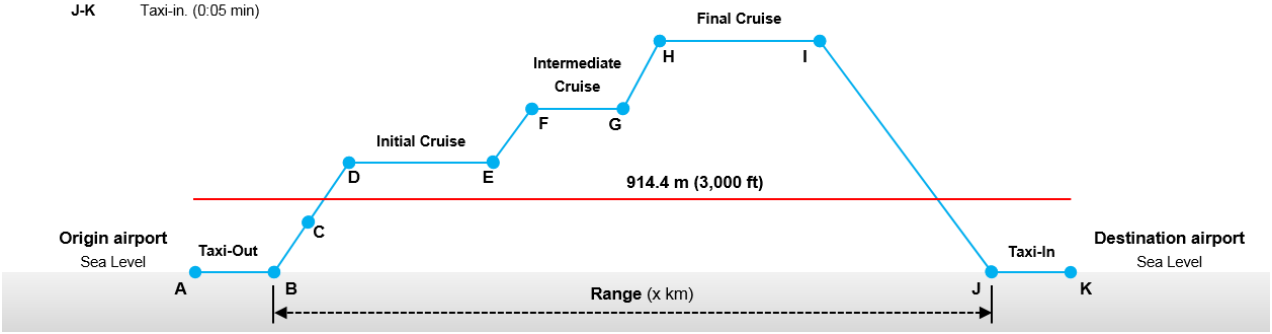

Figure 3: Flight profile to use in the LCA and EPD. LTO cycle is shown under the red line

Fuel reserves are considered as a dead weight in the aircraft and are not considered as burnt during the flight. Reserves shall be calculated according to NBAA management guide.

Note: other types of fuel (such as SAFs) may be considered for comparison in the EPD and specified in a specific section. Evidence of the carbon intensity advantage must be provided to the verifier. The type of SAF and its characteristics, e.g. density, net calorific value, feedstock, origin and conversion process, should be provided as a minimum and declared in the EPD.

31 The NBAA Management Guide is an industry how-to manual for business aviation management. Recognized as one of NBAA's most popular members benefits, this publication assists flight departments with operational, maintenance, administrative and other considerations. Much of the information contained in this guide may be used as reference material to educate non-aviation company personnel on accepted practices and norms of the business aviation community.

13 APPENDIX C: APU CYCLE DESCRIPTION

The selected APU flight duty cycle that shall be used in the LCA is defined as follows:

1. Pull up/down: 15 min
2. Steady State: 35 min
3. Main Engine Start (MES): 5 min
4. Steady State: 60 min

APU emissions shall be measured at sea level, ISA conditions.

When the Business jet does not have APU, then energy and/or fuel type and consumption on ground shall be declared and used.

Based on this information, the resulting fuel burn and CO_2 equivalent emissions shall be calculated and integrated into LCA analysis.

BUSINESS JETS

PRODUCT CATEGORY CLASSIFICATION: UN CPC 49623