Blue Marble™

Blue Marble Environmental Product Declaration

Client Guide to EPDs

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1. Introduction to this Guide

1.1. Background

As a Client of Blue Marble, we give you access to this Client Guide to EPDs (the "Guide") in order to support your understanding of your EPDs. This Guide supplements the EPD we have prepared with you, with a Plain English explanation of the content, structure and terminology used in the EPD.

1.2. What is Life Cycle Assessment and how is it used?

To understand an EPD, it is necessary to first have a basic knowledge of Life Cycle Assessment (LCA). LCA provides a unique approach to managing and relating the environmental impacts of a product to its supply chain and life cycle from cradle to grave and requires a thorough investigation of processes across a product's life cycle. At each stage of the product's life, resource consumption results in environmental impacts, as shown in Figure 1.

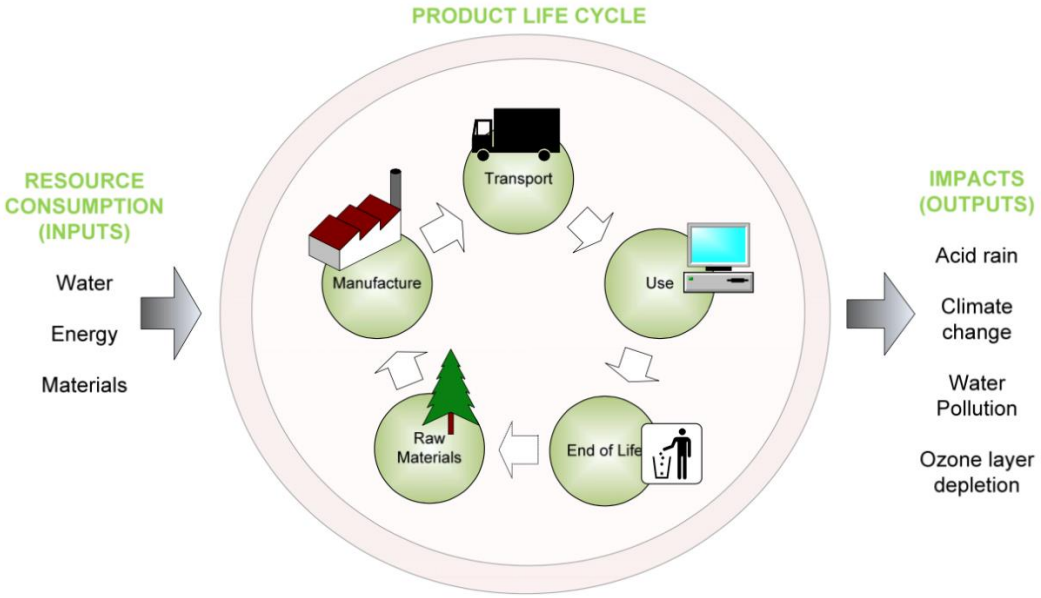

Figure 1.
LCA based on inputs and outputs

By summing the inputs of resource consumption, and outputs of environmental emissions at each life cycle stage, one can show the environmental impact of a product from cradle to grave. Where applicable, this enables environmental management efforts to be successfully directed to reduce a product's impacts, as shown in Figure 2.

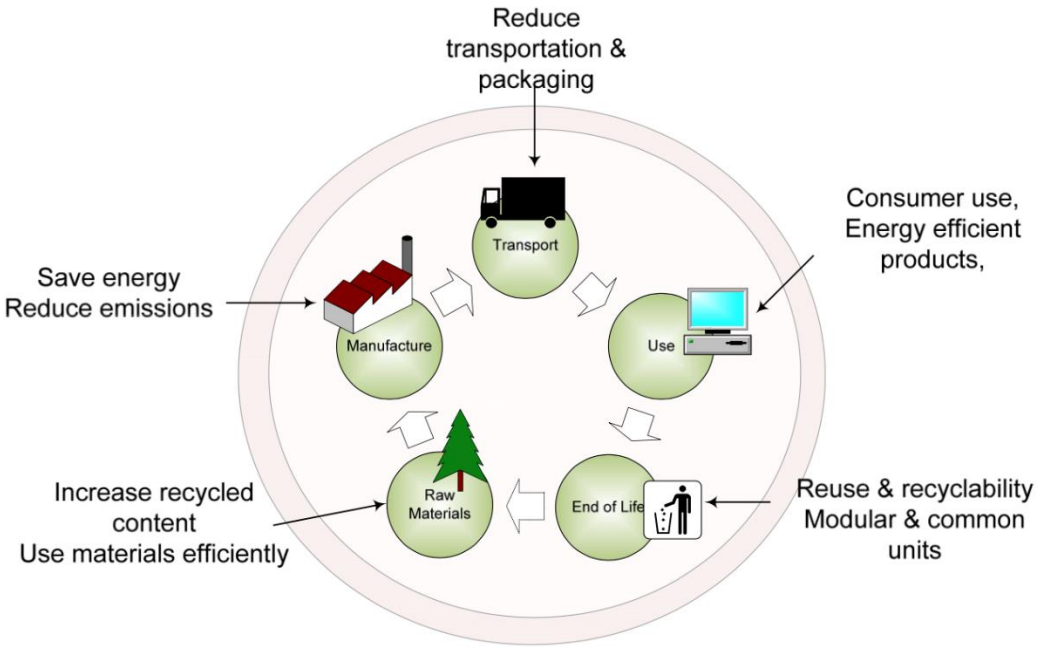

Figure 2.
Environmental improvements in LCA

1.3. What is an Environmental Product Declaration?

An EPD is a ten-to-fifteen-page document which summarises the life cycle assessment of a product.

It contains technical details about the product and the manufacturer, details on the life cycle stages the product goes through, and the results of the life cycle impact assessment; this is usually in the form of tables listing the life cycle stages horizontally and environmental impacts vertically[1].

An EPD will tell you the environmental impact of a product's life cycle. As it is based on an LCA, it is a calculation based on a model of the life cycle. The data required to produce an EPD is detailed, therefore it can be considered a highly accurate representation of the total life cycle environmental impact of a product.

1.4. How is an EPD produced?

Typically, the following parties are involved in producing an EPD:

1. The manufacturer of the product;
2. The suppliers of raw materials who may need to provide data to the manufacturer;
3. The LCA consultant, who performs the LCA (e.g. Blue Marble);
4. The third-party verifier, who confirms that the LCA has been modelled correctly; and
5. The program operator, who publishes the EPD on a website or database (e.g. EPD Hub).

This may seem like a significant number of interested parties, but it is designed to give rigor to the process and ensure that, as much as possible, the results in the EPD are, in fact, an accurate representation of reality.

1.5. What Standards are followed?

Most EPDs are third-party verified, and that verification is done in accordance with ISO 14025 - Environmental labels and declarations. ISO 14025 specifies the rules for verification.

[1] See section 3.5 for further details on the environmental impact tables found in an EPD.

The verifier, who is typically an individual LCA consultant with significant experience in conducting and verifying LCAs, checks that the LCA has been done in accordance with other standards, usually EN15804 and ISO 14040/44.

EN 15804 is the European standard for sustainability of construction materials. It is a complex Standard which sets out the core rules for construction LCAs.

ISO 14040 and ISO 14044 are the Standards for establishing the principles and requirements for conducting life cycle assessment respectively.

Additionally, program operators set their own Product Category Rules (PCR) and General Program Instructions (GPI) which:

(1) define how their program deals with certain points not covered in the Standards (e.g. averaging multiple of products within an EPD); and

(2) set additional rules for certain categories of products.

1.6. What are the benefits of producing an EPD?

Producing an EPD will enable Blue Marble's Clients to:

- Highlight the key environmental impacts over the life cycle of the products in a simple form that meets sustainability priorities.
- Confidently report on the environmental performance of the products in accordance with industry standards.
- Demonstrate transparency over the products' environmental impact.
- Improve the environmental performance of products and/or manufacturing processes whilst considering the full life cycle of the product.

1.7. About Blue Marble

Blue Marble is an environmental consultancy which specialises in managing the environmental impacts of businesses, their supply chains and products. Its clients come from a broad range of sectors and industries including electronics, construction, furniture, textiles, waste management and food & drink.

2. Quality Control

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3. How to Read an EPD

EPDs can be accessed via the website of the Program Operator (EPD Hub): https://www.epdhub.com/[2]

Your EPDs will also be published on the Blue Marble Directory on our website. We also encourage you to publish your EPDs on your own website.

The EPDs are produced to the standardised format of the Program Operator and must contain the information required by the EPD Standards. The following sections are a mirror image of the headers in the EPD documents, and the explanation given below unpacks some of the key concepts from those sections.

3.1. General Information

This section of the EPD provides details on the manufacturer, the EPD Standards followed, the product and a summary of the environmental data. Key concepts from this section which benefit from further explanation are as follows:

CONCEPT / TERM	EXPLANATION
Declared unit	Fundamental to any LCA / EPD is the concept of a *declared unit*. This is the metric to which all other data relates. For example, if the declared unit was 1 kilogram of product, the amount of energy consumed in manufacturing relates to the production of 1 kilogram of product. It is common for the declared unit to be the production of 1 kilogram of product, or 1 square metre of product. However, in some cases it makes more sense for the declared unit to be one *unit* of product, with certain dimensions, for example: *"1 unit of product measuring 3000 x 1200 mm with a thickness of 12mm"* The declared unit usually relates to the units in which the Products are typically sold.
Declared unit mass	A mass per declared unit presented in kilograms should be provided in all EPDs to make comparisons between EPDs possible.
GWP-fossil, A1-A3 (kgCO2e)	There are three elements to this term: 1) GWP-fossil: this is the Global Warming Potential (or Climate Change) attributable to the burning of fossil fuels. 2) A1-A3: this refers to the lifecycle stages to which the results relate. Module A1 is raw materials, module A2 is transport of raw materials, module 3 is manufacturing. Effectively this is 'Cradle-to-Gate'. 3) kgCO2e: this means kilograms of carbon dioxide equivalent[3]. Therefore, the results presented in this section mean the Cradle-to-Gate impacts from fossil fuels in terms of kilograms of carbon dioxide equivalents. This is also often referred to as the *'embodied carbon'* of the product.

[2] This client guide specifically refers to EPDs published via EPD Hub. EPDs published with Blue Marble via other program operators (e.g. International EPD System) follow a different format, though the terminology and concepts remain the same.
[3] See also 4.1 for further details.

GWP-total, A1-A3 (kgCO2e)	This is the same as the above but takes into account biogenic carbon[4] and carbon released into the atmosphere from land-use change[5].
Secondary material, inputs (%)	Means the percentage of the declared unit which comes from recovered material.
Secondary material, outputs (%)	Means the percentage of the declared unit which has been modelled as being recovered at the end-of-life (e.g. by recycling or reuse).
Total energy use, A1-A3 (kWh)	This means the total amount of energy consumed in the cradle-to-gate life cycle stages, expressed as kilowatt hours.

Table 1.
Key terms in General Information

3.2. Product and Manufacturer Information

This section of the EPD provides some information about the manufacturer and the product. It also provides technical details about the product, from data sheets.

Also within this section is a summary of the main materials used within the product.

The biogenic carbon content in the product and packaging are also reported.

The concept of a 'functional unit' is introduced in this section. A functional unit is similar to a declared unit but describes the functional performance of the product. It is necessary to disclose a functional unit if the use phase is included in the life cycle assessment.

The reference service life is the number of years the use phase relates to. Often the reference service life is set to align to a warranty period, within which there may be data available on the number of repairs, replacements or refurbishment required. In many cases, the reference service life is a conservative estimate on the number of years consumers typically use the products for - though in reality this may be considerably longer.

Finally, any REACH[6] materials in the product need to be disclosed in this section.

3.3. Product Life-cycle

The LCA modelling assumptions and description are included in this section. There is a small chart which shows the scope of the life cycle assessment and importantly if there are any life cycle stages which have been excluded - this is known as the 'System Boundary'.

The life cycle stages are grouped into four categories and a description given for each:

Manufacturing and Packaging (Modules A1-A3)

This includes raw materials, transport of those materials to a manufacturing plant, manufacturing (including, but not limited to, production losses, ancillary materials, manufacturing wastes, energy and water consumption), and packaging.

[4] See 4.1 for further details on biogenic carbon.
[5] See 4.1 for further details on land use change.
[6] REACH stands for registration , evaluation, authorisation and restriction of chemicals. For more information see: https://www.hse.gov.uk/reach/about.htm#:~:text=REACH%20stands%20for%20registration%20%2C%20evaluation%2C%20authorisation%20and%20restriction%20of%20chemicals.

Transport and Installation (Modules A4-A5)

This includes transportation of the product to a place of installation (based on averaged data over a twelve-month period) and installation of the product. It also includes waste treatment for packaging waste.

Product Use and Maintenance (Modules B1-B7)

For some products, the only relevant use phase module is maintenance in the form of cleaning water and detergent and treatment of waste-water over the reference service life.

Other use phase modules include operational energy and water consumption, repair, replacement and refurbishment.

Product End of Life (Modules C1-C4, D)

Module C includes removal of the product at the end of its life, transporting it to waste treatment, waste treatment and final disposal.

Module D is known as 'beyond the system boundary', in other words, what is likely to happen to the product and packaging after it has reached the end of its current usable life.

Within Module D, it is possible to claim some benefit from the provision of recyclates to the next lifecycle, once the recycling has taken place. Therefore, it is normal to see the Module D figures reported as a negative figure.

Finally, a simplified flowchart of the life cycle is provided as a point of reference.

NOTE: As is common with most EPDs, all modules beyond A1-A3 are largely scenario-based and driven by a combination of primary data from the Client and reasonable / justified assumptions based on industry reports.

Full details of the product life cycle are provided in the EPD documents themselves.

3.4. Life-cycle Assessment

This section deals with some of the methodological choices which have been made when conducting the LCA modelling and has three main elements:

1. **Cut-off Criteria**

This paragraph explains that no data has been excluded which represents more than 1% of the total mass of the product. It is common in LCA to exclude some materials with very low / negligible mass on the basis that they are likely to have a negligible impact on the environmental impact results.

2. Allocation

Allocation can be used when there is no specific data related to the declared unit. A common form of allocation is to look at the energy consumption of a factory over a twelve-month period and divide by the quantity of products produced over that same period.

3. LCA Software and Database

Many LCA studies will use EcoInvent as the background database. This means that the LCA practitioner will search the EcoInvent database for data which best represents the activity / material being modelled. This background data is then combined with primary data (quantities, masses, distances etc.) provided by the Client.

The LCA software is the tool which is used to run the calculations and generate the environmental impact results. The LCA software allows the LCA practitioner to enter data and reads from background databases. In the case of Blue Marble, the EPD tool from OneClickLCA is often used. Other software also used by Blue Marble (such as SimaPro, Gabi etc.) can perform the

same function and produce the same results, as it is the primary and background data selected which determines the environmental impact results.

3.5. Environmental Impact Data

The EPDs contain a series of six tables, each containing large volumes of numerical data. The environmental impacts are listed vertically, and the lifecycle stages are listed horizontally.

Before diving into the individual indicators (see section 4 below), it is helpful to explain the difference between and purpose of the six tables.

TABLE HEADING	PURPOSE
Core Environmental Impact Indicators - EN 15804+A2, PEF	Lists the thirteen (13) environmental indicators required by EN 15084+A2 as well as the European Commission's draft Product Environmental Footprint framework, so-called 'PEF'.
Additional (Optional) Environmental Impact Indicators - EN 15804+A2, PEF	Lists the six (6) optional environmental indicators of EN15804+A2 and the PEF. Note, that there is a high degree of uncertainty with these indicators, hence why they are not commonly used. In many cases these indicators are characterising impacts on environmental aspects (e.g. ecotoxicity of freshwater) based on developing scientific studies.
Use of Natural Resources	Lists the amount of primary energy used to create the product and where that energy comes from, including whether it is from renewable or non-renewable sources. Also includes the amount of secondary materials and fuels and water used.
End of Life - Waste	Lists quantities of waste at end of life, categorised into hazardous, non-hazardous and radioactive waste.
End of life - output flows	Lists the outputs of components / materials for re-use, recycling or energy recovery. In other words, materials which can be used as inputs to subsequent life cycles.
Environmental impacts - EN 15804+A1, CML / ISO 21930	This table lists the environmental indicators required by the previous version of EN 15804 (+A1). This version became obsolete in 2022, but there are still many extant EPDs produced in accordance with this version, which are valid for five years from the point of production. Therefore, this table is useful when making comparisons with older EPDs. This table also complies with ISO 21930 - Sustainability in buildings and civil engineering works; this is the Standard most often used outside of Europe.

Table 2.
The six data tables in the EPDs explained

4. Summary of Core Environmental Impact Categories

4.1. Core Environmental Impact Indicators - EN 15804+A2, PEF

Impact Category	Indicator	Unit	Unit expanded	Model	Description
Core Environmental Impact Indicators - EN 15804+A2, PEF					
Climate change - total	Global Warming Potential total (GWP-total)	Kg CO2e	Kilograms of carbon dioxide equivalents	Baseline model of 100 years of IPCC 2013	The sum of GWP-fossil, GWP-biogenic and GWP-luluc
Climate change - fossil	Global Warming Potential fossil fuels (GWP-fossil)	Kg CO2e	Kilograms of carbon dioxide equivalents	Baseline model of 100 years of IPCC 2013	This indicator is Global Warming Potential (GWP) fossil - also known as *carbon footprint*. It is a measure of climate change attributable to the burning of fossil fuels. The unit is kilograms of carbon dioxide equivalents. Therefore, this indicator expresses how much heat a greenhouse gas traps compared to an equivalent amount of carbon dioxide within a certain period of time (100 years).
Climate change – biogenic	Global Warming Potential biogenic (GWP-biogenic)	Kg CO2e	Kilograms of carbon dioxide equivalents	Baseline model of 100 years of IPCC 2013	Biogenic GWP is carbon which comes from biomass e.g. trees / plants. It is sequestered by biomass but released into the atmosphere in a short cycle as the biomass is burnt / decays at the end-of-life.
Climate change – land use and land use change	Global Warming Potential land use and land use change (GWP-luluc)	Kg CO2e	Kilograms of carbon dioxide equivalents	Baseline model of 100 years of IPCC 2013	This is any carbon that is released through a change in land use e.g. removing native forest for agriculture.
Ozone Depletion	Depletion potential of the stratospheric ozone layer	Kg CFC 11 eq.	kilograms of trichlorofluoro methane equivalents	WMO 2014	Indicates the emissions to air that cause the destruction of the stratospheric ozone layer (protection from UV radiation)
Acidification	Acidification potential, accumulated exceedance	Mol H+ eq.	Hydrogen ions equivalents	Accumulated exceedance, Seppala et. Al. 2006, Posch et. Al. 2008.	Indicates the potential acidification of soils and water due to the release of gases such as nitrogen oxides and sulfur oxides
Eutrophication aquatic freshwater	Eutrophication potential, fraction of nutrients reaching freshwater and compartment (EP-freshwater)	Kg P eq.	kilograms of phosphorus equivalents	EUTREND model	Indicates the enrichment of the freshwater ecosystem with nutritional elements, due to the emission of nitrogen or phosphorus.
Eutrophication aquatic marine	Eutrophication potential, fraction of nutrients	Kg N eq.	Kilograms of nitrogen equivalents	EUTREND model	Indicates enrichment of the marine ecosystem with nutritional elements, due to the

Impact Category	Indicator	Unit	Unit expanded	Model	Description
	reaching freshwater end compartment (EP-marine)				emission of nitrogen-containing compounds.
Eutrophication terrestrial	Eutrophication potential, accumulated exceedance (EP-terrestrial	Mol N. eq	Moles of nitrogen equivalents	Accumulated exceedance, Seppala et. Al. 2006, Posch et. Al. 2008.	Indicates the enrichment of the terrestrial ecosystem with nutritional elements, due to the emission of nitrogen-containing compounds.
Photochemical ozone formation	Formation potential of tropospheric ozone	Kg NMVOC eq.	Kilograms of non-methane volatile organic compounds equivalents	LOTOS-EUROS	This is an indicator of emissions of gases that affect the creation of photochemical ozone in the lower atmosphere (so called 'urban smog').
Depletion of abiotic resources – minerals and metals	Abiotic depletion potential for non-fossil resources	Kg sb eq.	Kilograms of antimony equivalents	CML 2002	These indicators are for the depletion / reduction of abiotic (non-living) natural resources from the earth. Two indicators are used: 1) Metals and Minerals, 2) Fossil resources. For metals and minerals, like the carbon footprint, chemicals are calculated in relation a single element, in this case antimony or Sb equivalents. For fossil resources, the impact category is measured in megajoules (MJ) of energy based on the calorific value (amount of energy released during burning) of the material.
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources.	MJ, net calorific value	Megajoules	CML 2002	
Water use	Water (user) deprivation potential, deprivation weighted water consumption (WDP)	M3 world eq. deprived	Cubic metres	Available Water Remaining (AWARE)	This indicator refers to a water footprint (as opposed to actual water use on a production line, for instance). Unlike a carbon footprint based on emissions, water is a resource, and supply / demand varies globally based on water scarcity.

Table 3.
Environmental indicators and models used in EN 15804+A2