ICE Database Insights: Are All EPDs Created Equal?

22nd May 2025

Dr Craig Jones & Joe Rouse

circularecology.com

Today's Webinar

- Introduction
- Overview of Environmental Product Declarations
- Introduction to the ICE Background Dataset
- Product Lifetime and Functional Units
- Environmental Indicators & Standards
- Biogenic Carbon Handling
- Allocation and Methodology Differences
- Are All EPDs Created Equal?
- Q&A

Your Presenters Today

Dr Craig Jones

Managing Director

- *20 years experience product footprints & LCA*
- *Original author ICE Database*

Joe Rouse

Senior Consultant

- *Experience in Life Cycle Assessments and Product Carbon Footprinting*
- *Project Manager on ICE*

Background & Introduction

Circular Ecology – Introduction

Environmental consultancy, founded in 2013

Offer a range environmental services:

- Whole-Life Embodied Carbon Assessments for Construction Projects
- Organisational Carbon Footprints, Scope 1, 2 & 3
- Product Carbon Footprints
- Life Cycle Assessments (LCA)
- Carbon Footprint Verification & Assurance
- Net Zero Carbon Strategy
- Carbon Footprint Database (library) Development
- Online E-Learning Training Courses
- Carbon Offsetting and Tree Planting

Hosts the Inventory of Carbon & Energy (ICE) database

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Scaling Carbon Reduction Initiative (SCRI)

Launch of our **Scaling Carbon Reductions Initiative (SCRI)**

- Key to our purpose **to release impactful work, to enable scalable carbon reductions**
- We will be diverting a specified amount from some of our sales into the SCRI
- Funds will be used to **develop free carbon footprint data, tools and resources**
- Publication of an annual impact report disclosing the amount raised and use of funds

https://circularecology.com/scaling-carbon-reductions-initiative.html

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ICE Database Supporters

HOPE SOLUTIONS

RAIL SAFETY AND STANDARDS BOARD

ICE v4.0 Funders

BCIS

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UKRI Innovate UK

https://circularecology.com/ice-supporters.html

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What is an EPD?

What is an Environmental Product Declaration?

An Environmental Product Declaration (EPD) is standardised, verified document that communicates the environmental impact of a product.

- Based on a Life Cycle Assessment study following specific **Product Category Rules (PCRs)**
- Includes multiple environmental indicators beyond carbon but follows specific guidance for standardisation
- EPD programs include **mandatory verification** for credibility

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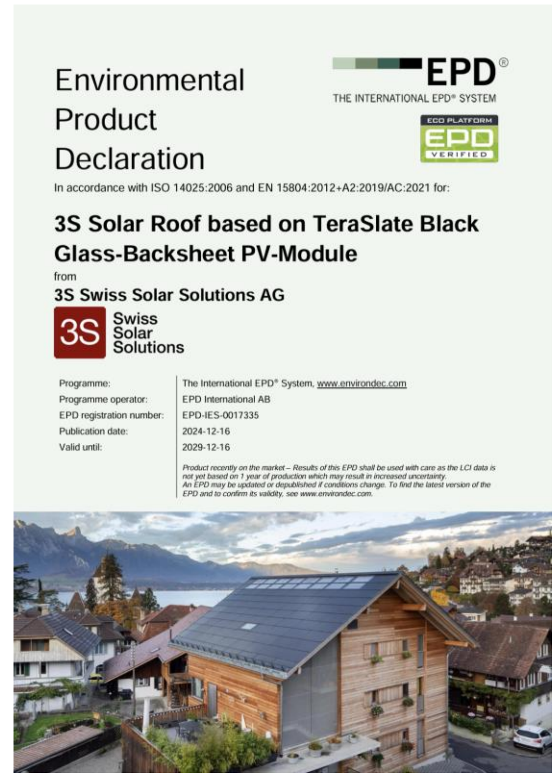
How are Environmental Product Declarations (EPD) Used?

- **Regulatory Compliance** – Meets requirements in green building certifications (e.g., BREEAM, LEED, DGNB).
- **Procurement & Supply Chain Decisions** – Companies use EPDs to compare and select low-carbon materials.
- **Eco-Labelling & Marketing** – Provides clarity for customers and stakeholders.
- **Carbon Reduction Strategies** – Identifies improvement areas in manufacturing and supply chains.


Environmental Product Declaration

EPD® THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

3S Solar Roof based on TeraSlate Black Glass-Backsheet PV-Module

from

3S Swiss Solar Solutions AG

3S Swiss Solar Solutions

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0017335
Publication date:	2024-12-16
Valid until:	2029-12-16

Product recently on the market – Results of this EPD shall be used with care as the LCI data is not yet based on 1 year of production which may result in increased uncertainty.
An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

What do EPDs Look Like?

General Information

GENERAL INFOMATION

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction products (EN 15804+A2)
PCR review was conducted by: Claudia A. Peña
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☑ EPD verification
Third party verifier: Chris Foster, EuGeos, chrisf@eugeos.co.uk In case of accredited certification bodies: Accredited by: Not applicable In case of recognised individual verifiers: Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☑ No

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Company/Product Information

COMPANY INFORMATION

Owner of the EPD: Lafarge Cauldon Ltd

Contact: Vincent Olivier (vincent.olivier@aggregate.com), Hannah Clark (hannah.clark@lafargeholcim.com)

Description of the organisation:

Lafarge Cement is a major manufacturer and supplier of cement, GGBS, Fly Ash and specialist cementitious materials to the UK construction industry. Lafarge Cement joined Aggregate Industries UK Ltd in 2015, Aggregate Industries, manufactures and supplies a wide range of heavy building materials to the construction industry and with the cement business now offers a complete solution.
The company part of the Holcim group, which employs 70,000 people across 70 countries with 386.5Mt of installed capacity worldwide and leads the industry for innovation.

Product-related or management system-related certifications:

ISO 9001, ISO 14001, ISO 50001, ISO 45001, BES 6001
More information can be found at www.lafargecement.co.uk

Name and location of production site(s):

Cauldon Cement Plant, Yelsway Lane, Waterhouses, Staffordshire, ST10 3EQ

PRODUCT INFORMATION

Product name: Lafarge Cauldon Portland Cement

Product identification: Cauldon CEM I 52.5N

Product description:

Ordinary Portland Cement (OPC) is the most commonly used cement in the UK and indeed the world. It is suitable for a range of uses and is produced to consistent quality standards. OPC can be used on its own or in conjunction with other supplementary materials such as Fly Ash and GGBS. It is compatible with admixtures including plasticizers and air-entrainers.

UN CPC code: 3744 Cement

Other codes for product classification:
Not applicable

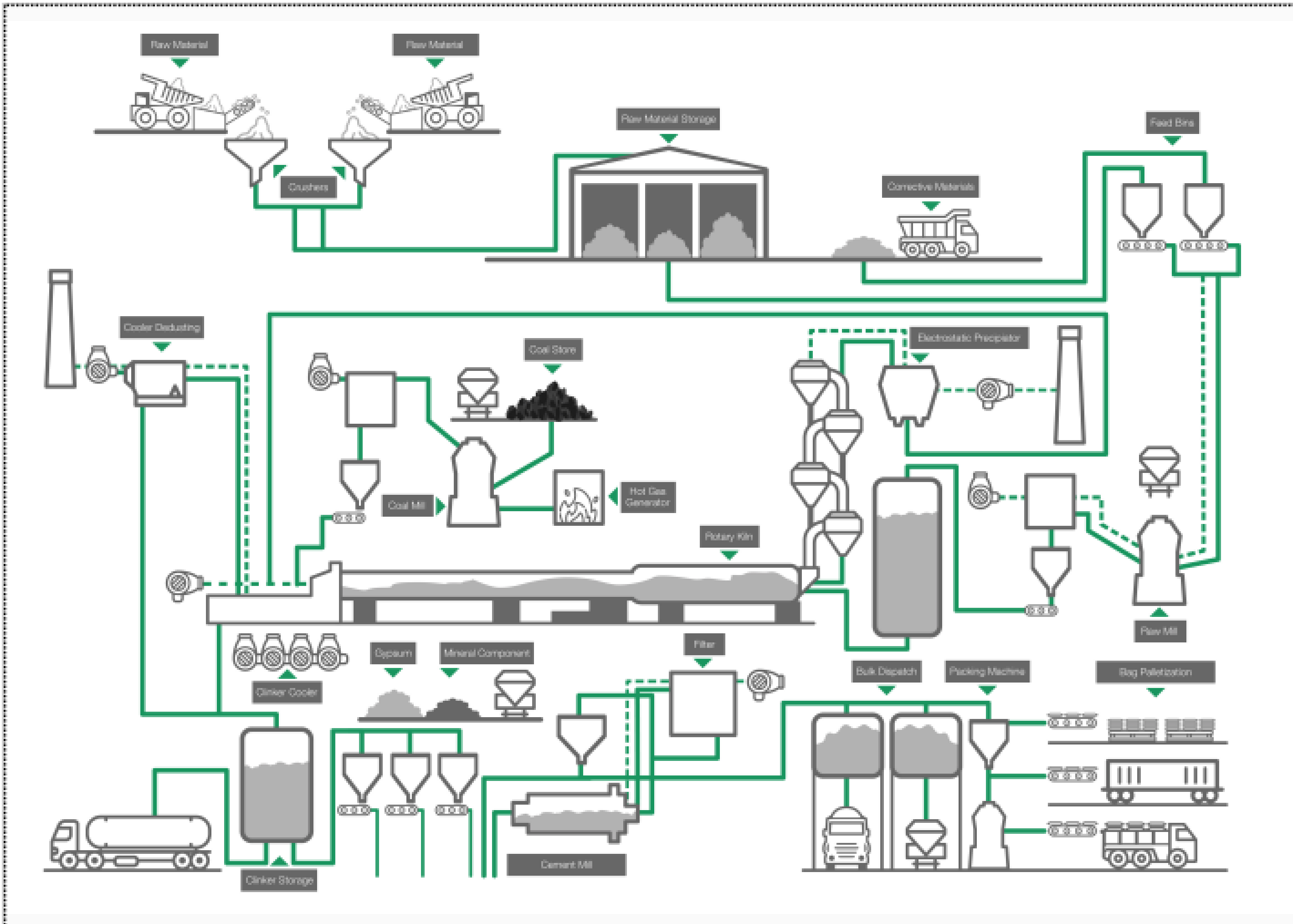
Product Information

CONTENT INFORMATION

Product components	Weight, kg	Post-consumer material, weight -%	Renewable material, weight -%
Clinker	886	-	-
Gypsum	66	-	-
Ground limestone	44	-	-
Ferrous sulphate	3.66	-	-
Grinding aids (additives)	0.52	-	-
TOTAL	1000	-	-

System/Process Information

System diagram:



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Lifecycle Information

LCA INFORMATION

Functional unit / declared unit: 1 tonne

Reference service life: Not applicable

Time representativeness:

All material and energy flows within the scope of the study are based on the plant specific data collected for the year 2020. Background data is in large part from the Ecoinvent database v3.5.

Database(s) and LCA software used:

GCCA EPD tool, version 3 / ecoinvent database version 3.5 in large part, completed by processes adapted from ecoinvent database and by literature data in order to represent regional electricity production. Further details of LCI methodology is described in the section 3 of "GCCA Industry EPD Tool for Cement and concrete - LCA model, International Version"

Description of system boundaries:

EPD type is "Cradle to gate" (A1–A3). This system includes the extraction and production of raw materials, transportation of raw materials to the cement plant, cement manufacturing process (including on-site transportation) and treatment of waste produced within processes throughout the cement plant. All processes related to construction stage, use stage, end-of-life of cement and module D are out of the scope of this EPD.

Lifecycle Information

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

	Product stage		Construction process stage			Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules	v	v	v	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	UK	UK	UK	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Specific data	All foreground data					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ND	ND					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ND	ND					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Lifecycle Results

Results per functional or declared unit																			
Indicator	**Unit**	**A1**	**A2**	**A3**	**Total A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP - fossil	kg CO_2 eq.	7.20E+2	4.60E-1	9.05E+0	7.30E+2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP - biogenic	kg CO_2 eq.	2.37E-1	1.63E-4	1.41E-2	2.51E-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP - luluc	kg CO_2 eq.	4.22E-2	1.79E-4	1.15E-2	5.39E-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP - total	kg CO_2 eq.	7.21E+2	4.60E-1	9.07E+0	7.30E+2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ODP	kg CFC 11 eq.	1.08E-5	8.32E-8	4.26E-6	1.51E-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AP	mol H^+ eq.	1.23E+0	1.37E-3	6.05E-2	1.29E+0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP - freshwater	kg PO_4^{3-} eq.	1.94E-1	1.13E-4	5.83E-3	2.00E-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP - freshwater	kg P eq	6.32E-2	3.69E-5	1.90E-3	6.51E-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP - marine	kg N eq.	4.43E-3	3.07E-6	3.67E-4	4.80E-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP - terrestrial	mol N eq.	4.88E+0	2.72E-3	1.90E-1	5.07E+0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
POCP	kg NMVOC eq.	1.18E+0	1.07E-3	4.17E-2	1.22E+0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADP - minerals & metals*	kg Sb eq.	1.19E-4	1.43E-6	2.92E-5	1.50E-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADP - fossil*	MJ	1.97E+3	6.80E+0	1.26E+2	2.10E+3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WDP	m^3	2.34E+1	4.82E-2	3.26E+0	2.67E+1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Lifecycle Results

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg of electromechanical building hardware and swing door operators											
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B6/1**	**B6/2**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq	1.18E+01	6.75E-01	3.14E-01	1.48E+00	2.03E+02	0	1.86E-02	1.86E-02	4.93E-02	4.85E-01
GWP-fossil	kg CO_2 eq	1.2E+01	6.74E-01	2.26E-02	1.47E+00	2.03E+02	0	1.86E-02	1.85E-02	4.93E-02	4.84E-01
GWP-biogenic	kg CO_2 eq	-2.69E-01	0	2.92E-01	0	0	0	0	0	0	0
GWP-luluc	kg CO_2 eq	2.82E-02	2.7E-04	1.8E-06	2.69E-03	5.07E-01	0	7.44E-06	3.14E-05	3.75E-06	7.47E-04
ODP	kg CFC11 eq	6.48E-07	1.56E-07	1.02E-09	1.15E-07	1.05E-05	0	4.31E-09	8.96E-10	1.52E-09	3.2E-08
AP	mol H^+ eq	3.08E-01	1.91E-03	1.95E-05	3.07E-02	1.11E+00	0	5.28E-05	2.03E-04	4.35E-05	2.35E-02
EP-freshwater	kg P eq	1.87E-03	4.81E-06	3.74E-08	1.66E-04	2.27E-02	0	1.33E-07	1.06E-06	8.24E-08	7.47E-05
EP-marine	kg N eq	3.85E-02	3.81E-04	6.46E-06	2.35E-03	1.38E-01	0	1.05E-05	1.67E-05	1.76E-05	1.02E-03
EP-terrestrial	mol N eq	2.8E-01	4.24E-03	6.99E-05	2.81E-02	1.6E+00	0	1.17E-04	1.85E-04	1.7E-04	1.4E-02
POCP	kg NMVOC eq	7.77E-02	1.63E-03	2.03E-05	8.53E-03	4.4E-01	0	4.5E-05	5.78E-05	4.98E-05	4.23E-03
ADPE	kg Sb eq	4.07E-03	2.39E-06	1.62E-08	5.7E-04	1.97E-03	0	6.59E-08	7.78E-07	2.26E-08	5.66E-04
ADPF	MJ	1.29E+02	1.02E+01	6.85E-02	1.93E+01	4.27E+03	0	2.82E-01	2.38E-01	1.11E-01	6.82E+00
WDP	m^3 world eq deprived	5.06E+00	3.11E-02	3.36E-04	8.35E-01	5.07E+01	0	8.58E-04	9.87E-03	-3.16E-04	4.14E-01

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

Lifecycle Results

Impact Category	Simplex, Duplex, Quad Interconnect						Microarray Data Center Interconnect						2mm Microarray Breakout					
	Raw Mater-ial	Manu-fact-uring	Mark-eting	Instal-lation	Waste Dispo-sal	Cradle to Grave	Raw Mater-ial	Manu-fact-uring	Mark-eting	Instal-lation	Waste Dispo-sal	Cradle to Grave	Raw Mater-ial	Manu-fact-uring	Mark-eting	Instal-lation	Waste Dispo-sal	Cradle to Grave
Global Warming (kg CO_2 eq)	2.1E+00	4.6E-01	9.9E-02	2.6E-03	3.0E-01	3.0E+00	3.0E+00	7.0E-01	1.5E-01	4.0E-03	4.5E-01	4.3E+00	1.6E+01	3.6E+00	7.6E-01	2.0E-02	2.3E+00	2.2E+01
Acidification (kg SO_2 eq)	2.3E-02	4.0E-03	5.9E-04	5.6E-06	5.2E-04	2.8E-02	3.3E-02	6.1E-03	8.9E-04	8.5E-06	7.9E-04	4.1E-02	1.7E-01	3.1E-02	4.6E-03	4.3E-05	4.0E-03	2.1E-01
Eutrophication (kg N eq)	8.7E-02	1.9E-04	3.3E-05	2.6E-04	3.5E-04	8.8E-02	8.3E-02	2.9E-04	5.0E-05	4.0E-04	5.4E-04	8.4E-02	7.2E-01	1.5E-03	2.5E-04	2.0E-03	2.7E-03	7.3E-01
Smog (kg O_3 eq)	2.0E-01	2.2E-02	1.6E-02	1.4E-04	6.5E-03	2.4E-01	2.4E-01	3.4E-02	2.5E-02	2.2E-04	9.9E-03	3.1E-01	1.5E+00	1.7E-01	1.2E-01	1.1E-03	5.0E-02	1.9E+00
Ozone Depletion (kg CFC-11 eq)	2.3E-07	1.7E-09	3.8E-12	2.4E-10	6.5E-09	2.4E-07	2.9E-07	2.6E-09	5.7E-12	3.7E-10	9.8E-09	3.0E-07	1.7E-06	1.3E-08	2.9E-11	1.9E-09	5.0E-08	1.7E-06

Overview of the ICE Background Dataset

ICE Background Dataset

The digitisation of Environmental Product Declarations has allowed us to access large online libraries of EPD data. This is not without its challenges, however. Not all this data is suitable to use for analysis immediately. Context is required.

- Previous iterations of the ICE Database relied on **manual processes to extract data**
- EPDs make up most of the ICE Background Dataset, but are **not always accurate or reliable**
- Our approach focuses on **quality-driven analysis** using the **best available data**

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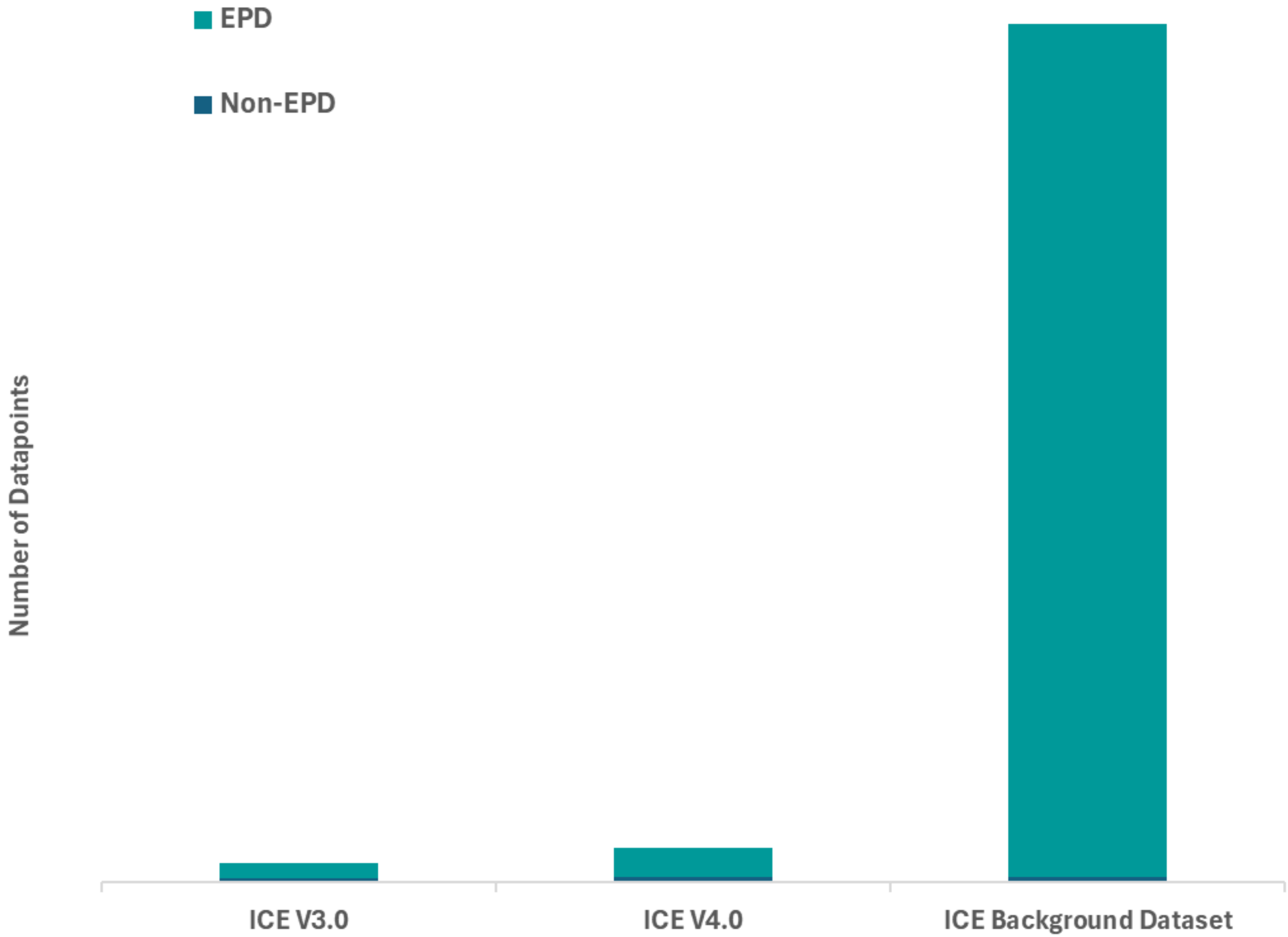
ICE Background Dataset



Challenges with Using EPD Data:

Functional Unit and Product Lifetimes

Functional/Declared Unit in EPDs

Functional Unit:

The quantified performance of a product system for comparison (e.g., "1 m^2 of flooring over 50 years")

Declared Unit:

***The quantity of product* – used when an EPD does not consider the full lifecycle stages**

(e.g., "1 tonne of concrete")

Functional/Declared Unit in EPDs

	Module A1 - A3					Modules A4/A5/C1/C2/C3					Module D				
	20mm	100mm	120mm	140mm	200mm	20mm	100mm	120mm	140mm	200mm	20mm	100mm	120mm	140mm	200mm
GWP - total	0,26	0,81	1,00	1,18	1,74	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,18	1,74
GWP - fossil	0,26	0,81	1,00	1,18	1,74	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
GWP - biogenic	0,26	0,84	1,00	1,16	1,66	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
GWP - luluc	0,29	0,82	1,00	1,18	1,72	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
ODP	0,30	0,84	1,00	1,15	1,63	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
AP	0,31	0,83	1,00	1,17	1,68	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
EP - freshwater	0,26	0,81	1,00	1,19	1,75	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
EP - marine	0,28	0,82	1,00	1,18	1,72	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
EP - terrestrial	0,28	0,82	1,00	1,18	1,71	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
POCP	0,87	0,97	1,00	1,03	1,13	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
ADPF	0,20	0,79	1,00	1,19	1,77	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
ADPE	0,28	0,82	1,00	1,18	1,72	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74
WDP	0,24	0,81	1,00	1,19	1,76	0,34	0,83	1,00	1,16	1,66	0,26	0,81	1,00	1,19	1,74

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Functional/Declared Unit in EPDs

- EPDs use different base units such as per kg, per m^2, per item, making it **essential to convert units** when trying to aggregate EPD data

- **Manual normalisation of units is time intensive**, and EPDs often do not include the information required to do this, introducing uncertainty

- Functional units **may not align with the actual usage in a building or system**. For example two insulations with differing R values

- Product Category Rules (PCRs) sometimes prescribe a specific unit to use, but **this is often not followed**

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Product Lifetimes in EPDs

Some EPDs will include the Reference Service Life (RSL) in the functional unit.

This is the expected lifetime during which a product performs its intended function when properly installed and maintained under typical conditions.

Example of Product Lifetimes in EPDs

Table 5: Impact assessment results for all life cycle stages of 1m² 2.0mm linoleum for 1 year and 60 year use

Impact Assessment Method: CML 2001 – Nov. 2010	Units	Sourcing / Extraction	Manufacturing	Installation	Use	End-of-Life	Total
1-year Use							
Acidification Potential	kg SO_2-eq.	0.0242	0.00445	1.22E-02	1.84E-03	0.000168	**0.0429**
Eutrophication Potential	kg PO_4^{3-}-eq.	0.0092	3.99E-04	1.42E-03	1.07E-04	1.96E-03	**0.0131**
Global Warming Potential	kg CO_2-eq.	-0.60999	2.95	1.45	0.388	2.21	**6.39**
Ozone Depletion Potential	kg R11-eq.	1.23E-08	2.58E-08	4.57E-09	1.28E-08	-6.5E-09	**4.9E-08**
Photochem. Oxidant Formation Potential	kg Ethene-eq.	0.00136	5.48E-04	8.74E-04	1.04E-04	5.67E-04	**0.00345**
Abiotic Depletion, Elements	kg Sb-eq.	2.76E-06	2.01E-07	3.96E-07	3.79E-08	1.44E-08	**3.41E-06**
Abiotic Depletion, Fossil	MJ	42.7	44.4	27	4.35	0.659206	**119**
60-years Use							
Acidification Potential	kg SO_2-eq.	0.0415	0.00762	2.10E-02	1.10E-01	0.000288	**0.181**
Eutrophication Potential	kg PO_4^{3-}-eq.	0.0158	6.85E-04	2.44E-03	6.45E-03	3.35E-03	**0.0287**
Global Warming Potential	kg CO_2-eq.	-1.0457	5.06	2.49	23.3	3.79	**33.6**
Ozone Depletion Potential	kg R11-eq.	2.10E-08	4.42E-08	7.84E-09	7.68E-07	-1.1E-08	**8.3E-07**
Photochem. Oxidant Formation Potential	kg Ethene-eq.	0.00232	9.39E-04	1.50E-03	6.22E-03	9.71E-04	**0.012**
Abiotic Depletion, Elements	kg Sb-eq.	4.73E-06	3.44E-07	6.78E-07	2.27E-06	2.48E-08	**8.05E-06**
Abiotic Depletion, Fossil	MJ	73.2	76.1	46.3	261	1.130067	**458**

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Product Lifetimes in EPDs

- Varying expected lifetimes **impact end-of-life emissions and replacement cycles** (Module B). Some EPDs will report the environmental impacts of a product over multiple different lifetimes, introducing another challenge when extracting and analysing EPD data
- There is often **ambiguity on the calculation methodology used** for results of differing product lifetimes
- Normalisation of the products with different declared service lives is a **manual process,** but key to allowing a **fair and justifiable** comparison across a material category

Challenges with Using EPD Data:

Environmental Indicators and Standards

Impact of Changing Standards

EPDs aren't static — their rules change over time.
As environmental science and policy progress, so do the rules for EPDs.

Key Drivers of Change:

- Updates to **EN 15804** (e.g., A1 → A2)
- Shifts in **impact assessment methods** (CML → EF 3.0)
- New **policy requirements** (EU Green Deal, CSRD)
- Better scientific models (e.g. for biogenic carbon, water scarcity)

This means that older EPDs or EPDs from differing geographies may have incompatible indicators or methods, requiring us to dissect and investigate these issues to ensure comparability within our datasets

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Core (Mandatory) EN 15804 Indicators

EN 15804 (pre-2019)

- Global Warming Potential (GWP)
- Ozone Depletion Potential (ODP)
- Acidification Potential (AP)
- Eutrophication Potential (EP)
- Photochemical Ozone Creation Potential (POCP)
- Abiotic Depletion – Elements (ADP-elements)
- Abiotic Depletion – Fossil Fuels (ADP-fossil)

EN 15804+A2 (post-2019)

- GWP -total
- GWP-fossil
- GWP-biogenic
- GWP-LULUC (land use and land-use change)
- Ozone Depletion Potential
- Acidification Potential
- Eutrophication – freshwater (EP-fw)
- Eutrophication – marine (EP-marine)
- Eutrophication – terrestrial (EP-terrestrial)
- Photochemical Ozone Formation
- Abiotic Depletion – non-fossil
- Abiotic Depletion – fossil
- Use of resources – fossil (PENRT)
- Water Use – deprivation-weighted (WDP)
- Ionising Radiation – human health effect

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EN 15804 (pre-2019) Example EPD

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg set accelerator		
Parameter	**Unit**	**A1-A3**
Global warming potential	[kg CO_2-Eq.]	1.33E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.80E-10
Acidification potential of land and water	[kg SO_2-Eq.]	2.56E-3
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	3.95E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	3.64E-4
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	5.31E-7
Abiotic depletion potential for fossil resources	[MJ]	2.80E+1

EN 15804 + A2 (post-2019) Example EPD

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² Ionoplast film (SentryGlas®) interlayer									
Parameter	**Unit**	**A1-A3**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq	2.64E+00	2.2E-01	0	2.27E-03	0	5.22E-02	-7.45E-02
GWP-fossil	kg CO_2 eq	2.83E+00	3.01E-02	0	2.28E-03	0	5.22E-02	-7.41E-02
GWP-biogenic	kg CO_2 eq	-1.9E-01	1.9E-01	0	0	0	0	-3.79E-04
GWP-luluc	kg CO_2 eq	4.48E-04	2.01E-06	0	1.54E-05	0	2.54E-05	-8.15E-06
ODP	kg CFC11 eq	6.25E-12	1.56E-14	0	2.24E-16	0	7.02E-14	-5.02E-13
AP	mol H^+ eq	5.41E-03	3.11E-05	0	7.5E-06	0	1.55E-04	-9.75E-05
EP-freshwater	kg P eq	3.04E-06	4.54E-09	0	8.15E-09	0	9.75E-06	-1.02E-07
EP-marine	kg N eq	1.73E-03	1.01E-05	0	3.42E-06	0	3.43E-05	-2.64E-05
EP-terrestrial	mol N eq	1.89E-02	1.49E-04	0	3.83E-05	0	3.76E-04	-2.83E-04
POCP	kg NMVOC eq	5.08E-03	2.7E-05	0	6.74E-06	0	1.1E-04	-7.4E-05
ADPE	kg Sb eq	4.37E-05	4.21E-10	0	2.3E-10	0	3.62E-09	-1.12E-08
ADPF	MJ	7.41E+01	4.84E-02	0	2.99E-02	0	7.41E-01	-1.26E+00
WDP	m^3 world eq deprived	7.22E-01	2.23E-02	0	2.55E-05	0	-5.15E-04	-7.9E-03

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

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Challenges with Using EPD Data:

Biogenic Carbon

Biogenic Carbon in EPDs

Biogenic Carbon:

Biogenic carbon refers to carbon that is part of the natural carbon cycle and is absorbed, released, or stored by biomass-based materials (e.g., wood, plants, natural fibres) during their life cycle

Stored Carbon:

Stored carbon in an EPD refers to temporarily retained carbon in the product (e.g. in wood), which may eventually be released (e.g. via combustion or decay)

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Biogenic Carbon in EPDs

- Before the EN 15804+A2 update, biogenic carbon reporting was **optional** and often not included

- Biogenic carbon storage could be noted in the EPD documentation, but was not reported or quantified in a **standard, transparent** way

- End-of-Life (EOL) emissions from biogenic sources were often **inconsistently handled** across EPDs

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Biogenic Carbon in EPDs

Two units are used in EPDs: **kgC and kgCO_2e.**

kgC

- Refers to **kilograms of carbon atoms**

kgCO_2e

- Refers to **kilograms of carbon dioxide equivalents**

1 kgC is equal to 3.667 kgCO_2e
(molecular weight conversion:
$CO_2/C = 44/12$)

Biogenic Carbon in EPDs

Information on biogenic carbon content

BIOGENIC CARBON CONTENT	kgC	$kgCO_2e$
Biogenic carbon content in product	**219**	802
Biogenic carbon content in packaging	**0**	0

Note: 1kg biogenic carbon is equivalent to 44/12 kg CO_2

Indicator	Unit	Tot.A1-A3	A4	A5	B2	C2	C3	C4	D
GWP-fossil	**kg CO_2 eq.**	1.08E+03	5.43E+00	4.24E+01	0.00E+00	5.43E-01	3.28E+00	0.00E+00	-8.19E+02
GWP-biogenic	**kg CO_2 eq.**	-7.74E+02	3.23E-03	1.45E+00	0.00E+00	3.23E-04	4.17E-03	8.02E+02	-2.99E-01
GWP-luluc	**kg CO_2 eq.**	7.31E-01	1.83E-03	1.02E-01	0.00E+00	1.83E-04	1.02E-03	0.00E+00	-2.26E-01
GWP - total	**kg CO_2 eq.**	3.02E+02	5.44E+00	4.39E+01	0.00E+00	5.44E-01	3.29E+00	8.02E+02	-8.19E+02

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Biogenic Carbon in EPDs

These inconsistencies in the handling of biogenic carbon represent a challenge for the ICE Database.

- Mix of pre and post EN 15804+A2 update data means **differences in our datapoints and their methodology** when reporting biogenic carbon

- Frequent mistakes in EPDs when reporting biogenic carbon **distort our results** and make comparisons between datapoints difficult

- Manual extraction of biogenic data and checking their calculations are a **time-intensive process**

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Challenges with Using EPD Data:

Allocation and Methodology Differences

Allocation

Allocation is the process of dividing environmental impacts among multiple products or outputs of a process.

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Allocation

Why It's Needed:

- Many industrial processes **produce more than one product** (e.g. cement + fly ash, steel + slag)
- Allocation determines how emissions and resource use are shared between co-products

Common Allocation Scenarios:

- By-products (e.g. sawdust from lumber production)
- Waste-to-resource flows (e.g. recycled content)
- Shared infrastructure (e.g. energy use in a multi-product facility)

EN 15804 Guidance:

- **Avoid allocation** when possible
- If allocation is necessary, follow EN 15804 priority of allocation methods

Types of Allocation Methods

Method	Description	Impact on EPDs
Mass Allocation	Impacts distributed by product weight	Simple but may misrepresent value or use
Economic Allocation	Based on product market value	Reflects market reality, but volatile over time
Energy Content	Allocates based on calorific value	Used for fuels or energy carriers

Variance in the allocation rules used in a material category can lead to inconsistent results when comparing even similar EPDs.

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Why Allocation Matters for ICE

1. **Incompatible Allocation Methods = Skewed Results:**
   - Aggregating EPDs using **different allocation bases** (mass vs economic) can lead to **non-comparable results**
   - Impacts may be **over- or under-represented**, especially for by-products

2. **No Harmonization Across PCRs:**
   - Product Category Rules (PCRs) can **define allocation differently**
   - Even within the same material class (e.g. plastics, metals), allocation can vary

You cannot reliably aggregate or compare EPDs without understanding the underlying allocation logic!

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Impact Assessment Methods

Impact assessment methods are the set of models and procedures used in **Life Cycle Assessment (LCA)** to translate the **inventory of emissions and resource use** into **environmental impact indicators** (e.g. global warming, acidification, eutrophication).

For example, converting the sum of kg carbon dioxide, kg methane, kg nitrous oxide into their combined Global Warming Potential in kgCO_2e

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Impact Assessment Methods

Not all EPDs speak the same language.
Different impact assessment methods — like CML, TRACI, and EF 3.0 — calculate indicators in different ways, making aggregation and comparison a major challenge.

Aspect	CML	EF 3.0	TRACI
Use in EPDs	EU EPDs EN 15804 (A1, pre-2019)	Recent EPDs	North American EPDs
Origin	Leiden University	EU Commission, JRC	U.S. Environmental Protection Agency
Regionalisation	Global Average	EU Optimised	U.S. Specific
Biogenic Carbon	Often Not Included	Mandatory Reporting	Often Not Included

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Why Methodology Matters for ICE

1. **Indicators and Units Differ:**
    - GWP in CML ≠ GWP in EF 3.0 (e.g., LULUC and biogenic carbon now separated)
    - TRACI lacks some EU-required indicators (e.g. GWP-LULUC, EP-freshwater)
    - CML doesn't reflect U.S. regional impacts (e.g. smog formation, nutrient runoff)

2. **Regional Context Not Comparable:**
    - TRACI reflects U.S. baselines
    - EF 3.0 reflects EU policy
    - CML is globally averaged

3. **No Common Normalization/Weighting Factors:**
    - You can't apply normalization across methods without recalculating everything from life cycle inventory (LCI)

Mixing and comparing EPDs that use different methodologies is not always appropriate, and requires knowledge of the underlying life cycle inventory to ensure appropriate and fair use

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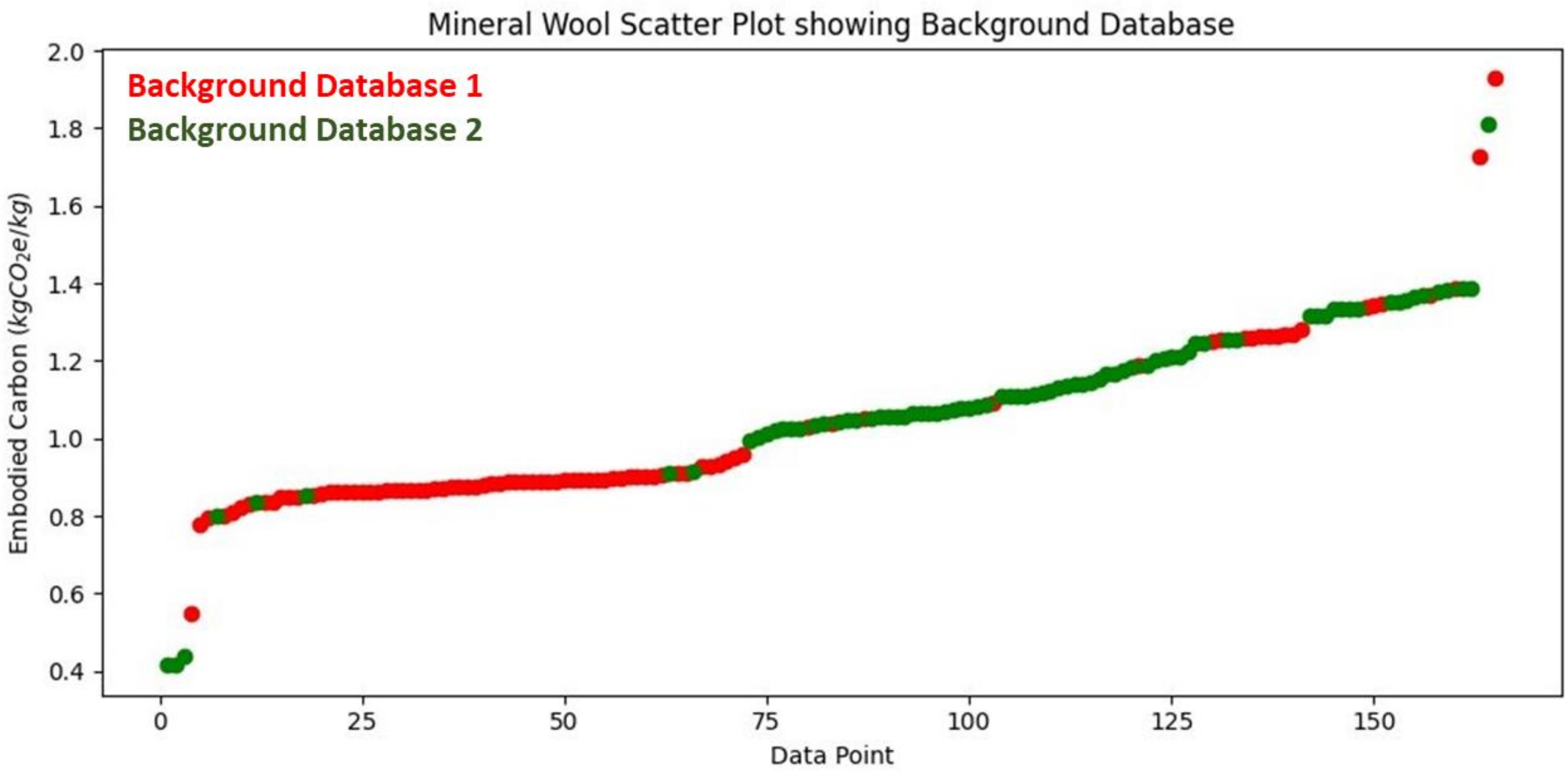
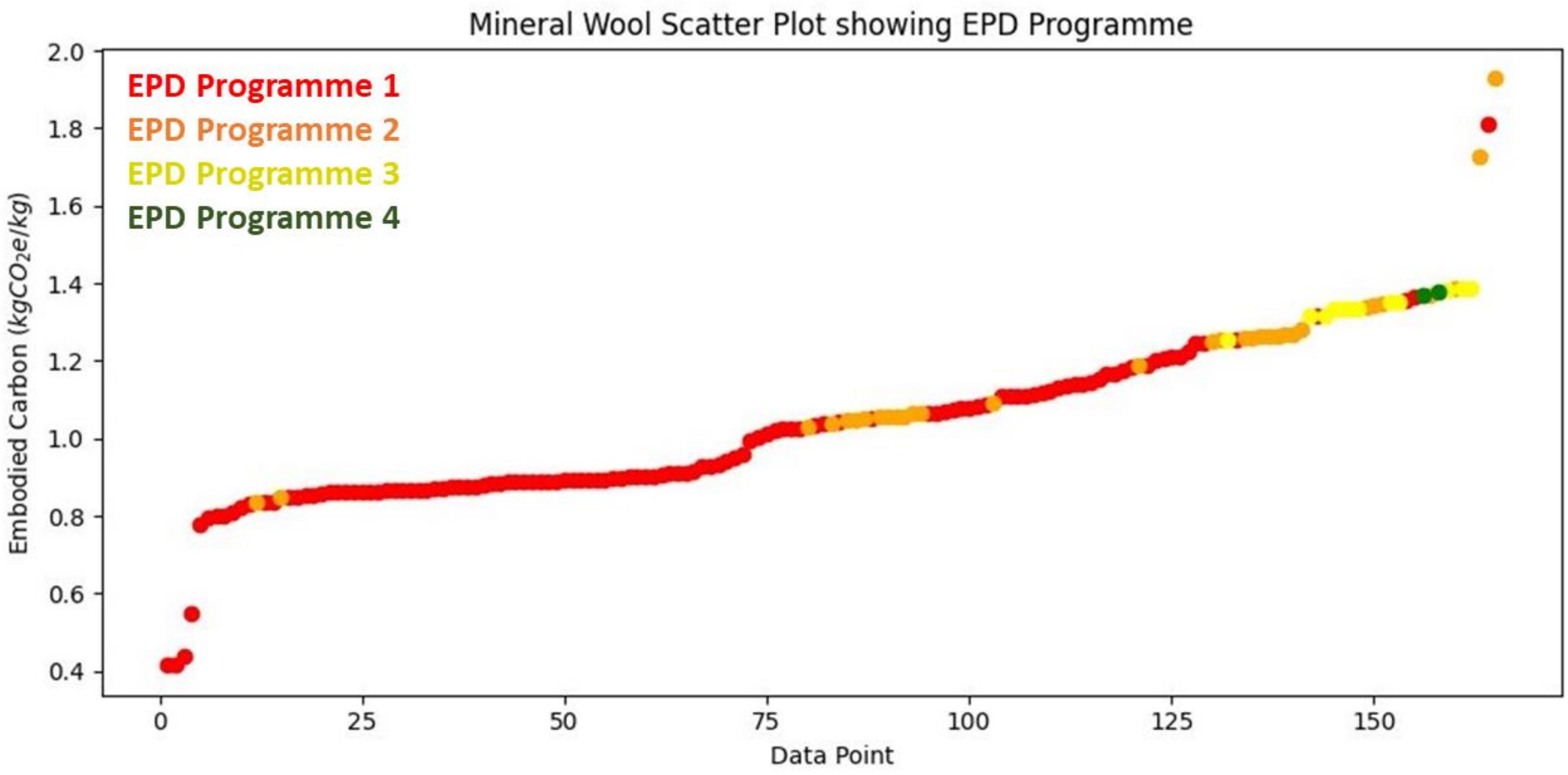
Are All EPDs Created Equal?

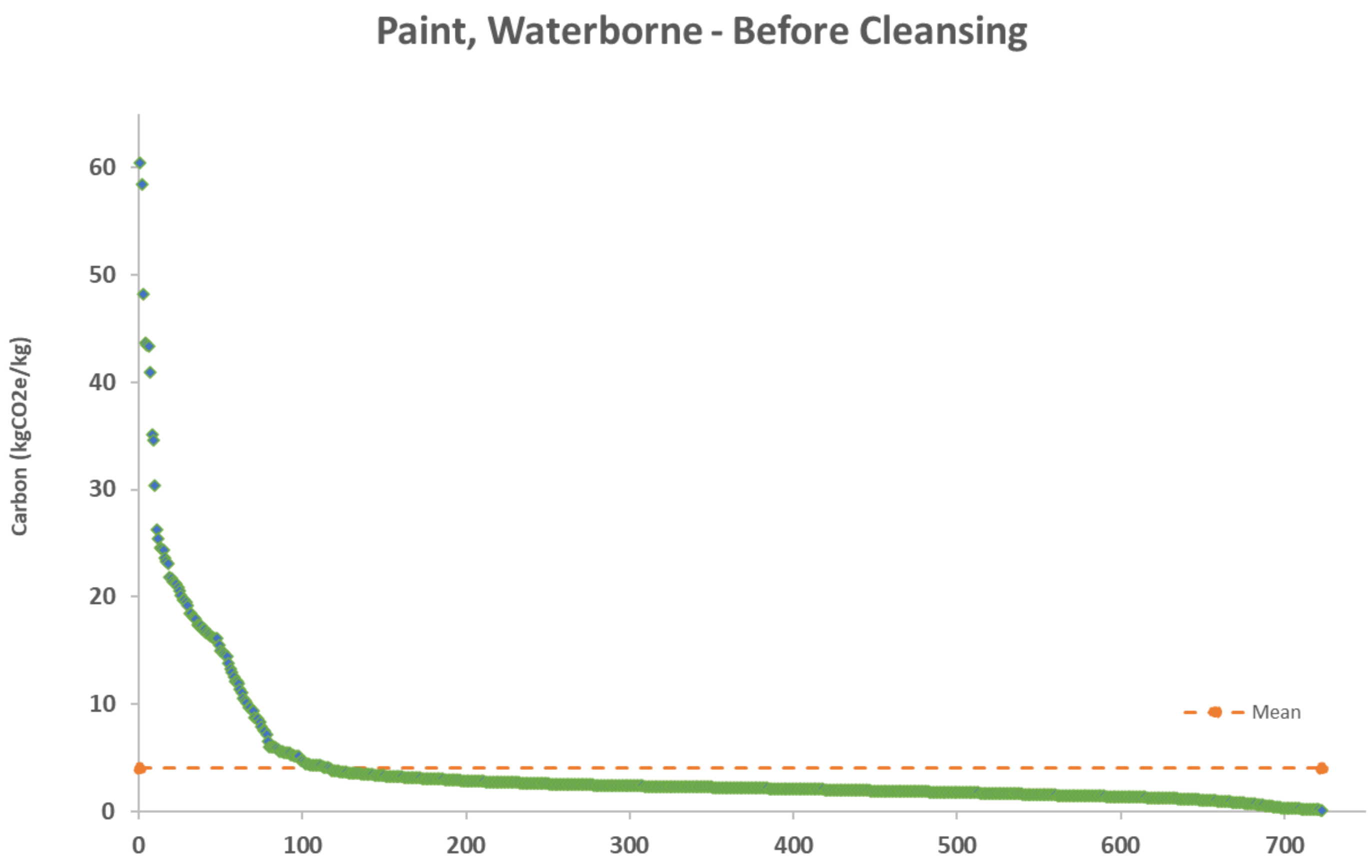
Impact of Background Database



Impact of EPD Programme



Impact of the ICE Analysis Process



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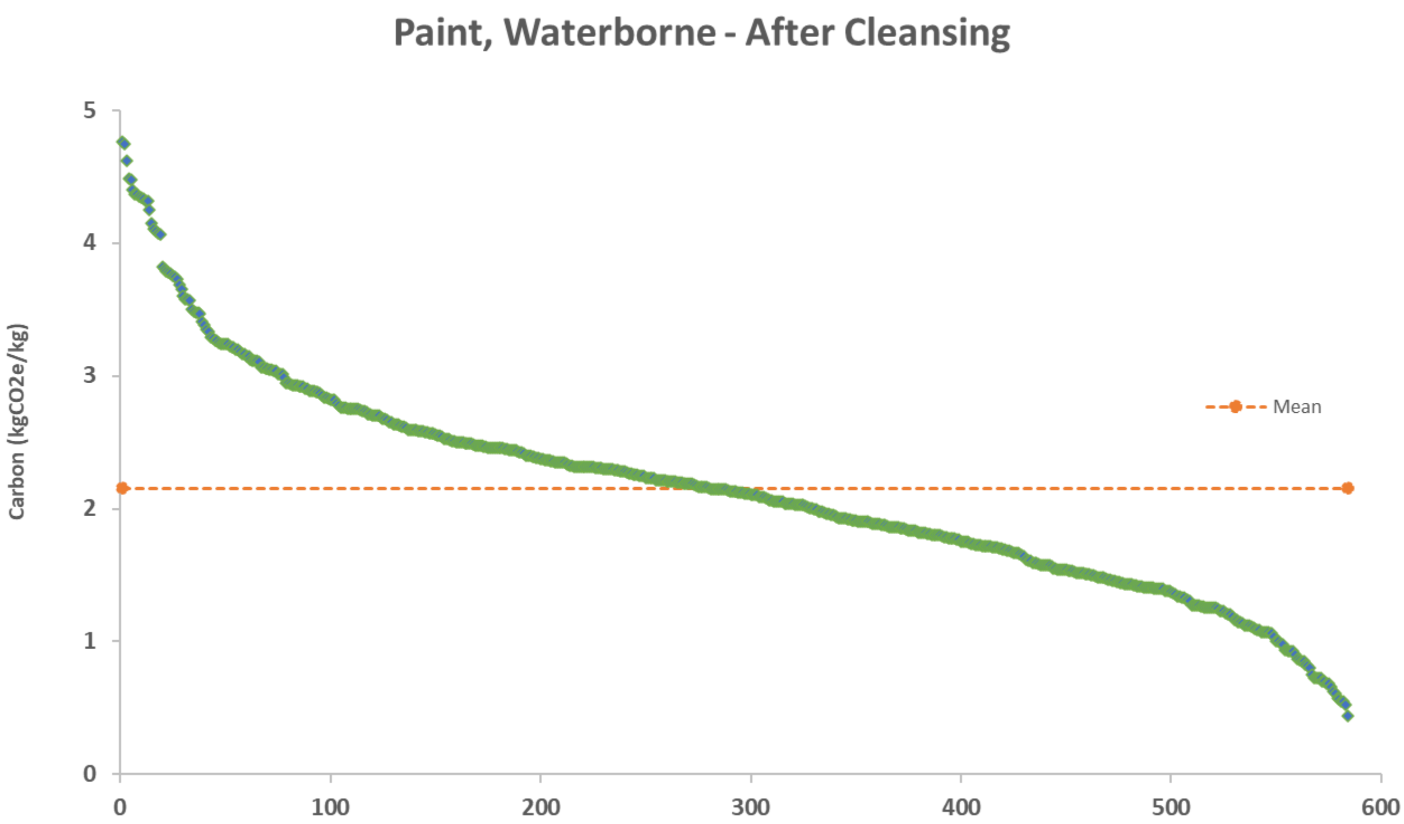
Impact of the ICE Analysis Process



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Overview of the Challenges of EPD Data

EPD Data Issues for ICE

- Inconsistencies in the handling, reporting and methodology used to show biogenic carbon
- Conversion and normalization of functional units across each ICE category
- Flagging and removal/normalisation of Referenced Service Life for each datapoint
- Extraction of the standards followed to assess compatibility for comparison
- Analysis of the allocation method used in each datapoint to ensure fairness
- Understanding the methodology and indicators reported and how/if these can be fairly compared

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Today's Webinar - Recap

- Overview of Environmental Product Declarations
- Understanding the ICE Background Dataset
- Product Lifetime and Functional Units
- Environmental Indicators & Standards
- Biogenic Carbon Handling
- Allocation and Methodology Differences
- Are All EPDs Created Equal?
- Summary and Recap

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How You Can Support ICE

- Share with your networks **how you use the ICE Database** in projects, tools and research
- Contribute to our **Scaling Carbon Reductions Initiative (SCRI)** by choosing some of the Circular Ecology products which diverts revenue from sales towards ICE and other free data and tools
- **Donate directly to the ICE Database** and be recognised as an ICE Supporter or Contributor
- **Invite us to collaborate on research grant funding applications** (Innovate UK, Horizon…etc), part funded research can be an important part of updating the ICE Database

https://circularecology.com/how-to-support-ice.html

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Next Webinars

We are planning a **webinar series across 2025...**

Continuing **ICE Database Insights** series

1. **Methodological Challenges Behind the Scenes** – Thurs 12th June
2. **Appropriate Use of Generic Data** - Weds 16th July

Read more and sign up at circularecology.com/news/new-webinar-series-the-ice-database

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Q&A

Please use the Q&A interface to ask your questions

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Thank you for watching

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