



ICE Database Insights: ICE Analytical Review Processes

30th April 2025

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circularrecology.com

Today's Webinar

- ⊖ Introduction
- ⊖ Overview of the ICE Background Dataset
- ⊖ ICE Data Categorisation Processes
- ⊖ ICE Data Analysis Processes
- ⊖ Importance of Applying a Robust Analytical Approach
- ⊖ Recap
- ⊖ Q&A

Your Presenters Today

Jon Burrow

Head of Carbon Accounting

- Over a decade's experience in carbon footprints
- Expertise in developing Carbon Reduction Strategies for organisations
- Oversight for the development and launch of ICE V4.0

Sophie Vernon

Senior Sustainability Consultant

- Leading & delivering on carbon projects for clients across many industries and sectors
- Background in materials science and engineering
- Project manager for the development and launch of ICE V4.0

Charlie Zhu

Senior Sustainability Analyst

- Wide range of carbon consultancy in manufacturing, construction, and design sectors
- Delivery of data assets for carbon accounting and LCA using data science & machine learning
- Category Lead on ICE Database



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

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**

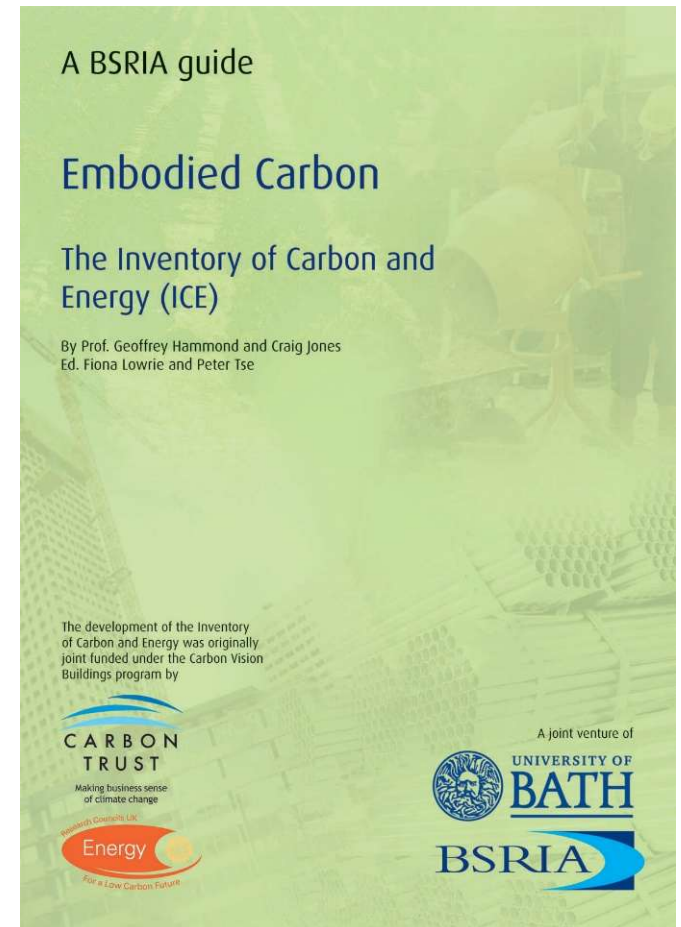


Publication of an annual impact report disclosing the amount raised and use of funds

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

The Inventory of Carbon & Energy (ICE)

- An **embodied energy and carbon database** for building materials
 - First version (2005) released by Dr Craig Jones and Professor Geoff Hammond, University of Bath
- Carbon Data for over 200 materials
 - Primarily for Construction Materials
- Over 50,000 worldwide users
- Updated in 2011 (v2.0), and 2019 (v3.0)
- Latest version (ICE v4.0, Nov 2024) is free to download as an excel file from -
www.circularecology.com/ice-database.html
- Further ICE updates hopefully to come





Overview of the ICE Background Dataset

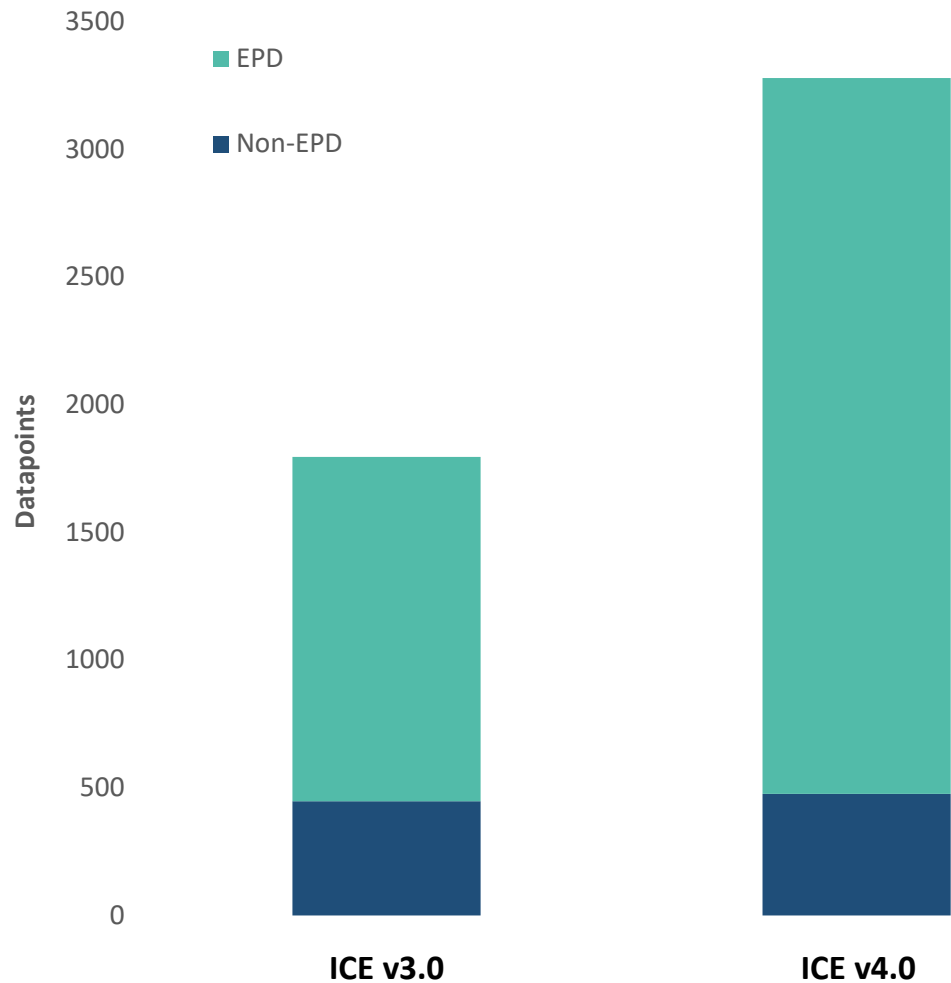
Digitisation of Carbon Data

- Carbon data is becoming **more digital, more structured, and more accessible**
- Where once largely analogue, it is now increasingly being stored and **used in machine-readable formats**
- Digitisation enables **much greater scalability** of carbon datasets (e.g., EC3, GLAD, One Click LCA Database)



ICE Database Size

- ICE v4.0 is a beneficiary of this **digitisation**
- Previously, data collection efforts were largely a **manual process of extraction**
- Datapoints shown for ICE v4.0 represent the **'tip of the iceberg'**



Role of EPDs

- EPDs make up a **significant share** of ICE database
 - started in the construction sector
 - **high-quality** data source
- But they are **not without challenges**
- Our approach focusses on **Quality-driven analysis using the best available data**



Types of Data Captured

Critical Data

- GWP Values (kgCO₂e per FU)
 - GWP, Total
 - Breakdown of GWP (e.g., fossil, biogenic, LULUC) if available
- Mass Data (kg per FU)
- Functional Unit
- Resource Description
- Access to Primary Data Source (e.g., URL, pdf links)

Useful Data

- Existing Classification Systems
- Geographical Information
- Age of Data
- Allocation Methodology
- Background Data Sources
- EPD Programme
- Standards Followed
- Assurance Level
- Wider Environmental Metrics (beyond carbon...)



ICE Data Categorisation & Analysis

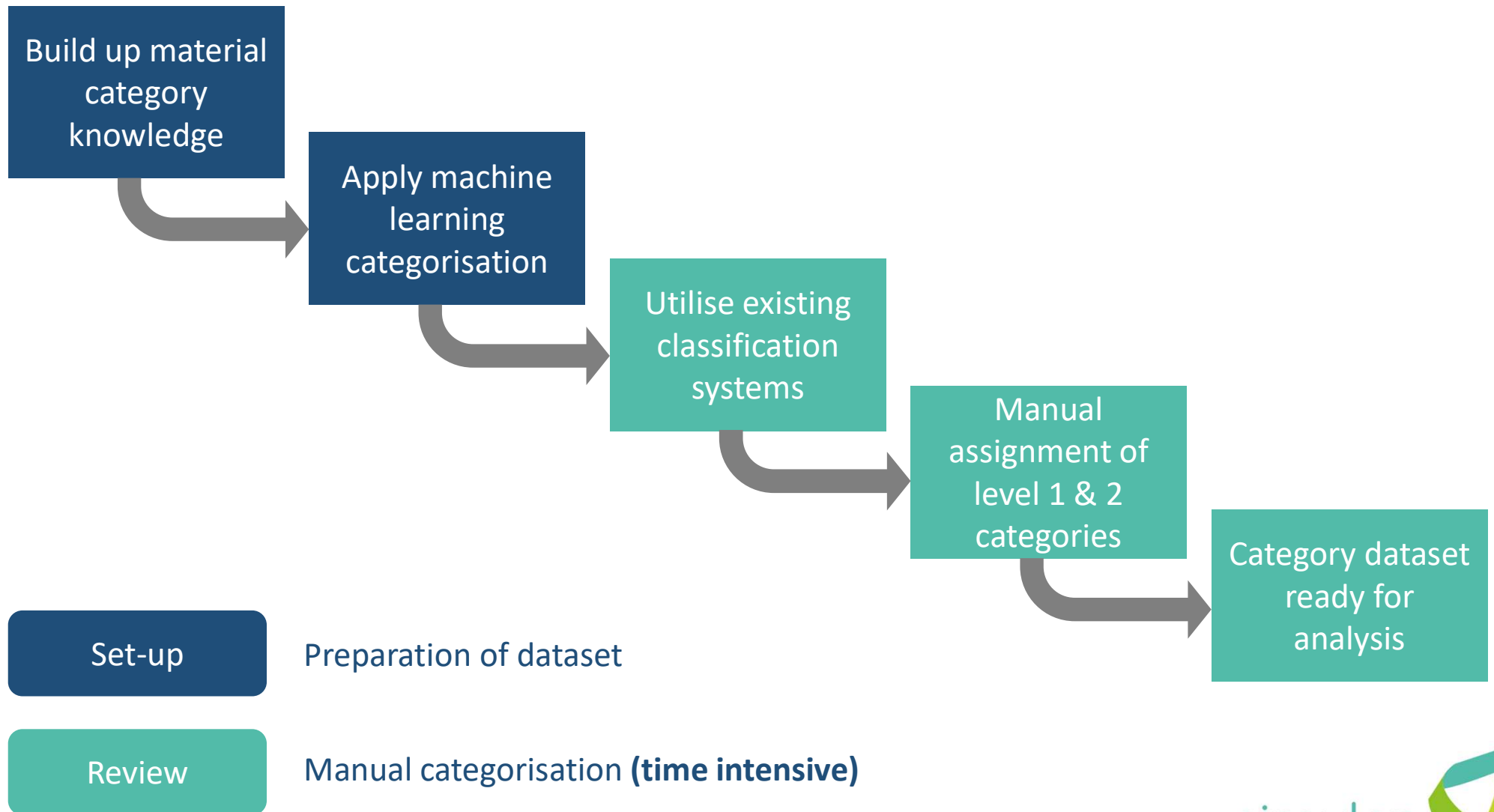
ICE Categorisation

ICE is made up of **level 1** material category profiles which contain **level 2** category embodied carbon averages

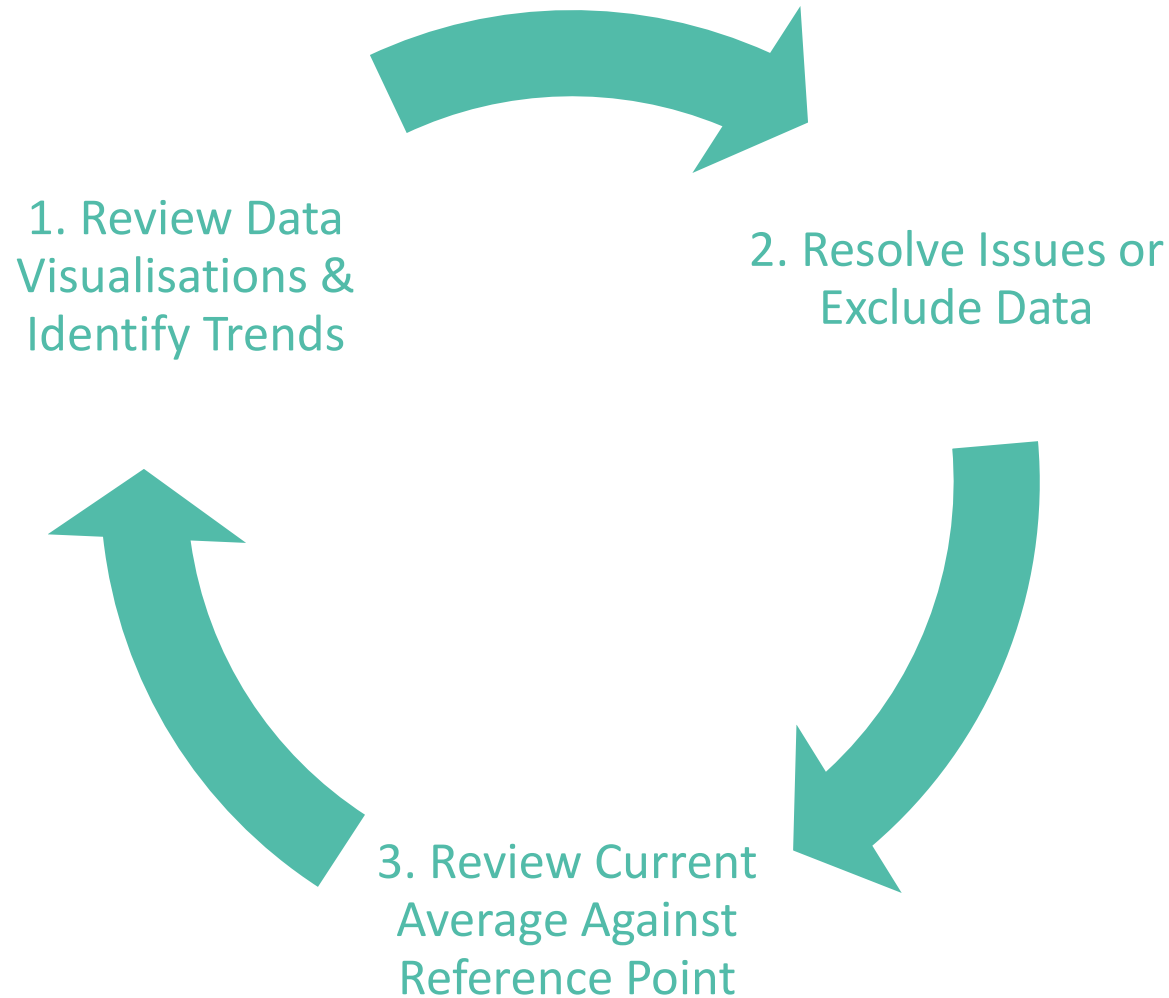
<<< Start of Main Embodied Carbon Data >>>				
Materials	Embodied Carbon - kgCO2e/kg	Comments	DQI Score	DQI Version
Ceramic, Porcelain Tile	0.758	Average of data collected, 51 datapoints. Porcelain Tiles are typically fired at higher temperatures in the manufacturing process when compared to other Ceramic Tiles which could affect the embodied carbon. Possible overlaps between Porcelain Tiles and other general Ceramic should be considered.	64%	V2.0
Ceramic, Sanitary	1.930	Average of data collected, 19 datapoints. This refers to sanitary ceramic products (e.g., wash basins, toilets etc.)	67%	V2.0
Ceramic, Tile	0.796	Average of data collected, 81 datapoints. Possible overlaps between Ceramic Tiles and Porcelain Tiles should be considered. Other terms such as Stoneware can also be used to refer to either type.	66%	V2.0
<<< End of Main Embodied Carbon Data >>>				

Snapshot taken from ICE v4.0

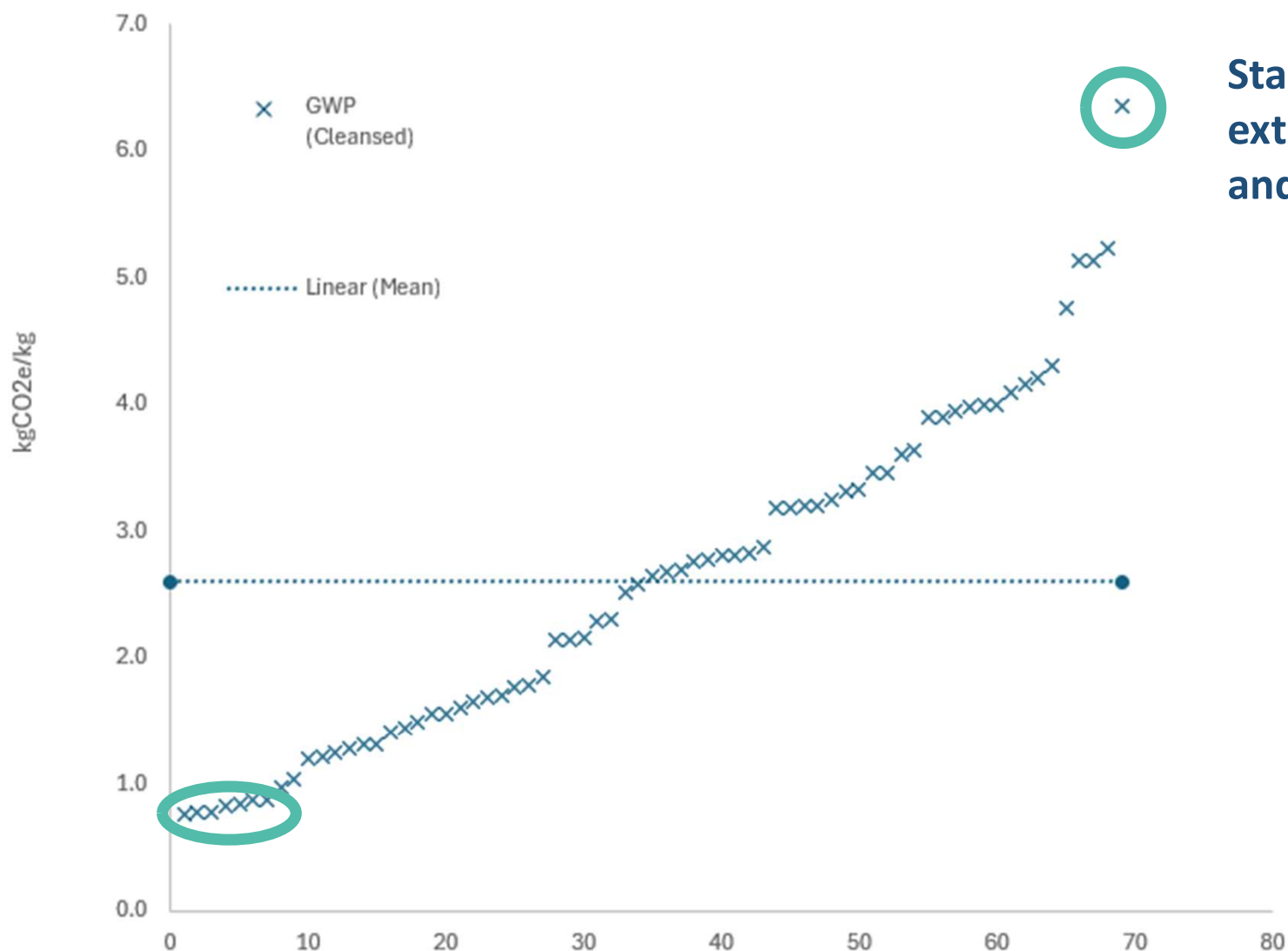
ICE Categorisation Process



ICE Data Analysis Process

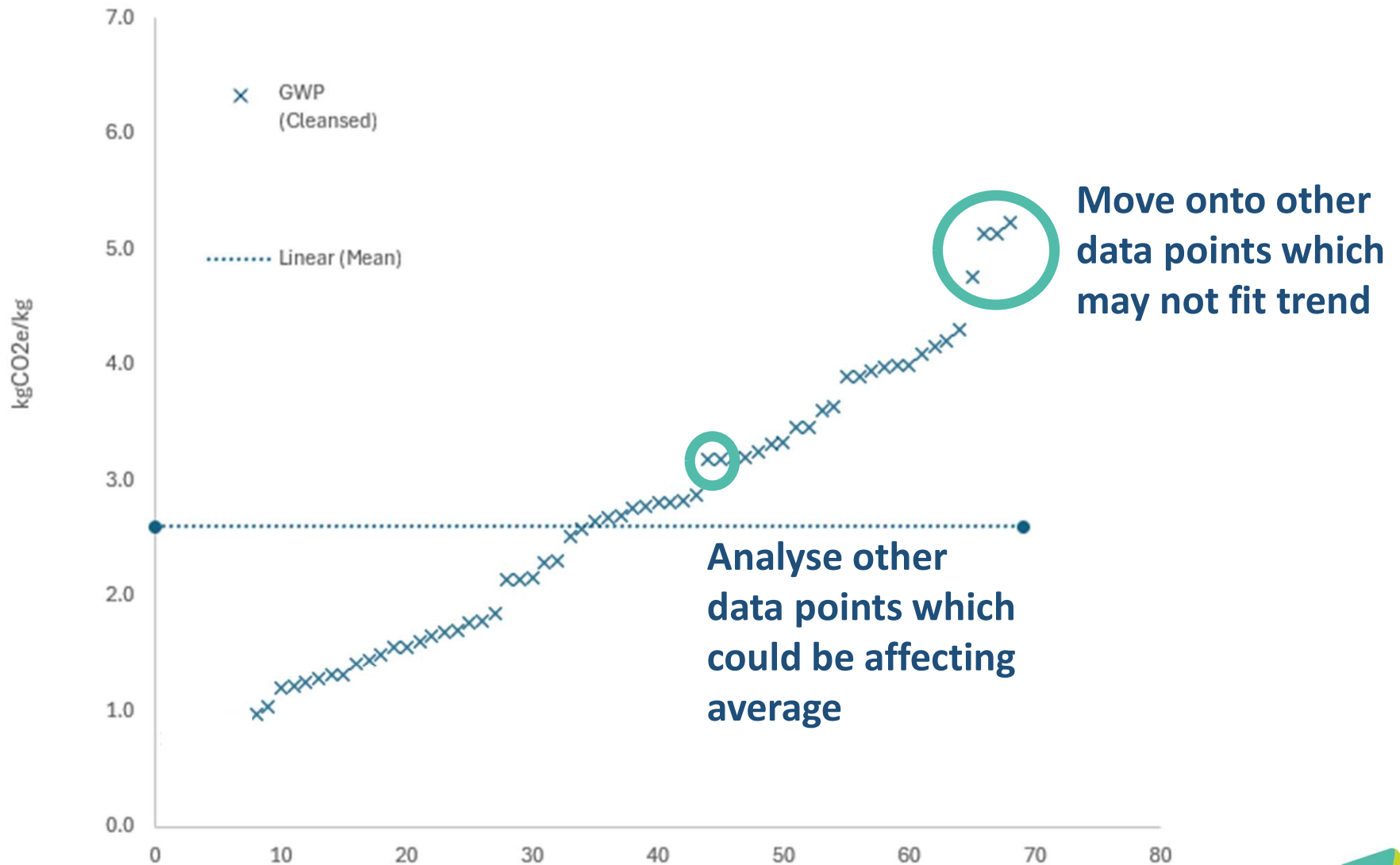


ICE Data Analysis: Example



Start with the extreme high and low

ICE Data Analysis: Example





Importance of Applying a Robust Analytical Approach

Context



Objective

To produce a figure that is as **representative/plausible of an average** to the overall category. This requires us to aggregate **distributions of data into a single point (generic data)**.



Challenge

Generic data **requires scrutiny** due to the aggregation resulting in **inherent uncertainty** that is not easily seen or managed.



Problem

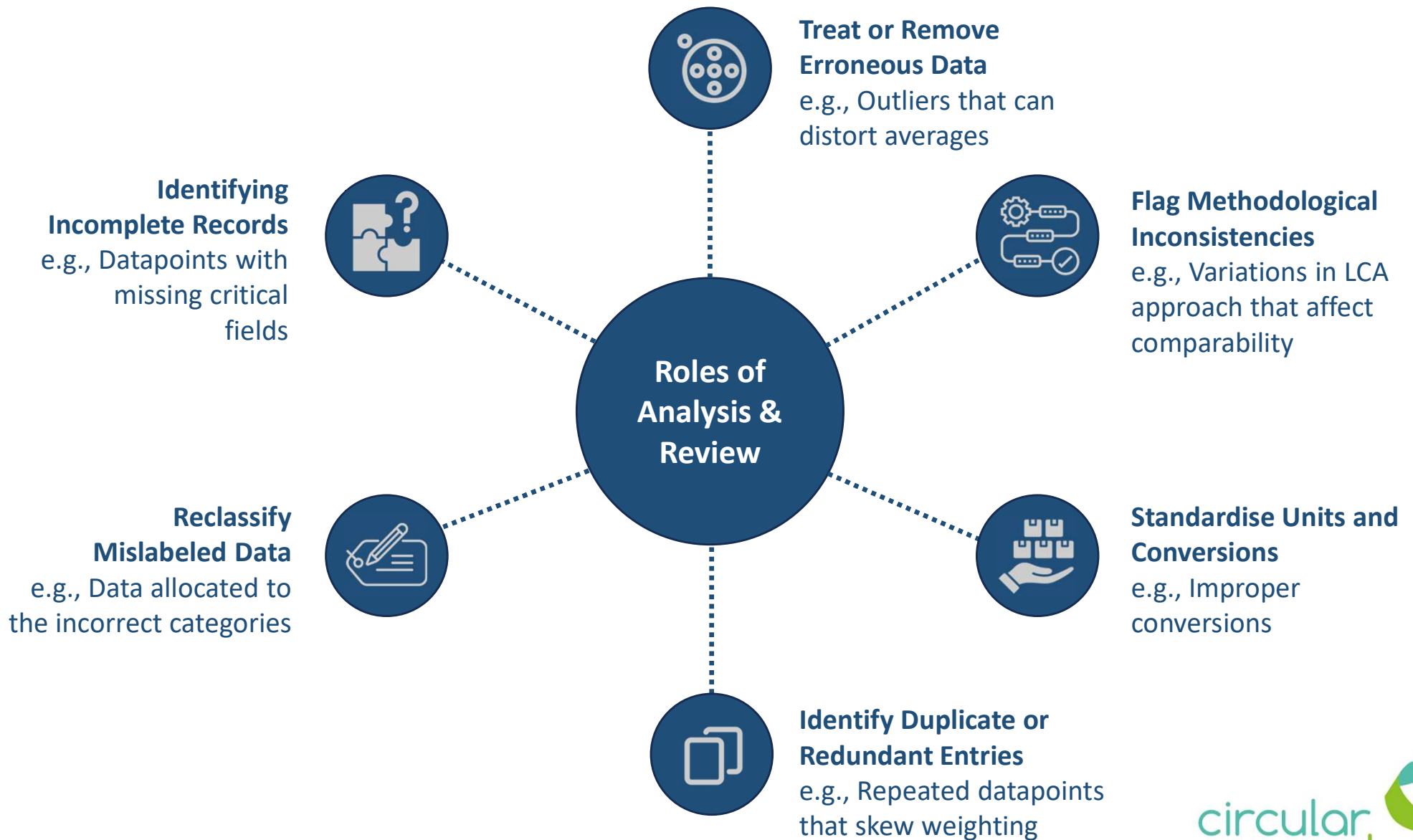
Underlying datasets of this scale and variety **will inevitably contain issues** (e.g., inconsistent LCA methodologies, incorrect unit conversions...)



Impact

Unaddressed issues leads to carbon data that is **less comparable**, thereby **contaminating the data sample(s) and harming the integrity** of the final aggregated emission factor

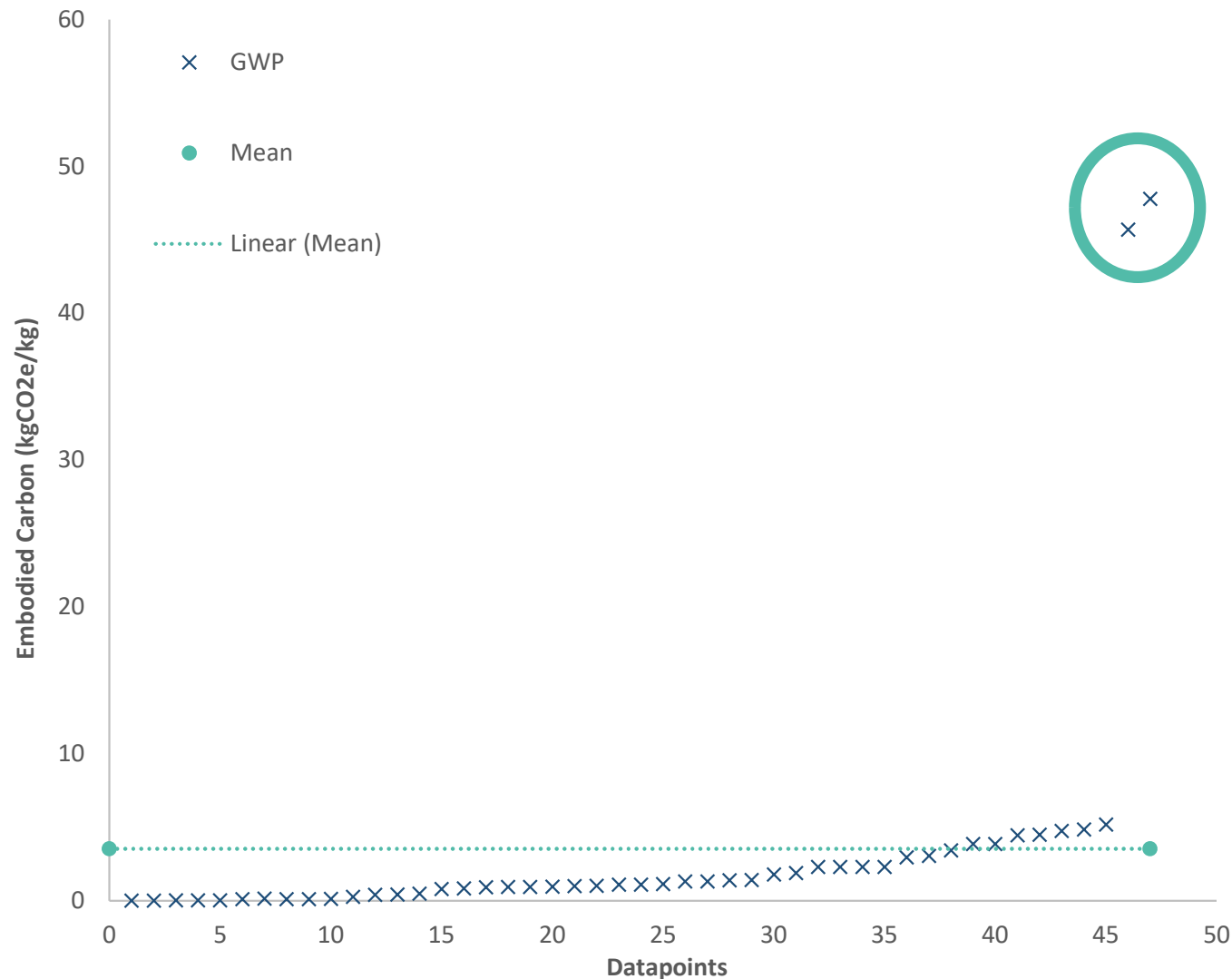
Resolving Common Issues



Example Category (I)

Uncleansed Data

Material category's GWP data in raw form

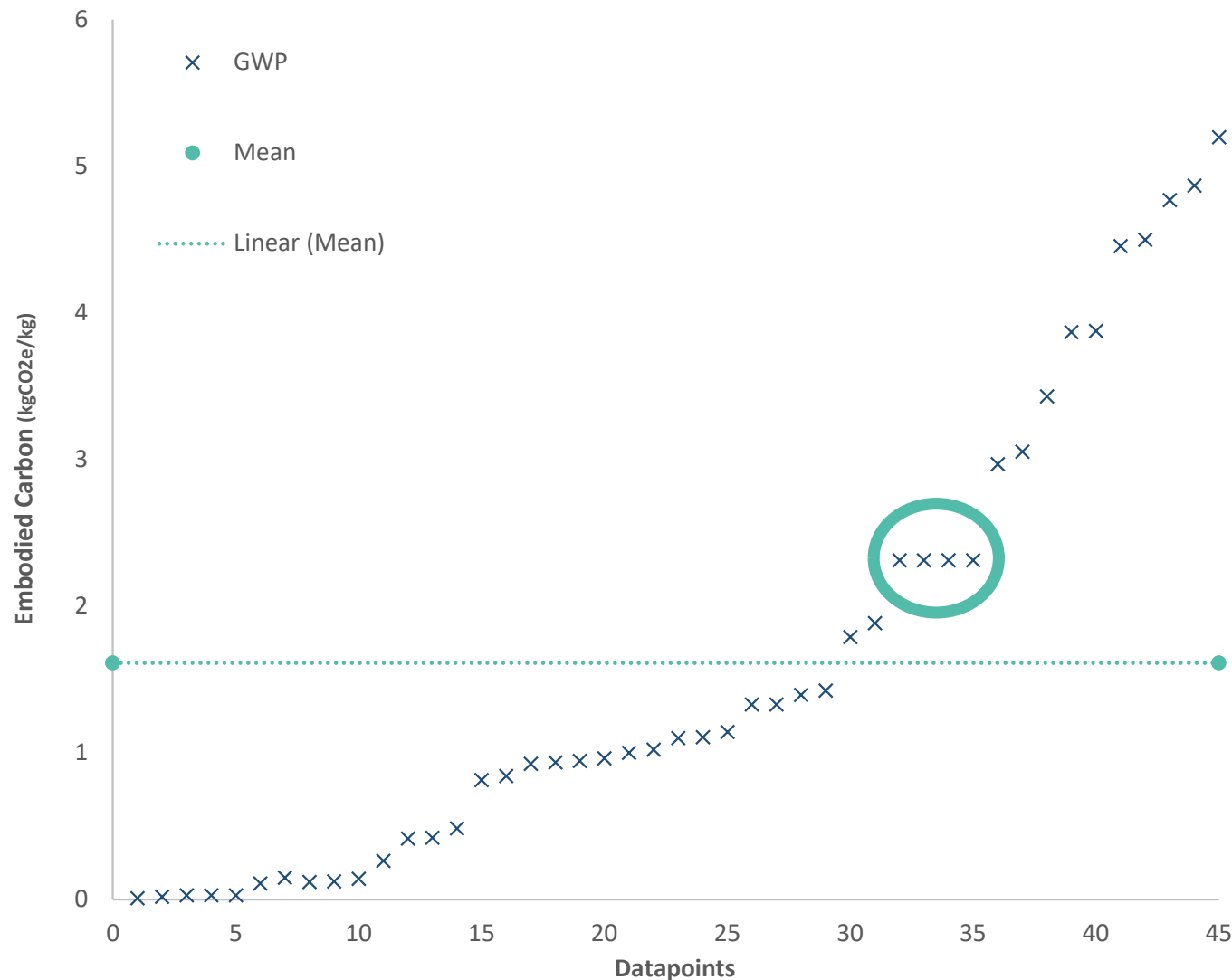


Mean Value
3.67 kgCO₂e/kg

Example Category (II)

Cleansing - Outliers

Outliers treated or removed from the same dataset

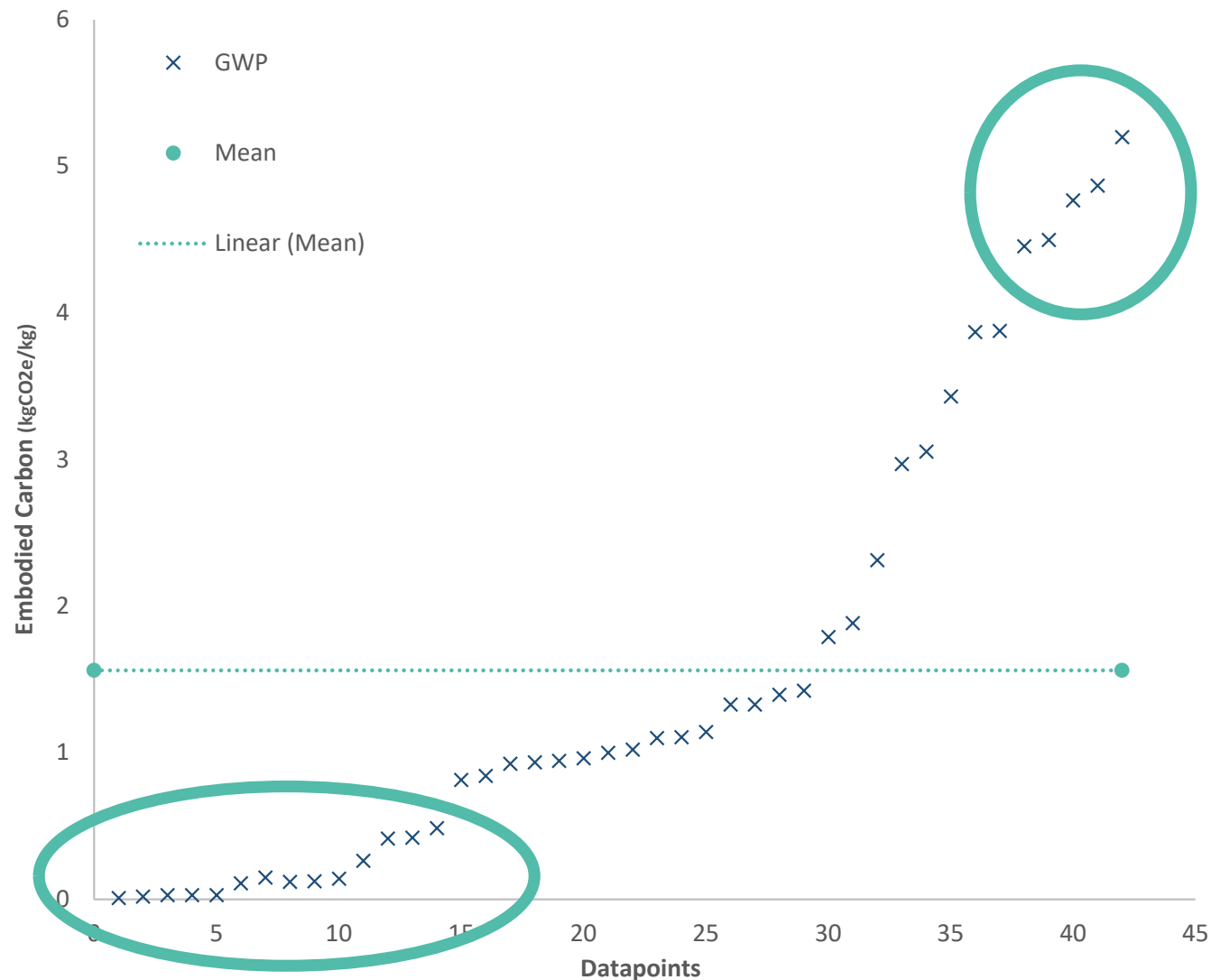


Mean Value
1.75 kgCO₂e/kg

Example Category (III)

Cleansing - Duplicates

Duplicates treated or removed from the same dataset



Mean Value
1.71 kgCO₂e/kg

Broader Implications

Guides Sustainability Decisions at Scale

Data forms the basis for design, procurement, and policy decisions



Affects Performance Benchmarks

Inaccuracies distort benchmarking efforts



Why Getting the Data Right Matters

Supports Transparency and Accountability

Robust data builds trust between stakeholders



National and Corporate Reporting

Flawed data can undermine credibility of reporting



Future Improvements

- **Breakdown of fossil, land use change and biogenic carbon**
 - Better alignment with updates to EPD/LCA methodologies (e.g., EN15804+A2)
- **Three-point uncertainty**
 - Preserving more of the distribution present in categories, rather than reducing it to one datapoint (e.g., *'plausible minimum'*, *'most-likely'*, *'plausible maximum'* scenarios)
- **Maximising the data**
 - Further investigations into the data using the additional fields that are available to us
- **Expanding machine learning's applications**
 - To support the manual analytical processes



Summary

Today's Webinar - Recap

- ✓ Understand ICE Background Datasets
- ✓ ICE Data Categorisation Processes
- ✓ ICE Data Analysis Processes
- ✓ The importance of applying a robust analytical approach
- ✓ Review of an Example Material Category
- ✓ Future improvements

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>

Next Webinars

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

Continuing **ICE Database Insights** series -

1. **Are All EPDs Created Equal?** - Thurs 22nd May
2. **Methodological Challenges Behind the Scenes** – Thurs 12th June
3. **Appropriate Use of Generic Data** - Weds 16th July

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

Keep an eye on our networks for more information

- Website - circularecology.com
- LinkedIn - linkedin.com/company/circular-ecology



Q&A

**Please use the Q&A interface to ask
your questions**



Thank you for watching

Sign up for more information on ICE and for future updates

<https://circularecology.com/newsletter.html>