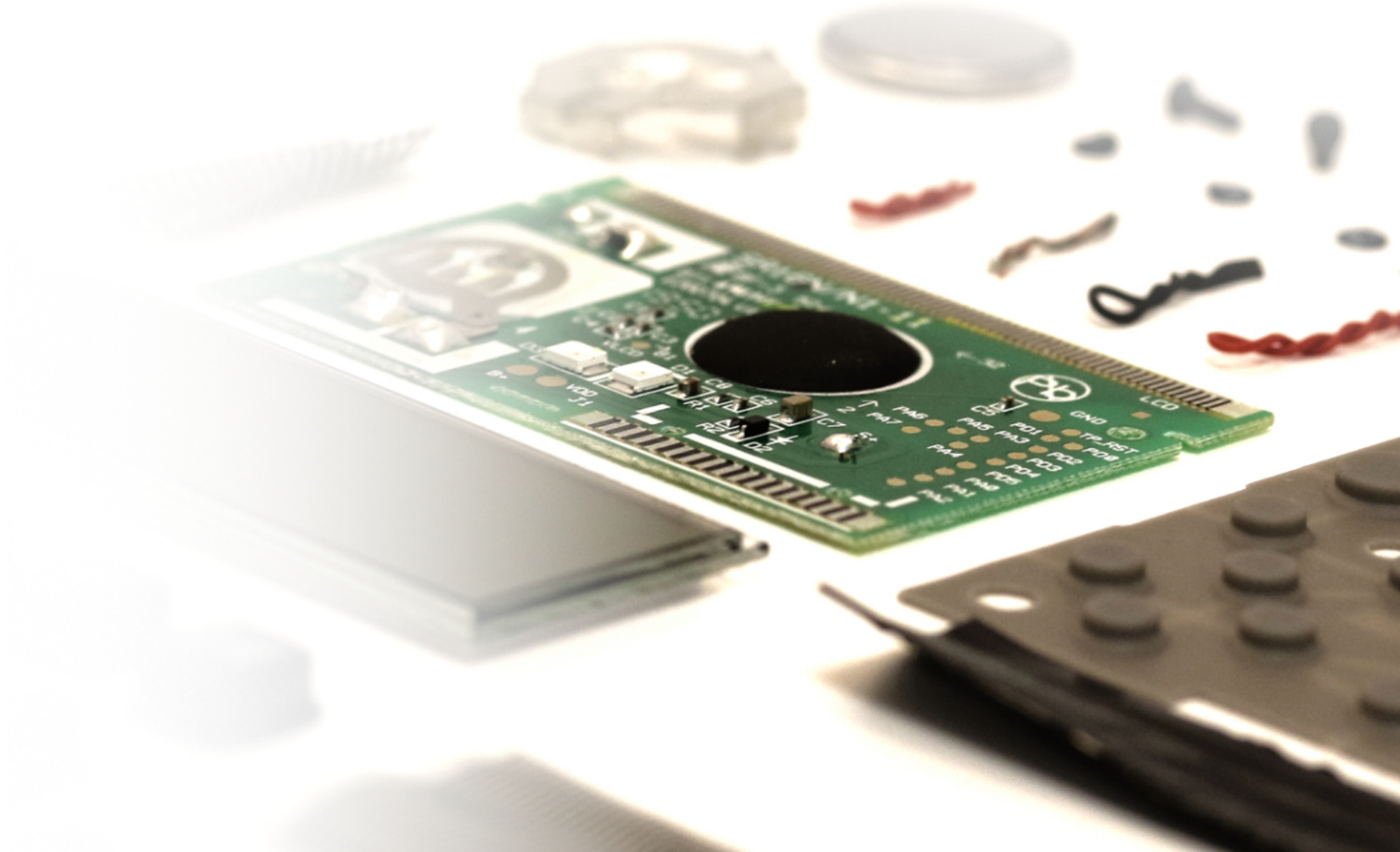
Claigan
Less Journey. More Results.

Claigan Webinar - Masterclass in LCA-EPD-PCR

A Technical Walkthrough of Life Cycle Assessment for Electronics

Presented by:
Bruce Calder
VP Consulting

March 18, 2026



Overview - Agenda

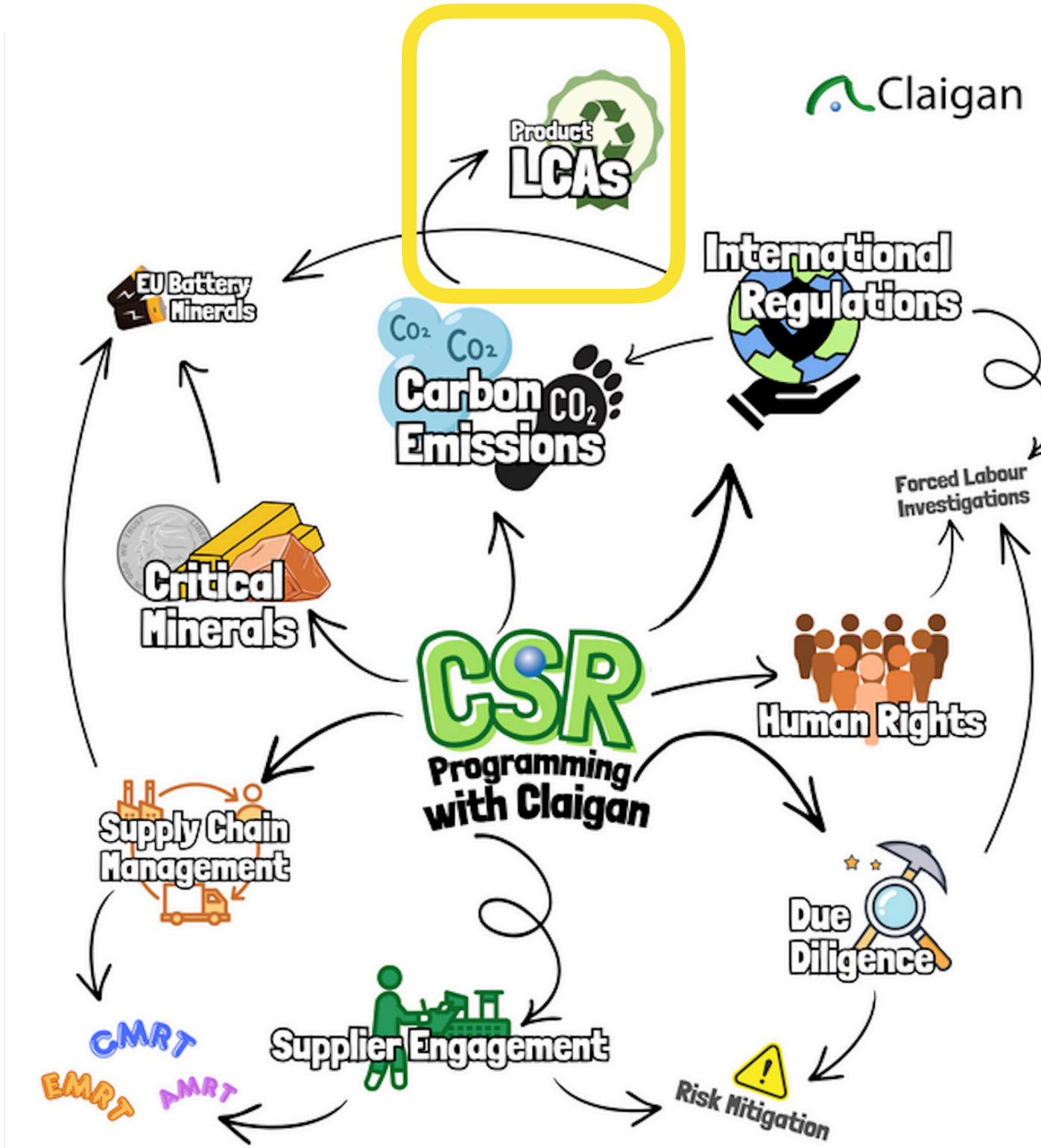
- Life Cycle Assessment
  - LCA
  - EPD
  - PCR
- Why conduct an LCA
  - Details on cost reduction
- PCR for electronics
  - Modules
- Example LCA/EPD
  - Full detail
- Q&A

Claigan Experience

- **Claigan has been around for fifteen (15) years**

- **Life Cycle Assessment Experience**
    - Predominantly
        - Electronics
        - Medical devices
        - Machinery
    - Combination of
        - Consumer
        - Professional products

Claigan and CSR



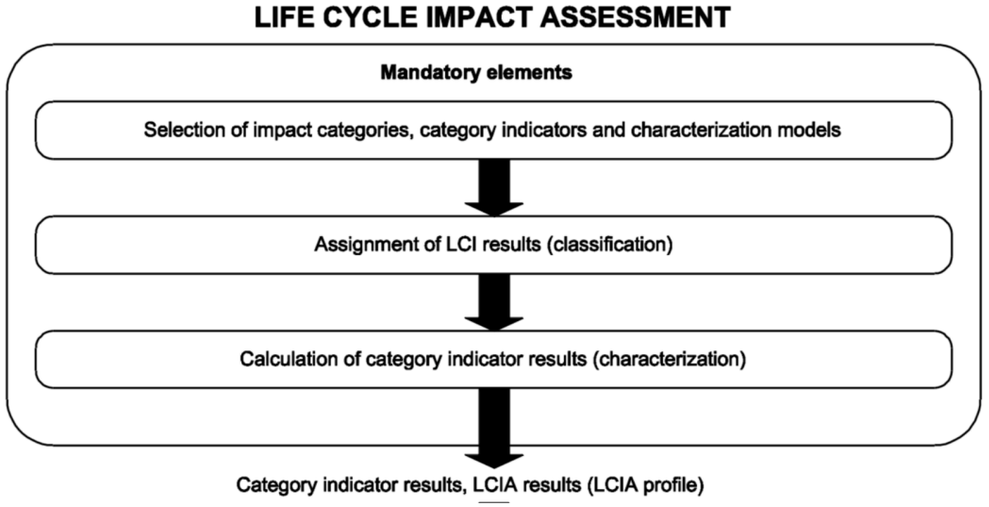
What is an LCA?

- **L**ife **C**ycle **A**ssessment (LCA)
  - a standardized scientific method used to evaluate the environmental impact of a product, process, or service across its entire lifespan

- **Which means**
  - It can be used in many general ways, but specific details are not included

LCA Standards

- **ISO 14040**
  - Principles and Framework
  - Very high level



- **ISO 14044**
  - Requirements and Guidelines
  - Still fairly high level

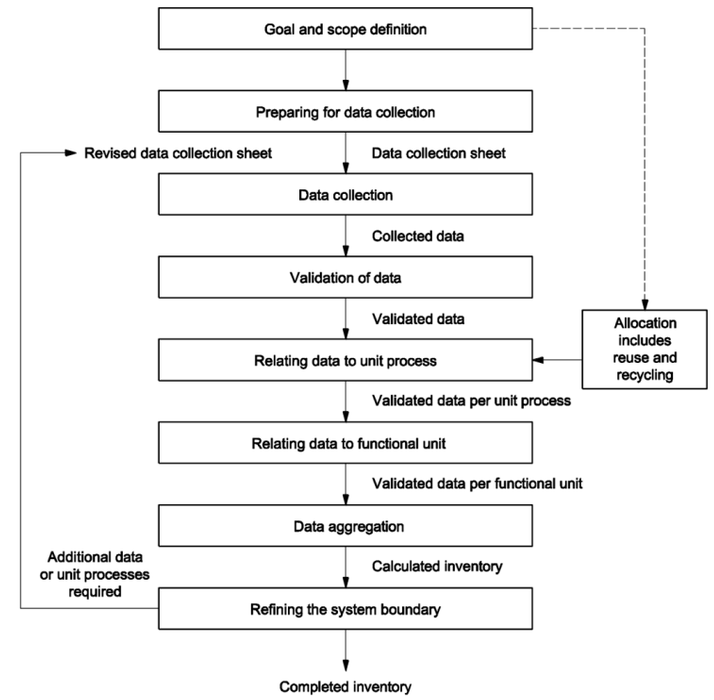


Figure 1 — Simplified procedures for inventory analysis

What is an EPD?

- **E**nvironmental **P**roduct **D**eclaration (**EPD**)
  - A verified, transparent, and standardized report disclosing a product's environmental impact across its entire life cycle

- **Key pieces**
  - Standardized
  - Verified

- **ISO 14025**
  - Type 3 Product Declarations - Principles and Procedures
  - Getting more specific but need specific procedures

What is an PCR?

- **P**roduct **C**ategory **R**ule
  - a set of standardized guidelines, requirements, and definitions used to conduct Life Cycle Assessments (LCAs) and develop Environmental Product Declarations (EPDs) for specific product groups
- **Key pieces**
  - Standardized guidelines and requirements for
    - LCA's / EPD for **specific** product groups
- The PCR is the fundamental requirement you need to comply to for an EPD

Similar Situation
Electrical Safety

- The **L**ow **V**oltage **D**irective (**LVD**)
  - Sets are the general requirements for product electrical safety in the EU

- **However**
  - Specific EN/IEC standards set the specific standardized requirements for specific product groups

- Basically the same as LCA

LCA / EPD / PCR

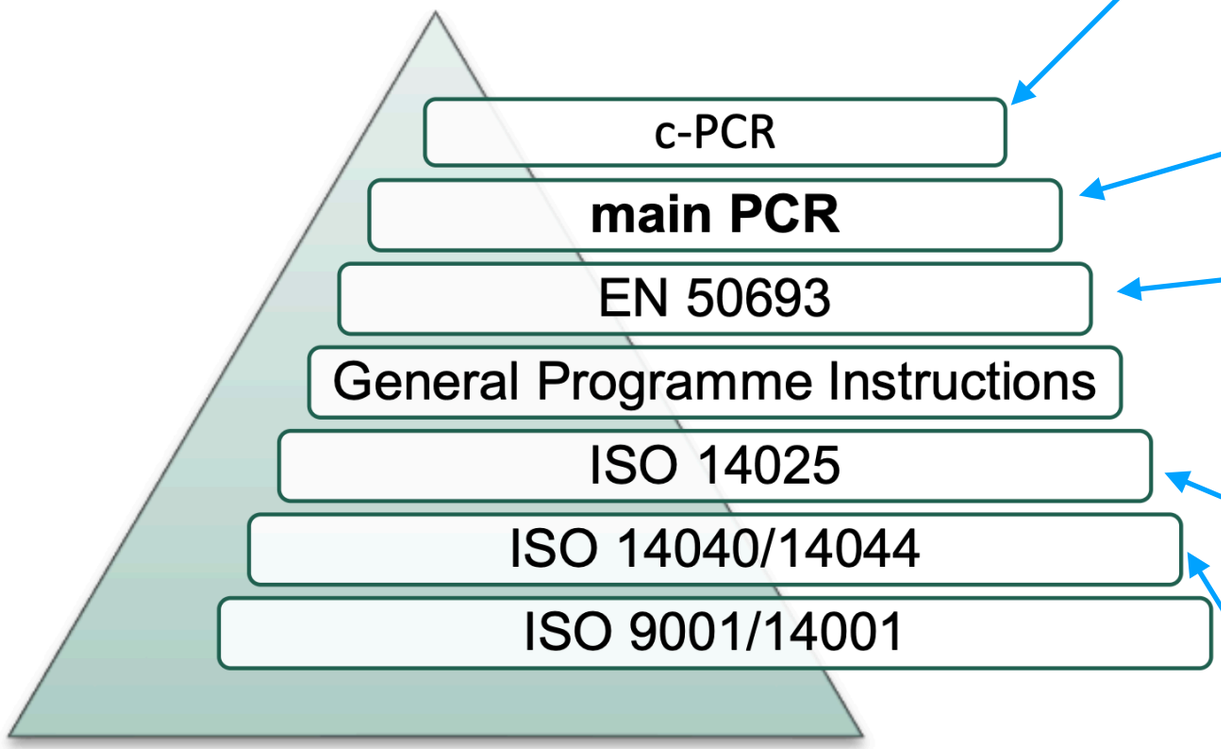


Figure 1. The hierarchy between PCRs, standards, and other documents.

Complementary -
Product Category Rule
Example - Refrigerators

Product Category Rule
Example - Electronics

EN / IEC Standard

(Since replaced by EN IEC 63366:2025)

Environmental Product Declaration (EPD)

Life Cycle Assessment (LCA)

PCR for Electronics

- **PCR 2024:06**
  - Electronics and Electric Equipment, and Electronic Components (Non-Construction)
  - **EPD International**

Why Conduct an LCA? (Or EPD)

- **Customer requirement**
  - Common in tenders for larger organizations
  - Especially in the EU

- **'Points' towards a Certification**
  - Such as LEED or EPEAT

- **Cost reduction**
  - Yes, cost reduction

Co2 and Cost Reduction

- **Co2 reduction means cost reduction**
  - A 20% reduction in Co2 normally means a 20% cost reduction

- **Oversimplification**
  - Co2 emissions means energy
  - Energy = Effort = Cost

- **When you conduct an LCA**
  - You will identify at least two significant opportunities for cost reduction

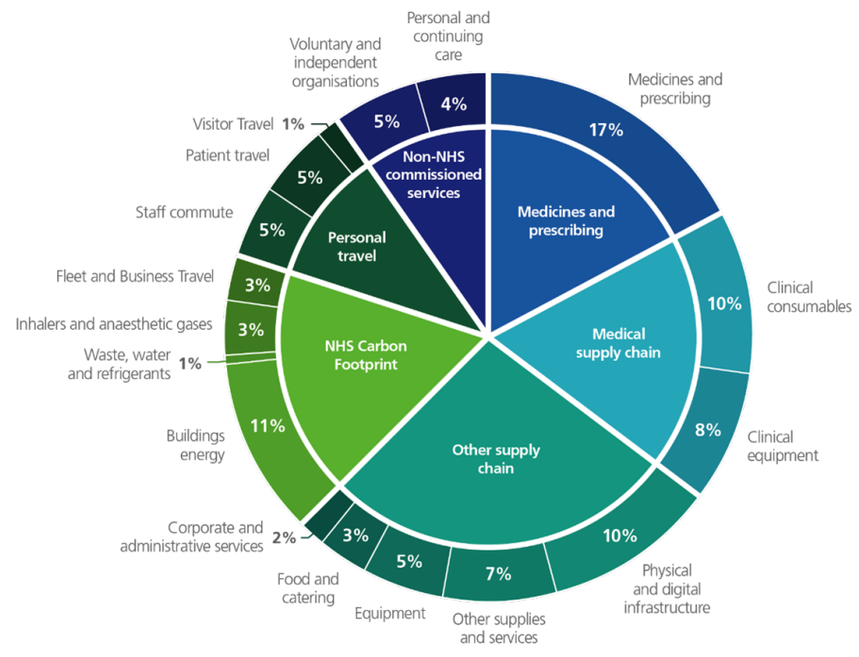
The Great Thing about Co2 Related Cost Reduction

- **If you tell a customer that you have done a cost reduction on a product**
  - They will expect a price reduction

- **If you tell a customer that you have done a carbon footprint reduction**
  - They will **NOT** expect a price reduction

Life Cycle Assessment
UK NHS

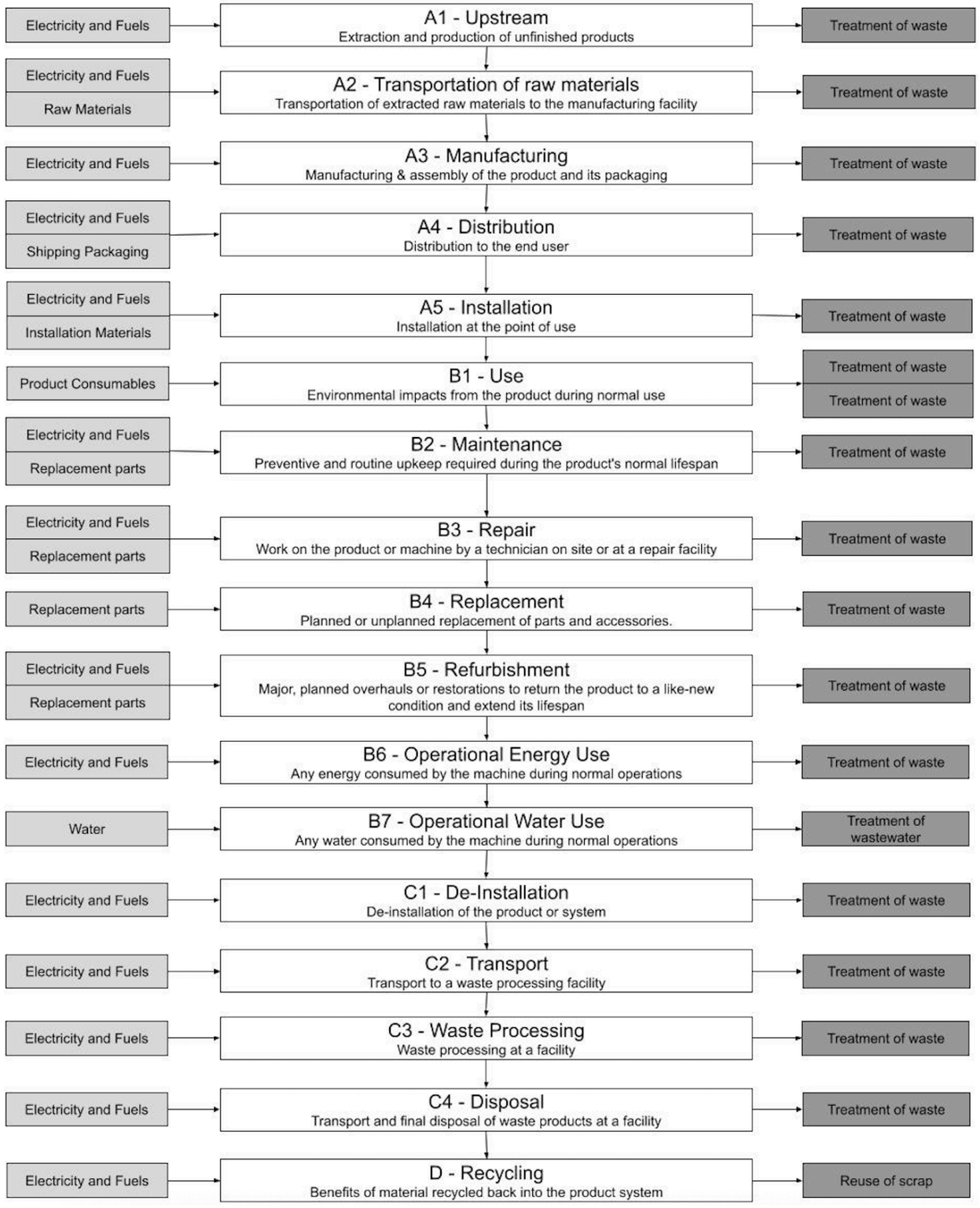
- **Starting April 2028**
  - Many products sold to the NHS will require carbon foot printing
  - Prioritization with be ‘propotionate’ and will focus on
    - Pharmaceuticals
    - Medical technologies
    - Digital technologies



- Very likely
  - You will asked for your carbon footprint much sooner than 2028
    - Even though not mandatory yet, they can assign value to the answer

PCR for Electronics

- **What is included?**
- Come again?
- *Full Cradle to Grave*
- Now the details…..



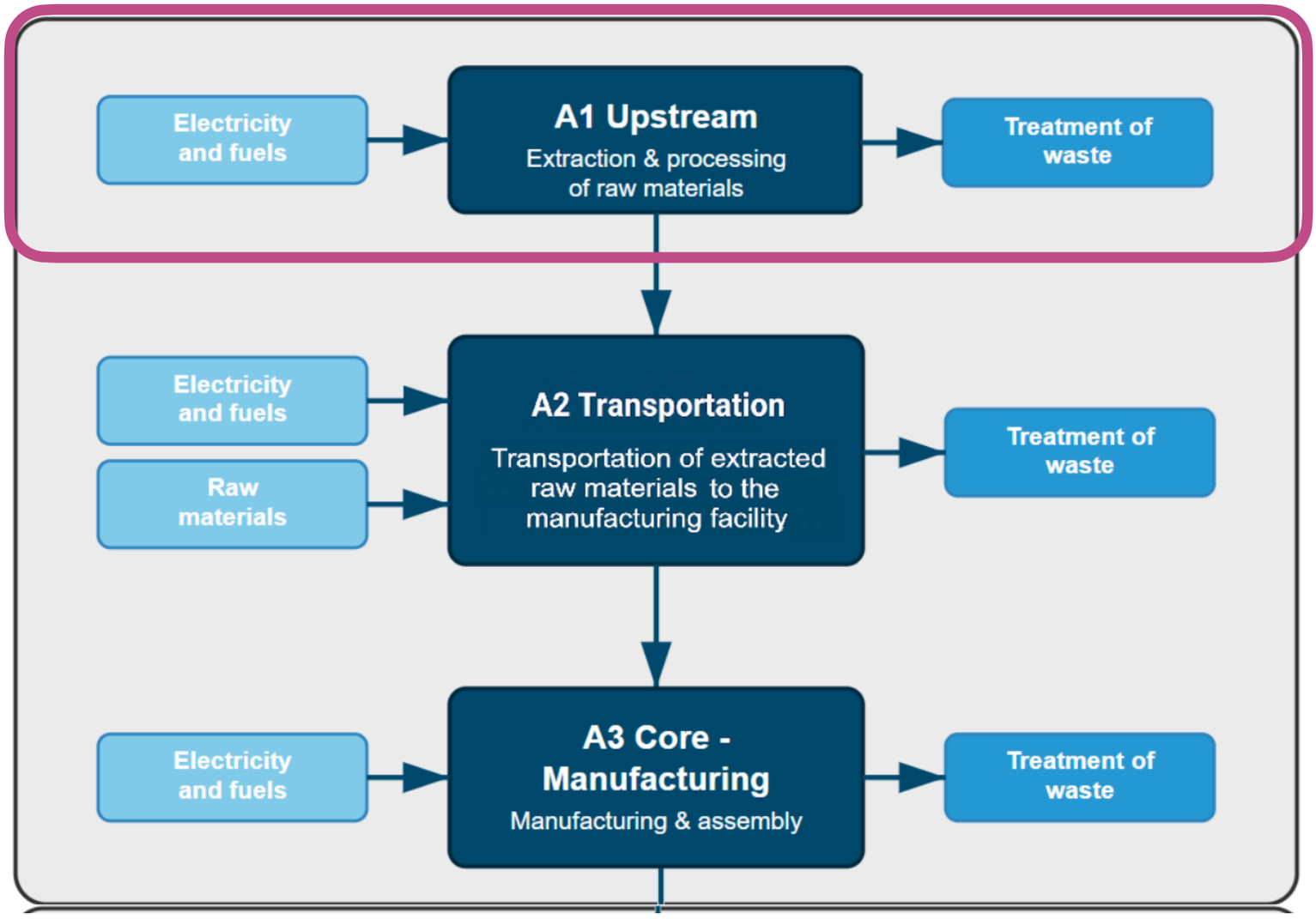
Module A1 to A5
Product Manufacturing and Distribution

- **Starting with**
  - Rock out of the ground
- **Ending with**
  - Product installed at customer location
- **And everything in between**
  - ***That's a lot***

Module A1 - Material and components supply

- **Upstream**

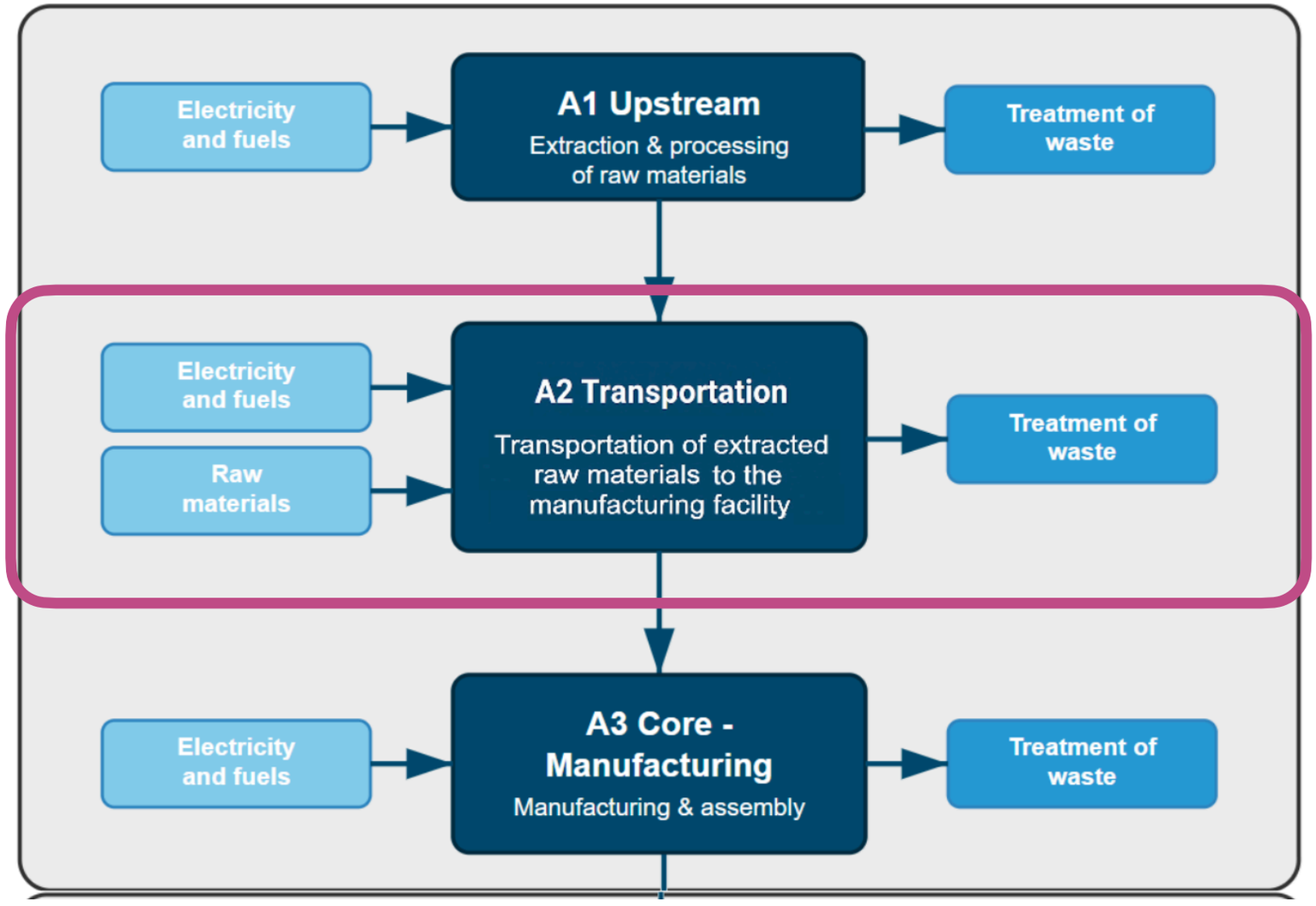
- Turning the earth into
  - Metals
  - Plastics
  - Ceramics
  - *Then* components



- Key questions
  - What are the materials in your products?
  - What are you components and assemblies
  - And where did this happen? Materials and components

Module A2 - Transportation of Raw Materials

- **Components to manufacturing site**



- Transportation of
  - Components
  - To manufacturing site

- Key questions
  - What are your major components / assemblies?
  - What are they made from?
  - How and how far are they shipped?

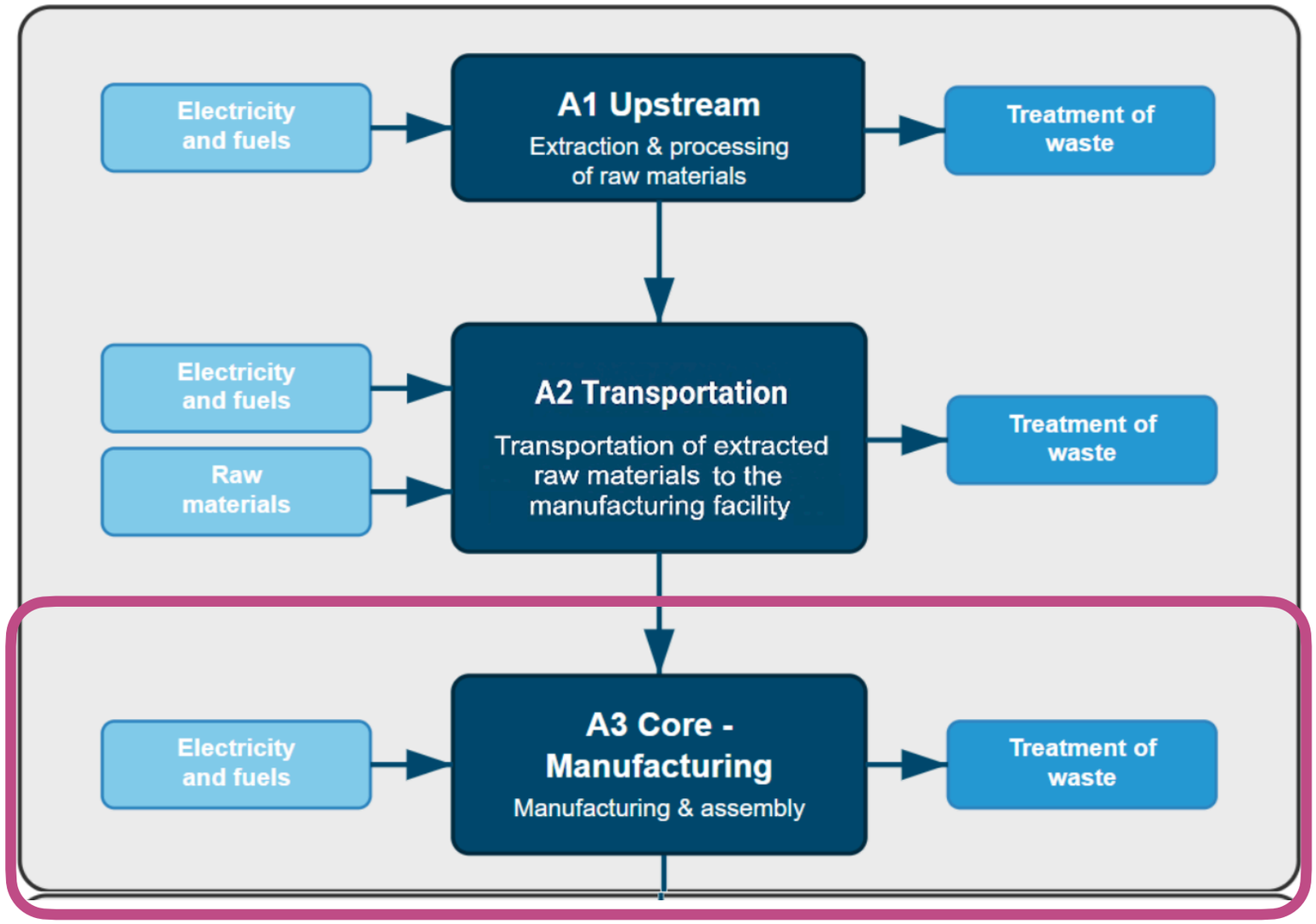
Primarily agreed upon models

Module A3 - Product Manufacturing

- **Product assembly**

- Turning parts into
  - Products

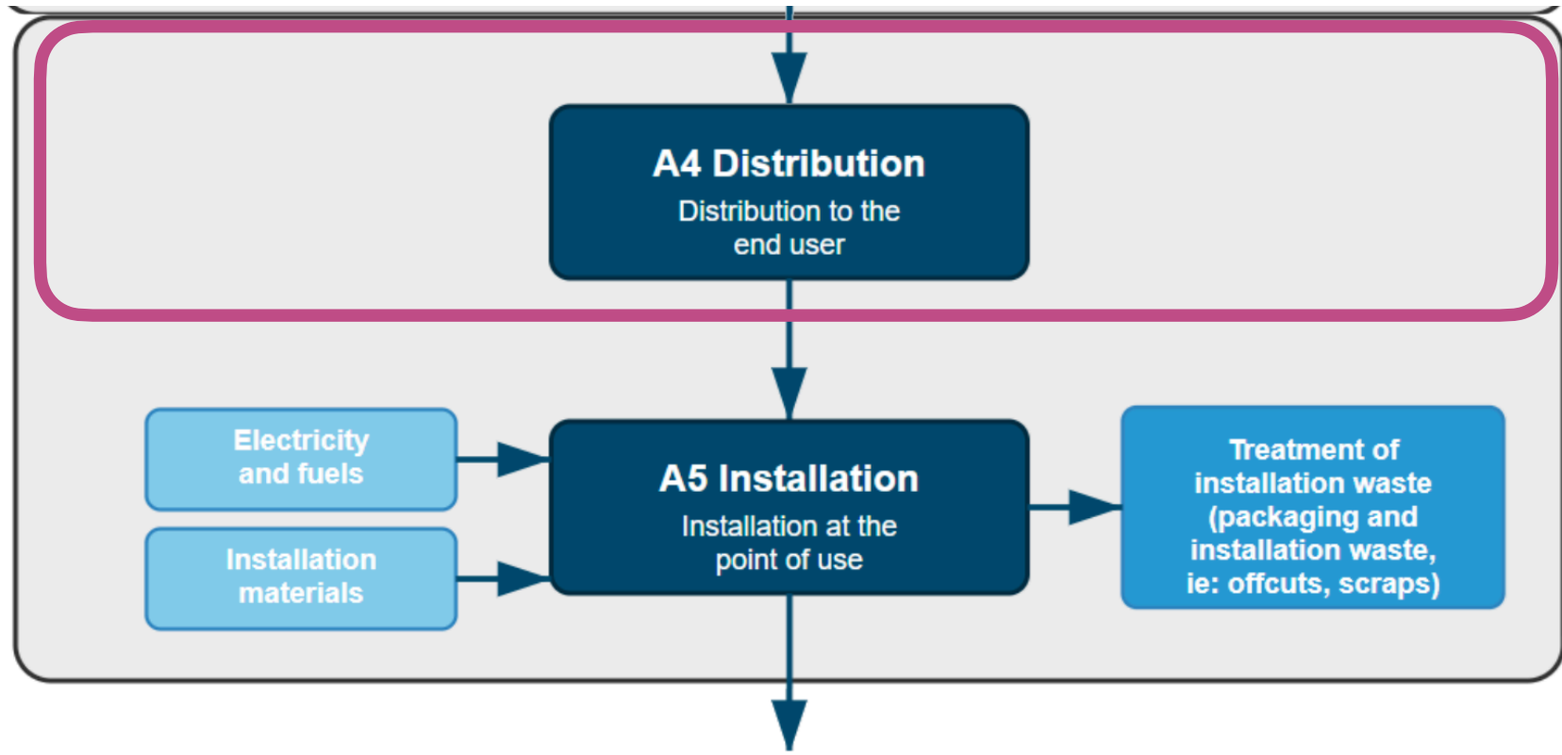
- Key questions
  - How much energy is spent in manufacturing?
  - And where did this happen?



Module A4 - Distribution

- **Distribution**

- Getting the product to
  - Distribution
  - And customer

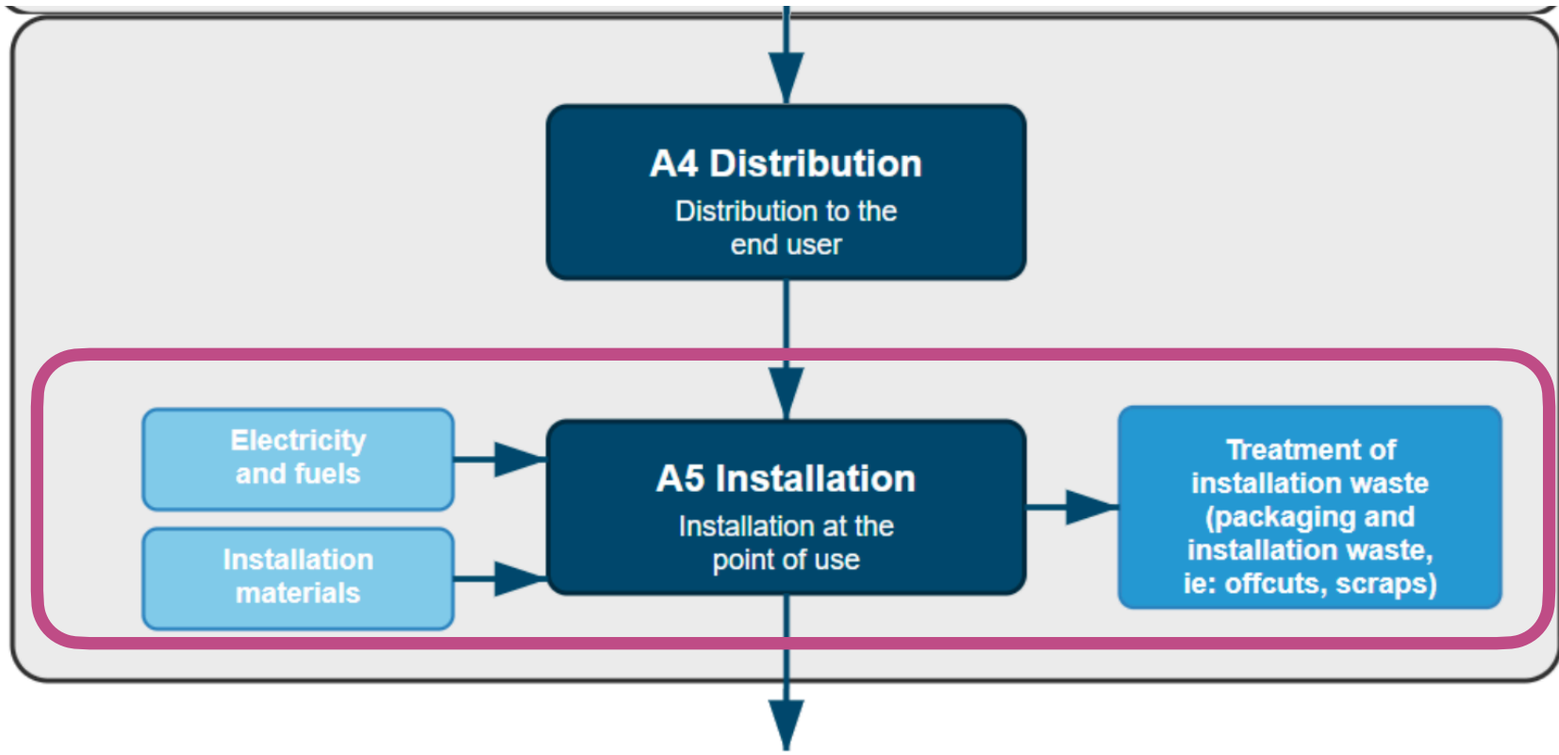


- Key questions
  - How many km of each shipping type?
  - Shipping weight
  - Number of units per shipment

Module A5 - Installation

- **Installation**

- Installing the product
  - At customer



- Key questions
  - What does installation entail?
  - How much energy is spent to install?
  - What waste is created?
  - Where is this happening?

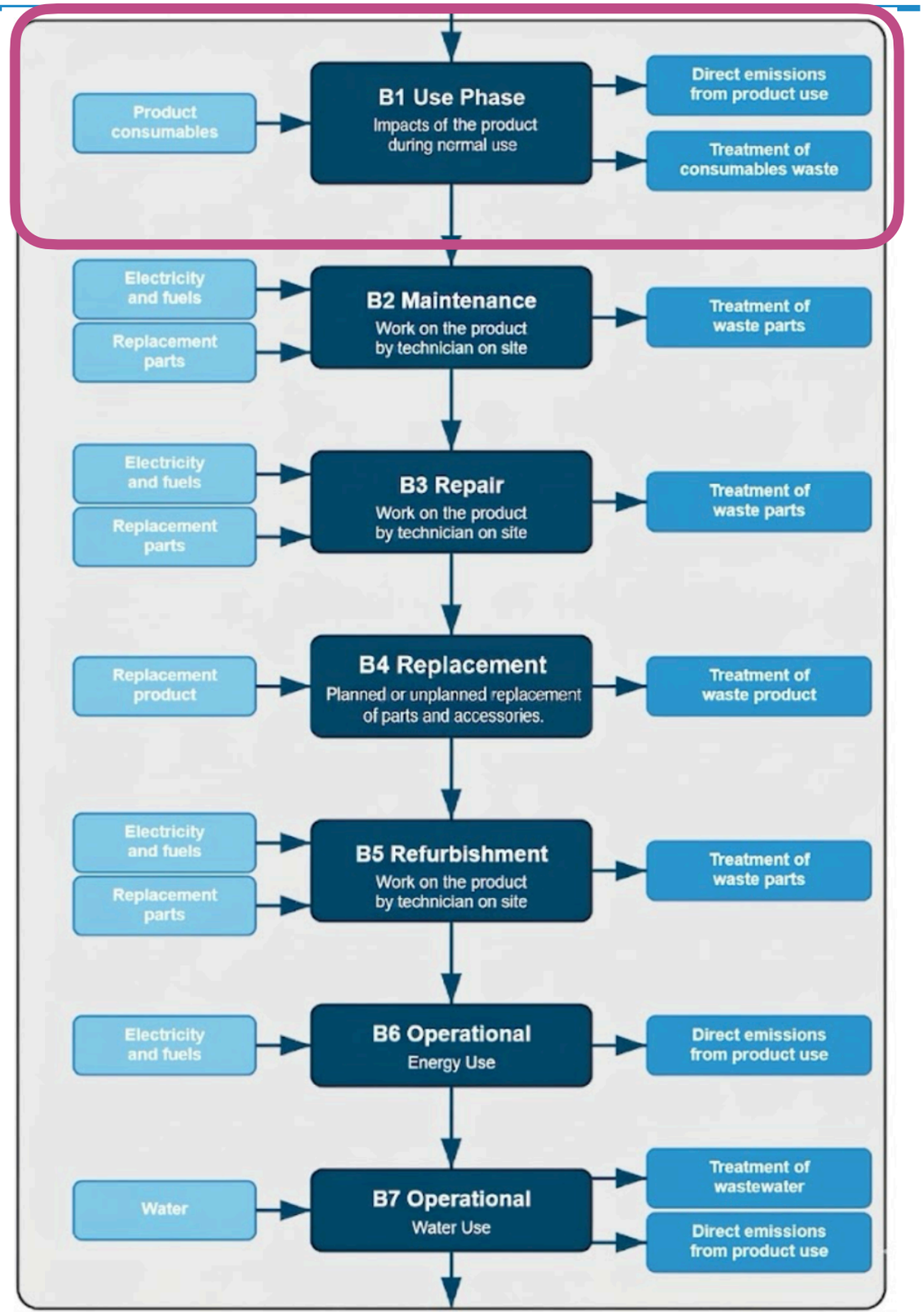
Module B1 - Use

- **Use**

Yeah.

- Use of the product
  - Not energy consumption
  - Consumable consumption

- Key questions
  - What are the consumables?
  - Has a parallel LCA been conducted on consumables?

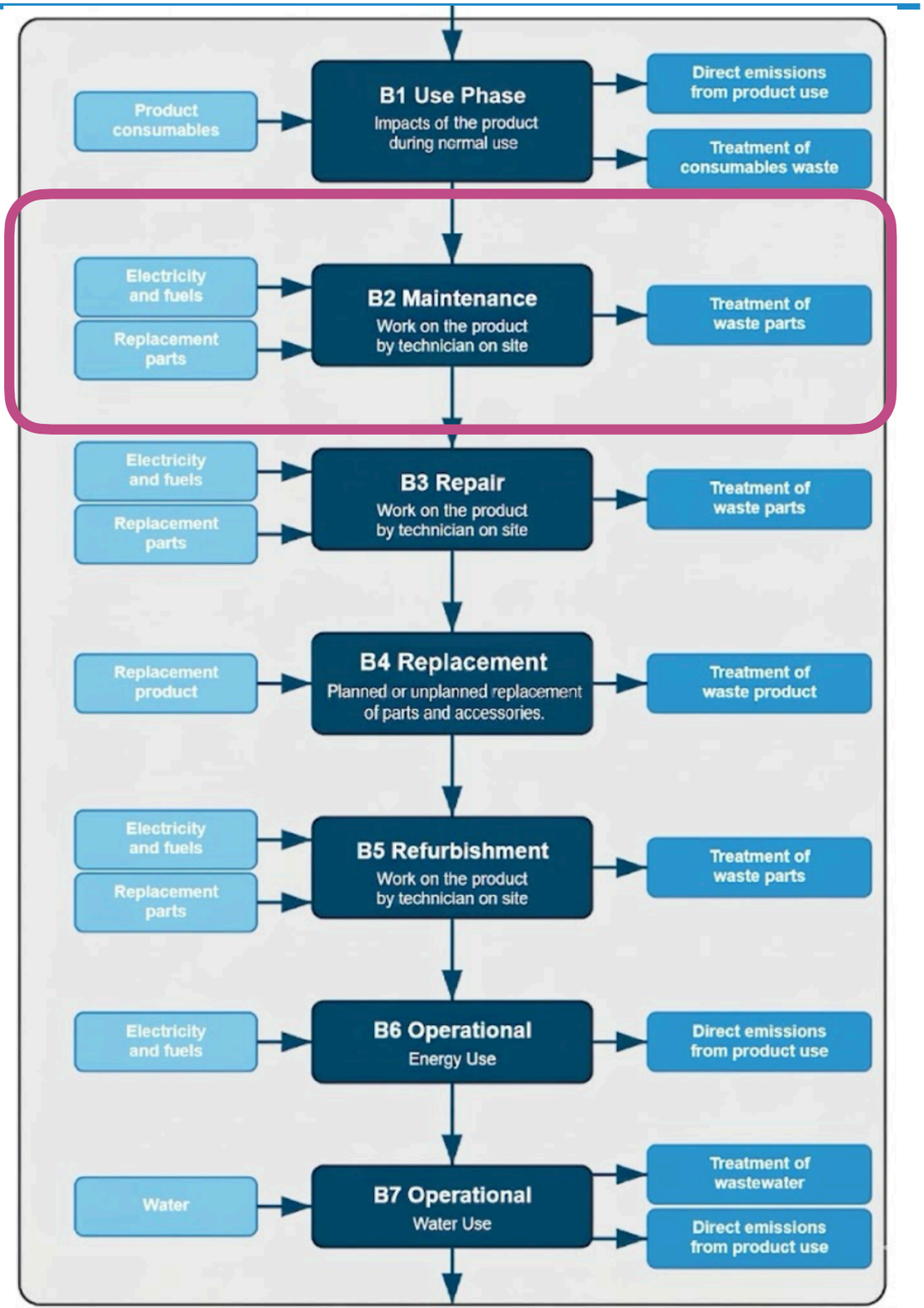


Module B2 - Maintenance

- **Maintenance**

- Maintenance of the product
  - Energy used during regular maintenance

- Key questions
  - Is maintenance of the product significant?
  - If so, what does it entail?

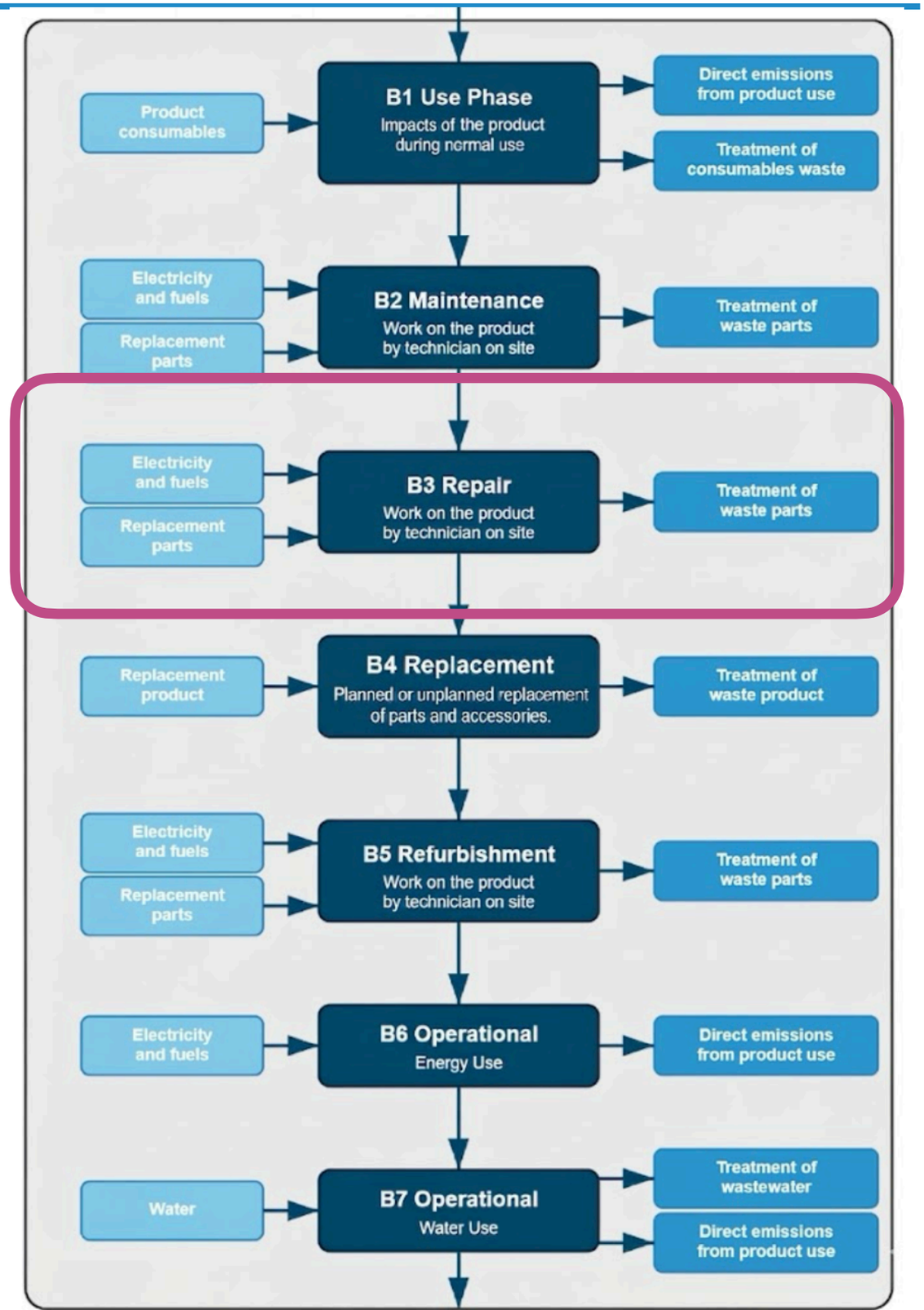


Module B3 - Repair

- **Repair**

- Repair of the product
  - Energy used during repair

- Key questions
  - Is repair of the product significant?
  - If so, what does it entail?

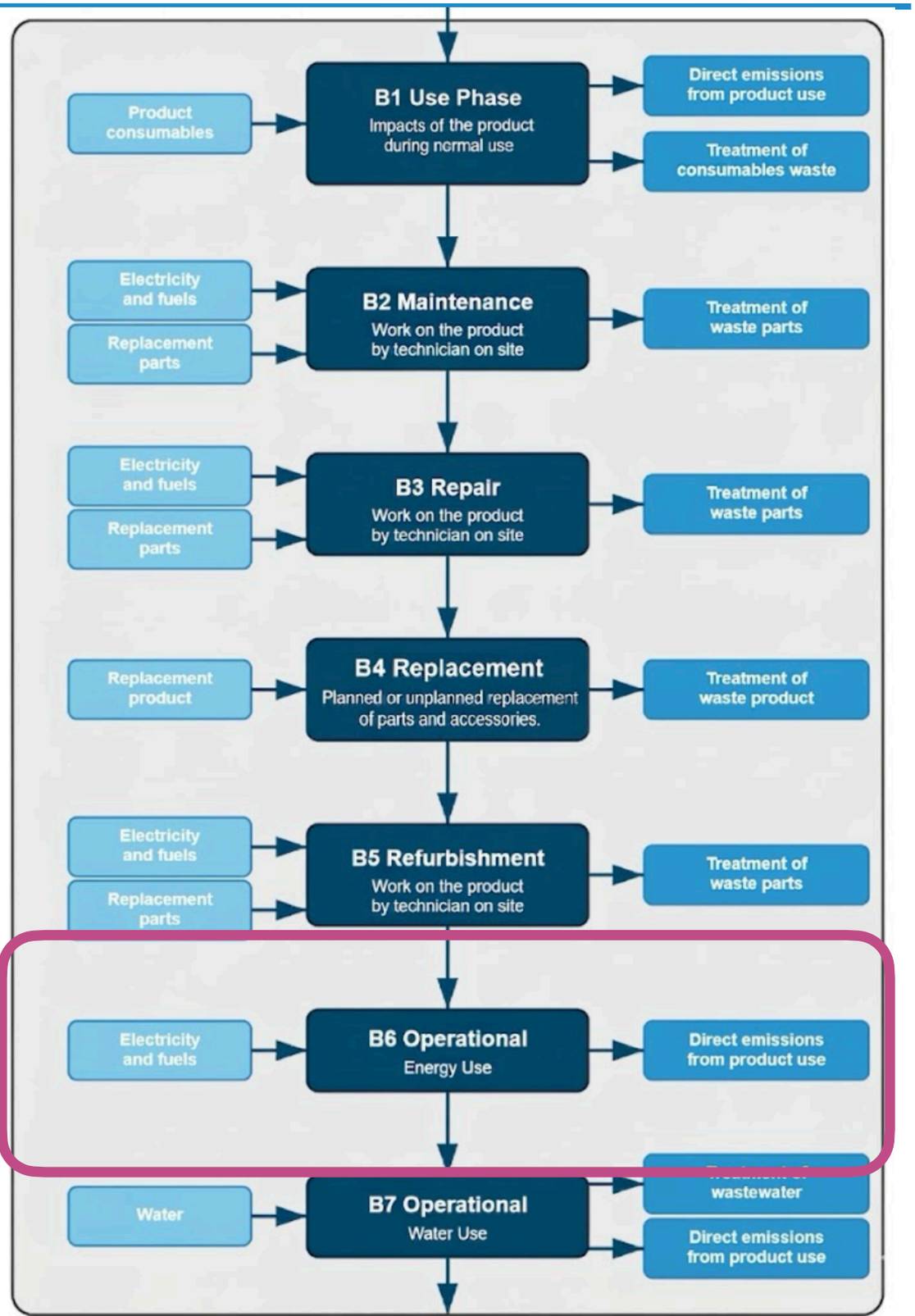


Module B6 - Operational Energy Use

- **Energy used during operation**

- The main contributor for most electronics
  - Energy used during operations

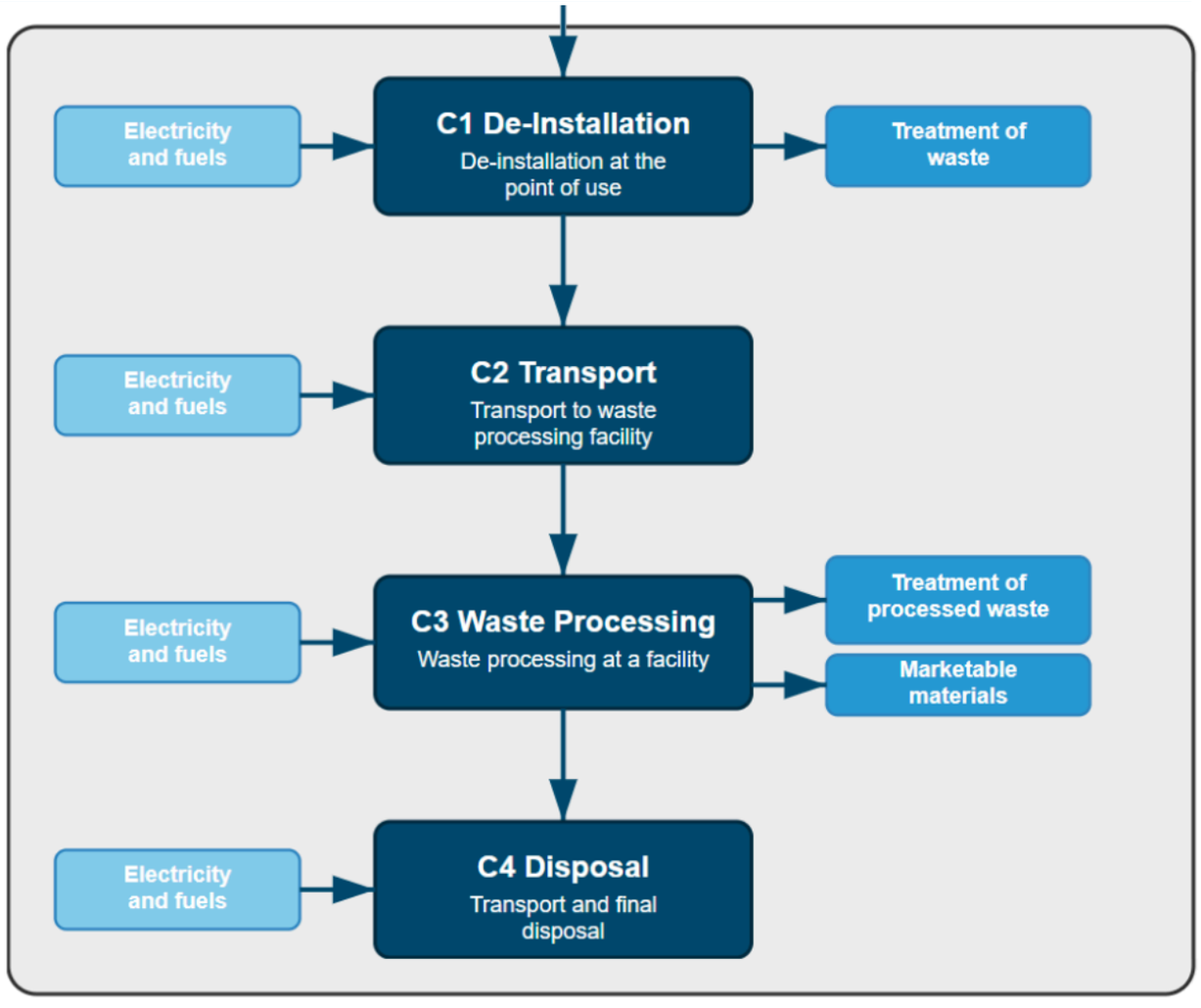
- Key questions
  - Power consumption for each operations mode
  - Time per day in each mode
  - Life time of product



Module C1 to C4 - End of Life

- **Effort of End of Life**

- End of life of Product
  - De-installation
  - Transport
  - Waste processing
  - Disposal



- Key questions
  - Which of these are significant?
  - If so, quantify

How does Claigan Handle this is Practice?

- **Two parts**

Part 1	Part 2
Product Content	Product Operations & Transportation
• Lab testing Or • Detailed client information	• Detailed client questionnaire

Backed by hundreds of Claigan models

- **Note**
  - Complex consumables often need both sets of their own data

Example Claigan EPD

LCA Project Report for EPD Verification

Claigan Standardized Report

This Report is not for publication or general disclosure to the public

Project Reference: *Company A - Streaming Capable TV 50 inch*

Product Name: *Streaming Capable TV*

Date: *January 28, 2026*

Status: *For Verification*

Example Claigan EPD Content

Table of Contents

LCA Project Report - *Streaming Capable TV* Claigan Environmental Inc.

List of Tables

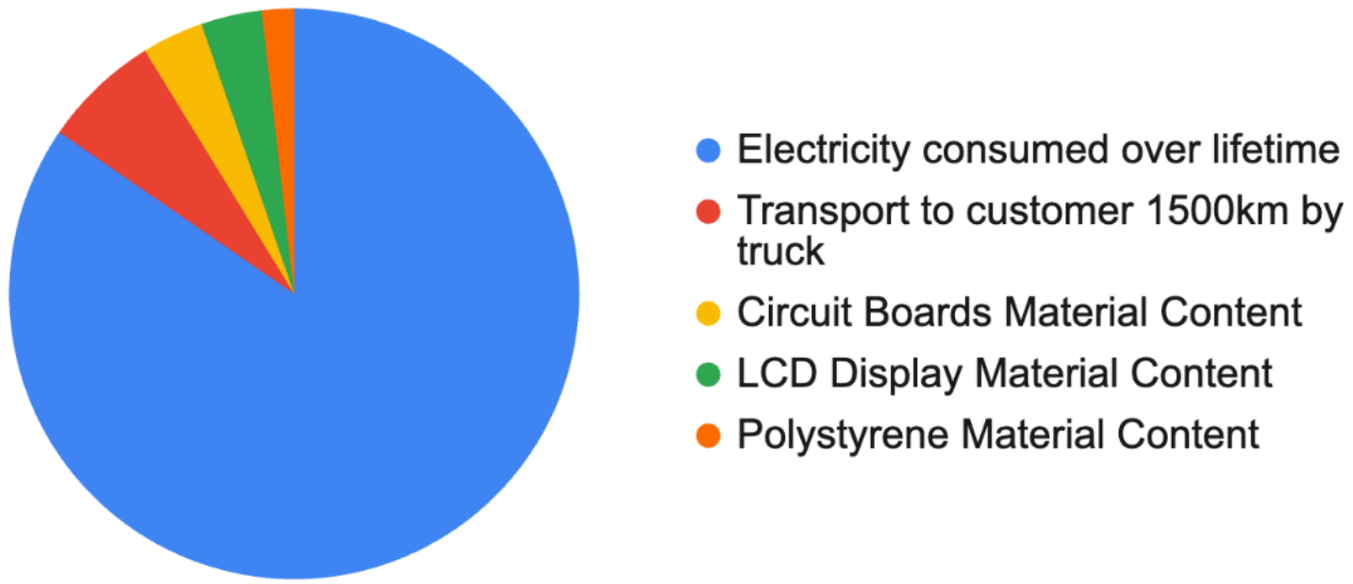
List of Figures

- **39 pages**
- Fairly typical

Example Claigan EPD Major Contributors

- **Largest contributors**
  - Fairly typical
  - But you do often get surprised

Figure 2. Major Contributors to Global Warming Potential



Example Claigan EPD Data Quality Assessment

- **Mandatory element**
  - Top 80% of contributors
  - Of significant interest to reviewers

Table 5. Data Quality Assessment Reference Table

Module	Process / Material	Database Source (Version)	Ref. Year	Geo.	Technology	Data Type	Overall Quality	GWP % Contribution
B6	Electricity market group for electricity, low voltage | electricity, low voltage | APOS, U" with "Electricity market group for electricity, low voltage |	EcoInvent 3.11	2024	US	Average	Secondary Data	Good	76.48%
A4	Distance by Truck (km) - 1,500 km market for transport, freight, light commercial vehicle, fleet average | transport, freight, light commercial vehicle, fleet average | APOS, U	EcoInvent 3.11	2024	ROW	Average	Secondary Data	Good	6.01%
A1	Circuit Boards - PCBs market for printed wiring board, surface mounted, unspecified, Pb free | printed wiring board, surface mounted, unspecified, Pb free | APOS, U	EcoInvent 3.11 Claigan Lab Data	2024	GLO	Average	Primary Data	Good	3.16%
A1	glass panel - flat glass LCD Display market for liquid crystal display, unmounted | liquid crystal display, unmounted | APOS, U	EcoInvent 3.11 Claigan Lab Data	2024	ROW	Average	Primary Data	Good	3.12%
A1	White layer - 2811231 Polystyrene (PS) resins Main housing - 2811231 Polystyrene (PS) resins Foam - 2811231 Polystyrene (PS) resins market for polystyrene, general purpose | polystyrene, general purpose | APOS, U	EcoInvent 3.11 Claigan Lab Data	2024	GLO	Average	Secondary Data	Good	1.65%

- **But also**
  - The largest opportunities for Co2 reduction
  - Especially activities not core to the product

Example Claigan EPD Impact Categories

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Hundreds

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of Life)	D (Recovery)	TOTAL
GWP-total	kg CO2 eq	1.17E+02	4.96E+01	0.00E+00	6.15E+02	1.63E+01	MND	7.98E+02
GWP-GHG	kg CO2 eq	1.16E+02	4.96E+01	0.00E+00	6.14E+02	1.60E+01	MND	7.96E+02
ODP	kg CFC-11 eq	3.30E-05	6.88E-07	0.00E+00	1.04E-05	2.35E-07	MND	4.43E-05
AP	mol H+ eq	6.79E-01	2.63E-01	0.00E+00	2.12E+00	7.00E-02	MND	3.13E+00
EP-fresh	kg P eq	7.40E-02	8.00E-03	0.00E+00	5.11E-01	4.00E-03	MND	5.97E-01
POCP	kg NMVOC eq	5.00E-01	3.28E-01	0.00E+00	1.24E+00	5.60E-02	MND	2.13E+00
ADP-min	kg Sb eq	1.26E-02	4.00E-04	0.00E+00	5.60E-03	5.77E-05	MND	1.87E-02
ADP-fossil	MJ	1.65E+03	6.46E+02	0.00E+00	1.06E+04	1.95E+02	MND	1.31E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02

- **Yes** Scientific notation

Hundred**ths**

Example Claigan EPD
LCAs Love their TLAs

7 List of Abbreviations

Table 10: Terms and Definitions

Term	Definition
LCA	Life Cycle Assessment: A systematic analysis of the environmental impacts of a product throughout its entire life cycle.
EPD	Environmental Product Declaration: A standardized document communicating the environmental impact of a product.
SOP	Standard Operating Procedure: Established steps to be followed for data collection or LCA modeling.
PCR	Product Category Rules: A set of specific rules, requirements, and guidelines for developing EPDs for one or more product categories.
EPEAT	Electronic Product Environmental Assessment Tool: A global ecolabel for IT sector products.
ISO	International Organization for Standardization: The body that defines the standards for LCAs (*e.g.*, ISO 14040/44).
GPI	General Program Instructions: The rules governing the operation of a specific EPD program (*e.g.*, International EPD System).
LCI	Life Cycle Inventory: The phase of LCA involving the compilation and quantification of inputs and outputs for a product.
LCIA	Life Cycle Impact Assessment: The phase aimed at understanding and evaluating the magnitude of potential environmental impacts.
TRACI	Tool for Reduction and Assessment of Chemical and Other Environmental Impacts: The impact assessment methodology developed by the US EPA.
IEEE	Institute of Electrical and Electronics Engineers: Often referenced in EPDs for hardware standards and energy efficiency.
GWP	Global Warming Potential: A measure of how much heat a greenhouse gas traps in the atmosphere, expressed in kg CO2 eq
DQA	Data Quality Assessment: The process of evaluating the reliability, representativeness, and uncertainty of LCI data.
FU	Functional Unit: Quantified performance of a product system for use as a reference unit.
UN CPC	United Nations Central Product Classification: A classification for products and services used to categorize EPDs.
LCD	Liquid Crystal Display
EURO	European: Geographical scope indicator for European-specific data or currency.
GLO	Global: A geographical code used in LCI databases (like Ecoinvent) to represent a global average.
ROW	Rest of World: A geographical code for data representing areas outside specifically defined regions.
US	United States: Geographical scope for the inventory data.
GHG	Greenhouse Gas: Gases that contribute to the greenhouse effect, measured in kg CO2 eq
ODP	Ozone Depletion Potential: Potential for the depletion of the stratospheric ozone layer.
AP	Acidification Potential: Potential for the acidifying effect of substances on soil and water.
EP-fresh	Eutrophication Potential (Freshwater): Impact of excessive nutrients (phosphorus) in freshwater ecosystems.
POCP	Photochemical Ozone Creation Potential: Potential for the creation of ground-level smog (ozone).
ADP-min	Abiotic Depletion Potential (Minerals): Depletion of non-fossil resources (minerals).
ADP-fossil	Abiotic Depletion Potential (Fossil Fuels): Depletion of fossil energy resources.
WDP	Water Deprivation Potential: Impact of water use on water scarcity.
PERE	Primary Energy Renewable (Energy): Use of renewable primary energy excluding renewable primary energy resources used as raw materials.
PERM	Primary Energy Renewable (Materials): Use of renewable primary energy resources used as raw materials.
PENRE	Primary Energy Non-Renewable (Energy): Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.
SM	Use of Secondary Material: The amount of recycled material used as input.
RSF	Use of Renewable Secondary Fuels: Renewable fuels derived from waste.
NRSF	Use of Non-Renewable Secondary Fuels: Non-renewable fuels derived from waste.
FW	Use of Net Fresh Water: Total volume of freshwater used.
HWD	Hazardous Waste Disposed: The amount of waste classified as hazardous according to regulations.
NHWD	Non-Hazardous Waste Disposed: Total non-hazardous waste sent to landfill or treatment.
RWD	Radioactive Waste Disposed: Waste containing radioactive substances.
CRU	Components for Re-use: Materials that are recovered to be used again for their original purpose.
MFR	Materials for Recycling: Materials diverted from waste to be processed into new materials.
MER	Materials for Energy Recovery: Waste materials used as a fuel source.
SFP	Smog Formation Potential: Synonymous with POCP in some North American methodologies.
CML-IA	Centrum voor Milieukunde Leiden - Impact Assessment: A methodology developed by Leiden University widely used in European EPDs.
APOS	Allocation at Point of Substitution: An LCI modeling approach (often used in Ecoinvent).
LCD	Liquid Crystal Display: A flat-panel display technology that uses the light-modulating properties of liquid crystals combined with polarizers.
RSL	Reference Service Life: The expected period of time a product serves its intended function.
n.e.c.	Not Elsewhere Classified: A statistical designation used to group items that belong to a general category but do not have a specific, separate code.
MND	Module not declared: the module was excluded from study.
Material	**Definition**
PS	Polystyrene: A synthetic aromatic hydrocarbon polymer made from the monomer styrene.
PET	Polyethylene Terephthalate: A common thermoplastic polymer resin of the polyester family.
ABS	Acrylonitrile Butadiene Styrene: A common thermoplastic polymer used for rigid components.

- **Plus a 3rd page**

Example Claigan EPD Impact Categories

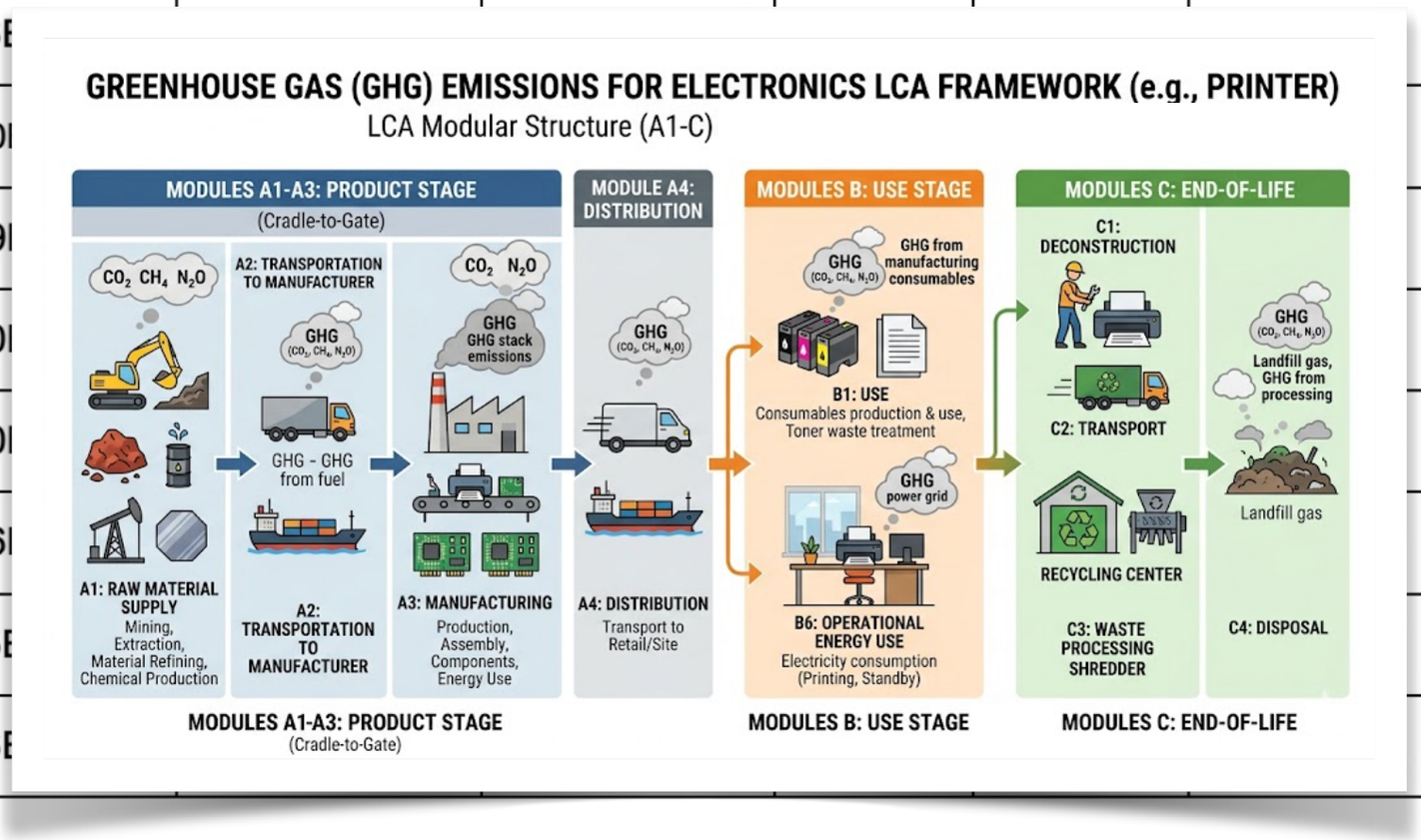
Claigan

4.1 Impact Categories

Global warming potential

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of Life)	D (Recovery)	TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+02	4.96E+01	0.00E+00	6.15E+02	1.63E+01	MND	7.98E+02
GWP-GHG	kg CO2 eq	1.16E						7.96E+02
ODP	kg CFC-11 eq	3.30I						4.43E-05
AP	mol H+ eq	6.79I						3.13E+00
EP-fresh	kg P eq	7.40I						5.97E-01
POCP	kg NMVOC eq	5.00I						2.13E+00
ADP-min	kg Sb eq	1.26I						1.87E-02
ADP-fossil	MJ	1.65E						1.31E+04
WDP	m3 eq	4.46E						2.11E+02



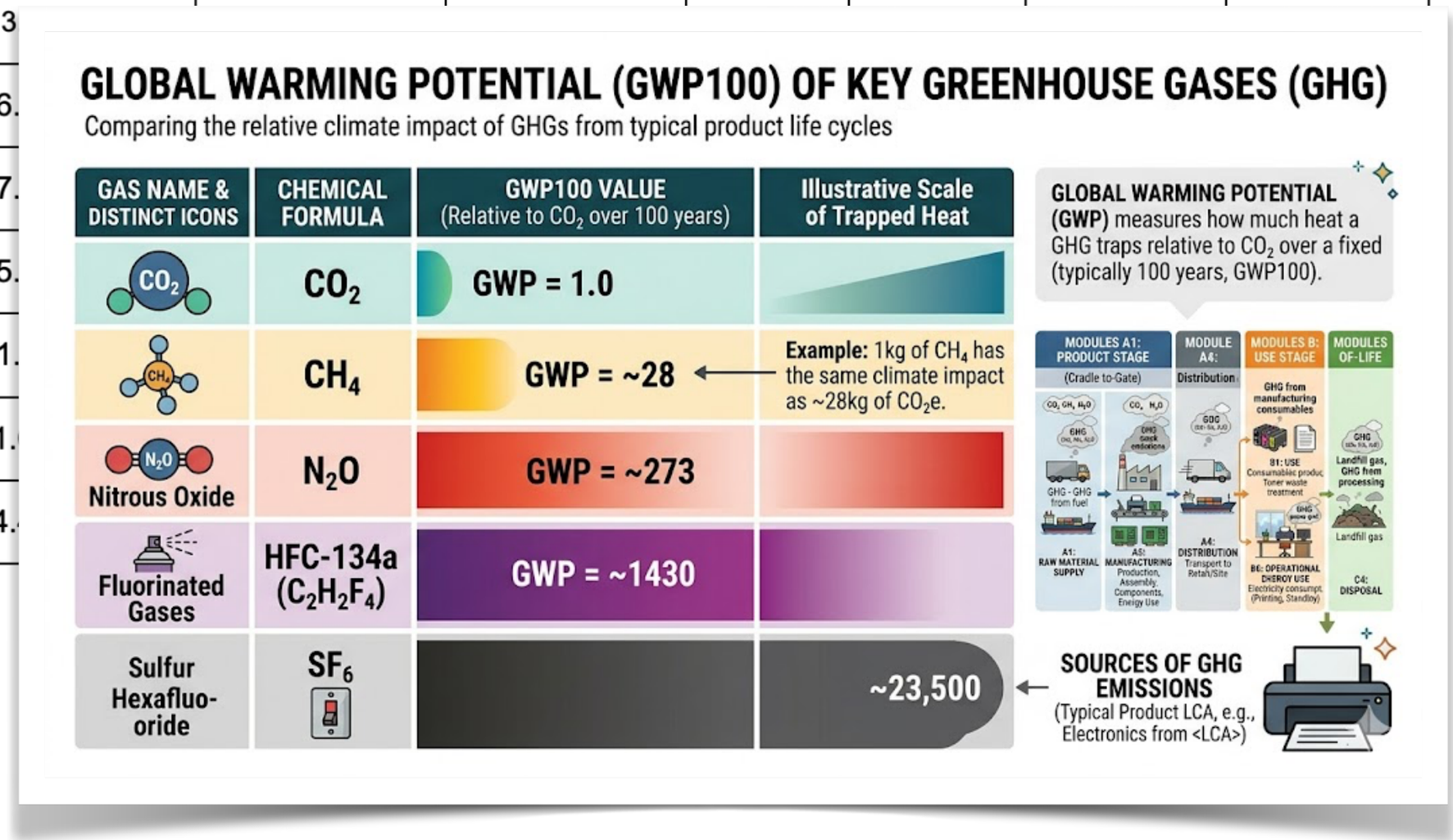
Example Claigan EPD Impact Categories

Global warming potential - Green House Gases

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of Life)	D (Recovery)	TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+02	4.96E+01	0.00E+00	6.15E+02	1.63E+01	MND	7.98E+02
GWP-GHG	kg CO2 eq	1.16E+02	4.96E+01	0.00E+00	6.14E+02	1.60E+01	MND	7.96E+02
ODP	kg CFC-11 eq	3						
AP	mol H+ eq	6.						
EP-fresh	kg P eq	7.						
POCP	kg NMVOC eq	5.						
ADP-min	kg Sb eq	1.						
ADP-fossil	MJ	1.						
WDP	m3 eq	4.						



Example Claigan EPD Impact Categories

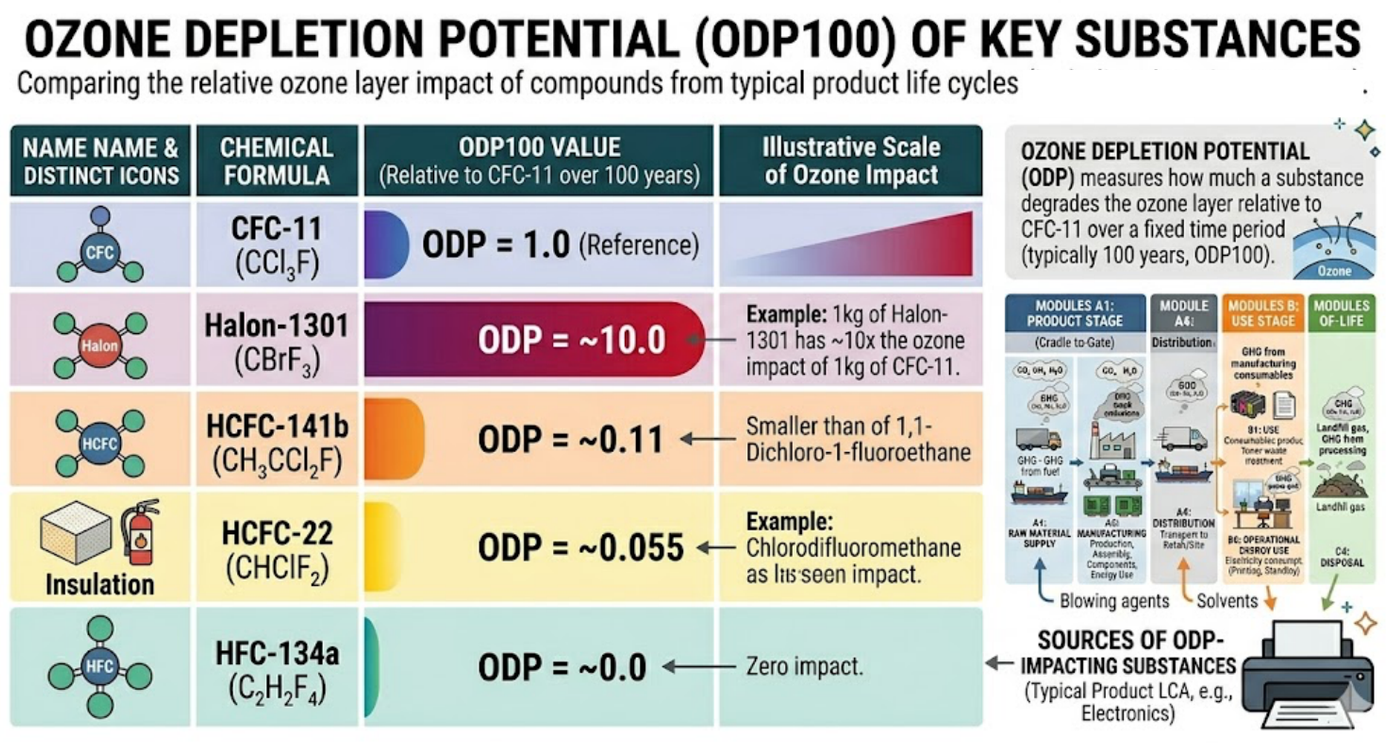
Claigan

Ozone Depletion Potential

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of Life)	D (Recovery)	TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+02	4.96E+01	0.00E+00	6.15E+02	1.63E+01	MND	7.98E+02
GWP-GHG	kg CO2 eq	1.16E+02	4.96E+01	0.00E+00	6.14E+02	1.60E+01	MND	7.96E+02
ODP	kg CFC-11 eq	3.30E-05	6.88E-07	0.00E+00	1.04E-05	2.35E-07	MND	4.43E-05
AP	mol H+ eq	6.79E-01						
EP-fresh	kg P eq	7.40E-02						
POCP	kg NMVOC eq	5.00E-01						
ADP-min	kg Sb eq	1.26E-02						
ADP-fossil	MJ	1.65E+03						
WDP	m3 eq	4.46E+01						



Example Claigan EPD Impact Categories

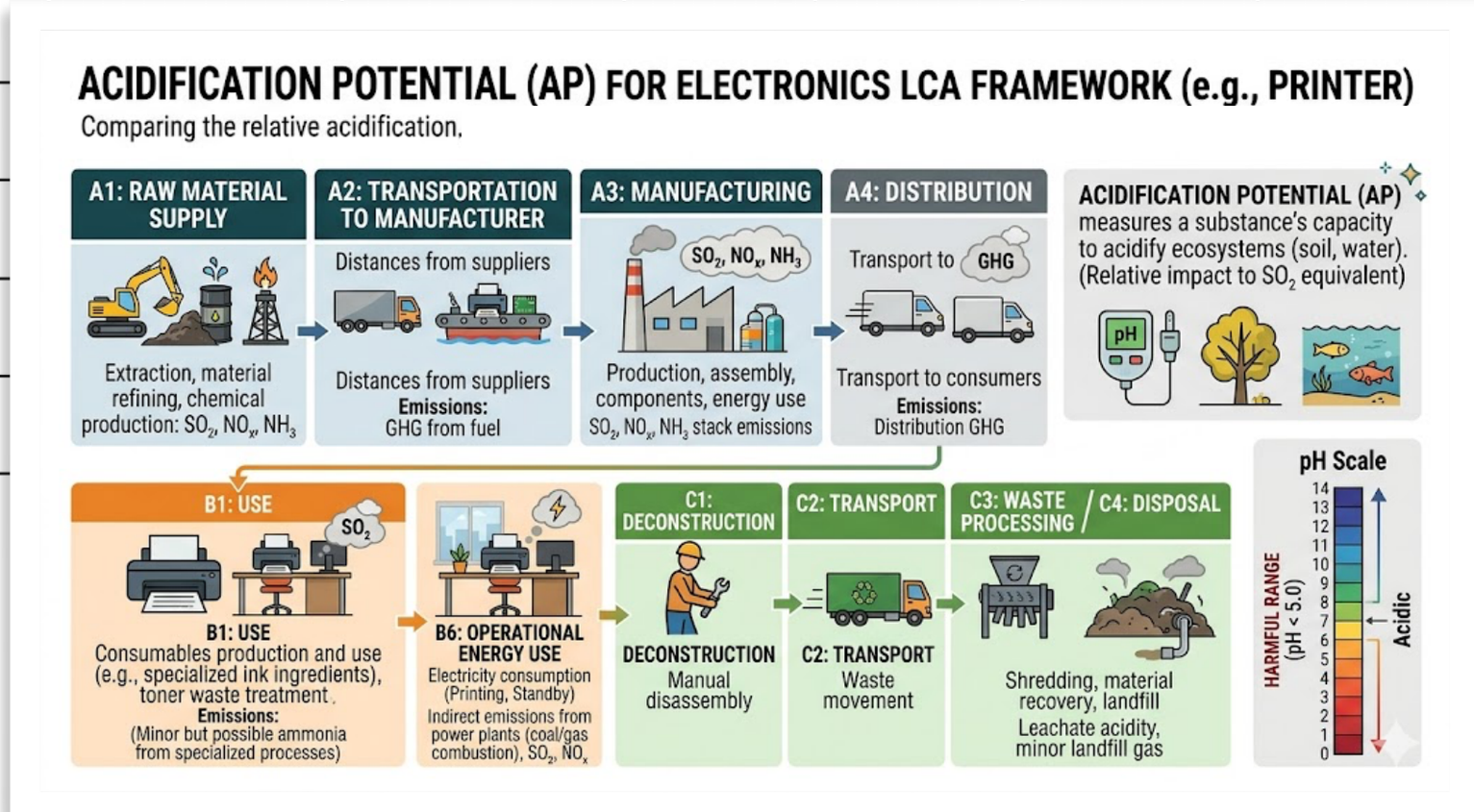
Claigan

Acidification potential

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of Life)	D (Recovery)	TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+02	4.96E+01	0.00E+00	6.15E+02	1.63E+01	MND	7.98E+02
GWP-GHG	kg CO2 eq	1.16E+02	4.96E+01	0.00E+00	6.14E+02	1.60E+01	MND	7.96E+02
ODP	kg CFC-11 eq	3.30E-05	6.88E-07	0.00E+00	1.04E-05	2.35E-07	MND	4.43E-05
AP	mol H+ eq	6.79E-01	2.63E-01	0.00E+00	2.12E+00	7.00E-02	MND	3.13E+00
EP-fresh	kg P eq	7.40E-02						
POCP	kg NMVOC eq	5.00E-01						
ADP-min	kg Sb eq	1.26E-02						
ADP-fossil	MJ	1.65E+03						
WDP	m3 eq	4.46E+01						

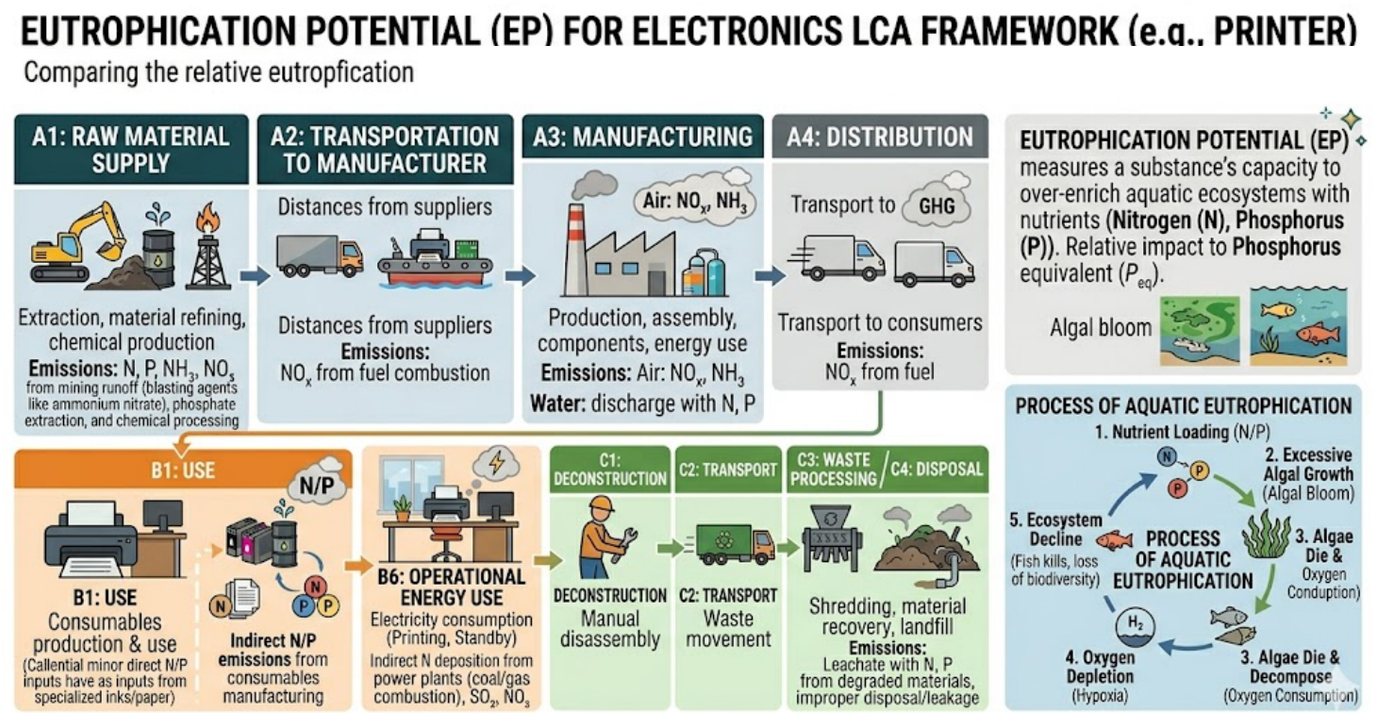


Example Claigan EPD Impact Categories

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	(					
GWP-total	kg CO2 eq	1.17E+02						
GWP-GHG	kg CO2 eq	1.16E+02						
ODP	kg CFC-11 eq	3.30E-05						
AP	mol H+ eq	6.79E-01						
EP-fresh	kg P eq	7.40E-02						
POCP	kg NMVOC eq	5.00E-01	3.28E-01	0.00E+00	1.24E+00	5.60E-02	MND	2.13E+00
ADP-min	kg Sb eq	1.26E-02	4.00E-04	0.00E+00	5.60E-03	5.77E-05	MND	1.87E-02
ADP-fossil	MJ	1.65E+03	6.46E+02	0.00E+00	1.06E+04	1.95E+02	MND	1.31E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02



Eutrophication Potential

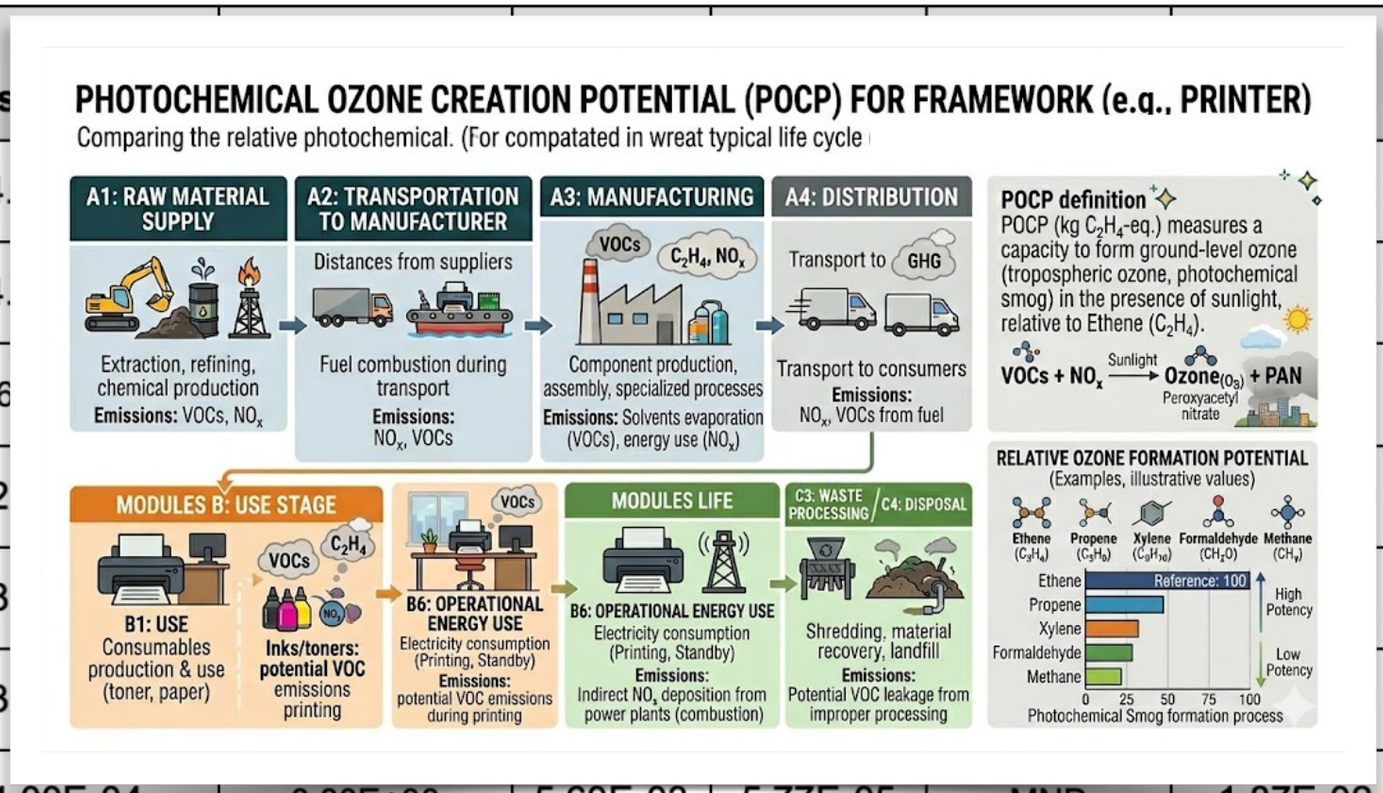
Nitrogen into environment

Example Claigan EPD Impact Categories

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	(Dis					
GWP-total	kg CO2 eq	1.17E+02	4.					
GWP-GHG	kg CO2 eq	1.16E+02	4.					
ODP	kg CFC-11 eq	3.30E-05	6					
AP	mol H+ eq	6.79E-01	2					
EP-fresh	kg P eq	7.40E-02	8					
POCP	kg NMVOC eq	5.00E-01	3					
ADP-min	kg Sb eq	1.26E-02	4.00E-04	0.00E+00	5.60E-03	5.77E-05	MND	1.87E-02
ADP-fossil	MJ	1.65E+03	6.46E+02	0.00E+00	1.06E+04	1.95E+02	MND	1.31E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02



Photochemical Ozone Creation Potential

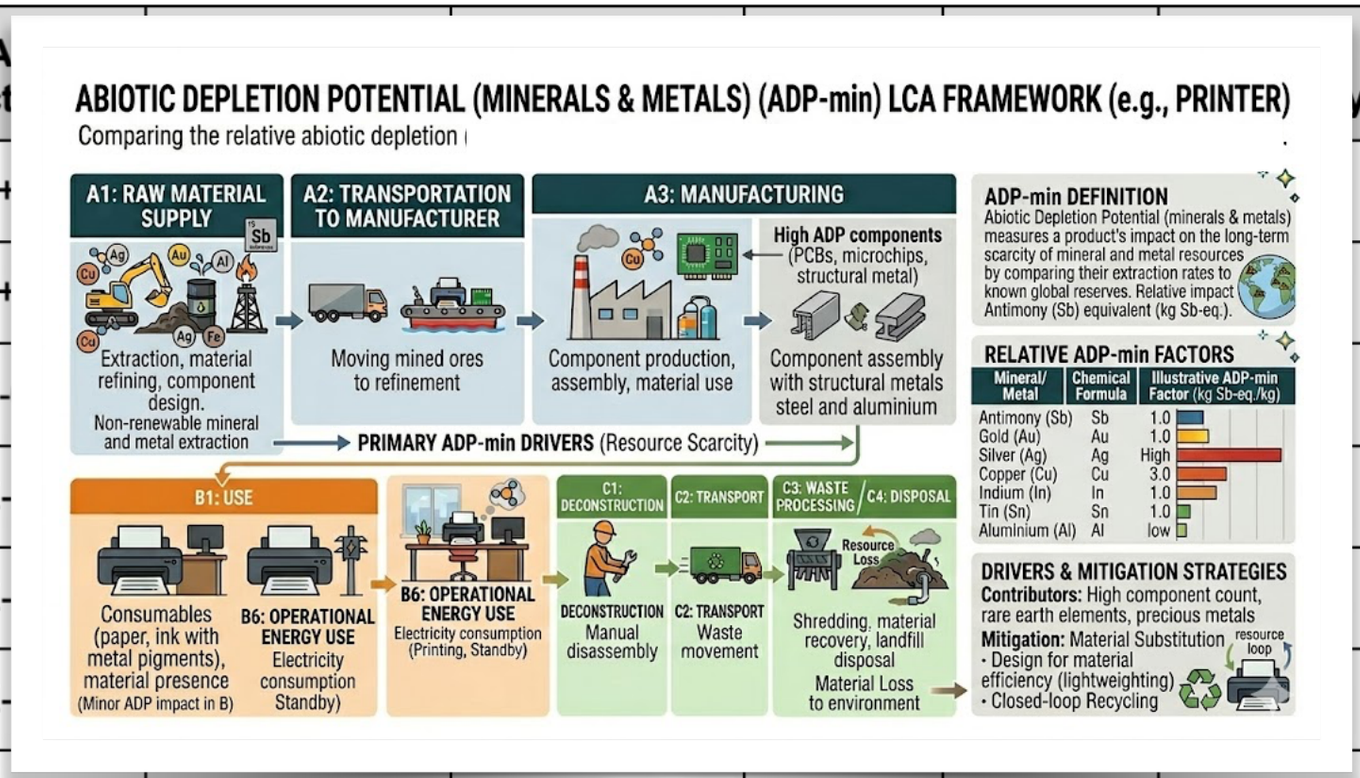
Creation of smog

Example Claigan EPD Impact Categories

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A (Manufact						TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+						7.98E+02
GWP-GHG	kg CO2 eq	1.16E+						7.96E+02
ODP	kg CFC-11 eq	3.30E-						4.43E-05
AP	mol H+ eq	6.79E-						3.13E+00
EP-fresh	kg P eq	7.40E-						5.97E-01
POCP	kg NMVOC eq	5.00E-						2.13E+00
ADP-min	kg Sb eq	1.26E-02	4.00E-04	0.00E+00	5.60E-03	5.77E-05	MND	1.87E-02
ADP-fossil	MJ	1.65E+03	6.46E+02	0.00E+00	1.06E+04	1.95E+02	MND	1.31E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02



Abiotic depletion of minerals

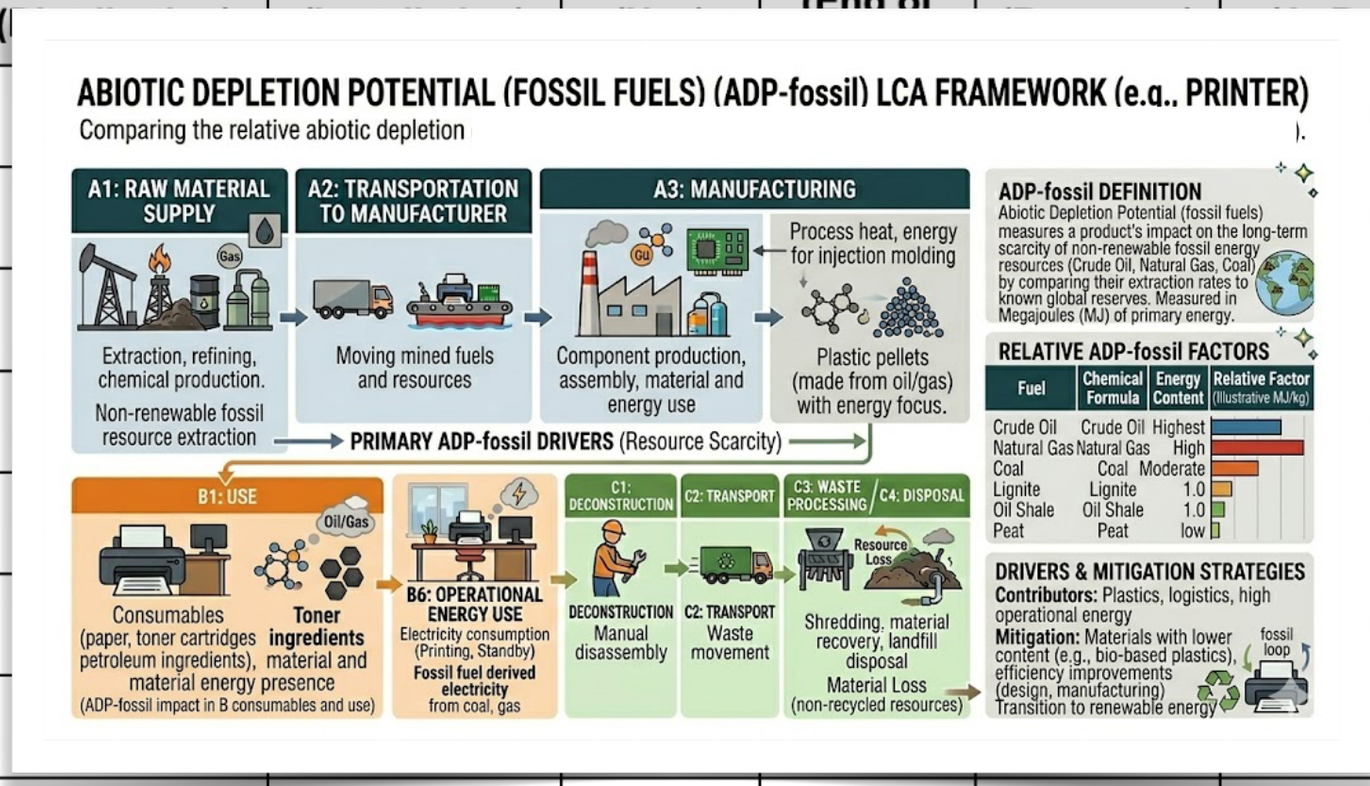
Depletion of non-fossil resources (minerals)

Example Claigan EPD Impact Categories

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4	A5	B1-B7	C1-C4 (End of	D	TOTAL C)
GWP-total	kg CO2 eq	1.17E+02						+02
GWP-GHG	kg CO2 eq	1.16E+02						+02
ODP	kg CFC-11 eq	3.30E-05						-05
AP	mol H+ eq	6.79E-01						+00
EP-fresh	kg P eq	7.40E-02						-01
POCP	kg NMVOC eq	5.00E-01						+00
ADP-min	kg Sb eq	1.26E-02						-02
ADP-fossil	MJ	1.65E+03	6.46E+02	0.00E+00	1.06E+04	1.95E+02	MND	1.31E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02



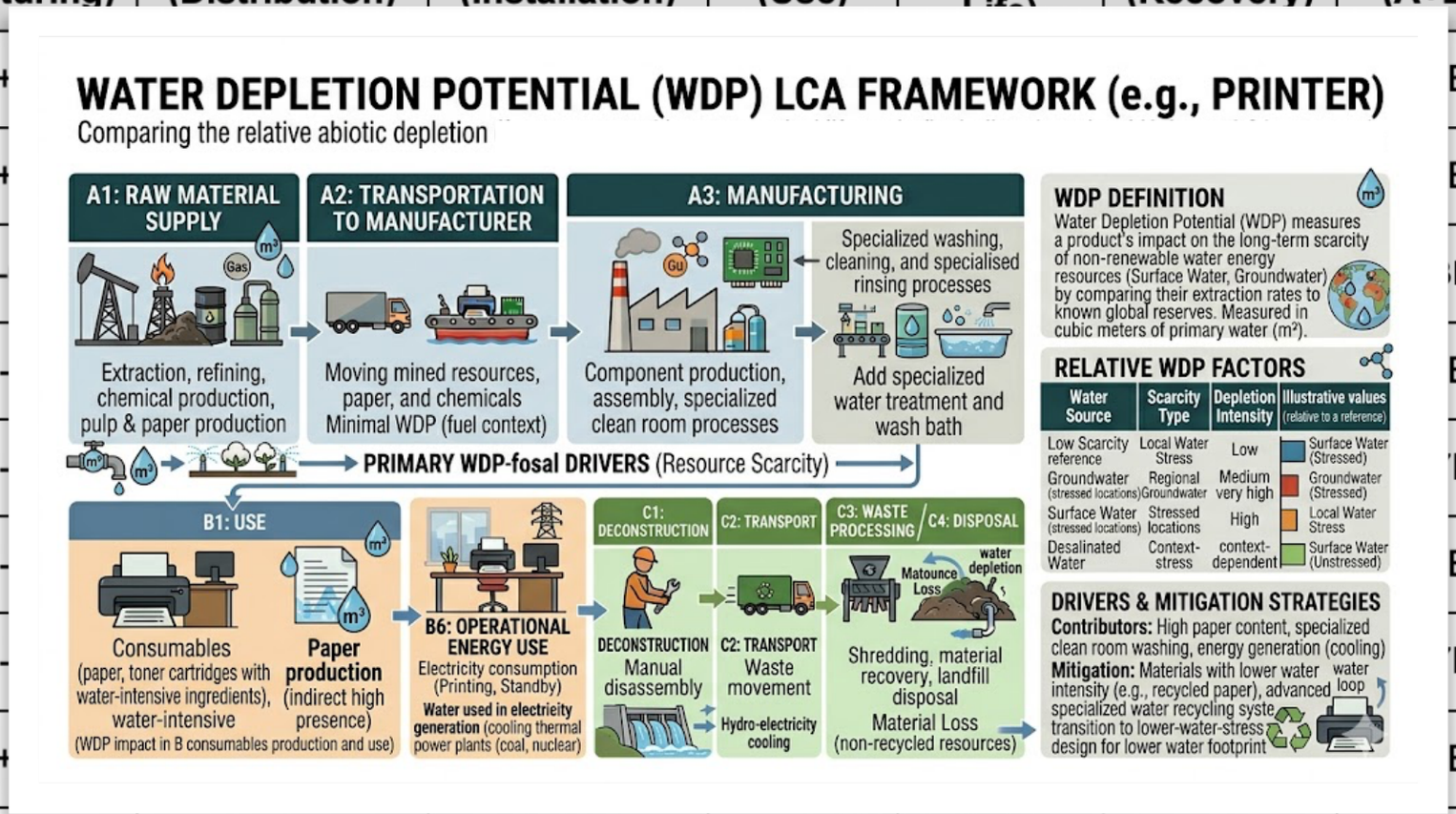
Abiotic depletion of fossil fuels

Example Claigan EPD Impact Categories

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of	D (Recovery)	TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+						E+02
GWP-GHG	kg CO2 eq	1.16E+						E+02
ODP	kg CFC-11 eq	3.30E-						E-05
AP	mol H+ eq	6.79E-						E+00
EP-fresh	kg P eq	7.40E-						E-01
POCP	kg NMVOC eq	5.00E-						E+00
ADP-min	kg Sb eq	1.26E-						E-02
ADP-fossil	MJ	1.65E+						E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02



Water depletion potential

Example Claigan EPD
Appendix B - Detailed LCIA Results

Appendix B: Detailed LCIA Results (by Module)

Table 12: Detailed EF v3.1 LCIA results by Module

Impact category	Reference unit	A1_Raw Materials and Components	A2_Transport to Manufacturing	A3_ Manufacturing	A4_ Transport to Customer	B1_ Consumables	B6_ Energy Use	C2_Waste Transport	C3 C4_Waste Processing
Ecotoxicity: freshwater	CTUe	1.03E+03	1.04E+00	2.31E+02	1.22E+02	1.08E+02	1.65E+03	6.06E-01	7.37E+01
Ecotoxicity: freshwater, organics	CTUe	9.67E+01	5.69E-02	1.17E+01	4.61E+00	4.14E+00	4.54E+01	7.00E-02	1.14E+01
Climate change: land use and land use change	kg CO2-Eq	2.02E+00	3.62E-04	7.93E-01	2.71E-02	8.90E-03	6.87E-01	1.05E-04	1.91E-01
Eutrophication: terrestrial	mol N-Eq	1.03E+00	4.49E-02	2.89E-01	8.93E-01	5.05E-02	3.07E+00	2.49E-02	1.50E-01
Climate change	kg CO2-Eq	9.03E+01	7.81E-01	2.35E+01	4.81E+01	4.16E+00	6.01E+02	1.00E+00	1.48E+01
Human toxicity: carcinogenic, inorganics	CTUh	2.48E-08	9.73E-11	7.93E-09	5.14E-09	3.99E-09	9.24E-08	2.56E-11	2.15E-09
Ecotoxicity: freshwater, inorganics	CTUe	9.30E+02	9.86E-01	2.19E+02	1.18E+02	1.04E+02	1.61E+03	5.36E-01	6.24E+01
Energy resources: non-renewable	MJ, net calorific value	1.33E+03	1.00E+01	3.20E+02	6.46E+02	5.21E+01	1.06E+04	1.29E+01	1.82E+02
Particulate matter formation	disease incidence	5.07E-06	4.22E-08	1.48E-06	4.53E-06	3.31E-07	1.16E-05	1.29E-07	1.17E-06

Example Claigan EPD
Appendix C - Data Sources

Appendix C: Data Sources & Proxy List

Table 13: Data Quality Assessment

Module	Process/Material	Database Source (Version)	Ref. Year	Ref. GEO	Technology	Data category	Overall Quality	Data Contribution % Climate Change	Comment
A1	White layer - 2811231 Polystyrene (PS) resins Main housing - 2811231 Polystyrene (PS) resins Foam - 2811231 Polystyrene (PS) resins market for polystyrene, general purpose | polystyrene, general purpose | APOS, U	EcoInvent 3.11 Claigan Lab Data	2024	GLO	Average	Secondary Data	Good	1.65%	Material was identified by Claigan using FTIR to be PS High Precision: Modelled using Primary Activity Data (measured weights) combined with secondary background data.
A1	Clear layer A - 2811299 All other thermoplastic resins, n.e.c. Clear layer B - 2811299 All other thermoplastic resins, n.e.c. Black trim - 2811299 All other thermoplastic resins, n.e.c. (2811299 = polycarbonate) market for polycarbonate | polycarbonate | APOS, U	EcoInvent 3.11 Claigan Lab Data	2024	ROW	Average	Secondary Data	Good	0.94%	Material was identified by Claigan using FTIR to be PC High Precision: Modelled using Primary Activity Data (measured weights) combined with secondary background data.

- **Plus a whole additional data package for a 3rd party reviewer**

Claigan Experience

- **Claigan has been around for fifteen (15) years**

- **Life Cycle Assessment Experience**
    - Predominantly
        - Electronics
        - Medical devices
        - Machinery
    - Combination of
        - Consumer
        - Professional products

Why Conduct an LCA? (Or EPD)

- **Customer requirement**
  - Common in tenders for larger organizations
  - Especially in the EU

- **'Points' towards a Certification**
  - Such as LEED or EPEAT

- **Cost reduction**
  - Yes, cost reduction

Co2 and Cost Reduction

- **Co2 reduction means cost reduction**
  - A 20% reduction in Co2 normally means a 20% cost reduction

- **Oversimplification**
  - Co2 emissions means energy
  - Energy = Effort = Cost

- **When you conduct an LCA**
  - You will identify at **least two significant opportunities for cost reduction**

Selling LCA to Management

- **Interested in a cost reduction?**
  - And the customer will not ask for a price reduction?

- **Management will listen**

Questions?

4.1 Impact Categories

Table 6: Impact Categories from EF v3.1 LCIA calculation

Indicator	Unit	A1-A3 (Manufacturing)	A4 (Distribution)	A5 (Installation)	B1-B7 (Use)	C1-C4 (End of Life)	D (Recovery)	TOTAL (A+B+C)
GWP-total	kg CO2 eq	1.17E+02	4.96E+01	0.00E+00	6.15E+02	1.63E+01	MND	7.98E+02
GWP-GHG	kg CO2 eq	1.16E+02	4.96E+01	0.00E+00	6.14E+02	1.60E+01	MND	7.96E+02
ODP	kg CFC-11 eq	3.30E-05	6.88E-07	0.00E+00	1.04E-05	2.35E-07	MND	4.43E-05
AP	mol H+ eq	6.79E-01	2.63E-01	0.00E+00	2.12E+00	7.00E-02	MND	3.13E+00
EP-fresh	kg P eq	7.40E-02	8.00E-03	0.00E+00	5.11E-01	4.00E-03	MND	5.97E-01
POCP	kg NMVOC eq	5.00E-01	3.28E-01	0.00E+00	1.24E+00	5.60E-02	MND	2.13E+00
ADP-min	kg Sb eq	1.26E-02	4.00E-04	0.00E+00	5.60E-03	5.77E-05	MND	1.87E-02
ADP-fossil	MJ	1.65E+03	6.46E+02	0.00E+00	1.06E+04	1.95E+02	MND	1.31E+04
WDP	m3 eq	4.46E+01	4.56E+00	0.00E+00	1.56E+02	5.94E+00	MND	2.11E+02

Q&A