# ENVIRONMENTAL PRODUCT DECLARATION

of multiple products, based on the average results of the product group

## ECHOFLEX

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

| | |
|---|---|
| **Programme:** | The International EPD® System<br>www.environdec.com |
| **Programme operator:** | International EPD AB |
| **Regional Programme operator:** | EPD Australasia Ltd |
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| **Geographical scope:** | Global |
| **Version:** | 001 |

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at http://www.environdec.com

Revision detail: In accordance with PCR v1.3.4, the results of Waste-to-energy (W2E) are placed to the Additional environmental information section. There are no changes to the environmental results.

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WOVEN IMAGE®

# GENERAL INFORMATION

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**CEN STANDARD EN 15804+A2:2019/AC2021 SERVES AS THE CORE PRODUCT CATEGORY RULES (PCR)**

**Product Category Rules (PCR):** PCR 2019:14; Construction products (EN 15804+A2) (1.3.4)

**UN CPC code:** 54

**PCR review was conducted by:** The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com for a list of members.

**Review chair:** Claudia A. Peña, University of Concepción, Chile
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**Independent third-party verification of the declaration and data according to ISO 14025:2006:** EPD verification by individual verifier

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**Procedure for follow-up of data during EPD validity involved third party verifier:**
☐ Yes
☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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**ECHOFLEX** in colours 384, 580 & 454 on arch

# VALUES & BENEFITS OF AN EPD

**WHAT IS AN EPD?**

An Environmental Product Declaration (EPD) is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a Product Category Rules (PCR). This is a specific EPD. The EPD owner has the sole ownership, liability, and responsibility for this EPD.

An EPD provides robust transparency information on the material flows and environmental impact that happen during the life of a product. It is akin to the ingredient and nutrition label on food, but an EPD provides information on raw material extraction, energy use, emissions to air, soil and water use and waste generation.

Because this EPD is EN15804-compliant and third-party reviewed, it is recognised by sustainability rating schemes across the globe.

**Green Star (Australia):** EPDs may be used by project teams using the Design & As Built and Interiors rating tools to obtain Green Star points under the following credits in their legacy tools:

Materials > Product Transparency and Sustainability.

Materials > LCA: By providing data for an EN 15978 compliant whole-of-building whole-of-life assessment.

Innovation Challenge > Responsible Carbon Impact: by providing embodied carbon impacts (i.e. data on Global Warming Potential) which can be used in the calculation and reduction of the total embodied carbon impacts of a project.

EPDs are also recognised for credits under the Materials category in the Infrastructure Sustainability (IS) rating scheme of the Infrastructure Sustainability Council of Australia (ISCA).

**LEED (US):** Using EPDs to disclose and reduce product impacts contributes to several LEED credits including: Building Product Disclosure and Optimisation points for EPD (option 1) and Life-Cycle Assessment (LCA)/Embodied Carbon Optimisation (option 2).

**BREEAM (UK):** EPD support a projects BREEAM rating with:
Mat 01 Building life cycle assessment. The data presented in the EPD results tables can be used within a building level life cycle assessment to demonstrate how different options have been considered to improve the design. Seven credits are available in this section including two credits for building performance against a benchmark.
Mat 02 Environmental Impacts from construction products. Up to 1.5 credits are available for using at least 20 products in the build that have their own product specific EPD.

**EPDs can be used** in green building schemes across the world, such as Lotus Interiors (Vietnam) and HQE (UK, Europe, Asia, North America and Middle East).

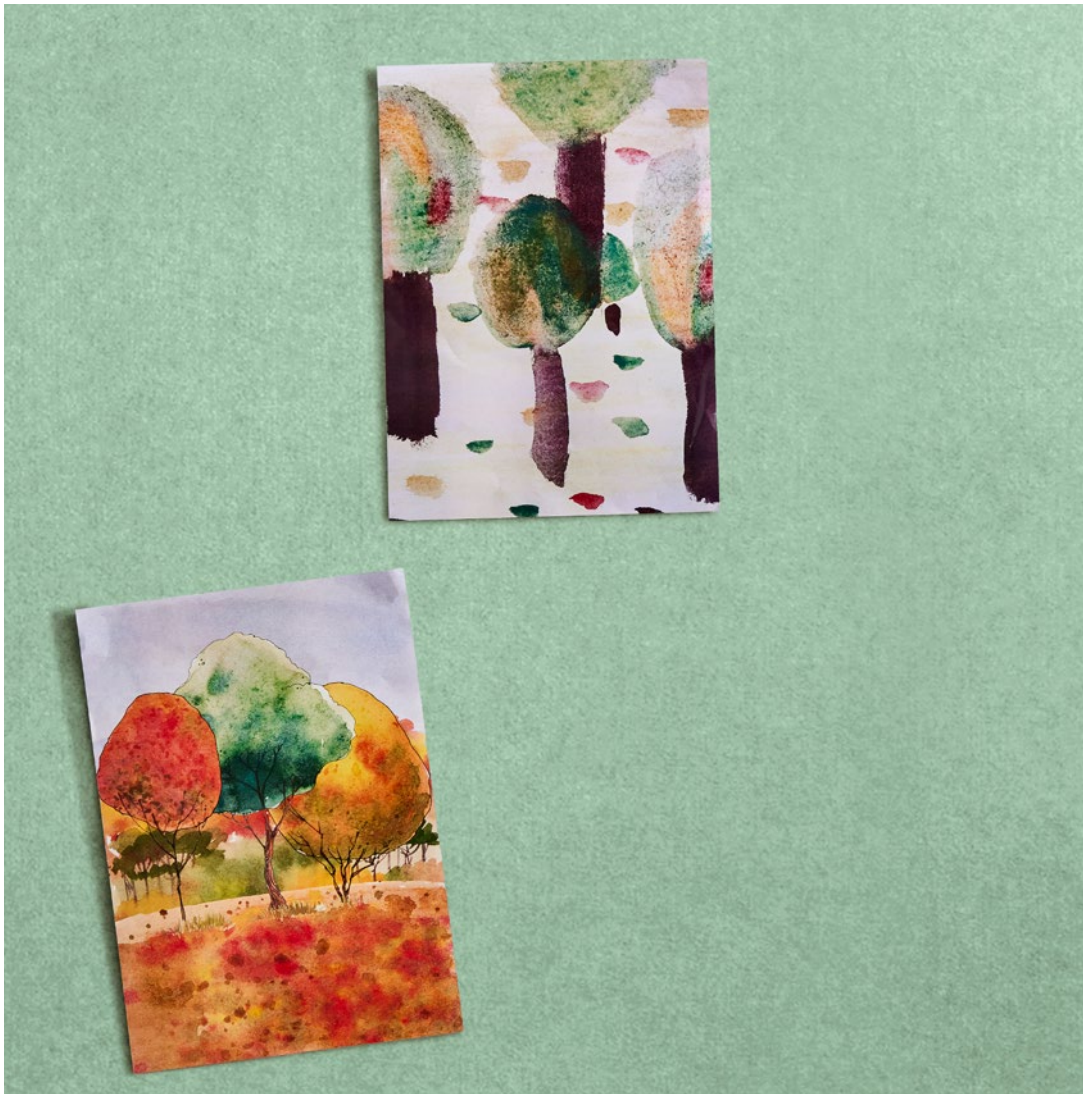
# ABOUT WOVEN IMAGE

Woven Image was established in 1987 after identifying a strong need for design driven interior finishes.

Based in Australia, they fast became a leading international business to business supplier of high-performance acoustic finishes and textiles for a wide range of commercial interiors across workspace, hospitality and education sectors.

Woven Image has offices throughout Australia as well as Singapore, Hong Kong and China and an established network of distributors, resellers and stockists, covering all major global markets.

Resource efficiency, dematerialisation and minimising environmental impacts at the heart of our design thinking and, because of Woven Image's ongoing attention to product life-cycle management and understanding of the importance of delivering responsible and positive product outcomes, they became pioneers in producing high performance acoustic finishes, wallcovering and textiles using recycled materials.



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# SUSTAINABILITY

Since our inception and well before it became a global necessity, sustainable design and manufacturing has been part of our DNA. It's who we are, not simply what we do. Now part of CSR, we continue to work towards **building solutions for a better future.**

Going beyond waste reduction, recycling and recycled content, Woven Image understands the importance of valuing and respecting our planet and its resources, and we are on a journey to reduce the environmental and social impacts of our operations and product. We are unequivocally committed to playing our role in meeting the 1.5°C Climate Ambition and a net-zero carbon economy by 2050 through three pillars of action – product stewardship, climate leadership and social responsibility.

CSR's operations span Australia, New Zealand, parts of Asia and Europe, with the scale and expertise to innovate for the sustainable solutions our customers and communities need to build for a better future.

As a trusted supplier of building solutions, CSR are taking on industry challenges to cut carbon emissions and waste, and better manage resources. To set ambition and ignite progress, CSR are committed to 2030 targets across:

1. Reducing our emissions, waste and water use
2. Increasing uptake of renewable energy
3. Improving biodiversity outcomes

**CSR TARGETS FOR 2030***

**50%** of energy from renewables

**20%** energy reduction per tonne of saleable product manufactured

**30%** reduction in greenhouse gas (GHG) emissions per tonne of saleable product manufactured

Woven Image's regional production hub produced on average 394.5 MWh of solar energy per annum, supplying on average 54% of the total energy consumption for this manufacturing hub from renewable sources. We are committed to further investment in renewable energy to reduce our scope 2 emissions including the procurement of 100% green energy for our Woven Image Brookvale distribution centre and will continue offsetting our unavoidable operational emissions in partnership with Greenfleet, through regenerative carbon removal projects.

**TOWARDS NET ZERO IN THE BUILT ENVIRONMENT**

CSR takes a strategic approach to investing in solutions that reduce emissions - from increasing the uptake of renewable energy to exploring emerging technologies across operations. This includes optimising manufacturing plants, energy and process efficiencies and building collaborative partnerships across operations.

*2030 targets baseline is 1st July 2019 to 30th June 2020.

# SUSTAINABILITY

### REDUCING WASTE AND PRESERVING RESOURCES TO PROTECT OUR ENVIRONMENT

As a major supplier of building solutions, CSR has an important role in becoming a closed loop business to influence a circular economy in the built environment.

Woven Image's approach to product stewardship is underpinned by principles of circularity. Our design team puts resource efficiency, dematerialisation and minimising environmental impacts at the heart of its thinking. This results in products that are not only beautiful, but functional and highly durable, with a timeless aesthetic to ensure their longevity.

The process of working with customers and other relevant stakeholders on end-of-life requirements provides Woven Image with an unmatched opportunity to develop practical Product Stewardship measures that maximise environmental performance in a commercially viable manner. We continue to collaborate in circular R&D and invest in end-of-life recovery programmes for our products, actively encouraging our customers to utilise our take-back scheme.

Being a member of the Australian Packaging Covenant Organisation (APCO) demonstrates CSR's focus on redesigning packaging to minimise plastic use and waste. In collaboration with suppliers, we are committed to monitoring our progress towards our 2025 sustainable packaging targets, where CSR packaging is closed loop (either 100% reusable, recyclable or compostable) and using 50% average recycled content in packaging.

### CSR CLOSING THE LOOP GOALS FOR 2030*

**75%** reduction in solid waste to landfill

**30%** energy reduction per tonne of saleable product manufactured

enhance biodiversity outcomes on CSR sites and developments

CSR continually work to eliminate waste across the business and source the 'right' materials to manufacture building products from natural, reused, re-purposed and recycled materials. Our approach includes working with our team and suppliers to look beyond energy, water and waste to explore holistic environmental management solutions and influence the wider industry to follow circular principles.

*2030 targets baseline is 1st July 2019 to 30th June 2020.

# PRODUCT CREDENTIALS

## PRODUCTS & APPLICATIONS

EchoFlex is a velcro receptive acoustic wallcovering from Woven Image. It has been designed to deliver against environmental, aesthetic and acoustic criteria to improve the overall look, feel and comfort of a commercial interior space.

EchoFlex's ability to be cut and installed on curved surfaces enables a host of unique applications such as a panel or tile applied directly to the wall, as a room or space divider, in workstations, as a ceiling solution or a variety of other applications where both good design and acoustic performance are required.

It is available in a range of colours that match Woven Image's EchoPanel® colour palette.

For specifications and performance details please visit wovenimage.com

**ECHOFLEX** in colours 580, 384 & 454 on arch

# PRODUCT SPECIFICATIONS

Table 1: EchoFlex products included in this EPD

| Design | Colour Code | Thickness (mm) | Length (mm) | Width (mm) | Area ($m^2$) | Weight (kg) | Density ($g/m^2$) |
|---|---|---|---|---|---|---|---|
| **EchoFlex** | 101 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 106 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 124 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 167 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 269 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 349 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 365 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 384 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 402 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 442 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 447 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 454 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 484 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 495 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 542 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 551 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 573 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 580 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 721 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |
| | 908 | 10-12 | 25000 | 1220 | 30.5 | 48.8 | 1600 |

# PRODUCT LIFE-CYCLE ASSESSMENT

Table 2: Product characteristics

| | Product characteristics |
|---|---|
| Declared unit | 1m² of EchoFlex, weighted 1.6kg, manufactured in Australia |
| Modules included | A1-A3, A4-A5, C1–C4, D |
| Technical life time | 30 years |
| Geographical coverage | Global |
| Time period | July to September 2024 |

## SYSTEM BOUNDARY

The scope of this EPD is cradle to gate (modules A1-A3) with optional modules A4-A5, modules C1–C4, and module D.

The scope of this declaration is according to the General Programme Instructions (GPI) and four information modules according to ISO 21930 and EN 15804 and supplemented by an optional information module on potential loads and benefits beyond the building life cycle, as given in Figure 1.

The specific system boundary is shown in Figure 2. The following modules have not been declared as they are deemed not applicable for Woven Image products:
B1 – material emissions from usage, B2 – maintenance including transport, B3 – repair, B4 – replacement, B5 – refurbishment, B6 – operational energy use and B7 – operational water use.

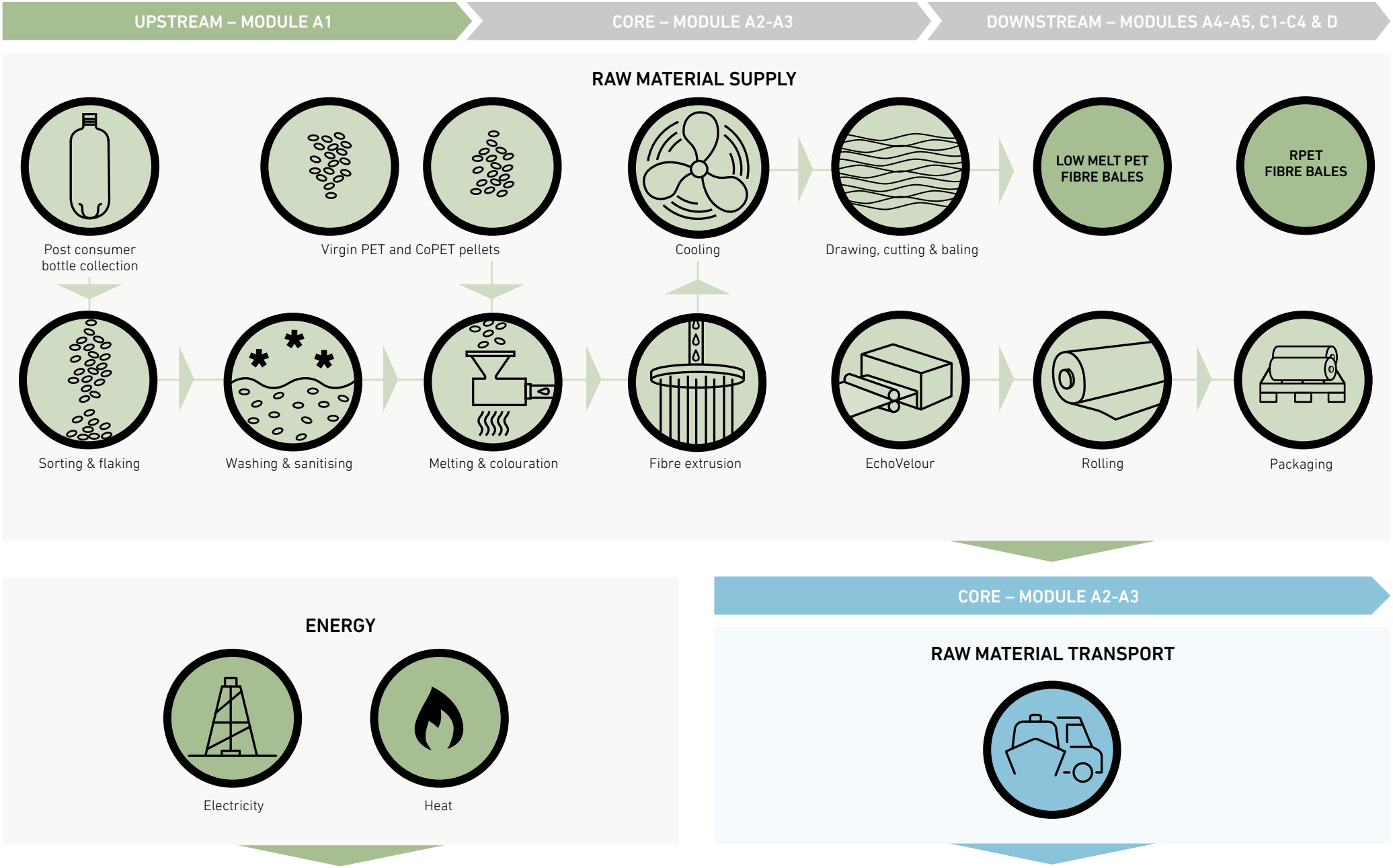
Figure 1: System boundary and scope of study

| | 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 declared | X | X | X | X | X | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| Geography | GLO | GLO | AU | GLO | GLO | - | - | - | - | - | - | - | GLO | GLO | GLO | GLO | GLO |
| Specific data used | >90% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – products | <10% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – sites | 0% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |

X = module included in EPD I AU = Australia, GLO = Global, ND = Not declared

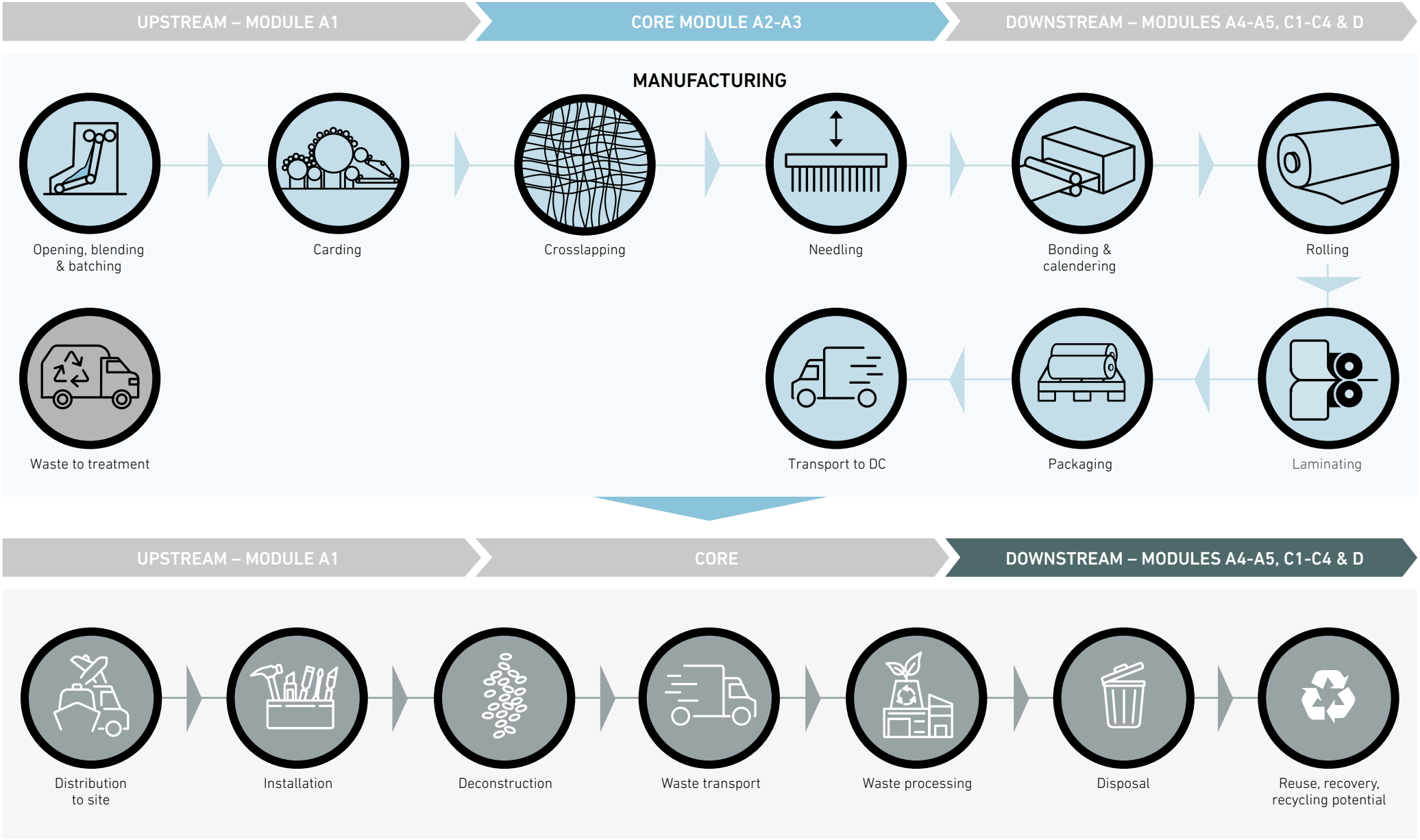
# PRODUCT LIFE-CYCLE ASSESSMENT

Figure 2: EchoFlex lifecycle system boundary



# PRODUCT LIFE-CYCLE ASSESSMENT

Figure 2 (*continued):* EchoFlex lifecycle system boundary



# PRODUCT LIFE-CYCLE ASSESSMENT

## RAW MATERIAL SUPPLY

The primary raw materials used in the manufacturing of EchoFlex are EchoVelour made from 100% dope dyed post-consumer recycled PET fibre and Flex nonwoven backing made from regen PET staple fibre, virgin PET staple fibre and virgin bicomponent fibre.

Details on PET fibre:

- 100% post-consumer recycled PET fibre is melt spun from collected, sorted, washed and flaked post-consumer water bottles and soft drink bottles. Pigment is added to molten bottle flakes before being pumped through a spinneret under pressure. The extruded polymer is then quenched with cold air and the molten mass is drawn and solidified into filaments before being texturised and cut into staple length.
- Regen PET staple fibre is produced by reprocessing waste materials such as PET bottles, fabric scraps, or industrial polyester waste. Melt spun from a blend of PET bottle flake, post-industrial and pre-consumer waste PET pellets and second grade virgin PET pellets. RPSF provides a sustainable alternative to virgin fibre. It helps reduce environmental waste and conserves energy compared to the production of virgin fibre.
- 100% virgin PET staple fibre is melt spun from freshly polymerised polyester pellets. Virgin PET is derived from petrochemical sources like ethylene glycol and terephthalic acid and consistently provides quality, strength, and versatility.
- Virgin low melt bicomponent PET fibre – Bicomponent PET staple fibre is melt spun with virgin PET and coPET pellet. When the fibre is extruded 50% virgin PET forms the core of the fibre and 50% coPET the sheath.

## MANUFACTURING AND HANDLING

EchoFlex rolls are manufactured in Australia by CSR Martini at the Villawood site, NSW. They are manufactured by flame laminating EchoVelour to needle punched non-woven substrate Flex. The primary energy source used in the Villawood site is based on the NSW grid electricity, which are black coal: 75% and photovoltaic: 17% – 0.72kg $CO_2$ eq./kWh (GWP-GHG).

The manufactured products are transported by road to Woven Image, Brookvale warehouse for storage, quality assurance and preparation for distribution. Local electricity mix of Woven Image is based on NSW region, which primary energy sources of energy during the assessment period are black coal: 75%, and photovoltaic: 17% – 0.72kg $CO_2$ eq./kWh (GWP-GHG). In addition, the purchased GreenPower from a local electricity supplier Next Business Energy, documented as 100% wind is consumed as well. The GWP-GHG of GreenPower is 2.21 E-04 kg $CO_2$ eq./kWh (GWP-GHG).

Table 3 lists the main materials and packaging used to produce EchoFlex. Product packaging is made up of plastics, wooden pallets, and cardboard. The packaging is less than 2% of the weight of the product.

Table 3: Content declaration for non-printed EchoFlex

| Material input | Percent composition for 1m² of product | Post-consumer recycled material, weight | Biogenic content kg C/m² of product |
|---|---|---|---|
| Polyester (polyethylene terephthalate) fibre | 97.8% – 99.8% | 30%* | 0 |
| Pigment | <2.2% | 0% | 0 |
| **Packaging materials** | **Percent composition for 1m² of product** | **Post-consumer recycled material, weight** | **Biogenic content kg C/m² of product** |
| Plastic | 0.8% | 0% | 0 |
| Cardboard | 1.0% | 0% | 7.4E-03 |

* Post-consumer recycled content may change constantly depending on the availability of waste in the market to make Regen PET. For guidelines, Regen PET contains 20% PET flakes (post-consumer waste), 60% of industrial polyester waste (pre-consumer waste), and 20% of second grade polyester pellets (reject quality of virgin materials). None of the products contain one or more substances that are listed in the 'Candidate List of Substances of Very High Concern for authorisation'. Based on available information and safety data sheets, Woven Image products and their raw materials are not classified as hazardous according to criteria of Safe Work Australia GHS 7.

# PRODUCT LIFE-CYCLE ASSESSMENT

## DISTRIBUTION

Woven Image's EchoFlex is distributed worldwide through international sales offices, Australian sales offices and international distribution partners. Logistics modes used include road, sea and air.

During the reporting period, the product was sold in Australia and was not transported by sea or air. However, to enable customised calculations of the A4 transport impact, unit transport impacts for different modes are provided in the Additional Environmental Information section.

Table 4: Distribution mode and average distance

| | By road | By sea | By air |
|---|---|---|---|
| Average distance (km) | 1114 | N/A | N/A |
| Portion | 100% | N/A | N/A |

## INSTALLATION, USE AND DECONSTRUCTION

EchoFlex is installed following the methodology outlined in the EchoFlex Installation Guide. Depending on the client's preference, Woven Image products can be installed using an adhesive or can be mechanically fixed using screws. In this EPD, bead tube adhesive method is used for modelling as it is more common during the installation. Data was made from the most conservative assumptions based on Woven Image's installation methodology, although scissor lifts are not necessary for all installation purposes.
0.208 kWh grid electricity is used for scissor lifts for product installation.
0.1 kg of bead tube adhesive is used for bonding 1m² of panel.
There is no waste during the installation process because all products are designed to be made-to-fit.

Product packaging is discarded or reused – plastic and metal packaging go to landfill, cardboard packaging goes to recycling, and wooden pallet is reused directly. The reason considering the metal strapping seals to be landfilled is because of the small quantity used per m² of product.

## END-OF-LIFE

At end-of-life, products are removed, transported to waste processing, and landfilled. There is very limited data available from Woven Image's extended producer responsibility product take-back scheme. For this reason, the conservative assumption is that 100% of the products used in the area outside Europe go to landfill, which corresponds to the final disposition of the product (Module C4). In Europe, the regulation forces the waste-to-energy (W2E) of plastic products, which leads to 100% of products sent for municipal incineration. The impacts are disclosed in the Additional Environmental Information section.

Assuming a product required a scissor lift for installation, and a scissor lift with same electricity consumption of 0.208 kWh/m² of product was included for deconstruction (C1).

The impacts associated with deconstruction are assumed to be negligible and have not been assessed in detail in this study.

C2 (transport to end-of-life) is assumed at a distance of 25km since there was no primary data available.

If 100% of products end up in landfill, the amounts for C3 are 0 and C4 are the weight of the installed product. Otherwise, the amount ends up in C3 is the weight of the installed product.

A second waste to energy scenario has been modelled if Woven Image products are shipped and used in Europe as an alternative to landfill. As per the end-of-life requirements of waste in Europe, 100% of plastic and adhesive are incinerated for energy recovery. The end-of-life impacts targeting the European market are available in the Additional Environmental Information section.

## BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY

In Module A5, the packaging cardboard is recycled, which brings a certain benefit to Module D.

All products are sent to landfill as it's end-of-life, there is no benefit to Module D due to the product is 100% destined for landfill – no specific market yet exists for waste panels.

If the products are deconstructed and treated in Europe, 100% of products end up with energy recovery. Net energy production from PET incineration is 2.97MJ/kg electric energy and 5.81MJ/kg thermal energy suggested by ecoinvent. The avoided products are considered as electricity and heat from natural gas in Europe. Please refer to the Additional Environmental Information section for Module D impacts.

# PRODUCT LIFE-CYCLE ASSESSMENT

## METHODOLOGY AND COMPLIANCE WITH STANDARDS

The methodology and report format has been modified to comply with:

- ISO 14040:2006 and ISO14044:2006+A1:2018 which describe the principles, framework, requirements and provides guidelines for life cycle assessment (LCA).
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures, which establishes the principles and specifies the procedures for developing Type III environmental declaration programmes and Type III environmental declarations.
- EN 15804:2012+A1:2013; Sustainability of construction works – Environmental product declarations.
- EN 15804:2012+A2:2019; Sustainability of construction works – Environmental product declarations.
- Product Category Rules (PCR) 2019:14, v1.3.4 – Construction products – Hereafter referred to as PCR 2019:14.
- General Programme Instructions (GPI) for the International EPD System V4.0 – containing instructions regarding methodology and the content that must be included in EPDs registered under the International EPD System.
- Instructions of EPD Australasia V4.2 – a regional annex to the general programme instructions of the International EPD System.

According to EN 15804, EPDs of construction products may not be comparable if they do not comply with this standard, and EPDs might not be comparable, particularly if different functional units are used.

It is discouraged to use the results of modules A1-A3 without considering the results of module C.

The best way to compare products and materiality of differences is to place them into the context of a structure across the whole life cycle.

## CORE DATA COLLECTION

The primary data used for the study is based on direct utility bills or feedstock quantities from CSR Martini, TTN and Woven Image's procurement records. Edge used contribution analysis to focus on the key pieces of data contributing to the environmental impact categories. The data was benchmarked against relevant benchmark data in ecoinvent. Edge considers the data to be of high quality for primary data used in this study.

For the background data, the quality was considered very good when processes chosen were geographically, temporally, and technologically relevant as shown in Table 5 (next page). For data that was based on assumptions, quality was considered fair, unless based on official reports.

## BACKGROUND DATA

The inventory data for the process is entered into the SimaPro (v9.6) LCA software Programme and linked to the pre-existing data for the upstream feedstocks and services selected in order of preference from:

For Australia, the Australian Life Cycle Inventory (AusLCI) v1.42 compiled by the Australian Life Cycle Assessment Society ((ALCAS), 2023). The AusLCI database at the time of this report was about 2 years old.

Other authoritative sources (e.g., ecoinvent v3.9.1, (Wernet, et al., 2022)), where necessary adapted for relevance to Australian conditions (energy sources, transport distances and modes and so on, and documented to show how the data is adapted for national relevance). At the time of reporting, the ecoinvent v3.9.1 database was 2 years old.

Other sources with sensitivity analysis reported to show the significance of this data for the results and conclusions drawn.

Table 5: Data source, time, and quality

| Module | Asset life cycle stage | Geographical coverage | Primary data | Generic data | Primary data quality | Generic data quality |
|---|---|---|---|---|---|---|
| A1 | Raw material supply | Australia, Taiwan, Thailand | Source and quantities of materials of feed mix<br>Inputs: electricity, diesel and gas | Extraction of raw materials | Very good | Good |
| A2 | Transport from supplier | Thailand | Transport mode and distance | Fuel consumption embedded in process | Good | Good |
| A3 | Manufacturing | Australia | Inputs: water use<br>Outputs: manufactured product quantities, packaging, waste | | Very good | |
| A4 | Transport to customer | Global | Transport mode and average distances to DC from manufacturing sites | | Good | |
| A5 | Construction, installation | Global | | Packaging disposal/recycling methods and rates – national rates | | Good |
| C2 | Transport to waste processing | Global | | Transportation to landfill – reprocessing – assumption | | Good |
| C3 | Waste processing | Europe | | Waste to energy recovery from European standard | | Good |
| C4 | Disposal | Global | | Waste to landfill scenario and rates from industry data | | Good |
| D | Benefits | Global | | Energy recovery | | Good |

### CUT OFF CRITERIA

It is common practice in LCA/LCI protocols to propose exclusion limits for inputs and outputs that fall below a threshold % of the total, but with the exception that where the input/output has a 'significant' impact it should be included. According to the PCR 2019:14 v1.3.4, Life cycle inventory data shall according to EN 15804+A2 include a minimum of 95% of total inflows (mass and energy) per module. Inflows not included in the LCA shall be documented in the EPD. Data gaps in included stages in the downstream modules shall be reported in the EPD, including an evaluation of their significance. In accordance with the PCR 2019:14 v1.3.4, the following system boundaries are applied to manufacturing equipment and employees:

- Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI. Capital equipment and buildings typically account for less than a few percent of nearly all LCIs and this is usually smaller than the error in the inventory data itself.
- For this project, it is assumed that capital equipment makes a negligible contribution to the impacts as per Frischknecht et al. (Frischknecht, 2007) with no further investigation.
- Personnel-related impacts, such as transportation to and from work, are also not accounted for in the LCI. The impacts of employees are also excluded from inventory impacts on the basis that if they were not employed for this production or service function, they would be employed for another. It is very hard to decide what proportion of the impacts from their whole lives should count towards their employment. For this project, the impacts of employees are excluded.
- The transport of scissor lift to and from the installation site is excluded.
- Besides these exclusions, no energy or mass flows were excluded in this LCA report.

## ALLOCATION

According to EN 15804+A2, in a process step where more than one type of product is generated, it is necessary to allocate the environmental stressors (inputs and outputs) from the process to the different products (functional outputs) in order to get product-based inventory data instead of process-based data. An allocation problem also occurs for multi-input processes.

In an allocation procedure, the sum of the allocated inputs and outputs to the products shall be equal to the unallocated inputs and outputs of the unit process.

The following stepwise allocation principles shall be applied for multi-input/output allocations:

- The initial allocation step includes dividing up the system sub-processes and collecting the input and output data related to these sub-processes.
- The first (preferably) allocation procedure step for each sub-process is to partition the inputs and outputs of the system into their different products in a way that reflects the underlying physical relationships between them.
- The second (worst case) allocation procedure step is needed when physical relationship alone cannot be established or used as the basis for allocation. In this case, the remaining environmental inputs and outputs from a sub-process must be allocated between the products in a way that reflects other relationships between them, such as the economic value of the products.

Waste values were provided in lump sums per material, and were allocated to each product according to the percentage of total product produced in one year.

## PRODUCT GROUPING

This is an EPD for product presented in table 6. The data presented is based on the grouped average results of 1m$^2$ of EchoFlex in different colours.

Table 6: Product grouping

| Product group | Products in each group | Selected product |
|---|---|---|
| EchoFlex rolls | Non-printed | Coloured average |

## ASSUMPTIONS, CHOICES, AND LIMITATIONS

Table 7: Assumptions or limitations data assessment scheme

| Assumption or limitation | Impact on LCA results | Discussion |
|---|---|---|
| **Raw material data for panel production is based on generic information** | Significant | The EN 15804 standard permits generic data for upstream processes, however, this is where the main impacts are for panels across the life cycle. Supplier specific data was only used for shipping and transport of raw materials. |
| **Use of proxy process for PET fibre production** | Moderate | Complete data for producing fibre from PET granulate is limited. Extrusion is the primary process and was used for all PET fibres in this assessment. It is assuming that additional manufacturing stages are insignificant, and extrusion is an accurate proxy for PET fibre production. |
| **Average pigment composition** | Minor | In the case of coloured Woven Image products, this LCA uses an average pigment composition. This generalisation is justified by the large size of product stock in the Woven Image range if each different colour classified a different product and the fact that the colour stock changes frequently and is often added to. |
| **Exclusion of employees, capital good and infrastructure** | Minor | Allowed/required as per EPD rules. |
| **Assumed material for installation** | Moderate | Assumptions of what material used for the installation process of the panels referred to the most conservative methodology by Woven Image. |
| **Mixed origins of electricity in installation and deconstruction** | Minor | The normalised electricity is modelled based on the distribution of panels. It doesn't reflect the installation, and deconstruction impacts in the specific country. The electricity consumption is listed to help understand the impacts. |
| **Landfill disposal** | Moderate | A 100% landfill rate is assumed at end-of-life. There could be instances where the end-of-life sections are sent for energy recovery through incineration. This scenario has been modelled as an alternative solution, applying a 100% waste-to-energy assumption. |

# PRODUCT LIFE-CYCLE ASSESSMENT

## ENVIRONMENTAL IMPACT INDICATORS

The potential environmental impacts, use of resources and waste categories included in this EPD were calculated using the SimaPro v9.6 tool and are listed in Table 8. The characterisation factors applied to the calculation of potential environmental impacts are based on version 3.1 of the reference package for CFs used in the Product Environmental Footprint (PEF) framework (EF 3.1). The impact results of the biogenic carbon and energy resource use are coherent with the guidance and requirement in Annex 2 and Annex 3 – Option A of PCR 2019:14

All tables from this point will contain the abbreviation only. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Table 8: **Life cycle impact, resource and waste assessment categories, measurements and methods accordance with EN15804+A2**

| Impact category | ABR | Unit | Assessment method and implementation |
|---|---|---|---|
| **Global warming potential – total** | GWP-T | kg $CO_2$ eq. (GWP100) | Baseline model of 100 years of the IPCC based on IPCC 2021 |
| **Global warming potential – fossil** | GWP-F | kg $CO_2$ eq. (GWP100) | Baseline model of 100 years of the IPCC based on IPCC 2021 |
| **Global warming potential – biogenic** | GWP-B | kg $CO_2$ eq. (GWP100) | Baseline model of 100 years of the IPCC based on IPCC 2021 |
| **Land use/land transformation** | GWP-L | kg $CO_2$ eq. (GWP100) | Baseline model of 100 years of the IPCC based on IPCC 2021 |
| **Ozone depletion potential** | ODP | kg CFC 11 eq. | Steady-state ODPs, WMO 2014 |
| **Acidification potential** | AP | mol H+ eq. | Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008 |
| **Eutrophication – aquatic freshwater** | EP-F2 | kg P eq. | EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe |
| **Eutrophication – aquatic marine** | EP-M | kg N eq. | EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe |
| **Eutrophication – terrestrial** | EP-T | mol N eq. | Accumulated Exceedance, Seppälä et al. 2006, Posch et al. |
| **Photochemical ozone creation potential** | POCP | kg NMVOC eq. | LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe |
| **Abiotic depletion potential – elements*** | ADPE | kg Sb eq. | CML (v4.8) |
| **Abiotic depletion potential – fossil fuels*** | ADPF | MJ net calorific value | CML (v4.8) |
| **Water depletion potential*** | WDP | $m^3$ eq. deprived | Available Water Remaining (AWARE) Boulay et al., 2016<br>(includes Australia flows calculated using 36 Australian catchments) |

* Disclaimer – The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

# PRODUCT LIFE-CYCLE ASSESSMENT

## RESOURCE USE

Table 8 (*continued*): **Life cycle impact, resource and waste assessment categories, measurements and methods accordance with EN15804+A2**

| Impact category | ABR | Unit | Assessment method and implementation |
|---|---|---|---|
| **Use of renewable primary energy excluding renewable primary energy resources used as raw materials** | PERE | MJ, net calorific value | Manual for direct inputs[1] |
| **Use of renewable primary energy resources used as raw materials** | PERM | MJ, net calorific value | Manual for direct inputs[2] |
| **Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)** | PERT | MJ, net calorific value | ecoinvent version 3.9.1 and expanded by PRé Consultants[3] |
| **Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials** | PENRE | MJ, net calorific value | Manual for direct inputs[4] |
| **Use of non-renewable primary energy resources used as raw materials** | PENRM | MJ, net calorific value | Manual for direct inputs[5] |
| **Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)** | PENRT | MJ, net calorific value | ecoinvent version 3.9.1 and expanded by PRé Consultants[6] |
| **Use of secondary material** | SM | kg | Manual for direct inputs |
| **Use of renewable secondary fuels** | RSF | mol N eq. | Manual for direct inputs |
| **Use of non-renewable secondary fuels** | NRSF | MJ, net calorific value | Manual for direct inputs |
| **Use of net fresh water** | FW | $m^3$ | ReCiPe 2016 |

## WASTE PRODUCTION

Table 8 (*continued*): **Life cycle impact, resource and waste assessment categories, measurements and methods accordance with EN15804+A2**

| Impact category | ABR | Unit | Assessment method and implementation |
|---|---|---|---|
| **Hazardous waste disposed** | HWD | kg | EDIP 2003 (v1.05) |
| **Non-hazardous waste disposed** | NHWD | kg | EDIP 2003 (v1.05)[7] |
| **Radioactive waste disposed/stored** | RWD | kg | EDIP 2003 (v1.05) |

1 PERE = PERT - PERM
2 Calculated based on the lower heating value of renewable raw materials. LHV is taken from https://phyllis.nl/, as recommended by SimaPro in compliance with EN15804+A2: https://support.simapro.com/s/article/How-to calculate-EN-15804-A2-indicators-in-desktop-SimaPro
3 Calculated as sum of renewables, biomass; renewable, wind, solar and geothermal, and renewable, water.
4 PENRE = PENRT – PENRM
5 Calculated based on the lower heating value (LHV) of non-renewable raw materials. LHV is taken from https://phyllis.nl/, as recommended by SimaPro in compliance with EN15804+A2: https://support.simapro.com/s/article/How-to-calculate-EN-15804-A2-indicators-in-desktop-SimaPro
6 Calculated as sum of non-renewables, fossil and non-renewable, nuclear.
7 Calculated as sum of bulk waste and slags/ash.

# PRODUCT LIFE-CYCLE ASSESSMENT

### OUTPUT FLOWS

Table 8 (*continued*): **Life cycle impact, resource and waste assessment categories, measurements and methods accordance with EN15804+A2**

| Impact category | ABR | Unit | Assessment method and implementation |
|---|---|---|---|
| **Components for re-use** | CRU | kg | Manual for direct inputs |
| **Material for recycling** | MFR | kg | Manual for direct inputs |
| **Materials for energy recovery** | MERE | kg | Manual for direct inputs |
| **Exported energy – electricity** | EE - e | MJ per energy carrier | Manual for direct inputs |
| **Exported energy – thermal** | EE - t | MJ per energy carrier | Manual for direct inputs |

### ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

Table 8 (*continued*): **Life cycle impact, resource and waste assessment categories, measurements and methods accordance with EN15804+A2**

| Impact category | ABR | Unit | Assessment method and implementation |
|---|---|---|---|
| **Global warming potential, excluding biogenic uptake, emissions and storage** | GWP-GHG | kg $CO_2$ equivalents (GWP100) | Baseline model of 100 years of the IPCC based on IPCC 2021[8] |
| **Particulate matter** | Potential incidence of disease due to PM emissions (PM) | Disease incidence | SETAC-UNEP, Fantke et al. 2016 |
| **Ionising radiation – human health**** | Potential human exposure efficiency relative to U235 (IRP) | kBq U-235 eq | Human health effect model |
| **Eco-toxicity (freshwater)*** | Potential comparative toxic unit for ecosystems (ETP-fw) | CTUe | USEtox |
| **Human toxicity potential – cancer effects*** | Potential comparative toxic unit for humans (HTP-c) | CTUh | USEtox |
| **Human toxicity potential – non cancer effects*** | Potential comparative toxic unit for humans (HTP-nc) | CTUh | USEtox |
| **Soil quality*** | Potential soil quality index (SQP) | Dimensionless | Soil quality index (LANCA®) |

8 This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic $CO_2$ is set to zero.

* Disclaimer – The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

**Disclaimer – This impact category deals mainly with the eventual impact of low dose ionising radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

# ENVIRONMENTAL PERFORMANCE

## LANDFILL SCENARIO

Note that the use of results of modules A1-A3 or A1-A5, without considering the results of module C may mislead the communication and decision-making. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

### ENVIRONMENTAL IMPACTS

Table 9: **Environmental impact per m² of installed EchoFlex – End-of-life landfill scenario**

| Indicator | ABR | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **Global warming potential – total** | GWP - T | kg $CO_2$ eq. | 5.08E+00 | 2.75E-01 | 5.35E-01 | 1.46E-01 | 6.55E-03 | 0.00E+00 | 4.47E-03 | 4.47E-03 |
| **Global warming potential – fossil** | GWP - F | kg $CO_2$ eq. | 5.09E+00 | 2.75E-01 | 5.07E-01 | 1.46E-01 | 6.55E-03 | 0.00E+00 | 1.43E-01 | 4.39E-03 |
| **Global warming potential – biogenic** | GWP - B | kg $CO_2$ eq. | -1.64E-02 | 1.63E-05 | 2.76E-02 | 3.33E-04 | 3.88E-07 | 0.00E+00 | 1.04E-0.4 | 5.87E-05 |
| **Global warming potential – land use/land transformation** | GWP - L | kg $CO_2$ eq. | 5.39E-03 | 9.44E-06 | 2.98E-05 | 2.49E-05 | 2.25E-07 | 0.00E+00 | 5.61E-06 | 1.55E-05 |
| **Ozone depletion potential** | ODP | kg CFC 11 eq. | 1.26E-05 | 3.75E-09 | 4.89E-06 | 5.30E-10 | 8.94E-11 | 0.00E+00 | 1.32E-10 | 6.81E-11 |
| **Acidification potential** | AP | mol H+ eq. | 2.35E-02 | 8.04E-04 | 3.32E-03 | 5.64E-04 | 1.91E-05 | 0.00E+00 | 8.79E-05 | 5.55E-05 |
| **Eutrophication – freshwater** | EP - F | kg P eq. | 1.20E-03 | 5.42E-06 | 2.04E-05 | 1.35E-05 | 1.29E-07 | 0.00E+00 | 1.30E-06 | 1.11E-06 |
| **Eutrophication – marine** | EP - M | kg N eq. | 5.14E-03 | 2.96E-04 | 6.78E-04 | 9.97E-05 | 7.04E-06 | 0.00E+00 | 3.83E-03 | 1.49E-05 |
| **Eutrophication – terrestrial** | EP - T | mol N eq. | 5.00E-02 | 3.14E-03 | 7.10E-03 | 1.05E-03 | 7.47E-05 | 0.00E+00 | 4.02E-04 | 1.53E-04 |
| **Photochemical ozone creation potential** | POCP | kg NMVOC eq. | 1.84E-02 | 1.13E-03 | 1.94E-03 | 2.94E-04 | 2.68E-05 | 0.00E+00 | 1.55E-04 | 4.49E-05 |
| **Abiotic depletion potential – minerals and metals** | ADP | kg Sb eq. | 2.90E-04 | 1.63E-08 | 2.62E-08 | 1.18E-09 | 3.89E-10 | 0.00E+00 | 3.87E-10 | 9.20E-09 |
| **Abiotic depletion potential – fossil fuels*** | ADPF | MJ | 9.63E+01 | 3.67E+00 | 5.62E+00 | 1.81E+00 | 8.73E-02 | 0.00E+00 | 1.34E-01 | 5.23E-02 |
| **Water Depletion Potential*** | WDP | m³ | 1.85E+00 | 5.22E-03 | 5.43E-02 | 1.70E-02 | 1.24E-04 | 0.00E+00 | 5.71E-04 | 4.04E-04 |

# ENVIRONMENTAL PERFORMANCE

## RESOURCE USE

Table 9 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life landfill scenario**

| Indicator | ABR | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **Use of renewable primary energy excluding renewable primary energy resources used as raw materials** | PERE | MJ | 6.07E+00 | 5.38E-03 | 3.91E-01 | 1.66E-01 | 1.28E-04 | 0.00E+00 | 5.52E-03 | 5.76E-01 |
| **Use of renewable primary energy resources used as raw materials** | PERM | MJ | 1.92E-01 | 0.00E+00 | -1.92E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Primary renewable energy – total** | PERT | MJ | 6.26E+00 | 5.38E-03 | 1.99E-01 | 1.66E-01 | 1.28E-04 | 0.00E+00 | 5.52E-03 | 5.76E-01 |
| **Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials** | PENRE | MJ | 5.90E+01 | 3.67E+00 | 6.11E+00 | 1.81E+00 | 8.73E-02 | 0.00E+00 | 3.60E+01 | 5.23E-02 |
| **Use of non-renewable primary energy resources used as raw materials** | PENRM | MJ | 3.73E+01 | 0.00E+00 | -4.92E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -3.68+01 | 0.00E+00 |
| **Primary non-renewable energy – total** | PENRT | MJ | 9.63E+01 | 3.67E+00 | 5.62E+00 | 1.81E+00 | 8.73E-02 | 0.00E+00 | 1.34E-01 | 5.23E-02 |
| **Use of secondary material** | SM | kg | 5.19E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of renewable secondary fuels** | RSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of non-renewable secondary fuels** | NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of net fresh water** | FW | $m^3$ | 4.70E-02 | 1.87E-04 | 1.98E-03 | 4.15E-04 | 4.46E-06 | 0.00E+00 | 2.57E-05 | 1.16E-05 |

## WASTE PRODUCTION

Table 9 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life landfill scenario**

| Indicator | ABR | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **Hazardous waste disposed** | HWD | kg | 2.56E-04 | 2.46E-05 | 1.20E-06 | 1.09E-06 | 5.85E-07 | 0.00E+00 | 7.02E-07 | 4.02E-07 |
| **Non-hazardous waste disposed** | NHWD | kg | 2.89E-01 | 9.63E-04 | 2.18E-02 | 4.31E-03 | 2.29E-05 | 0.00E+00 | 1.70E+00 | 8.88E-05 |
| **Radioactive waste disposed/stored** | RWD | kg | 6.93E-05 | 1.31E-07 | 1.92E-06 | 1.91E-06 | 3.12E-09 | 0.00E+00 | 1.08E-07 | 3.44E-08 |

# ENVIRONMENTAL PERFORMANCE

## OUTPUT FLOWS

Table 9 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life landfill scenario**

| Indicator | ABR | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **Components for reuse** | CRU | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for recycling** | MFR | kg | 0.00E+00 | 0.00E+00 | 1.60E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for energy recovery** | MFRE | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy – electricity** | EE - e | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy – thermal** | EE - t | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

## ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

Table 9 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life landfill scenario**

| Indicator | ABR | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **Global warming potential, excluding biogenic uptake, emissions and storage** | GWP-GHG | kg $CO_2$ eq | 5.11E+00 | 2.75E-01 | 5.08E-01 | 1.46E-01 | 6.55E-03 | 0.00E+00 | 1.43E-01 | 4.47E-03 |
| **Particulate matter** | PM | Disease incidence | 2.14E-07 | 1.84E-08 | 5.95E-08 | 5.00E-09 | 4.38E-10 | 0.00E+00 | 2.18E-09 | 7.62E-10 |
| **Ionising radiation – human health** | IRP | kBq U-235 eq | 2.84E-01 | 6.60E-04 | 7.95E-03 | 7.86E-03 | 1.57E-05 | 0.00E+00 | 4.50E-04 | 1.39E-04 |
| **Eco-toxicity – freshwater*** | ETP - fw | CTUe | 1.37E+01 | 1.93E+00 | 5.89E+00 | 7.89E-02 | 4.59E-02 | 0.00E+00 | 4.17E-01 | 2.45E-02 |
| **Human toxicity potential – cancer effects*** | HTP - c | CTUh | 1.46E-09 | 2.06E-11 | 1.06E-10 | 9.75E-12 | 4.89E-13 | 0.00E+00 | 1.52E-12 | 3.05E-12 |
| **Human toxicity potential – non cancer effects*** | HTP - nc | CTUh | 3.87E-08 | 1.98E-09 | 7.04E-09 | 2.58E-10 | 4.71E-11 | 0.00E+00 | 2.53E-10 | 3.44E-11 |
| **Soil quality*** | SQP | Pt | 1.73E+01 | 1.42E-02 | 3.67E-01 | 3.52E-01 | 3.37E-04 | 0.00E+00 | 2.99E-01 | 3.35E+00 |

# ENVIRONMENTAL PERFORMANCE

**EN 15804 + A1**

Table 9 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life landfill scenario**

| Indicator | ABR | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| **Global warming (GWP100a) – A1** | GWP100a - A1 | kg $CO_2$ eq | 5.10E+00 | 2.75E-01 | 4.92E-01 | 1.46E-01 | 6.55E-03 | 0.00E+00 | 1.44E-01 | 4.46E-03 |
| **Ozone layer depletion (ODP) – A1** | ODP - A1 | kg CFC-11 eq | 8.41E-06 | 2.98E-09 | 6.70E-06 | 4.37E-10 | 7.09E-11 | 0.00E+00 | 1.06E-10 | 5.92E-11 |
| **Acidification – A1** | AP - A1 | kg SO2 eq | 1.87E-02 | 6.04E-04 | 2.49E-03 | 2.19E-04 | 1.44E-05 | 0.00E+00 | 6.35E-05 | 4.33E-05 |
| **Eutrophication – A1** | EP - A1 | kg PO4 eq | 5.49E-03 | 1.21E-04 | 2.95E-04 | 7.77E-05 | 2.87E-06 | 0.00E+00 | 1.62E-03 | 8.77E-06 |
| **Photochemical oxidation – A1** | POCP - A1 | kg C2H4 eq | 1.08E-03 | 3.37E-05 | 8.54E-05 | 1.22E-05 | 8.02E-07 | 0.00E+00 | 2.41E-05 | 1.83E-06 |
| **Abiotic depletion – A1** | ADPE - A1 | kg Sb eq | 2.90E-04 | 1.64E-08 | 2.90E-08 | 1.58E-09 | 3.89E-10 | 0.00E+00 | 4.05E-10 | 9.21E-09 |
| **Abiotic depletion (fossil fuels) – A1** | ADPF - A1 | MJ | 1.01E+02 | 3.61E+00 | 5.25E+00 | 2.10E+00 | 8.59E-02 | 0.00E+00 | 1.35E-01 | 1.53E-02 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

Due to the uncertainty surrounding A4 distribution, additional environmental information has been provided detailing the impacts of delivering 1m² of packaged product over 100km via different transport modes. This is intended to facilitate customised impact calculations.

Table 10: **Environmental impact of distributing per m² of EchoFlex over 100km by different transport modes**

| Indicator | ABR | Unit | By road | By sea | By Air |
|---|---|---|---|---|---|
| **Global warming potential – total** | GWP – T | kg $CO_2$ eq. | 2.51E-02 | 1.06E-03 | 1.27E-01 |
| **Global warming potential – fossil** | GWP - F | kg $CO_2$ eq. | 2.51E-02 | 1.06E-03 | 1.27E-01 |
| **Global warming potential – biogenic** | GWP - B | kg $CO_2$ eq. | 1.49E-06 | 5.71E-08 | 6.93E-06 |
| **Global warming potential – land use/land transformation** | GWP - L | kg $CO_2$ eq. | 8.61E-07 | 3.56E-08 | 3.98E-06 |
| **Ozone depletion potential** | ODP | kg CFC 11 eq. | 3.42E-10 | 1.59E-11 | 1.97E-09 |
| **Acidification potential** | AP | mol H+ eq. | 7.33E-05 | 3.02E-05 | 5.44E-04 |
| **Eutrophication – freshwater** | EP - F | kg P eq. | 4.94E-07 | 6.40E-09 | 6.96E-07 |
| **Eutrophication – marine** | EP - M | kg N eq. | 2.70E-05 | 6.92E-06 | 2.23E-04 |
| **Eutrophication – terrestrial** | EP - T | mol N eq. | 2.86E-04 | 7.68E-05 | 2.39E-03 |
| **Photochemical ozone creation potential** | POCP | kg NMVOC eq. | 1.03E-04 | 2.07E-05 | 7.43E-04 |
| **Abiotic depletion potential – minerals and metals** | ADP | kg Sb eq. | 1.49E-09 | 1.15E-11 | 4.35E-09 |
| **Abiotic depletion potential – fossil fuels** | ADPF | MJ | 3.34E-01 | 1.31E-02 | 1.68E+00 |
| **Water depletion potential*** | WDP | $m^3$ | 4.76E-04 | 1.15E-05 | 2.06E-03 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

## RESOURCE USE

Table 10 (*continued*): **Environmental impact of distributing per m² of EchoFlex over 100km by different transport modes**

| Indicator | ABR | Unit | By road | By sea | By Air |
|---|---|---|---|---|---|
| **Use of renewable primary energy excluding renewable primary energy resources used as raw materials** | PERE | MJ | 4.90E-04 | 2.19E-05 | 2.63E-03 |
| **Use of renewable primary energy resources used as raw materials** | PERM | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Primary renewable energy – total** | PERT | MJ | 4.90E-04 | 2.19E-05 | 2.63E-03 |
| **Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials** | PENRE | MJ | 3.34E-01 | 1.31E-02 | 1.68E+00 |
| **Use of non- renewable primary energy resources used as raw materials** | PENRM | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Primary non renewable energy – total** | PENRT | MJ | 3.34E-01 | 1.31E-02 | 1.68E+00 |
| **Use of secondary material** | SM | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of renewable secondary fuels** | RSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of non-renewable secondary fuels** | NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of net fresh water** | FW | m3 | 1.71E-05 | 4.93E-07 | 7.86E-05 |

## WASTE PRODUCTION

Table 10 (*continued*): **Environmental impact of distributing per m² of EchoFlex over 100km by different transport modes**

| Indicator | ABR | Unit | By road | By sea | By Air |
|---|---|---|---|---|---|
| **Hazardous waste disposed** | HWD | kg | 2.24E-06 | 6.20E-08 | 1.12E-05 |
| **Non-hazardous waste disposed** | NHWD | kg | 8.78E-05 | 7.86E-07 | 9.40E-05 |
| **Radioactive waste disposed/stored** | RWD | kg | 1.20E-08 | 5.50E-10 | 6.91E-08 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

## OUTPUT FLOWS

Table 10 (*continued*): **Environmental impact of distributing per m² of EchoFlex over 100km by different transport modes**

| Indicator | ABR | Unit | By road | By sea | By Air |
|---|---|---|---|---|---|
| **Components for reuse** | CRU | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for recycling** | MFR | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for energy recovery** | MFRE | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy – electricity** | EE - e | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy – thermal** | EE - t | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 |

## ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

Table 10 (*continued*): **Environmental impact of distributing per m² of EchoFlex over 100km by different transport modes**

| Indicator | ABR | Unit | By road | By sea | By Air |
|---|---|---|---|---|---|
| **Global warming potential, excluding biogenic uptake, emissions and storage** | GWP-GHG | kg $CO_2$ eq | 2.51E-02 | 1.06E-03 | 1.27E-01 |
| **Particulate matter** | PM | Disease incidence | 1.68E-09 | 2.40E-11 | 9.53E-10 |
| **Ionising radiation – human health**** | IRP | kBq U-235 eq | 6.02E-05 | 2.75E-06 | 3.39E-04 |
| **Ecotoxicity – freshwater*** | ETP - fw | CTUe | 1.76E-01 | 6.28E-03 | 8.10E-01 |
| **Human toxicity potential – cancer effects*** | HTP - c | CTUh | 1.87E-12 | 1.58E-13 | 6.25E-12 |
| **Human toxicity potential – non cancer effects*** | HTP - nc | CTUh | 1.81E-10 | 2.58E-12 | 1.34E-09 |
| **Soil quality*** | SQP | Pt | 1.29E-03 | 1.82E-05 | 2.27E-03 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

**EN 15804+A1**

Table 10 (*continued*): **Environmental impact of distributing per m² of EchoFlex over 100km by different transport modes**

| Indicator | ABR | Unit | By road | By sea | By Air |
|---|---|---|---|---|---|
| **Global warming (GWP100a) – A1** | GWP (A1) | kg $CO_2$ eq | 2.51E-02 | 1.06E-03 | 1.27E-01 |
| **Ozone layer depletion (ODP) – A1** | ODP (A1) | kg CFC-11 eq | 2.72E-10 | 1.26E-11 | 1.56E-09 |
| **Acidification – A1** | AP (A1) | kg SO2 eq | 5.51E-05 | 2.44E-05 | 3.99E-04 |
| **Eutrophication – A1** | EP (A1) | kg PO4-eq | 1.10E-05 | 2.39E-06 | 7.72E-05 |
| **Photochemical oxidation – A1** | POCP (A1) | kg C2H4 eq | 3.07E-06 | 6.85E-07 | 1.23E-05 |
| **Abiotic depletion – A1** | ADPE (A1) | kg Sb eq | 1.49E-09 | 1.16E-11 | 4.36E-09 |
| **Abiotic depletion (fossil fuels) – A1** | ADPF (A1) | MJ | 3.29E-01 | 1.27E-02 | 1.63E+00 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

Waste to Energy Scenario is only applicable to European markets. The impacts at end-of-life stage (Module C) and corresponding benefits and loads beyond system boundary (Module D) are different from the landfill scenario. Only the module impacts that differ are reported here, focusing on regional variations. For Modules A1-A3, A4, and A5, please refer to the results presented in the previous section.

Table 11: **Environmental impact per m² of installed EchoFlex – End-of-life W2E scenario**

| Indicator | ABR | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **Global warming potential – total** | GWP-T | kg $CO_2$ eq. | 1.46E-01 | 6.55E-03 | 3.50E+00 | 0.00E+00 | -3.66E+00 |
| **Global warming potential – fossil** | GWP-Fossil | kg $CO_2$ eq. | 1.46E-01 | 6.55E-03 | 3.50E+00 | 0.00E+00 | -3.64E+00 |
| **Global warming potential – biogenic** | GWP-B | kg $CO_2$ eq. | 3.33E-04 | 3.88E-07 | 1.93E-05 | 0.00E+00 | -2.06E-02 |
| **Global warming potential – land use/land transformation** | GWP-Luluc | kg $CO_2$ eq. | 2.49E-05 | 2.25E-07 | 4.69E-06 | 0.00E+00 | -9.20E-03 |
| **Ozone depletion potential** | ODP | kg CFC 11 eq. | 5.30E-10 | 8.94E-11 | 8.82E-10 | 0.00E+00 | -5.94E-08 |
| **Acidification potential** | AP | mol H+ eq. | 5.64E-04 | 1.91E-05 | 6.44E-04 | 0.00E+00 | -1.78E-02 |
| **Eutrophication – freshwater** | EP-F2 | kg P eq. | 1.35E-05 | 1.29E-07 | 3.01E-06 | 0.00E+00 | -3.36E-03 |
| **Eutrophication – marine** | EP-M | kg N eq. | 9.97E-05 | 7.04E-06 | 4.39E-04 | 0.00E+00 | -3.14E-03 |
| **Eutrophication – terrestrial** | EP-T | mol N eq. | 1.05E-03 | 7.47E-05 | 3.50E-03 | 0.00E+00 | -2.71E-02 |
| **Photochemical ozone creation potential** | POCP | kg NMVOC eq. | 2.94E-04 | 2.68E-05 | 8.55E-04 | 0.00E+00 | -8.69E-03 |
| **Abiotic depletion potential – minerals and metals** | ADP | kg Sb eq. | 1.18E-09 | 3.89E-10 | 1.92E-08 | 0.00E+00 | -2.16E-07 |
| **Abiotic depletion potential – fossil fuels** | ADPF | MJ | 1.81E+00 | 8.73E-02 | 3.67E-01 | 0.00E+00 | -8.58E+01 |
| **Water depletion potential** | WDP | $m^3$ | 1.70E-02 | 1.24E-04 | -8.96E-03 | 0.00E+00 | -8.58E-01 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

## RESOURCE USE

Table 11 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life W2E scenario**

| Indicator | ABR | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **Use of renewable primary energy excluding renewable primary energy resources used as raw materials** | PERE | MJ | 1.66E-01 | 1.28E-04 | 4.17E-03 | 0.00E+00 | -1.82E+01 |
| **Use of renewable primary energy resources used as raw materials** | PERM | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Primary renewable energy – total** | PERT | MJ | 1.66E-01 | 1.28E-04 | 4.17E-03 | 0.00E+00 | -1.82E+01 |
| **Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials** | PENRE | MJ | 1.81E+00 | 8.73E-02 | 3.72E+01 | 0.00E+00 | -8.58E+01 |
| **Use of non-renewable primary energy resources used as raw materials** | PENRM | MJ | 0.00E+00 | 0.00E+00 | -3.68E+01 | 0.00E+00 | 0.00E+00 |
| **Primary non-renewable energy – total** | PENRT | MJ | 1.81E+00 | 8.73E-02 | 3.67E-01 | 0.00E+00 | -8.58E+01 |
| **Use of secondary material** | SM | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of renewable secondary fuels** | RSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of non-renewable secondary fuels** | NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of net fresh water** | FW | $m^3$ | 4.15E-04 | 4.46E-06 | -5.65E-05 | 0.00E+00 | -6.52E-02 |

## WASTE PRODUCTION

Table 11 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life W2E scenario**

| Indicator | ABR | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **Hazardous waste disposed** | HWD | kg | 1.09E-06 | 5.85E-07 | 4.02E-06 | 0.00E+00 | -9.56E-05 |
| **Non-hazardous waste disposed** | NHWD | kg | 4.31E-03 | 2.29E-05 | 4.35E-02 | 0.00E+00 | -1.01E-01 |
| **Radioactive waste disposed/stored** | RWD | kg | 1.91E-06 | 3.12E-09 | 5.38E-08 | 0.00E+00 | -6.28E-04 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

## OUTPUT FLOWS

Table 11 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life W2E scenario**

| Indicator | ABR | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **Components for reuse** | CRU | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for recycling** | MFR | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for energy recovery** | MFRE | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy – electricity** | EE - e | MJ | 0.00E+00 | 0.00E+00 | 4.75E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy – thermal** | EE - t | MJ | 0.00E+00 | 0.00E+00 | 9.30E+00 | 0.00E+00 | 0.00E+00 |

## ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

Table 11 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life W2E scenario**

| Indicator | ABR | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **Global warming potential, excluding biogenic uptake, emissions and storage** | GWP-GHG | kg $CO_2$ eq | 1.46E-01 | 6.55E-03 | 3.50E+00 | 0.00E+00 | -3.66E+00 |
| **Particulate matter** | PM | Disease incidence | 5.00E-09 | 4.38E-10 | 3.15E-09 | 0.00E+00 | -4.96E-08 |
| **Ionising radiation – human health** | IRP | kBq U-235 eq | 7.86E-03 | 1.57E-05 | 2.14E-04 | 0.00E+00 | -2.45E+00 |
| **Ecotoxicity – freshwater** | ETP – fw | CTUe | 7.89E-02 | 4.59E-02 | 1.82E+00 | 0.00E+00 | -8.08E+00 |
| **Human toxicity potential – cancer effects** | HTP – c | CTUh | 9.75E-12 | 4.89E-13 | 1.21E-10 | 0.00E+00 | -5.79E-10 |
| **Human toxicity potential – non cancer effects** | HTP – nc | CTUh | 2.58E-10 | 4.71E-11 | 1.04E-08 | 0.00E+00 | -2.44E-08 |
| **Soil quality** | SQP | Pt | 3.52E-01 | 3.37E-04 | 2.51E-02 | 0.00E+00 | -7.35E+00 |

# ADDITIONAL ENVIRONMENTAL INFORMATION

**EN 15804 + A1**

Table 11 (*continued*): **Environmental impact per m² of installed EchoFlex – End-of-life W2E scenario**

| Indicator | ABR | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| **Global warming (GWP100a) – A1** | GWP100a – A1 | kg $CO_2$ eq | 1.46E-01 | 6.55E-03 | 3.50E+00 | 0.00E+00 | -3.66E+00 |
| **Ozone layer depletion (ODP) – A1** | ODP – A1 | kg CFC-11 eq | 4.37E-10 | 7.09E-11 | 7.96E-10 | 0.00E+00 | -4.95E-08 |
| **Acidification – A1** | AP – A1 | kg SO2 eq | 2.19E-04 | 1.44E-05 | 4.41E-04 | 0.00E+00 | -1.51E-02 |
| **Eutrophication – A1** | EP – A1 | kg PO4 eq | 7.77E-05 | 2.87E-06 | 2.14E-04 | 0.00E+00 | -1.14E-02 |
| **Photochemical oxidation – A1** | PO – A1 | kg C2H4 eq | 1.22E-05 | 8.02E-07 | 5.62E-06 | 0.00E+00 | -6.60E-04 |
| **Abiotic depletion – A1** | ADP – A1 | kg Sb eq | 1.58E-09 | 3.89E-10 | 1.92E-08 | 0.00E+00 | -3.23E-07 |
| **Abiotic depletion (fossil fuels) – A1** | ADPF – A1 | MJ | 2.10E+00 | 8.59E-02 | 3.92E-01 | 0.00E+00 | -5.40E+01 |

# REFERENCES

ALCAS. (2023). Australian Life Cycle Inventory (AusLCI) – v1.42.

ISO. (2013). EN 15804:2012+A1:2013; Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. Brussels: European Committee for.

ISO. (2019). EN 15804:2012+A2:2019; Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products. Brussels: European Committee for.

EPD International. (2021). General Programme Instructions of the International EPD System, version 4.0.

EPD International. (2024). Product Category Rules (PCR) 2019:14, v1.3.4. EPD International.

Frischknecht, R. (2007). The Environmental Relevance of Capital Goods in Life Cycle Assessments of Products and Services. Int. J LCA.

Instructions of the Australasian EPD Programme – a Regional Annex to the General Programme Instructions. (2024) Version 4.2.

ISO. (2006). ISO 14025:2006 – Environmental labels and declarations – Type III environmental declarations – Principles and procedures. Geneva: International Organization for Standardization (ISO).

ISO. (2006). ISO 14040:2006. Environmental management – Life cycle assessment – Principles and framework. Geneva: International Organization for Standardization.

ISO. (2006). ISO 14044:2006. Environmental management – Life cycle assessment – Requirements and guidelines. Geneva: International Organization for Standardization.

PRe Sustainability. (2023). SimaPro. v9.6. Retrieved from https://simapro.com/

ProCarton. (n.d.). Cartonboard packaging's approach to fossil and biogenic carbon.

Quantis. (2020). Biogenic Carbon Footprint Calculator for Harvested Wood Products. World Wildlife Fund.

Rabinovich, E. B., & Summers, J. W. (2005, February 15). United States Patent. Weather resistant plastic composites capped with polyethylene terephthalate glycol (PETG) for outdoor exposures.

The British Standards Institution. (2021). EN 15804:2012+A2:2019. BSI Standards Limited 2020.

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., & & Weidema, B. (2023). The ecoinvent database version 3.9.1.