DYNEX PALLISIDE®

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

ENVIRONMENTAL PRODUCT DECLARATION

uPVC WEATHERBOARDS

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

Programme:	EPD Australasia www.epd-australiasia.com
Programme operator:	EPD Australasia
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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 www.environdec.com

Geographical area of application of this EPD:	New Zealand
Year taken as reference for the data:	CY 2019 - 1st Jan 2019 to 31st December 2019

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General Information

Programme information

An Environmental Product Declaration, or 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 PCR (Product Category Rules).

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Declaration owner

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Accredited or approved by

EPD Australasia

CEN standard EN 15804 served as the core PCR

PCR:	Construction products (2019:14), Version 1.11
PCR prepared by:	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. The review panel may be contacted via info@environdec.com. Review chair: Claudia A. Peña, University of Concepción, Chile.
Independent external verification of the declaration and data, according to ISO 14025:2006	EPD verification (External)
Procedure for follow-up of data during EPD validity involves third party verifier:	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.

Company information

Dynex Extrusions Limited (Dynex) is a leader in building solutions. They manufacture plastic extrusions, building products and plastic compounds for the building and construction industry since their foundation in 1977. Dynex products are proudly made in New Zealand, with products designed to enhance the look and performance of New Zealand homes. In particular, Dynex manufactures Palliside® weatherboards, a popular exterior cladding that is designed to be durable, attractive and low maintenance. Palliside® weatherboards have a proven track record of close to 30 years in the marketplace and continue to perform reliably well against these traits.

Certifications::

- ISO 9001:2015
- ISO14001:2015

Product information

Product name: Palliside® Weatherboards

Geographical scope: New Zealand

Product description: Palliside® weatherboards are designed as a durable engineered alternative to timber weatherboards. The system creates a weathertight, protective cladding system for homes. They are a cost effective solution that is designed to be long lasting with minimal maintenance.

The Palliside® weatherboards are available in three styles – traditional, rusticated smooth and rusticated woodgrain. The weatherboards are made of exactly the same materials but have different shaped designs to suit different building aesthetics. The traditional weatherboard has a bevel-back shape with a smooth finish, and the rusticated weatherboards have a shiplap shape. While the rusticated smoth and rusticated woodgrain weatherboards have the same shape, the latter has an embossed woodgrain textured finish on the surface.

Palliside® weatherboards come in a range of colours. The most common colour choices are slate and white. The results presented in this EPD are a weighted average of coloured and white weatherboard inputs, based on production volumes. Slate is the most popular coloured option and the pigmentation for the other colours uses the same type of pigment. The materials required for the slate colour option was assumed as an appropriate proxy for all non-white coloured products.

Profiles

Traditional

Clean lines and the enduring bevel-back weatherboard shape make this style a Kiwi favourite.

Rusticated Smooth

Straight lines and concave curves make this a stylish alternative to traditional weatherboard.

Rusticated Woodgrain

Rusticated profile with embossed woodgrain texture for a more rustic appearance.

Colours

Slate	White	Riverstone
Tea	Calico*	Sandstone*

*Made to order - lead times apply.

Product identification:

Specific product characteristics are shown in Table 1 and the content declaration in Table 2.

Table 1 - Product Characteristics of Palliside weatherboards

Product characteristics	
Product names	The Palliside® weatherboards covered in this EPD are - Palliside® Traditional Weatherboard - Palliside® Rusticated Smooth Weatherboard - Palliside® Rusticated Woodgrain Weatherboard
UN CPC Code	36910 – wall or ceiling coverings of plastic
Product weight	5.5 – 6.1 kg/m^2
Dimensions	Traditional 6.3m(l) x 260mm(w) x 21mm(d) Rusticated 6.3m(l) x 260mm(w) x 18mm(d)
Colour options	Slate and white

Table 2 - Content Declaration for 1m² Palliside® Weatherboard

Product components	Traditional	Rusticated	Post-consumer material, weight-%	Renewable material, weight-%	CAS #
PVC Resin	82 - 83%	82 - 83%	0.00	0.00	9002-86-2
Stabilisers	<1%	<1%	0.00	0.00	Proprietary
Lubricants	1.5 - 2.0%	1.5 - 2.0%	0.00	0.00	Mixture, proprietary
Acrylic processing aids	5 - 7%	5 - 7%	0.00	0.00	Proprietary
Filler (calcium carbonate)	4 - 5%	4 - 5%	0.00	0.00	1317-65-3
Titanium dioxide	2.0%	2.0%	0.00	0.00	13463-67-7
Foaming agent	<1%	<1%	0.00	0.00	Mixture, proprietary
Other pigments	<0.5%	<0.5%	0.00	0.00	Mixture
TOTAL	**100%**	**100%**	**0.00%**	**0.00%**	

Packaging materials	Traditional (kg)	Rusticated (kg)	Post-consumer material, weight-%	Renewable material, weight-%
Plastic film	0.08	0.08	0.0	0.0
Steel strap	0.03	0.03	0.0	0.0
Sellotape	0.004	0.004	0.0	0.0
Cardboard	0.10	0.10	0.0	0.0
Pallet	1.73	1.73	0.0	0.0

None of the products contain substances listed in the “Candidate List of Substances of Very High Concern for authorisation”. According to the PCR 2019:14, if one or more substances of the “Candidate List of Substances of Very High Concern (SVHC) for authorisation” are present in a product and their total content exceeds 0.1% of the weight of the product, they need to be reported.

Product life cycle overview

The life cycle of a building product is divided into three process modules according to the General Program 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. Table 3 shows the system boundary and scope of the EPD. The scope of this EPD is cradle to gate with modules A1-A3, module C, module D and optional modules A4-A5 and B2.

Table 3 - Scope of assessment and system boundary

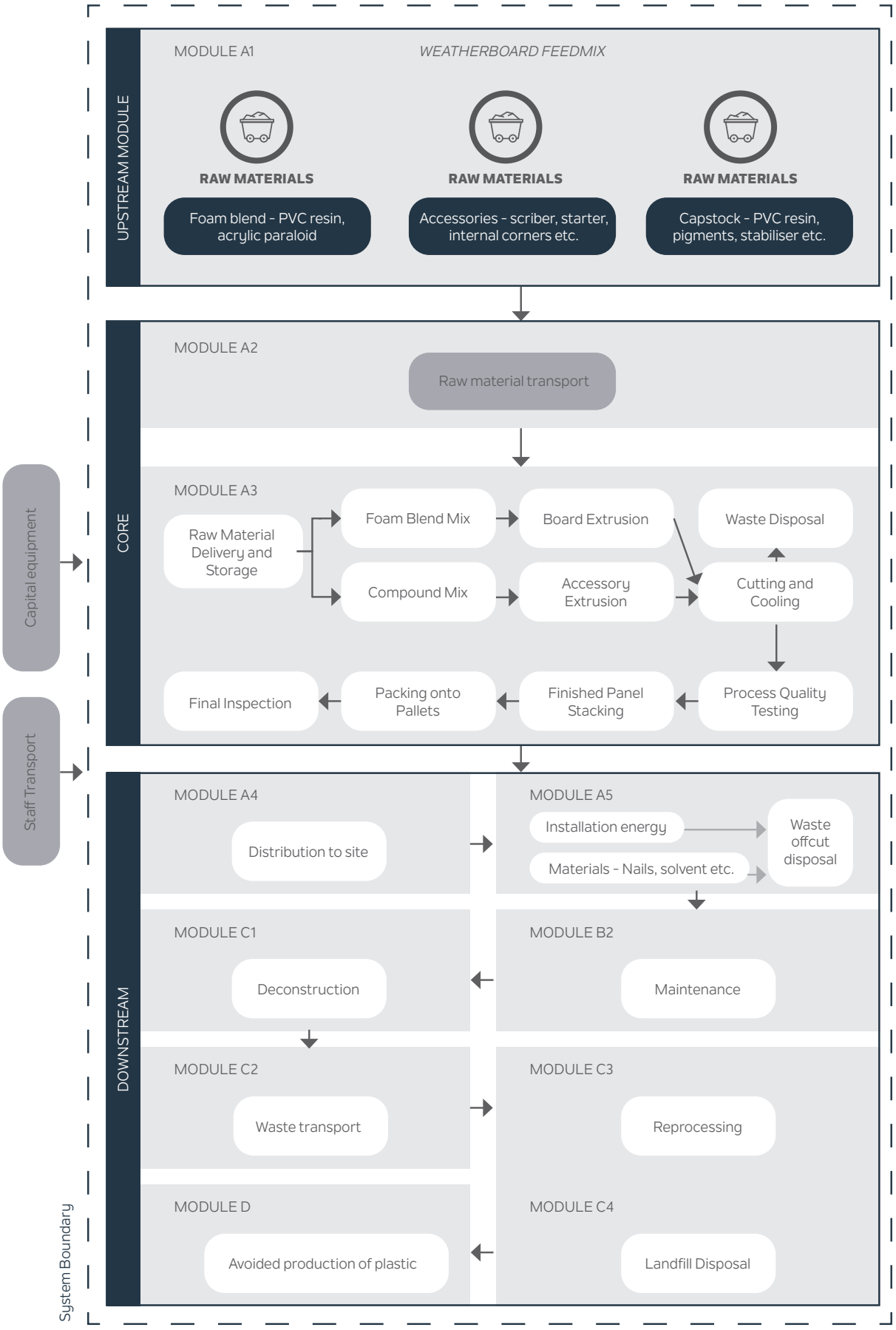
	Product stage			Construction		Use stage							End of life stage				Resource Recovery
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste 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	MND	X	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	Global	NZ	NZ	NZ	NZ		NZ						NZ	NZ	NZ	NZ	NZ
Specific data used	>90%	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Variation products	<10%	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Variation sites	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

X = module included in EPD

MND = module not declared (does not indicate zero impact results)

NZ – New Zealand

Figure 1 - System diagram



Manufacture of Palliside® weatherboards

The Palliside® weatherboard system is comprised of three elements – a foam blend as the inner core, an outer capstock and accessories to complete the weatherboard system. The weatherboards are manufactured primarily from PVC resin along with additives including acrylic processing acid, calcium carbonate and titanium dioxide. The capstock layer contains pigments to prevent UV damage and create a durable, low maintenance outer. Some lubricants, stabilisers and other chemicals are added to provide the required performance qualities such as stability and strength.

A number of accessories are manufactured using the same compound as the capstock and follow the same extrusion process. While these accessories are available in both white and slate colours, the accessories were modelled based on the capstock white material. The same compound mix is used for both the capstock and the accessories. These accessories are used as part of the weatherboard system such as for corner and window junctions and finishes, to provide for durability and a seamless look. Examples of these accessories include 90° and 135° corners, below window capping and flat boxed joiners, etc.

The feed mix for the foam blend and the compound are both heated and mixed prior to extrusion and then cooled with water to form the required structure. These panels are then inspected for quality before being packed onto pallets and distributed. Dynex has one manufacturing site based in Avondale, Auckland, New Zealand. The results shown in this EPD represent the weighted average Palliside® weatherboard system in both Traditional and Rusticated styles, incorporating both slate and white colour options. There is negligible difference between the Rusticated Smooth and Rusticated Woodgrain styles.

Packaging materials and waste

Packaging materials such as plastic film, steel straps and cardboard boxes are used to protect the product during distribution. The wooden pallets used to transport the produced weatherboards are designed to be single-use and made with softwood for light duty. Dynex has optimised the manufacturing process to minimise waste offcuts, with total waste accounting for approximately 7% of total material inputs. These waste product offcuts are currently processed and used in other PVC products manufactured by the parent company (Aliaxis) and subsidiary companies, such as Marley pipes.

Distribution Stage

Palliside® weatherboards are distributed across both North and South Islands within New Zealand. Distances were calculated based on the proportion of total products distributed to each city and the estimated distance by truck and ship to each of these cities. The weighted average was 279 km by truck and 10 km by ship.

Installation Stage

The installation of Palliside® weatherboards is similar to timber and can be cut and nailed using a variety of standard building equipment such as circular saws, jig saws and other power tools. Base accessories, including starter pieces, corner base pieces, and the two-part jointer base, are fixed into place prior to the installation of weatherboards. Once in place, the weatherboard can be nailed in, with the weatherboard trimmed to size where required. Aluminium joinery is generally fixed in place prior to the installation of the Palliside®. Waste offcuts during the installation process is estimated to 5% of the product system, with 20% of total waste collected by Dynex for recycling into other PVC products such as pipes. The remainder is sent to landfill.

Use Stage

The product maintenance guide published by Dynex recommends that weatherboards are washed down annually. Cleaning the weatherboards simply requires a wet cloth and warm soapy water. Solvent-based or abrasive cleaners are not recommended.

End of Life

The deconstruction of a weatherboard system is a simple process using standard building equipment, for example, a 1600w power saw. There is limited data on the recycling of the weatherboard system as they have an anticipated lifespan in excess of 50 years. PVC resin is the primary material used in the manufacture of Palliside® weatherboards and is 100% recyclable and a viable resource that deserves a second life. Dynex is committed to minimising waste and working towards the sustainable use of PVC with their distributors and customers. To the author's knowledge, there is no information on New Zealand's national PVC recycling rates and so recycling was based on Australian based evidence.

Currently, most PVC entering the waste stream is short offcut pieces. The most detailed known study of construction and demolition waste in Australia was conducted in NSW by the then Department of Environment and Climate Change (DECC). This study estimated around 600,000 tonnes of construction and demolition (C&D) waste is sent to landfill each year. Of this, around 13,000 tonnes consisted of plastic materials of all types, with approximately 65% estimated to be PVC. A 2011 case study by the then Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) estimated that 300-400 tonnes of PVC was being recycled annually in Sydney and Melbourne (DSEWPC, 2012). These figures provide an estimated range for the recycling rate of 15.4 – 61.5%. The middle of each estimate range would give 27%. With a lack of any better data, it was decided that a default rate of 27% would be used. This is considered a conservative estimate, as the situation is likely to change in the decades ahead, particularly with advocacy from the Vinyl Council of Australia and their PVC stewardship program.

Life Cycle Assessment Methodology

This section includes the main details of the LCA study as well as assumptions and methods of the assessment.

Table 4 - Details of LCA

Declared unit	1m^2 installed weatherboard system
Reference service life:	50 years. This is a conservative estimate based on the current performance of Palliside® weatherboard systems in the marketplace and the lifetime of preceding products such as Marley PVC cladding, which was manufactured using similar materials.
Geographical coverage:	New Zealand
Time representativeness:	Production data from 1 Jan 2019 – 31 Dec 2019

Core data collection

Lifecycle data has been sourced from material quantity data and production process data provided by Dynex. Energy and water consumption at the Dynex manufacturing site was allocated based on mass of weatherboard produced.

Background data

Generic background data was sourced for raw materials in the upstream module, transportation and end of life waste treatment. Background data was adapted to represent the weatherboard product as accurately as possible.

Database(s) and LCA software used:
The inventory data for the process are entered into the SimaPro LCA software program (v9.4.0.1) and linked to the pre-existing data for the upstream feedstocks and services selected in order of preference from:

- The Australian Life Cycle Inventory (AusLCI) v1.36 compiled by the Australian Life Cycle Assessment Society (Australian Life Cycle Assessment Society (ALCAS), 2021) and the Australasian Unit Process LCI v2014.09. The processes selected from the AusLCI database for this report range were last updated in 2020, and the processed selected from the Australasian Unit Process LCI were last updated between 2013-2014.
- Global averages from the Ecoinvent v3.8, 2021 database, where necessary adapted for relevance (energy sources, transport distances and modes and so on). The processes selected from the Ecoinvent database were last updated between 2015-2021.
- Other sources with sensitivity analysis reported to show the significance of this data for the results and conclusions drawn.

Data quality and validation

The following criteria was used in selecting data for modelling:

- **Relevance:** select sources, data, and methods appropriate to assessing the chosen product's LCI,
- **Completeness**: include all LCI items that provide a material's contribution to a product's life cycle emissions,
- **Consistency:** enable meaningful comparisons in life cycle impact assessment (LCIA) information
- **Accuracy:** reduce bias and uncertainty as far as is practical,
- **Transparency:** when communicating, disclose enough information to allow third parties to make decisions,
- **Time coverage:** the data collected represents recent practice for the construction of the project, and
- **Geographical coverage:** the data collected are representative of the sourcing of materials, whether from Australia or overseas, and are in line with the goal of the study.

Cut-off rules

According to the PCR 2019:14 and EN15804 A2, life cycle inventory data shall 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. In accordance with the PCR 2019:14, the following system boundaries are applied to manufacturing equipment and employees:

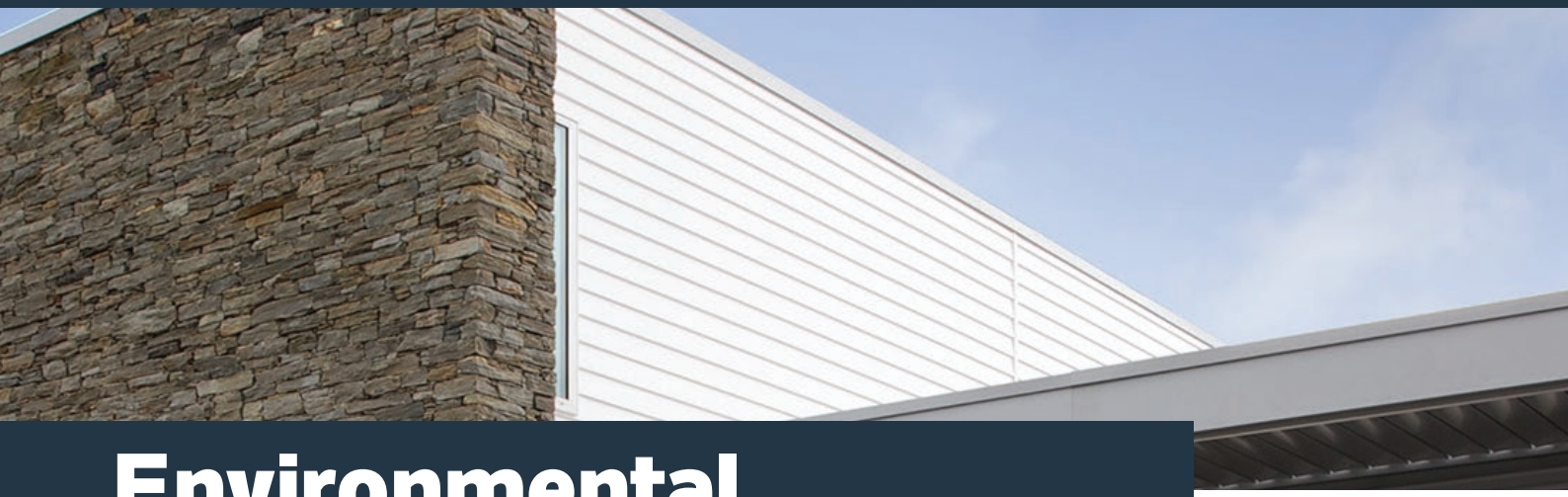
- Environmental impact from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI. Capital equipment and buildings typically account for less than a few percent of nearly all LCIs and this is usually smaller 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.
- Transport for raw materials accounting for less than 1% of the feedmix was excluded. This is because the impact contribution is considerably small.

Allocation

Allocation was carried out in accordance with the PCR section 4.5. There are no co-products created during the manufacturing process and no allocation was required. Energy and water consumed during manufacturing was allocated to the weatherboards based on mass of weatherboard produced.

Variation

The total impacts calculated were based on a split between slate and white colour options, calculated based on total production volumes from each colour option. The difference in Global Warming Potential – Total (GWP-T) between the two colours was 0.4% for both traditional and rusticated products. Differences ranged from -0.3% - 1.8% for all other indicators. As such, the weighted average of colour options has minimal impact on final results. Note slate is the most popular coloured option and so the materials required for the slate colour option were assumed as an appropriate proxy for all non-white coloured products.



Environmental Information

The potential environmental impact indicators used in this EPD are explained in the following table.

Table 5 - Environmental indicators used in the EPD

	Impact category	Abbreviation	Unit	Definition	Assessment Method
Core environmental impact	Global warming potential - Fossil	GWP - F	kg CO_2 eq	Estimates GHG warming effect for fossil, given as kgCO_2-eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
	Global warming potential - Biogenic	GWP - B	kg CO_2 eq	Estimates GHG warming effect for biogenic, given as kgCO_2-eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
	Global warming potential - Land use and Land use change	GWP - Luluc	kg CO_2 eq	Estimates GHG warming effect for land use and land use change, given as kgCO_2-eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
	Global warming potential - Total	GWP - T	kg CO_2 eq	Estimates the total GHG warming effect, given as kgCO_2-eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
	Ozone depletion potential	ODP	kg CFC 11 eq.	Estimates the potential reduction of ozone in Earth's atmosphere as per CFC-11 eq effects.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008
	Acidification potential	AP	mol H^+ eq	Estimates the increase of oceans acidity	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe[1]
	Eutrophication, freshwater	EP - F	kg P eq.	Estimates the potential increment of nutrients in freshwater as kg P equivalent effects.	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
	Eutrophication, marine	EP - M	kg N eq.	Estimates the potential increment of nutrients in marine water as kg N equivalent effects.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al.
	Eutrophication, terrestrial	EP – T	mol N eq.	Estimates the potential increment of nutrients in land as mol N equivalent effects.	LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe
	Photochemical ozone formation	POCP	kg NMVOC eq.	Estimates photochemical smog (air pollution) potential as kg NMVOC eq	CML (v4.1)
	Abiotic depletion potential - minerals and metals	ADP	kg Sb eq.	Estimates the impact on minerals reserves as antimony (Sb) equivalents	CML (v4.1)
	Abiotic depletion potential - Fossil	ADP - F	MJ	Estimates the impact on fossil fuels reserves as MJ	Steady-state ODPs, WMO 2014
	Water depletion Potential	WDP	m^3 eq	Estimates the potential of water deprivation, to either humans or ecosystems, and serves in calculating the impact score of water consumption at midpoint in LCA or to calculate a water scarcity footprint as per ISO 14046.	Available WAter REmaining (AWARE) Boulay et al., 2016

	Impact category	Abbreviation	Unit	Definition	Assessment Method
Resource Use	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ	Estimates the use of renewable primary energy excluding renewable primary energy resources used as raw materials	ecoinvent v3.8 and expanded by PRé Consultants[2]
	Use of renewable primary energy resources used as raw materials	PERM	MJ	Estimates the use of renewable primary energy resources used as raw materials	Manual for direct inputs[3]
	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ	Estimates the total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	ecoinvent v3.8 and expanded by PRé Consultants
	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ	Estimates the use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	Manual for direct inputs[4]
	Use of non- renewable primary energy resources used as raw materials	PENRM	MJ	Estimates the use of non-renewable primary energy resources used as raw materials	ecoinvent v3.8 and expanded by PRé Consultants
	Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ	Estimates the total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	ecoinvent v3.8 and expanded by PRé Consultants[5]
	Use of secondary material	SM	kg	Estimates the use of secondary material	Manual for direct inputs
	Use of renewable secondary fuels	RSF	MJ	Estimates the use of renewable secondary fuels	Manual for direct inputs
	Use of non-renewable secondary fuels	NRSF	MJ	Estimates the use of non-renewable secondary fuels	Manual for direct inputs
	Use of net fresh water	FW	m^3	Estimates the use of net fresh water	ReCiPe 2016
Waste	Hazardous waste disposed	HWD	kg	Estimates the hazardous waste disposed	EDIP 2003 (v1.05)
	Non-hazardous waste disposed	NHWD	kg	Estimates the non-hazardous waste disposed	EDIP 2003 (v1.05)[6]
	Radioactive waste disposed/ stored	RWD	kg	Estimates the radioactive waste disposed/stored	EDIP 2003 (v1.05)

[2] Method to calculate Cumulative Energy Demand (CED), based on the method published by ecoinvent and expanded by PRé Consultants for raw materials available in the SimaPro database.
[3] Calculated based on the lower heating value of renewable raw materials.
[4] Calculated based on the lower heating value of non-renewable raw materials.
[5] Calculated as sum of Non-renewable, fossil, Non-renewable, nuclear and Non-renewable, biomass.
[6] Calculated as sum of Bulk waste and Slags/ash.

	Impact category	Abbreviation	Unit	Definition	Assessment Method
Output flows	Components for re-use	CFR	kg	Estimates the components for re-use	N/A, mass balance calculation
	Material for recycling	MFR	kg	Estimates the material for recycling	N/A, mass balance calculation
	Materials for energy recovery	MFEE	kg	Estimates the materials for energy recovery	N/A, mass balance calculation
	Exported energy, electricity	EE - e	MJ	Estimates the exported energy, electricity	N/A, mass balance calculation
	Exported energy, thermal	EE - t	MJ	Estimates the exported energy, thermal	N/A, mass balance calculation
Additional environmental impact	Global warming potential, excluding biogenic uptake, emissions and storage	GWP - GHG	kg CO_2 eq. (GWP100)	Estimates GHG warming effect for a change in a 100 years time, given as CO_2 eq.	CML (v4.1)
	Particulate matter	PM	disease incidence	Estimates the potential incidence of disease due to PM emissions	SETAC-UNEP, Fantke et al. 2016
	Ionising radiation - human health	IRP	kBq U-235 eq	Estimates the potential health damages related to the man-made routine releases of radioactive material to the environment	Human Health Effect model
	Eco-toxicity, freshwater	ETP - fw	CTUe	Estimates the potential impact on fresh water ecosystems, as a result of emissions of toxic substances to air, water and soil.	USEtox
	Human toxicity potential - cancer effects	HTP - c	CTUh	Estimates the potential Comparative Toxic Unit for humans - cancer	USEtox
	Human toxicity potential - non cancer effects	HTP - nc	CTUh	Estimates the potential Comparative Toxic Unit for humans - non cancer	USEtox
	Soil quality	SQP	dimension-less	Estimates the potential soil quality index (SQP)	Soil quality index (LANCA®)
	Biogenic content	Biogenic Content	Kg C	Estimated the amount of carbon that is stored in biological materials, such as plants or soil	
Environmental impact according EN15804+A1:2013	Global warming potential	GWP (A1)	kg CO_2 eq	Estimates the total GHG warming effect, given as kgCO_2-eq.	CML (v4.02) based on IPCC AR4
	Ozone layer depletion	ODP (A1)	kg CFC-11 eq	Estimates the potential reduction of ozone in Earth's atmosphere as per CFC-11 eq effects.	CML (v4.02) based on WMO 1999
	Acidification potential	AP (A1)	kg SO_2 eq	Estimates the increase of oceans acidity as per SO_2 eq effects.	CML (v4.02)
	Eutrophication potential	EP (A1)	kg PO_4^{3-} eq	Estimates the potential increment of nutrients in freshwater as kg $PO4^{3-}$ eq equivalent effects.	CML (v4.02)
	Photochemical ozone creation potential	POCP (A1)	kg C_2H_4 eq	Estimates photochemical smog (air pollution) potential as kg C_2H_4 eq	CML (v4.2)
	Abiotic depletion potential for non-fossil resources	ADPE (A1)	kg Sb eq	Estimates the impact on minerals reserves as antimony (Sb) equivalents	CML (v4.2)
	Abiotic depletion potential for fossil resources	ADPF (A1)	MJ	Estimates the impact on fossil fuels reserves as MJ	CML (v4.02) based on IPCC AR4

Environmental Information – Palliside® Traditional Weatherboard

Potential environmental impact – mandatory indicators according to EN 15804

Core environmental impact

Table 6 - Results per m² of Palliside® Traditional weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	2.13E+01	2.39E-01	9.04E-01	1.83E-02	3.65E-03	3.07E-02	3.25E-01	9.03E-02	-2.67E+00
GWP-biogenic	kg CO_2 eq.	-2.24E+00	2.92E-05	2.22E+00	6.23E-07	1.26E-04	3.78E-06	6.62E-04	1.37E-05	-5.26E-02
GWP-luluc	kg CO_2 eq.	1.89E-02	2.33E-06	1.12E-04	4.29E-03	1.14E-10	2.39E-07	3.98E-08	6.45E-07	-3.70E-03
GWP-total	kg CO_2 eq.	1.91E+01	2.39E-01	3.12E+00	2.25E-02	3.78E-03	3.07E-02	3.26E-01	9.03E-02	-2.72E+00
ODP	kg CFC 11 eq.	6.23E-06	3.90E-08	7.04E-08	4.65E-10	2.52E-12	5.01E-09	5.00E-10	9.09E-09	-4.15E-07
AP	mol H^+ eq.	1.53E-01	1.48E-03	4.00E-03	1.27E-04	9.27E-06	1.89E-04	2.26E-03	7.09E-04	-3.81E-02
EP-freshwater	kg P eq.	7.14E-03	8.01E-06	6.48E-05	1.23E-06	1.19E-09	1.03E-06	1.02E-05	2.98E-06	-1.06E-05
EP-marine	kg N eq.	3.13E-02	3.24E-04	1.75E-03	8.38E-05	9.83E-07	4.14E-05	3.15E-04	2.09E-04	-1.97E-03
EP-terrestrial	mol N eq.	3.28E-01	3.62E-03	1.88E-02	6.06E-04	1.08E-05	4.61E-04	3.40E-03	2.28E-03	-1.97E-02
POCP	kg NMVOC eq.	8.68E-02	9.09E-04	5.01E-03	1.28E-04	3.01E-06	1.16E-04	9.03E-04	5.61E-04	-7.66E-03
ADP-minerals&metals*	kg Sb eq.	9.43E-04	7.82E-07	1.17E-06	7.05E-08	1.46E-10	1.01E-07	3.00E-07	3.62E-07	-2.30E-07
ADP-fossil*	MJ	4.23E+02	3.34E+00	2.37E+00	2.51E-01	9.98E-02	4.30E-01	1.67E+00	8.99E-01	-7.02E+01
WDP*	m^3	1.34E+02	8.13E-02	1.05E+01	1.28E-01	2.73E-01	1.05E-02	9.65E+00	9.30E-01	-8.54E+01

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

Resource Use

Table 7 - Results per m² of Palliside® Traditional weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	7.85E+01	3.46E-02	3.17E+01	1.75E-01	3.49E-02	4.45E-03	1.61E-01	1.44E-02	-4.22E-01
PERM	MJ	2.94E+01	0.00E+00	-2.94E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.08E+02	3.46E-02	2.34E+00	1.75E-01	3.49E-02	4.45E-03	1.61E-01	1.44E-02	-4.22E-01
PENRE	MJ	2.89E+02	3.34E+00	1.21E+01	2.51E-01	9.98E-02	4.30E-01	3.54E+01	9.20E+01	-7.02E+01
PENRM	MJ	1.35E+02	0.00E+00	-9.73E+00	0.00E+00	0.00E+00	0.00E+00	-3.37E+01	-9.11E+01	0.00E+00
PENRT	MJ	4.23E+02	3.34E+00	2.37E+00	2.51E-01	9.98E-02	4.30E-01	1.67E+00	8.99E-01	-7.02E+01
SM	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	0.00E+00
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	0.00E+00
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	0.00E+00
FW	m^3	1.39E-01	5.26E-04	1.60E-03	5.01E-04	2.13E-06	6.78E-05	5.35E-03	1.59E-04	-3.36E-03

Waste

Table 8 - Results per m² of Palliside® Traditional weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Hazardous waste disposed	kg	3.78E-04	4.31E-06	1.00E-05	9.93E-08	3.52E-10	5.55E-07	5.19E-07	1.36E-06	-3.74E-06
Non-hazardous waste disposed	kg	3.08E+00	3.49E-02	1.01E+00	2.01E-03	6.59E-06	4.50E-03	1.86E-02	4.21E+00	-1.43E-01
Radioactive waste disposed	kg	4.96E-04	6.68E-08	7.67E-06	8.48E-08	4.24E-11	2.56E-09	7.38E-09	5.44E-09	-2.41E-08

Output flows

Table 9 - Results per m² of Palliside® Traditional weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Components for re-use	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	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E+00	0.00E+00	0.00E+00
Materials for energy recovery	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	0.00E+00
Exported energy, electricity	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	0.00E+00
Exported energy, thermal	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	0.00E+00

Additional environmental impact

Table 10 - Results per m² of Palliside® Traditional weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-GHG[1]	kg CO_2 eq.	2.04E+01	2.35E-01	8.95E-01	2.17E-02	3.51E-03	3.02E-02	3.20E-01	8.85E-02	-2.47E+00
PM	disease incidence	1.06E-06	2.00E-08	2.33E-08	7.92E-10	8.46E-11	2.58E-09	1.74E-08	4.57E-09	-2.34E-07
IRP	kBq U-235 eq	1.14E+00	1.75E-04	2.58E-02	1.65E-04	2.93E-07	1.86E-05	5.11E-05	3.87E-05	-1.78E-04
ETP - fw	CTUe	6.70E+02	1.86E+00	3.04E+01	4.54E-01	1.13E-03	2.39E-01	1.02E+00	8.98E-01	-6.88E+01
HTP - c	CTUh	4.49E-08	7.06E-11	6.92E-10	1.17E-11	8.86E-14	9.05E-12	7.40E-11	2.68E-11	-6.45E-10
HTP - nc	CTUh	6.67E-07	2.55E-09	1.91E-08	2.72E-10	3.33E-12	3.28E-10	9.61E-10	9.59E-10	-5.94E-08
SQP	Pt	3.23E+04	8.75E-01	1.16E+00	3.26E-01	1.33E-03	1.13E-01	8.21E-01	4.20E-01	-1.95E+00

[1]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.

Potential environmental impact – optional indicators according to EN 15804 +A1:2013

Environmental impact according EN15804+A1:2013

Table 11 - Results per m² of Palliside® Traditional weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP (A1)	kg CO_2 eq	2.08E+01	2.35E-01	2.18E+00	2.19E-02	3.52E-03	3.03E-02	3.21E-01	8.87E-02	-2.52E+00
ODP (A1)	kg CFC-11 eq	6.14E-06	3.08E-08	8.62E-08	4.35E-10	1.99E-12	3.96E-09	4.25E-10	7.19E-09	-3.70E-07
AP (A1)	kg SO_2 eq	1.17E-01	7.36E-04	2.84E-03	8.23E-05	1.36E-06	9.32E-05	4.36E-04	3.58E-04	-3.44E-02
EP (A1)	kg PO_4^{3-} eq	3.34E-02	1.57E-04	1.10E-03	4.03E-05	3.43E-07	2.00E-05	1.49E-04	8.52E-05	-9.26E-04
POCP (A1)	kg C_2H_4 eq	6.75E-04	4.97E-05	4.00E-04	4.90E-06	1.45E-07	6.36E-06	1.23E-05	2.20E-05	-1.86E-03
ADPE (A1)	kg Sb eq	9.43E-04	7.82E-07	1.17E-06	7.22E-08	1.46E-10	1.01E-07	3.00E-07	3.62E-07	-2.35E-07
ADPF (A1)	MJ	4.23E+02	3.54E+00	2.37E+00	2.51E-01	9.98E-02	4.30E-01	1.67E+00	8.99E-01	-7.02E+01

Environmental Information – Palliside® Rusticated Weatherboard

Potential environmental impact – mandatory indicators according to EN 15804

Core environmental impact

Table 12 - Results per m² of Palliside® Rusticated weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	1.97E+01	2.13E-01	9.04E-01	1.83E-02	3.65E-03	2.79E-02	2.93E-01	8.19E-02	-2.41E+00
GWP-biogenic	kg CO_2 eq.	-2.25E+00	2.61E-05	2.22E+00	6.23E-07	1.26E-04	3.43E-06	5.98E-04	1.24E-05	-4.76E-02
GWP-luluc	kg CO_2 eq.	1.76E-02	2.08E-06	1.12E-04	4.29E-03	1.14E-10	2.17E-07	3.59E-08	5.86E-07	-3.35E-03
GWP-total	kg CO_2 eq.	1.75E+01	2.13E-01	3.12E+00	2.25E-02	3.78E-03	2.79E-02	2.94E-01	8.19E-02	-2.46E+00
ODP	kg CFC 11 eq.	5.72E-06	3.48E-08	7.04E-08	4.65E-10	2.52E-12	4.55E-09	4.52E-10	8.25E-09	-3.76E-07
AP	mol H^+ eq.	1.41E-01	1.32E-03	4.00E-03	1.27E-04	9.27E-06	1.71E-04	2.04E-03	6.43E-04	-3.45E-02
EP-freshwater	kg P eq.	6.56E-03	7.14E-06	6.48E-05	1.23E-06	1.19E-09	9.35E-07	9.23E-06	2.70E-06	-9.60E-06
EP-marine	kg N eq.	2.89E-02	2.89E-04	1.75E-03	8.38E-05	9.83E-07	3.75E-05	2.84E-04	1.89E-04	-1.78E-03
EP-terrestrial	mol N eq.	3.03E-01	3.23E-03	1.88E-02	6.06E-04	1.08E-05	4.18E-04	3.06E-03	2.07E-03	-1.78E-02
POCP	kg NMVOC eq.	8.03E-02	8.11E-04	5.01E-03	1.28E-04	3.01E-06	1.05E-04	8.15E-04	5.09E-04	-6.93E-03
ADP-minerals&metals*	kg Sb eq.	8.60E-04	6.97E-07	1.17E-06	7.05E-08	1.46E-10	9.14E-08	2.71E-07	3.29E-07	-2.09E-07
ADP-fossil*	MJ	3.84E+02	2.98E+00	2.37E+00	2.51E-01	9.98E-02	3.90E-01	1.52E+00	8.16E-01	-6.30E+01
WDP*	m³	1.25E+02	7.25E-02	1.05E+01	1.28E-01	2.73E-01	9.51E-03	8.71E+00	8.44E-01	-7.74E+01

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

Resource Use

Table 13 - Results per m² of Palliside® Rusticated weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	7.63E+01	3.08E-02	3.17E+01	1.75E-01	3.49E-02	4.04E-03	1.45E-01	1.31E-02	-3.82E-01
PERM	MJ	2.94E+01	0.00E+00	-2.94E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.06E+02	3.08E-02	2.34E+00	1.75E-01	3.49E-02	4.04E-03	1.45E-01	1.31E-02	-3.82E-01
PENRE	MJ	2.60E+02	2.98E+00	1.15E+01	2.51E-01	9.98E-02	3.90E-01	3.24E+01	8.43E+01	-6.30E+01
PENRM	MJ	1.23E+02	0.00E+00	-9.18E+00	0.00E+00	0.00E+00	0.00E+00	-3.09E+01	-8.35E+01	0.00E+00
PENRT	MJ	3.84E+02	2.98E+00	2.37E+00	2.51E-01	9.98E-02	3.90E-01	1.52E+00	8.16E-01	-6.30E+01
SM	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	0.00E+00
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	0.00E+00
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	0.00E+00
FW	m³	1.28E-01	4.69E-04	1.60E-03	5.01E-04	2.13E-06	6.15E-05	4.83E-03	1.44E-04	-3.04E-03

Waste

Table 14 - Results per m² of Palliside® Rusticated weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Hazardous waste disposed	kg	3.60E-04	3.84E-06	1.00E-05	9.93E-08	3.52E-10	5.03E-07	4.68E-07	1.23E-06	-3.39E-06
Non-hazardous waste disposed	kg	2.86E+00	3.11E-02	1.01E+00	2.01E-03	6.59E-06	4.08E-03	1.68E-02	3.82E+00	-1.30E-01
Radioactive waste disposed	kg	4.59E-04	5.97E-08	7.67E-06	8.48E-08	4.24E-11	2.33E-09	6.66E-09	4.94E-09	-2.18E-08

Output flows

Table 15 - Results per m² of Palliside® Rusticated weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Components for re-use	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	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E+00	0.00E+00	0.00E+00
Materials for energy recovery	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	0.00E+00
Exported energy, electricity	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	0.00E+00
Exported energy, thermal	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	0.00E+00

Additional environmental impact

Table 16 - Results per m² of Palliside® Rusticated weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-GHG[2]	kg CO_2 eq.	1.89E+01	2.09E-01	8.95E-01	2.17E-02	3.51E-03	2.74E-02	2.89E-01	8.03E-02	-2.24E+00
PM	disease incidence	9.89E-07	1.79E-08	2.33E-08	7.92E-10	8.46E-11	2.34E-09	1.57E-08	4.15E-09	-2.12E-07
IRP	kBq U-235 eq	1.05E+00	1.56E-04	2.58E-02	1.65E-04	2.93E-07	1.68E-05	4.61E-05	3.51E-05	-1.61E-04
ETP - fw	CTUe	6.14E+02	1.66E+00	3.04E+01	4.54E-01	1.13E-03	2.17E-01	9.20E-01	8.15E-01	-6.23E+01
HTP - c	CTUh	4.11E-08	6.29E-11	6.92E-10	1.17E-11	8.86E-14	8.21E-12	6.68E-11	2.43E-11	-5.84E-10
HTP - nc	CTUh	6.11E-07	2.27E-09	1.91E-08	2.72E-10	3.33E-12	2.98E-10	8.67E-10	8.70E-10	-5.38E-08
SQP	Pt	3.05E+04	7.80E-01	1.16E+00	3.26E-01	1.33E-03	1.02E-01	7.41E-01	3.81E-01	-1.76E+00

[2]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.

Potential environmental impact – optional indicators according to EN 15804 +A1:2013

Environmental impact according EN15804+A1:2013

Table 17 - Results per m² of Palliside® Rusticated weatherboard system

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP (A1)	kg CO_2 eq	1.92E+01	2.10E-01	2.18E+00	2.19E-02	3.52E-03	2.75E-02	2.90E-01	8.05E-02	-2.28E+00
ODP (A1)	kg CFC-11 eq	5.63E-06	2.75E-08	8.62E-08	4.35E-10	1.99E-12	3.59E-09	3.83E-10	6.53E-09	-3.35E-07
AP (A1)	kg SO_2 eq	1.08E-01	6.56E-04	2.84E-03	8.23E-05	1.36E-06	8.46E-05	3.94E-04	3.24E-04	-3.11E-02
EP (A1)	kg PO_4^{3-} eq	3.07E-02	1.40E-04	1.10E-03	4.03E-05	3.43E-07	1.82E-05	1.34E-04	7.73E-05	-8.38E-04
POCP (A1)	kg C_2H_4 eq	6.70E-04	4.43E-05	4.00E-04	4.90E-06	1.45E-07	5.77E-06	1.11E-05	2.00E-05	-1.68E-03
ADPE (A1)	kg Sb eq	8.60E-04	6.97E-07	1.17E-06	7.22E-08	1.46E-10	9.14E-08	2.71E-07	3.29E-07	-2.12E-07
ADPF (A1)	MJ	3.84E+02	2.98E+00	2.37E+00	2.51E-01	9.98E-02	3.90E-01	1.52E+00	8.16E-01	-6.30E+01

Information on biogenic carbon content of Palliside® Traditional and Rusticated weatherboard system

Table 18 - Results per m² of weatherboard system

Biogenic carbon content	Unit	Quantity
Biogenic carbon content in product	Kg C	0.00E+00
Biogenic carbon content in packaging	Kg C	7.70E-01

Note: 1kg biogenic carbon is equivalent to 44/12 kg CO2.

Additional Environmental Information

Dynex is committed to a sustainable future. We are focused on a number of initiatives that promote the use of renewable energy, make it easier to recycle our products and increase the content of recycled materials in our products.

PROUD SUPPORTERS OF CERTIFIED RENEWABLE ELECTRICITY GENERATION

See meridian.co.nz/certified

Meridian's Energy Certified Renewable Energy Programme

Globally Aliaxis has a goal to reach 100% renewable electricity by 2025 to help reduce the CO_2 emissions by 75% per tonne of production on its sites. Aligned with that goal, in November 2021 Dynex joined Meridian Energy's Certified Renewable Energy programme. Meridian is committed to only generating electricity from 100% renewable sources.

Meridian's Certified Renewable Energy product allows Dynex to purchase renewable energy certificates to verify that the amount of electricity Dynex use from the grid is matched on an annual basis with electricity produced from Meridian's certified hydro stations and wind farms. Committing to this programme enables Dynex to report our Scope 2 electricity emissions as zero, using the market-based reporting methodology as per the GHG Protocol's Scope 2 Standards."

Waste Production

As part of Aliaxis Group, Dynex is excited to play our role working with Aliaxis New Zealand, Waste Management New Zealand and Unitec ESRC supported by a grant from the Ministry for the Environment's Plastics Innovation Fund. The joint-venture partnership is making a significant $12.5m investment in our mission to dramatically reduce plastic construction and demolition waste in New Zealand.

The project includes:

- Investing in new plastic recycling facilities across New Zealand which will sort, wash and shred PVC and HDPE plastic from construction and demolition, commercial and industrial sources
- Establishing a network of metropolitan and regional PVC and HDPE collection services in partnership with Waste Management New Zealand
- Carrying out research with Unitec ESRC into practical solutions to minimise plastic construction waste and help to raise awareness of plastic recycling.

The collected plastic will then be used at Aliaxis New Zealand's sites to manufacture our next generation of PVC and HDPE piping systems used in building, infrastructure and agriculture projects across NZ, completing the loop and reducing our overall plastic resin importation.

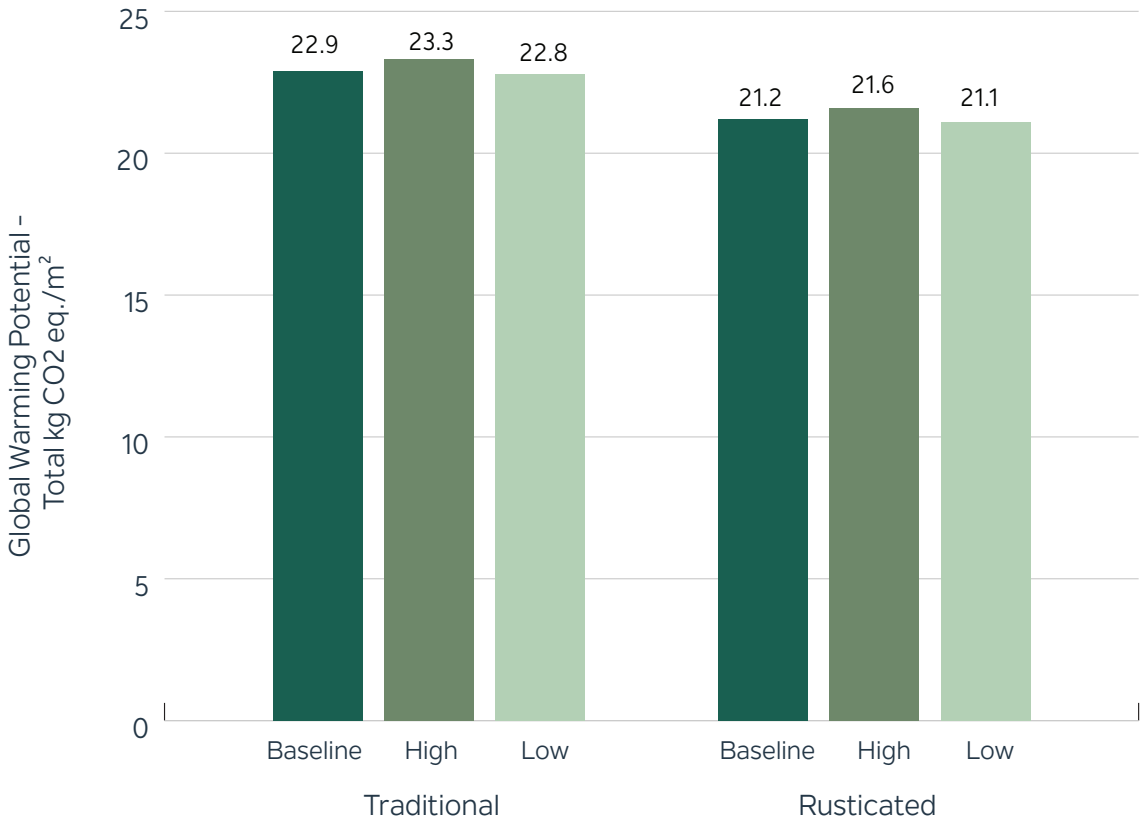
Sensitivity analysis

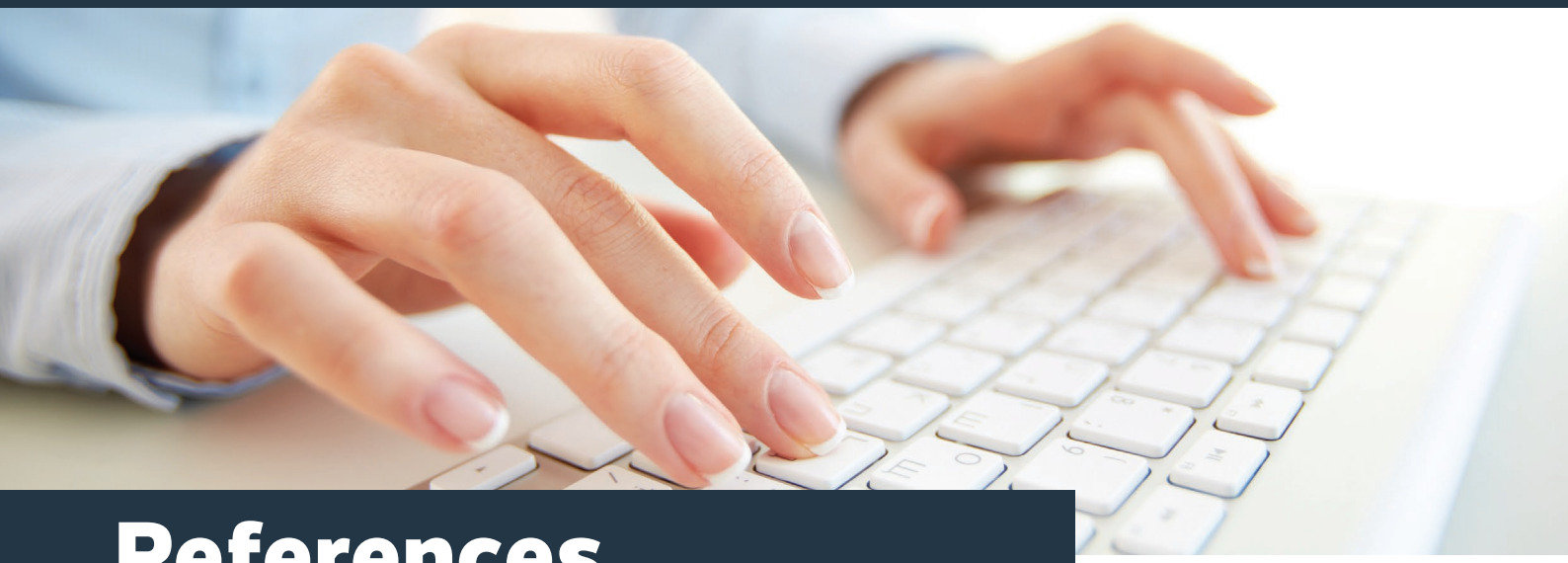
The amount of PVC weatherboard entering the waste stream and being recycled is difficult to ascertain due to its long service life. Given the high uncertainty concerning the end of life fate of the product to date, the recycling rate was tested using low and high rates of 15% and 62% respectively, in contrast to the 27% baseline. These scenarios were based on PVC waste data estimates by Plastics Industry Pipes Association of Australia (PIPA) in collaboration with the former Department of Environment and Climate Change (DSEWPC, 2012).

The impact on GWP of altering the recycling rate when assessing modules A1-C4, is illustrated in Figure 2 below. The 'high' case increases the GWP by 1.6% and 1.7% for the traditional and rusticated weatherboard systems respectively, and the 'low' case reduces the GWP by 0.6% in both cases. This is explained by the fact that the recycling process is more carbon impactful than the inert landfill process.

However, the higher the recycling rate the lower the emissions in the next system. For example, the 'high case' would avoid approximately 129% more emissions than the base case for the use of secondary PVC in further products. In contrast, the low scenario would avoid 44% less emissions than the base case.

Figure 2 - Sensitivity analysis GWP results from module A1 to C4





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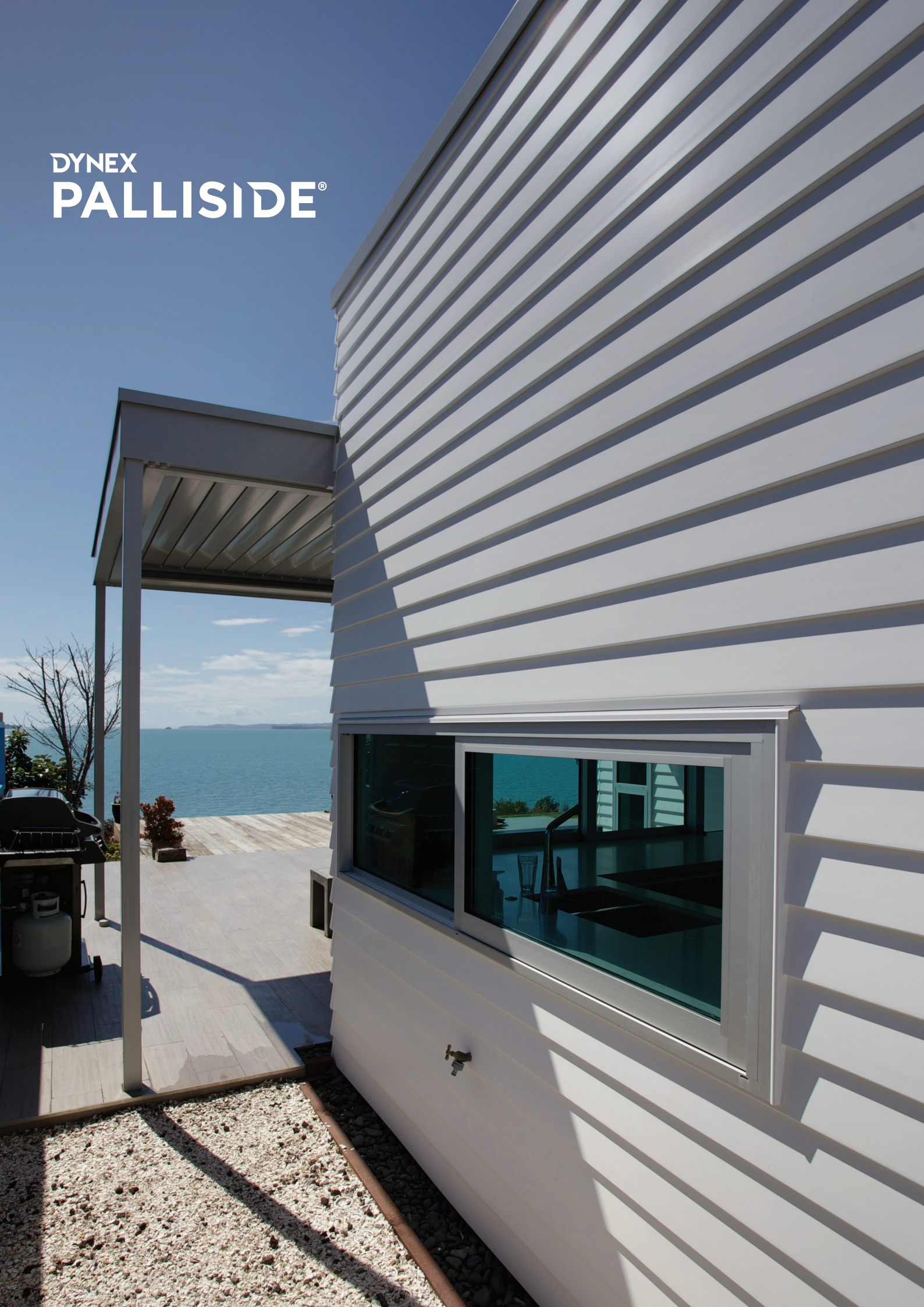
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Dynex is excited to play our role working with Aliaxis New Zealand, Waste Management New Zealand and Unitec ESRC supported by a grant from the Ministry for the Environment's Plastics Innovation Fund. The joint-venture partnership is making a significant $12.5m investment in our mission to dramatically reduce plastic construction and demolition waste in New Zealand.

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