NICHIHA

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025, EN 15804+A2:2019/AC:2021, and EN 50693:2019 for:

Fiber Cement Siding Panels

EPD®
THE INTERNATIONAL EPD® SYSTEM

EPD®
THE NORTH AMERICAN EPD® SYSTEM

PROGRAM
The International EPD® System, www.environdec.com

PROGRAMME OPERATOR
EPD International AB

EPD REGISTRATION NUMBER
EPD-IES-14597

ISSUE DATE
2024-08-10

VALID UNTIL
2029-08-09

PROGRAM INFORMATION

PROGRAM OPERATOR

THE INTERNATIONAL EPD SYSTEM

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DECLARATION HOLDER

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LCA CONSULTANT

INTERTEK ASSURIS

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GENERAL INFORMATION

PROGRAMME:	The International EPD® System
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Accountabilities for PCR, LCA, and independent third-party verification

Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): Construction products, 2019:14, version 1.3.3 and UN CPC 314

PCR review was conducted by: Claudia A. Peña

Life Cycle Assessment (LCA)

LCA accountability: Emilce Romarion
emilce.romarion@intertek.com

Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier
Third-party verifier: Sunil Kumar, SIPL Pvt Ltd

☒ Approved by: The International EPD® System

COMPANY INFORMATION

About Nichiha

For over 60 years, architects, builders, and contractors have turned to Nichiha fiber cement cladding to push beyond the boundaries of the commonplace. Founded in Japan in 1956, Nichiha boasts over 2,800 employees and 13 plants worldwide. Nichiha USA is a leading manufacturer of fiber cement siding and Architectural Wall Panels for commercial and residential applications. Nichiha Architectural Wall Panels provide state-of-the-art technology with limitless design possibilities.

Summary Information

This study was conducted to provide Nichiha USA with cradle-to-grave environmental impacts associated with the Fiber Cement Siding Panels manufactured in Macon, GA.

OWNER OF THE STUDY	Vance Thomas Director, Warranty Technical Services vthomas@nichiha.com
PRACTITIONER OF LCA (EXTERNAL)	Intertek
PURPOSE OF THE REPORT	Providing background LCA information on an Environmental Product Declaration
PRODUCT SYSTEM	1 (one) m2 of fiber cement siding panel is considered for the study. The product is manufactured at 3150 Avondale Mill Road, Macon, GA 31216. System boundaries is cradle-to-grave.
DECLARED UNIT	1 (one) m^2 of fiber cement siding panel
UNDERLYING PCR	Construction Products; PCR 2019:14; version 1.3.3
UNDERLAYING STANDARD(S)	ISO 14040:2006/AMD 1:2020; ISO 14044:2006+A1+A2:2020
REFERENCE YEAR	1 Jan 2022 - 31 Dec 2022
DATE OF STUDY	6 May 2024

PRODUCT INFORMATION

Fiber Cement Siding Panels

Nichiha USA produces innovative products designed to be low-maintenance and environmentally conscious. The Nichiha fiber-cement production process delivers superior quality and consistency, reflecting the company's commitment to precision and sustainability. Stringent quality control measures, including moisture control checks, particle control size, and rigorous inspection protocols, produce reliable and durable products. This attention to detail, combined with the use of recycled materials, results in environmentally responsible and technically superior products that meet the needs of both commercial and residential applications.

Nichiha fiber cement siding is designed to provide a durable, attractive, and versatile exterior cladding solution for buildings. Our fiber cement siding is crafted from a mixture of wood pulp and cement. It is pressed into sheets and cut into planks and panels, offering a variety of different looks from the same material.

NICHIBOARD
Smooth

NICHIBOARD
Cedar

NICHIPANEL
Cedar

NICHIPANEL
Grooved

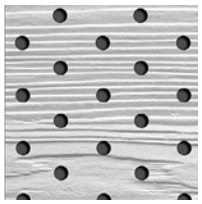
NICHIPANEL
Smooth

NICHIBOARD
Stucco

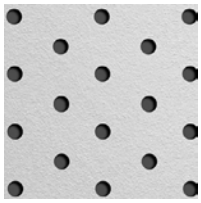
NICHISHAKE
Primed

NICHISOFFIT
Solid Cedar

NICHISOFFIT
Solid Smooth



NICHISOFFIT
Vented Cedar



NICHISOFFIT
Vented Smooth

NICHISTAGGERED
Primed

NICHISTRAIGHT
Primed

NICHITRIM
Cedar

NICHITRIM
Smooth

TECHNICAL DATA

Content Information

MATERIAL COMPONENTS	WEIGHT (lb) per declared Unit
Portland Cement	4 - 6
$CaCO_3$	3 - 5
Fly Ash	9 - 12
Mica	0.5 - 1.5
Cellulose Fiber	1 - 3
Retained Water	3 - 5

PACKAGING COMPONENTS	WEIGHT (lb) per declared Unit
Corners	0.0025 - 0.0050
Banding	0.0025 - 0.0050
Bonnetts	0.050 - 0.075
Pallets	1 - 2

Material Properties

PROPERTY	RESULT
6. Mechanical and Physical Requirements	
6.3.1: Density	77.6 lb/ft³
6.3.2: Flexural Strength	
Dry	2154 psi
Wet	1743 psi
7. Dimensions and Tolerances	
7.4: Length and Width Tolerance	0.03
7.5: Thickness Tolerance	0.03
7.6: Squareness Tolerance	0.06
7.7: Edge Straightness Tolerance	0.00
S2: Moisture Movement	
Machine Direction	0.08%
Cross Direction	0.10%
S3: Water Absorption	38.1%
S4: Moisture Content	10.5%
S6: Surface Burning Characteristics	
Flame-Spread Index	0
Smoke Development Index	0

UN CPC Code 314

MANUFACTURING PROCESS

Manufacturing involves fiber cement and uses a wet process. The process follows the steps in the diagram below.

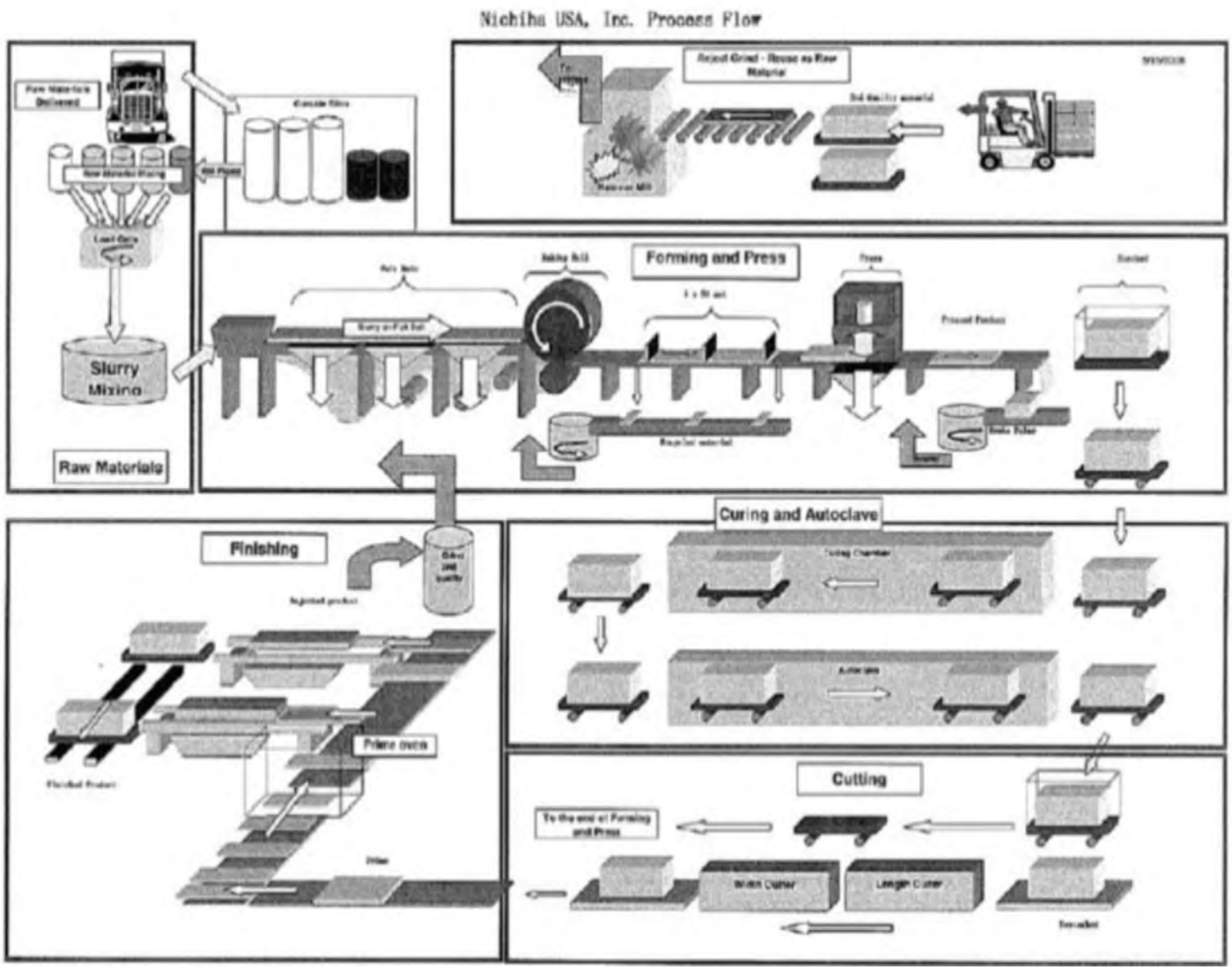


FIGURE 1. MANUFACTURING PROCESS

LCA INFORMATION

Declared Unit

In this assessment, the cradle to gate with end of life of the product is covered and quantified, and the declared unit for the study is defined based on PCR 2019:14, Version 1.3.3 with EPD international as 1m^2 of the Nichiha Fiber Cement Siding Panel.

Time Representativeness

From 2022-01-01 to 2022-12-31 (12 months).

Database and LCA Software Used

Ecoinvent v3.9.1 [cut-off] LCI database and SimaPro 9.5.

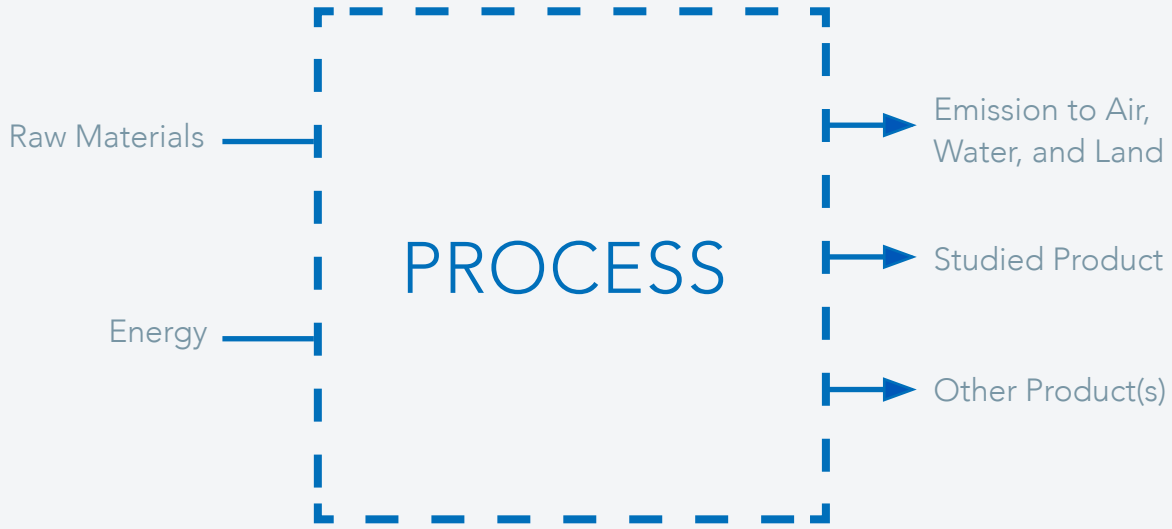


FIGURE 1. TYPICAL CATEGORIES OF DATA COLLECTED TO DESCRIBE PROCESSES IN LCA TERMS

DESCRIPTION OF SYSTEM BOUNDARIES

In this LCA study, the system boundary was defined as cradle to gate with modules C1–C4 and module D (A1-A3 + C + D) which comprised extraction of raw materials, transportation of raw materials to manufacturing plant, the manufacturing of the product itself, distribution of the product, and end of life. The same has been depicted in below figure:

	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	DECONSTRUCTION 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	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
GEOGRAPHY	U.S.A. JPN	U.S.A.	U.S.A.	U.S.A.	-	-	-	-	-	-	-	-	U.S.A.	U.S.A.	U.S.A.	U.S.A.	U.S.A.
SPECIFIC DATA USED		>90%				-	-	-	-	-	-	-	-	-	-	-	-
VARIATION – PRODUCTS		N/A				-	-	-	-	-	-	-	-	-	-	-	-
VARIATION – SAITES		N/A				-	-	-	-	-	-	-	-	-	-	-	-

JPN = JAPAN

FIGURE 2. DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

APPLIED DATABASE

The study has used generic secondary datasets from Ecoinvent for raw materials. The energy, waste disposal, and transport were taken from the database Ecoinvent 3.9.1. Allocation, cut-off by classification with adaptation of regional energy, and material data collected by Intertek.

SOFTWARE

The EPD was conducted with the life cycle assessment software SimaPro version 9.5.

ALLOCATION

In terms of the specific data for the raw materials, no co-product allocation has been applied and specific data was used in the product. In terms of generic data, the main database used, Ecoinvent v3.9.1 (cut-off), defaults to an economic allocation for most processes. However, in some cases, a mass-based allocation is used where there is a direct physical relationship. The allocation approach of specific Ecoinvent modules is documented on their website and method reports (see www.ecoinvent.org). In the case of end-of-life allocation of generic data, the Ecoinvent v3.9.1 with a cut-off by classification end-of-life allocation method was used. In this approach, environmental burdens and benefits of recycled/reused materials are given to the product system consuming them, rather than the system providing them, and are quantified based on recycling content of the material under investigation.

CUT-OFF CRITERIA

In the process of building a life cycle inventory (LCI), it is typical to exclude items considered to have a negligible (a.k.a. relatively inconsequential or immaterial) contribution to results. Criteria for the exclusion of inputs and outputs (cut-off rules) in the Life Cycle Assessment and information modules and any additional information are intended to support an efficient calculation procedure. They shall not be applied to hide data. Any application of the criteria for the exclusion of inputs and outputs shall be documented. Following the cut-off criteria, the maintenance (either ordinary or extraordinary) operations were assumed to be not applicable for this product as there are no scheduled interventions during the product's service life and therefore is excluded using the cut-off criteria as per the PCR recommendation. No known significant environmental flows are excluded using this criterion.

RESULTS OF THE ENVIRONMENTAL PERFORMANCE INDICATORS

The table below shows core mandatory indicators from EN 15804+A2:2019 for $1m_2$ of architectural wall panel.

MANDATORY IMPACT CATEGORY INDICATORS ACCORDING TO EN 15804

RESULTS PER DECLARED UNIT

INDICATORS	UNITS	A1–A3	A4	C1	C2	C3	C4	D
GWP-TOTAL	kg CO_2 eq	6.71E+00	5.06E-01	1.96E+00	1.13E-01	0.00E+00	6.82E-02	-1.38E-01
GWP-FOSSIL	kg CO_2 eq	2.27E-02	1.37E-04	6.17E-04	3.07E-05	0.00E+00	2.70E-05	-1.13E-03
GWP-BIOGENIC	kg CO_2 eq	6.69E+00	5.05E-01	1.96E+00	1.13E-01	0.00E+00	6.82E-02	-1.37E-01
GWP-LULUC	kg CO_2 eq	4.10E-03	2.49E-04	5.70E-04	5.55E-05	0.00E+00	4.12E-05	-4.94E-04
ODP	kg CFC 11 eq	1.72E-07	7.91E-09	1.33E-07	1.77E-09	0.00E+00	1.97E-09	-2.31E-09
AP	mol H^+eq	2.35E-02	1.83E-03	1.09E-02	4.08E-04	0.00E+00	5.14E-04	-9.69E-04
EP-FRESHWATER	kg P eq	1.43E-03	4.11E-05	9.17E-05	9.18E-06	0.00E+00	5.68E-06	-3.61E-05
EP-MARINE	kg N eq	5.37E-03	6.08E-04	2.10E-03	1.36E-04	0.00E+00	1.97E-04	-2.75E-04
EP-TERRESTRIAL	mol N eq	5.72E-02	6.44E-03	1.90E-02	1.44E-03	0.00E+00	2.11E-03	-2.99E-03
POCP	kg NMVOC eq	2.07E-02	2.60E-03	1.77E-02	5.80E-04	0.00E+00	7.36E-04	-1.06E-03
ADP-MINERALS & METALS*	kg Sb eq	7.51E+01	7.36E+00	1.29E+02	1.64E+00	0.00E+00	1.70E+00	-1.95E+00
ADP-FOSSIL*	MJ	9.20E-05	1.36E-06	1.28E-06	3.05E-07	0.00E+00	9.47E-08	-6.18E-07
WDP*	m_3	1.12E+00	3.75E-02	1.72E-01	8.38E-03	0.00E+00	7.51E-02	-5.39E-02
ACRONYMS	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption							

*Disclaimer note 1 - The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Note: LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. The table on page 13 shows resource use (energy & water) related indicators from EN 15804+A2:2019 for 1m2 of architectural wall panel.

Nichiha USA is disclaimed from responsibility if the results from Modules A1–A2 are used without taking into account the results of Module C.

ADDITIONAL MANDATORY AND VOLUNTARY IMPACT CATEGORY INDICATORS

RESULTS PER DECLARED UNIT

INDICATORS	UNITS	A1–A3	A4	C1	C2	C3	C4	D
GWP-GHG[1]	kg CO_2 eq	6.71E+00	5.06E-01	1.96E+00	1.13E-01	0.00E+00	6.82E-02	-1.38E-01
PARTICULATE MATTER	disease inc.	2.47E-07	5.08E-08	7.62E-08	1.14E-08	0.00E+00	1.12E-08	-2.10E-08
IONIZING RADIATION[2]	kBq U-235 eq	5.27E-01	6.76E-03	2.66E-02	1.51E-03	0.00E+00	1.08E-03	-5.51E-03
ECOTOXICITY, FRESHWATER[3]	CTUe	1.47E+01	2.87E+00	4.92E+01	6.41E-01	0.00E+00	5.95E-01	-5.80E-01
HUMAN TOXICITY, NON-CANCER[3]	CTUh	1.19E+01	1.10E+00	1.60E+01	2.45E-01	0.00E+00	2.02E-01	-3.53E-01
HUMAN TOXICITY, CANCER[3]	CTUh	3.90E-09	2.18E-10	6.93E-10	4.88E-11	0.00E+00	2.90E-11	-9.96E-10
LAND USE[3]	Pt	7.15E-08	5.36E-09	1.41E-08	1.20E-09	0.00E+00	3.63E-10	-1.67E-09

[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.

[2]This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

RESOURCE USE INDICATORS

RESULTS PER DECLARED UNIT

INDICATORS	UNIT	A1	A2	A3	A4	C1	C2	C3	C4	D
PERE	MJ, net calorific value	3.41E+01	1.19E +01	3.49E+01	7.82E+00	1.37E+02	1.75E+00	0.00E+00	1.81E+00	-2.09E+00
PERM	MJ, net calorific value	9.11E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ, net calorific value	3.41E+01	1.19E+01	3.49E+01	7.82E+00	1.37E+02	1.75E+00	0.00E+00	1.81E+00	-2.09E+00
PENRE	MJ, net calorific value	1.39E+01	1.39E-01	1.93E+00	9.30E-02	2.50E-01	2.08E-02	0.00E+00	1.44E-02	-1.09E+01
PENRM	MJ, net calorific value	1.49E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, net calorific value	1.39E+01	1.39E-01	1.93E+00	9.30E-02	2.50E-01	2.08E-02	0.00E+00	1.44E-02	-1.09E+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, net calorific value	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, net calorific value	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	2.19E-02	1.71E-03	7.31E-03	1.15E-03	5.54E-03	2.58E-04	0.00E+00	1.80E-03	-1.49E-03
ACRONYMS	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

WASTE INDICATORS

RESULTS PER DECLARED UNIT

INDICATORS	UNIT	A1	A2	A3	A4	C1	C2	C3	C4	D
HAZARDOUS WASTE DISPOSED	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
NON-HAZARDOUS WATER DISPOSED	kg	2.08E-04	8.90E-06	1.22E-05	5.79E-06	2.29E-05	1.29E-06	0.00E+00	1.12E+01	2.18E-02
RADIOACTIVE WASTE DISPOSED	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

OUTPUT FLOW INDICATORS

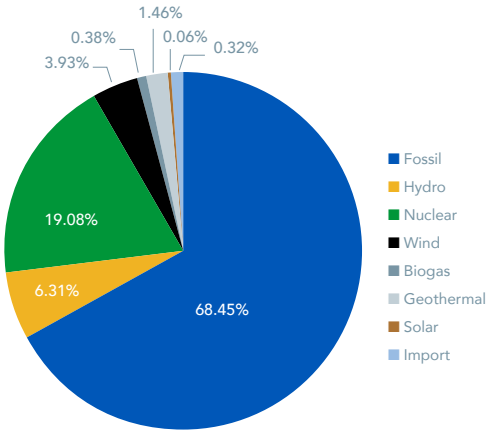
RESULTS PER DECLARED UNIT

INDICATORS	UNIT	A1-A3	A4	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	1.06E+00
MATERIAL FOR RECYCLING	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+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
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
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

OTHER PARAMETERS

PARAMETER	UNIT	VALUE
Biogenic carbon removal from packaging	kg C/kg of packaging	0.88

UTILITY	DATASET	DATA SOURCE	GEOGRAPHY	LAST UPDATED	GWP-GHG (kg CO^2 eq)
Electricity	Electricity, medium voltage {US} | market group for electricity, medium voltage | Cut-off, U	Ecoinvent v.3.9.1	U.S.A.	2022	9.62E-01



DETAILS OF ENERGY MIX USED IN MODULE A3

INTERPRETATION

Hotspot Analysis

It is observed that a majority of the environmental impacts are associated with the material acquisition stage, which contributes ~52% of the total GWP impacts. Besides this, the other major contributing life cycle stage is demolition with ~21%. In the case of manufacturing, the contribution is 12.08%, transport to manufacturer 8.44%, and downstream transport 5.49%. Waste transport, waste processing, and waste disposal have a negligible effect on GWP.

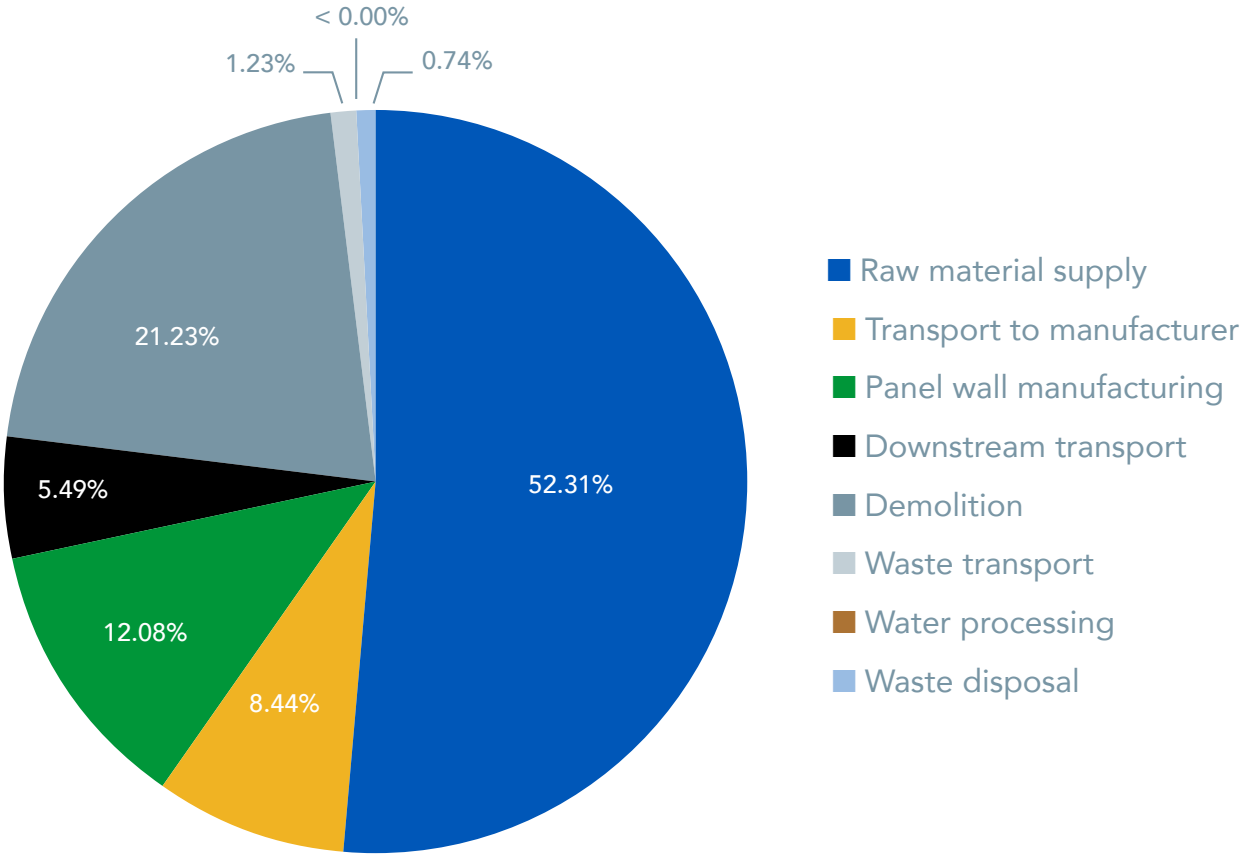


FIGURE 3. GLOBAL WARMING POTENTIAL IMPACT BY %

REFERENCES

Ecoinvent (2023). Ecoinvent v3.9.1, Swiss Centre for Life Cycle Inventories. Available from www.ecoinvent.ch

EN 15804+A2/2019+AC:2021, Environmental product declarations–Core rules for the product category of construction products.

ISO (2006a), ISO 14025:2006, Environmental labels and declarations–Type III environmental declarations– Principles and procedures

ISO (2006b), ISO 14040:2006, Environmental management–Life cycle assessment–Principles and framework ISO (2006c)

ISO 14044:2006+A1+A2:2020; Environmental management–Life cycle assessment–Requirements and guidelines ISO

PRé Consultants (2023). SimaPro v9.4. PRé Consultants, Amersfoort

Product Category Rule (PCR) 2019:14 for Preparing and Environmental Declaration (EPD), version 1.3.3 by EPD International