novawood® INTERIORS & EXTERIORS

VERIFIED by SCS GLOBAL SERVICES ™ ENVIRONMENTAL PRODUCT DECLARATION BASED ON LCA

Declaration Owner

NOVAWOOD

Nova Orman Urunleri San. Tic . A.S.
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Product:

- Novathermowood Ash /

Novawood Ash / Novawood Thermowood Ash

- Novathermowood Iroko
- Novawood Iroko / Novawood Thermowood Iroko
- Novathermowood Pine Novawood Pine / Novawood Thermowood Pine
- Novathermowood Ayous
- Novawood Ayous / Novawood Thermowood Ayous
- Novathermowood Tulipwood
- Novawood Tulipwood / Novawood Thermowood Tulipwood
- Novathermowood Oak
- Novawood Oak / Novawood Thermowood Oak

Declared Unit

The declared unit is one cubic meter of thermowood.

EPD Number and Period of Validity

SCS-EPD-08353
EPD Valid November 3, 2022 through November 2, 2027

Product Category Rule

Product Category Rules for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, Version 1.1, 2021 Part B: Requirements on the EPD for Solid wood products, 12.2018

Program Operator

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SCSglobal SERVICES

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Declaration Number:	SCS-EPD-08353
Declaration Validity Period:	EPD Valid November 3, 2022 through November 2, 2027
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	ERKE Sustainable Design and Consultancy
LCA Software and LCI database:	OpenLCA, Ecoinvent 3.8. Database
Product's Intended Application:	1 m^3 thermowood
Product RSL:	Not Applicable
Markets of Applicability:	Global
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Gate with modules C1–C4 and module D
LCIA Method and Version:	CML-IA, IPCC 2013, ILCD Midpoint+, USEtox 2 (recommended + interim) V2.02, Cumulative Energy Demand V2.0, EDIP 2003, EF 3.0 Method (adapted), AWARE
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Sevda Alanya-Rosenbaum, PhD, SCS Global Services
Product Category Rule:	Product Category Rules for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, Version 1.1, 2021
PCR Review conducted by:	
Product Category Rule:	Part B: Requirements on the EPD for Solid wood products, 12.2018
PCR Review conducted by:	
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Sevda Alanya-Rosenbaum, PhD, SCS Global Services
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Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

1. Novawood

Novawood has a justified pride in their position as the first company to introduce the thermal modification technology "Thermowood" in Turkey. Novawood improves and direct each stage of the production process with innovative approaches that enrich life. Novawood strives to reinforce wood products, which we regard as living materials, without compromising their aesthetics or natural value. With World-class facilities equipped with latest technology machineries and an annual production capacity of 18,000 m³, Novawood products are shipped to 65 countries worldwide including England, Switzerland, Canada, Germany, Spain, Japan, Russia, USA, Azerbaijan, Finland and People's Republic of China, India and Saudi Arabia.

Operating principles that are fully compliant with European standards and practices, a strong technological infrastructure including Thermowood production, the only solid wood R&D laboratory of Turkey and a corporate culture focusing on innovation are the qualities that make Novawood the uncontested leader of its sector.

2. Product

2.1 PRODUCT DESCRIPTION

Thermowood products mainly produced by Novawood include exterior claddings, decking, sunshades, pergolas, door and window scantlings, materials for urban furniture, blinds and shutters, solid and engineered floorings and interior wall coverings.

Heat treatment increases the stability and durability of wood. Wood is composed of 50% cellulose, 23% hemicellulose, 20% lignin, and 7% other organic compounds, called extractives. Heat treatment removes resin, other extractives and their attached OH (Hydroxil) groups from the wood.

This process reduces water absorption of wood, consequently increasing decay resistance while decreasing swelling and shrinking. Another factor that contributes to the high durability of wood is the crystallization of cellulose. The change in hemicellulose increases the durability. Hemicellulose is separated into furfural and carboxylic acid. Caramelization of lignin, caused by heat, results in a darker color.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 /CPR/ applies. The product needs a Declaration of Performance taking into consideration /EN 14915:2013+A1/ and the CE marking. For use, the respective national provisions apply.

2.2 SYSTEM BOUNDARY

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.

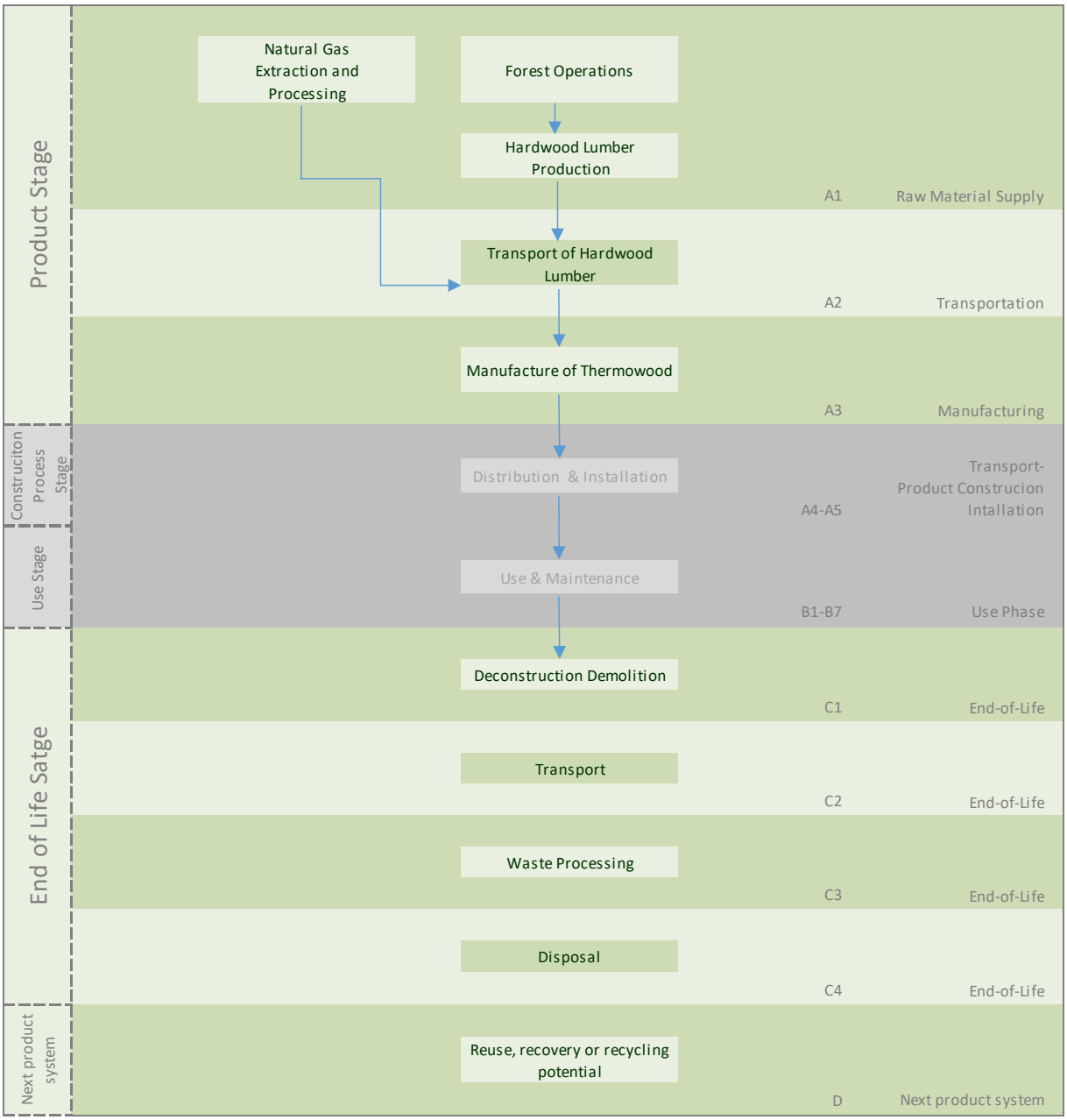


Figure 1. *Flow Diagram for the life cycle of the Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak*

2.3 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-gate with modules C1–C4 and module D, including raw material extraction and processing, transportation, thermowood manufacture and end of life stages. The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak product system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

X = Module Included | MND = Module Not Declared

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

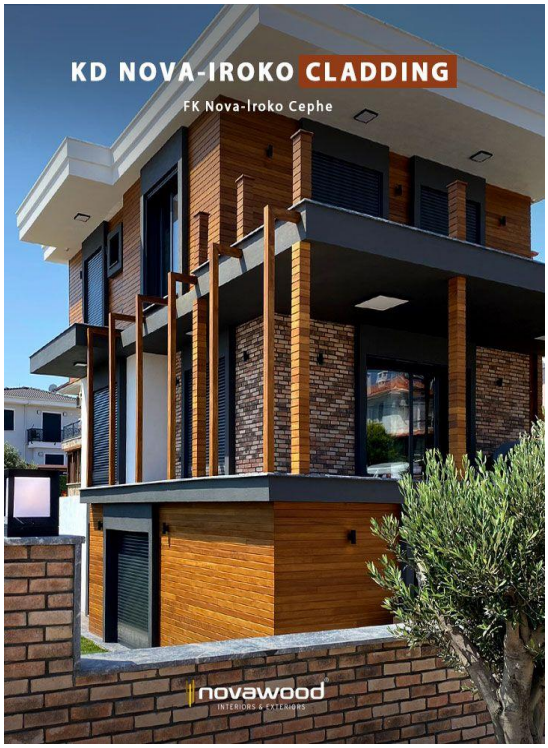
2.4 TECHNICAL DATA

Technical specifications for Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak.

Table 2. *Technical Data*

Mechanical Properties, Strength values						
	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
Modules of elasticity (MOE), flatwise (MPa-N/mm^2) DIN EN 408, TS 2478	12.480 - 14.000	10.420 - 13.550 (10.420)	7411	5200	9.100 - 13.900 (10.000)	12.460- 14.100
Modules of rupture (MOR), flatwise (MPa) DIN EN 408, TS 2474	56.6 – 85.7	55 - 60 (55.00)	31-42	40	48 - 62 (48.00)	56.5-85.5
Impact bending strength (IBS), flatwise (MPa) TS 2477	-		0,16			
Compressive strength (CS), (MPa) TS 2595	-		44			
Density and range of thickness EN 14915:2013 + A1:2017 (mm)	26/32/38/52	26/32/38/52	26/32/38/52	26/32/38/52	26/32/38/52	26/32/38/52
Dimensional Stability 65%Rh 20oC (Increased Stability) (Minimized deformations) (Minimized Expansion and Shrinkage)						
	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
Maximum swelling ratio, tangential (SW-T) (%) DIN 52184 , TS 4083, 4084	5,30		3,22	0,38		5,20
Maximum swelling ratio, radial (SW-R) (%) TS 4083, 4084	2,90		1,50	0,25		2,80
Maximum swelling ratio, longitudinal (SW-L) (%) TS 4083, 4084	-		0,07	0,26		
Maximum shrinkage ratio, tangential (Sh-T) (%) TS 4083, 4084	4,60		3,62	0,20		4,50
Maximum shrinkage ratio, radial (Sh-R) (%) TS 4083, 4084	2,03		4,00			2,01
Maximum shrinkage ratio, longitudinal (Sh-L) (%) TS 4083, 4084	-		0,08			
Physical Properties, Moisture content						
	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
Equilibrium moisture content at 20/65 (%) EN 13183-1	4.2 (4-6)	4 (4-6)	4 (4-6)	4.6 (4-7)	4 (4-6)	4.1(4-6)
Raw density at 20/65 (kg/m3) DIN 52182	595-629	576-650	362-404	430	390-420	590-625
Biological durability against wood-decaying basidiomycetes (Increased durability to decay) (Resins and sugars removed) (Low moisture content prevents decay and fungi growth)						
	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
Median mass loss with Coniophora puteana DSM 3085 (n = 30) (%) CEN/TS 15083-1	0,1	Class 1	Class 2	Class 2	Class 1	0,1
Median mass loss with Coriolus versicolor CTB 863A (n = 30) CEN/TS 15083-1	0,1					0,1
Preliminary durability Classification Median mass loss (< 5 %)	1 "very durable"					1 "very durable"
Thermal conductivity, Insulation (Decreased Thermal Conductivity)						
	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
Heat conductivity W/mK TS EN 12667	0,099	0,099	0,099	0,099	0,130	0,130

2.5 INTENDED APPLICATION



Thermowood products mainly produced by Novawood include exterior claddings, decking, sunshades, pergolas, door and window scantlings, materials for urban furniture, blinds and shutters, solid and engineered floorings and interior wall coverings.

Novawood constantly renews and develops its product range in accordance with the needs and demands of the industry, without sacrificing quality. Working with a focus on the customer satisfaction and quality, Novawood also produces special products suitable for the large architectural projects and customer specific solutions.

2.6 DELIVERY STATUS

Novawood Thermowoods are supplied in thicknesses of 26 mm to 52 mm. The dimensions of each product can be viewed on www.novawood.com.

2.7 MATERIAL COMPOSITION

The main raw material of thermowoods is lumber obtained from sustainable forests. In order to meet their need for raw materials and their customers' demands for lumber, Novawood supplies American hardwood (Ash, Oak, and Tulipwood) from North American forestry, which produce lumber exclusively for Novawood. Also, Novawood supplies other types of trees such as Iroko and Ayous, from Africa.

Table 3. *Component of thermowoods*

Novathermowood	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
Component (kg)	675	660	550	400	455	650
(%)	100%	100%	100%	100%	100%	100%

2.8 MANUFACTURING

Wood is composed of 50% cellulose, 23% hemicellulose, 20% lignin, and 7% other organic compounds, called extractives. Heat treatment removes resin, other extractives and their attached OH (Hydroxil) groups from the wood.

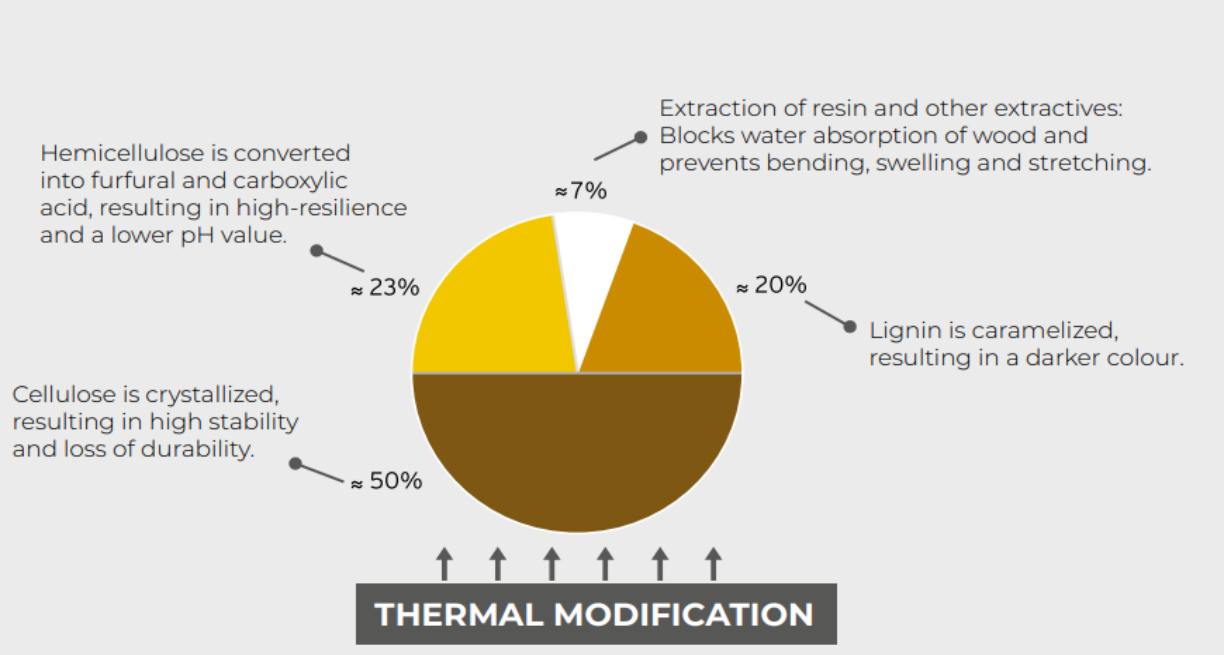


Figure 2. *Wood composition*

Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak manufactured in Gerede Organize Sanayi Bolgesi No: 101-2 Gerede – Bolu / Turkey.

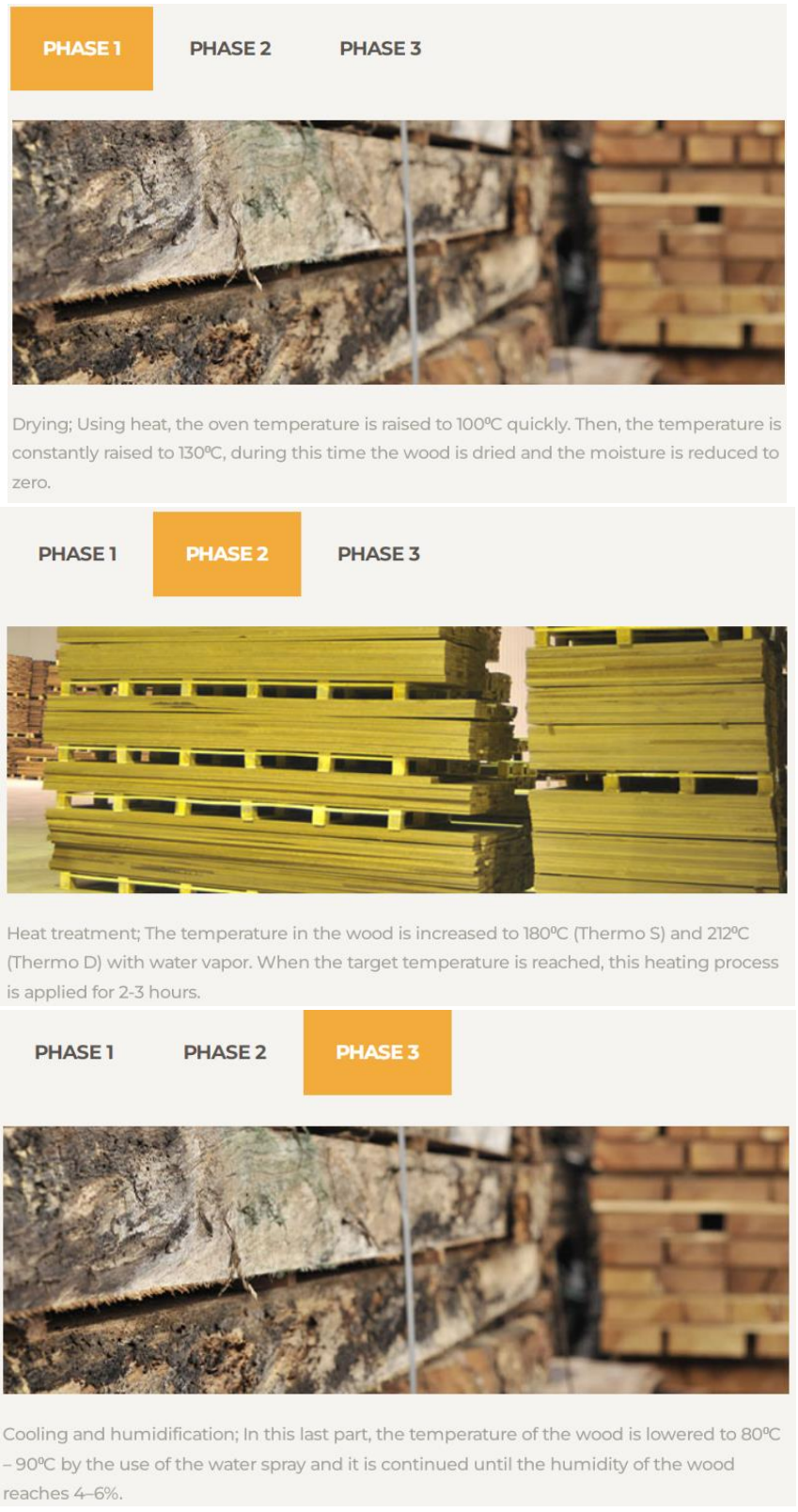


Figure 3. *Production stages*

2.9 ENVIRONMENT AND HEALTH DURING MANUFACTURING

Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak, are manufactured under the warranty of the /ISO 9001:2015/ Quality Management System to comply with the product requirement specifications. The company has also /EN ISO 14001:2015/ Environmental Management Systems.

Thermowoods are produced only from natural wood and there are no additional chemicals and materials during production, only heat treatment is applied during production.

Health protection
Owing to the manufacturing conditions, no other health protection measures are required extending beyond the legally specified measures.

Environmental protection
Air: Waste air generated during production is cleaned in accordance with statutory specifications.
Water/Soil: No direct pollution of water or soil is caused by the production process.

2.10 PACKAGING

There is no product-specific packaging considered in this EPD.

2.11 END-OF-LIFE

Demolition and transportation: The product is either disposed of with manually removed via scraping. Transportation of waste materials is assumed a 50 km average distance to recycling, incineration facility or landfill area.
Recycling, Recovery and Disposal: Since the manufacturer has no procedure for lifetime completed products, all products are considered 3 different scenarios to be recycled, incinerated and disposed in the end-of-life period.

2.12 FURTHER INFORMATION

Further information on the product can be found on the manufacturers 'website at https://novawood.com/

3. LCA: Calculation Rules

3.1 DECLARED UNIT

The declared unit used in the study is defined as one (1) m^3 of thermowood, consistent with the PCR.

Table 4. *Details on declared unit*

Name	Value	Density
Declared unit	1 m^3	
Declared unit for Novathermowood Ash	1 m^3	675 kg
Declared unit for Novathermowood Iroko	1 m^3	660 kg
Declared unit for Novathermowood Pine	1 m^3	550 kg
Declared unit for Novathermowood Ayous	1 m^3	400 kg
Declared unit for Novathermowood Tulipwood	1 m^3	455 kg
Declared unit for Novathermowood Oak	1 m^3	650 kg

Table 5. *The modules and unit processes included in the scope for Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak.*

Module	Module Description	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels.	Extraction and processing of raw materials for the thermowoods components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facility
A3	Manufacturing, including ancillary material production	Manufacturing of thermowood products
A4	Transport to the building site	Module Not Declared
A5	Construction – installation process	Module Not Declared
B1	Product use	Module Not Declared
B2	Product maintenance	Module Not Declared
B3	Product repair	Module Not Declared
B4	Product replacement	Module Not Declared
B5	Product refurbishment	Module Not Declared
B6	Operational energy use by technical building systems	Module Not Declared
B7	Operational water uses by technical building systems	Module Not Declared
C1	Deconstruction, demolition	Disposal of with manually removed via scraping.
C2	Transport to the waste processing	Transport of end-of-life products to the recycling facility
C3	Waste processing for reuse, recovery and/or recycling	The product is sent to recycling for waste processing
C4	Disposal	Disposal of end-of-life product
D	Reuse-recovery-recycling potential	Potential loads and benefits of end-of-life product

3.2 UNITS

All data and results are presented using SI units.

3.3 ESTIMATES AND ASSUMPTIONS

End of life stages, end-of-life wood is assumed to be recycled by 100%. Since there is no follow up procedure, transportation distance to the closest disposal area is estimated as 50 km and common transportation type and fuel are used in the calculation. All the other estimations and assumptions regarding the cut off criteria and the allocation are declared in that parts. There are no other additional estimations and/or assumptions in the scope of this study.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

Three alternative scenarios have been developed for the end-of-life stage.

3.4 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

All inputs and outputs to a (unit) process are included in the calculation, for which data were available. The applied cut off criteria is 1% off renewable and nonrenewable primary energy usage and 1% of the total mass input of that unit process in case of in sufficient input data or data gaps for a unit process.

The total of neglected input flows is a maximum of 5% of energy usage and mass.

3.5 DATA SOURCES

Data representing energy use at Novawood's facility in Turkey represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI datasets, Ecoinvent v3.8 LCI data are used, with a bias towards Ecoinvent v3.8. data.

Table 6. *Data sources for the Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak.*

Flow	Dataset	Data Source	Publication Date
Raw Materials			
Wood	hardwood forestry, mixed species, sustainable forest management | cleft timber, measured as dry mass | CutOff, S	Ecoinvent 3.8.	2021
Wood	hardwood forestry, pine, sustainable forest management | cleft timber, measured as dry mass | CutOff, S	Ecoinvent 3.8.	2021
Wood	hardwood forestry, oak, sustainable forest management | cleft timber, measured as dry mass | CutOff, S	Ecoinvent 3.8.	2021
Waste Plastic	treatment of waste plastic, mixture, sanitary landfill | waste plastic, mixture | CutOff, S - RoW	Ecoinvent 3.8.	2021
Waste Wood	treatment of waste wood, untreated, municipal incineration | waste wood, untreated | CutOff, S - RoW	Ecoinvent 3.8.	2021
Electricity			
Electricity	Electricity voltage transformation from high to medium voltage | electricity, medium voltage | CutOff, S - TR	Ecoinvent 3.8.	2021
Water	Market group for tap water | tap water | CutOff, S - GLO	Ecoinvent 3.8.	2021
Transportation			
Transportation (Truck)	transport, freight, lorry 16-32 metric ton, EURO5 | transport, freight, lorry 16-32 metric ton, EURO5 | CutOff, S - RER	Ecoinvent 3.8.	2021
Transportation (Truck)	transport, freight, lorry 7,5-15 metric ton, EURO5 | transport, freight, lorry 16-32 metric ton, EURO5 | CutOff, S - RER	Ecoinvent 3.8.	2021
Transportation (Sea)	transport, freight, sea, container ship | transport, freight, sea, container ship | CutOff, S - GLO	Ecoinvent 3.8.	2021

3.6. DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 7. *Data quality assessment for Novathermowood Ash, Novathermowood Iroko, Novathermowood Pine, Novathermowood Ayous, Novathermowood Tulipwood and Novathermowood Oak products system*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2020 so data for the time period between 01.01.2020 and 31.12.2020 is used.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The study generally applies to the actual situation in Turkey. When there is no specific data for Turkey, European or Global data has been preferred to use as the conditions in Europe are similar with Turkey. European data of raw materials, haulage vehicles, diesel used for transportation and waste has been used substitute for Turkey's specific data.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. For consistency of data, openLCA v1.10 ecoinvent v3.8 databases is used. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in the Turkey and Europe.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at Novawood's facility in Turkey represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI datasets, Ecoinvent v3.8 LCI data are used, with a bias towards Ecoinvent v3.8. data.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the wood products is very low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.7 PERIOD UNDER REVIEW

The period under consideration is defined as one year. The specific data for the year 2020 is utilized within this study.

3.8 ALLOCATION

The allocation was performed in which the product output fixed to 1 m3 and the corresponding amount of product was used in calculations.

Average breakdown was done by considering product total weight per year production. According to this, the total energy, water, and raw materials used to produce the product were divided by the total annual production.

3.9 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: Scenarios and Additional Technical Information

4.1 END-OF-LIFE

End-of-life wood is assumed to be recycled by 100%.

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following environmental impact category indicators are reported using characterization factors based on the EN15804:2012+A2:2019.

According to the PCR following environmental indicators are included in the LCA study:

- Potential environmental impacts: CML-IA Baseline V4.7, IPCC 2013, ILCD 2011 Midpoint+, AWARE, USEtox 2 (recommended + interim) V2.02, EF 3.0 Method (Adapted)
- Resource uses and waste production: Cumulative Energy Demand V2.0, EDIP 2003

Table 8. *Impact Categories*

Impact Category	Unit
Global Warming Potential (GWP) – Fossil	kg CO_2-eq.
Global Warming Potential (GWP) – Biogenic	kg CO_2-eq.
Global Warming Potential (GWP) – Land use and land transformation	kg CO_2-eq.
Global Warming Potential (GWP) – Total	kg CO_2- eq.
Ozone Depletion Potential (ODP)	kg CFC11- eq.
Acidification potential (AP)	kg SO_2 eq.
Acidification potential (AP)	mol H+ eq.
Eutrophication	kg PO_4 eq.
Eutrophication aquatic freshwater (EP-freshwater)	kg P eq.
Eutrophication aquatic marine (EP-marine)	kg N eq.
Eutrophication terrestrial (EP-terrestrial)	mol N eq.
Formation potential of tropospheric ozone (POCP)	kg ethene-eq.
Photochemical ozone formation (POCP)	kg NMVOC eq.
Abiotic depletion potential -Elements (ADPE)	kg Sb-eq.
Abiotic depletion potential -Fossil Fuels (ADPF)	MJ
Water use (WU)	m^3 eq.
Carbon uptake (CU)	CO_2 eq.
Freshwater ecotoxicity (FE)	PAF.m^3.day
Human toxicity, cancer (HTC)	cases
Human toxicity, non-cancer (HTNC)	cases
Land use - Potential soil quality index (SQP)	Dimensionless
Particulate matter (PM)	disease inc
Ionizing radiation, human	kBq U235 eq.

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

The following inventory parameters, specified by the PCR, are also reported.

Table 9. *Inventory Parameters*

Resources		Unit
Primary energy resources – Renewable (PERE)	Use as energy carrier	MJ
	Used as raw material	MJ
Primary energy resources – Non-renewable (PENRE)	Use as energy carrier	MJ
	Used as raw material	MJ
Secondary material (SM)		kg
Renewable secondary fuels (RSF)		MJ
Non-renewable secondary fuels (NRSF)		MJ
Net use of fresh water (FW)		m^3
Waste and Outflows		**Unit**
Hazardous waste disposed (HWD)		kg
Non-hazardous waste disposed (NHWD)		kg
Radioactive waste disposed (RWD)		kg
Components for reuse (CFR)		kg
Material for recycling (MFR)		kg
Materials for energy recovery (MER)		kg
Exported energy, electricity (EEE)		MJ
Exported energy, thermal (EET)		MJ

Disclaimer 1 – 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 nor due to 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.

Disclaimer 2 – 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 experienced with the indicator.

Table 10. *Life Cycle Impact Assessment (LCIA) results for ASH THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.85E+01	7.59E+01	8.37E+01	0.00E+00	7.19E+00	5.84E+00	0.00E+00	0,00E+00
Global Warming Potential – Biogenic	-1.19E+03	3.03E-01	9.41E-01	0.00E+00	6.42E-02	1.19E+03	0.00E+00	0,00%
Global Warming Potential – LULUC	7.92E-01	4.57E-02	6.35E-01	0.00E+00	3.38E-03	1.44E-02	0.00E+00	0,00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.17E+03	7.63E+01	8.52E+01	0.00E+00	7.26E+00	1.19E+03	0.00E+00	0,00%
	-46.16%	3.02%	3.37%	0.00%	0.29%	47.16%	0.00%	0,00E+00
Ozone Depletion Potential (kg CFC11-eq)	3.22E-06	1.27E-05	2.17E-06	0.00E+00	1.27E-06	3.42E-07	0.00E+00	0,00E+00
	16.36%	64.48%	10.99%	0.00%	6.44%	1.74%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	7.12E-02	1.42E+00	4.42E-01	0.00E+00	2.20E-02	2.70E-02	0.00E+00	0,00E+00
	3.60%	71.61%	22.32%	0.00%	1.11%	1.36%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.78E+00	4.44E-01	0.00E+00	2.83E-02	3.20E-02	0.00E+00	0,00E+00
	4.03%	74.75%	18.68%	0.00%	1.19%	1.35%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	3.82E-02	6.22E-01	2.83E-01	0.00E+00	5.25E-03	2.00E-02	0.00E+00	0,00E+00
	3.94%	64.25%	29.20%	0.00%	0.54%	2.06%	0.00%	100.00%
Eutrophication aquatic freshwater (kg P Eq.)	6.05E-03	3.31E-03	7.00E-02	0.00E+00	5.66E-04	5.75E-03	0.00E+00	0,00E+00
	7.06%	3.86%	81.70%	0.00%	0.66%	6.71%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.88E-02	4.44E-01	7.00E-02	0.00E+00	8.43E-03	5.91E-03	0.00E+00	0,00E+00
	6.84%	78.28%	12.35%	0.00%	1.49%	1.04%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.80E-01	4.92E+00	6.60E-01	0.00E+00	9.18E-02	5.00E-02	0.00E+00	0,00E+00
	6.23%	80.64%	10.81%	0.00%	1.50%	0.82%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.64E-02	3.73E-02	1.64E-02	0.00E+00	9.08E-04	1.12E-03	0.00E+00	0,00E+00
	39.49%	40.52%	17.78%	0.00%	0.99%	1.22%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	1.28E+00	1.86E-01	0.00E+00	2.74E-02	1.41E-02	0.00E+00	0,00E+00
	15.19%	72.03%	10.45%	0.00%	1.54%	0.79%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	4.27E-05	1.48E-04	4.45E-05	0.00E+00	3.04E-05	1.74E-05	0.00E+00	0,00E+00
	15.12%	52.25%	15.73%	0.00%	10.75%	6.15%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.55E+02	1.02E+03	9.27E+02	0.00E+00	1.05E+02	6.66E+01	0.00E+00	0,00E+00
	10.75%	43.00%	39.02%	0.00%	4.42%	2.80%	0.00%	0,00%
Water use	1.95E-01	3.78E-01	4.04E+00	0.00E+00	1.40E-02	6.63E-01	0.00E+00	0,00E+00
(m3 eq.)	3.69%	7.14%	76.38%	0.00%	0.26%	12.52%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.68E+04	1.78E+05	8.21E+05	0.00E+00	3.09E+04	7.51E+04	0.00E+00	0,00E+00
	6.51%	15.03%	69.49%	0.00%	2.61%	6.36%	0.00%	0,00%
Human toxicity, cancer (cases)	1.97E-06	6.95E-06	7.98E-06	0.00E+00	6.72E-07	2.52E-06	0.00E+00	0,00E+00
	9.83%	34.59%	39.71%	0.00%	3.34%	12.53%	0.00%	0,00%
Human toxicity, non-cancer (cases)	8.54E-07	5.15E-06	1.59E-05	0.00E+00	9.01E-07	1.47E-06	0.00E+00	0,00E+00
	3.52%	21.24%	65.45%	0.00%	3.71%	6.08%	0.00%	0,00%
Land use - (Dimensionless)	1.55E+05	1.11E+03	5.88E+02	0.00E+00	2.62E+01	1.86E-06	0.00E+00	0,00E+00
	98.90%	0.71%	0.38%	0.00%	0.02%	0.00%	0.00%	0,00%
Particulate matter (disease inc)	9.42E-07	3.29E-06	1.90E-06	0.00E+00	4.42E-07	1.17E-07	0.00E+00	0,00E+00
	14.08%	49.17%	28.40%	0.00%	6.61%	1.75%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.80E+00	4.99E+00	7.20E-01	0.00E+00	5.80E-01	3.12E+00	0.00E+00	0,00E+00
	16.06%	44.51%	6.42%	0.00%	5.17%	27.83%	0.00%	0,00%

Table 11. *Resource use and waste flows for ASH THERMOWOOD Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.10E+00	2.96E+00	5.65E+00	0.00E+00	5.33E-01	3.39E+00	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.20E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.20E+04	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	1.20E+04	2.96E+00	5.65E+00	0.00E+00	5.33E-01	-1.20E+04	0.00E+00	0.00E+00
	49.99%	0.01%	0.02%	0.00%	0.00%	-49.97%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.55E+02	1.02E+03	9.23E+02	0.00E+00	1.05E+02	6.65E+01	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.55E+02	1.02E+03	9.23E+02	0.00E+00	1.05E+02	6.65E+01	0.00E+00	0.00E+00
	10.77%	43.07%	38.93%	0.00%	4.43%	2.80%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.05E-01	4.08E-02	1.28E+00	0.00E+00	0.00E+00	1.26E+00	0.00E+00	0,00E+00
	3.90%	1.52%	47.69%	0.00%	0.00%	46.89%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.46E-03	1.54E-03	4.33E-04	0.00E+00	2.84E-04	6.18E-05	0.00E+00	0,00%
	38.59%	40.83%	11.45%	0.00%	7.50%	1.63%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	1.51E+00	1.98E+01	4.81E+00	0.00E+00	4.29E+00	7.95E-01	0.00E+00	0,00%
	4.82%	63.49%	15.40%	0.00%	13.74%	2.55%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.80E-03	7.24E-03	3.58E-04	0.00E+00	7.38E-04	8.55E-04	0.00E+00	0,00%
	16.39%	65.86%	3.26%	0.00%	6.72%	7.79%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,75+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 12. *Life Cycle Impact Assessment (LCIA) results for ASH THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. –INCINERATION SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.85E+01	7.59E+01	8.37E+01	0.00E+00	7.19E+00	3.50E+02	0.00E+00	0,00E+00
Global Warming Potential – Biogenic	-1.19E+03	3.03E-01	9.41E-01	0.00E+00	6.42E-02	1.19E+03	0.00E+00	0,00%
Global Warming Potential – LULUC	7.92E-01	4.57E-02	6.35E-01	0.00E+00	3.38E-03	1.00E-02	0.00E+00	0,00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.17E+03	7.63E+01	8.52E+01	0.00E+00	7.26E+00	1.54E+03	0.00E+00	0,00%
	-40.63%	2.66%	2.97%	0.00%	0.25%	53.49%	0.00%	0,00E+00
Ozone Depletion Potential (kg CFC11-eq)	3.22E-06	1.27E-05	2.17E-06	0.00E+00	1.27E-06	2.03E-06	0.00E+00	0,00E+00
	15.06%	59.39%	10.13%	0.00%	5.93%	9.49%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	7.12E-02	1.42E+00	4.42E-01	0.00E+00	2.20E-02	1.61E-01	0.00E+00	0,00E+00
	3.37%	67.09%	20.91%	0.00%	1.04%	7.60%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.78E+00	4.44E-01	0.00E+00	2.83E-02	2.19E-01	0.00E+00	0,00E+00
	3.73%	69.29%	17.32%	0.00%	1.10%	8.55%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	3.82E-02	6.22E-01	2.83E-01	0.00E+00	5.25E-03	2.08E-01	0.00E+00	9.68E-01
	3.30%	53.81%	24.46%	0.00%	0.45%	17.97%	0.00%	100.00%
Eutrophication aquatic freshwater (kg P Eq.)	6.05E-03	3.31E-03	7.00E-02	0.00E+00	5.66E-04	2.67E-02	0.00E+00	0,00E+00
	5.67%	3.10%	65.63%	0.00%	0.53%	25.07%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.88E-02	4.44E-01	7.00E-02	0.00E+00	8.43E-03	1.10E-01	0.00E+00	0,00E+00
	5.77%	66.10%	10.43%	0.00%	1.26%	16.44%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.80E-01	4.92E+00	6.60E-01	0.00E+00	9.18E-02	9.46E-01	0.00E+00	0,00E+00
	5.43%	70.31%	9.43%	0.00%	1.31%	13.52%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.64E-02	3.73E-02	1.64E-02	0.00E+00	9.08E-04	5.03E-03	0.00E+00	0,00E+00
	37.89%	38.87%	17.06%	0.00%	0.95%	5.24%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	1.28E+00	1.86E-01	0.00E+00	2.74E-02	2.32E-01	0.00E+00	0,00E+00
	13.54%	64.18%	9.31%	0.00%	1.37%	11.60%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	4.27E-05	1.48E-04	4.45E-05	0.00E+00	3.04E-05	3.21E-04	0.00E+00	0,00E+00
	7.29%	25.20%	7.59%	0.00%	5.18%	54.74%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.55E+02	1.02E+03	9.27E+02	0.00E+00	1.05E+02	2.00E+02	0.00E+00	0,00E+00
	10.18%	40.72%	36.95%	0.00%	4.19%	7.96%	0.00%	0,00%
Water use	1.95E-01	3.78E-01	4.04E+00	0.00E+00	1.40E-02	3.44E+01	0.00E+00	0,00E+00
(m^3 eq.)	0.50%	0.97%	10.40%	0.00%	0.04%	88.59%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.68E+04	1.78E+05	8.21E+05	0.00E+00	3.09E+04	2.84E+07	0.00E+00	0,00E+00
	0.26%	0.60%	2.79%	0.00%	0.10%	96.50%	0.00%	0,00%
Human toxicity, cancer (cases)	1.97E-06	6.95E-06	7.98E-06	0.00E+00	6.72E-07	3.27E-05	0.00E+00	0,00E+00
	4.09%	14.40%	16.53%	0.00%	1.39%	67.67%	0.00%	0,00%
Human toxicity, non-cancer (cases)	8.54E-07	5.15E-06	1.59E-05	0.00E+00	9.01E-07	1.78E-04	0.00E+00	0,00E+00
	0.42%	2.56%	7.90%	0.00%	0.45%	88.66%	0.00%	0,00%
Land use - (Dimensionless)	1.55E+05	1.11E+03	5.88E+02	0.00E+00	2.62E+01	7.56E+01	0.00E+00	0,00E+00
	98.85%	0.71%	0.38%	0.00%	0.02%	0.05%	0.00%	0,00%
Particulate matter (disease inc)	9.42E-07	3.29E-06	1.90E-06	0.00E+00	4.42E-07	1.83E-06	0.00E+00	0,00E+00
	11.21%	39.14%	22.60%	0.00%	5.26%	21.79%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.80E+00	4.99E+00	7.20E-01	0.00E+00	5.80E-01	7.70E-01	0.00E+00	0,00E+00
	20.32%	56.32%	8.13%	0.00%	6.55%	8.69%	0.00%	0,00%

Table 13. *Resource use and waste flows for ASH THERMOWOOD Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits – INCINERATION SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.10E+00	2.96E+00	5.65E+00	0.00E+00	5.33E-01	0.01128714	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.20E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.20E+04	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	1.20E+04	2.96E+00	5.65E+00	0.00E+00	5.33E-01	-1.20E+04	0.00E+00	0.00E+00
	49.99%	0.01%	0.02%	0.00%	0.00%	-49.98%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.55E+02	1.02E+03	9.23E+02	0.00E+00	1.05E+02	199.808282	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.98%	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.55E+02	1.02E+03	9.23E+02	0.00E+00	1.05E+02	2.00E+02	0.00E+00	0.00E+00
	10.20%	40.77%	36.86%	0.00%	4.19%	7.98%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+04	0.00E+00	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.05E-01	4.08E-02	1.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
	7.34%	2.86%	89.80%	0.00%	0.00%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.46E-03	1.54E-03	4.33E-04	0.00E+00	2.84E-04	2.07E-03	0.00E+00	0,00%
	25.22%	26.69%	7.48%	0.00%	4.90%	35.71%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	1.51E+00	1.98E+01	4.81E+00	0.00E+00	4.29E+00	3.71E+01	0.00E+00	0,00%
	2.23%	29.37%	7.12%	0.00%	6.35%	54.93%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.80E-03	7.24E-03	3.58E-04	0.00E+00	7.38E-04	6.96E-04	0.00E+00	0,00%
	16.63%	66.82%	3.30%	0.00%	6.82%	6.43%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Materials for energy recovery (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,75+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
Exported energy, electricity (MJ)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1.20E+04	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100.00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 14. *Life Cycle Impact Assessment (LCIA) results for ASH THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – LANDFILL SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.85E+01	7.59E+01	8.37E+01	0.00E+00	7.19E+00	0.00E+00	3.61E+01	0,00E+00
Global Warming Potential – Biogenic	-1.19E+03	3.03E-01	9.41E-01	0.00E+00	6.42E-02	0.00E+00	1.70E+03	0,00%
Global Warming Potential – LULUC	7.92E-01	4.57E-02	6.35E-01	0.00E+00	3.38E-03	0.00E+00	1.52E-02	0,00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.17E+03	7.63E+01	8.52E+01	0.00E+00	7.26E+00	0.00E+00	1.74E+03	0,00%
	-37.93%	2.48%	2.77%	0.00%	0.24%	0.00%	56.59%	0,00E+00
Ozone Depletion Potential (kg CFC11-eq)	3.22E-06	1.27E-05	2.17E-06	0.00E+00	1.27E-06	0.00E+00	1.88E-06	0,00E+00
	15.17%	59.81%	10.20%	0.00%	5.97%	0.00%	8.85%	0,00%
Acidification potential (kg SO_2 eq)	7.12E-02	1.42E+00	4.42E-01	0.00E+00	2.20E-02	0.00E+00	9.49E-02	0,00E+00
	3.48%	69.24%	21.58%	0.00%	1.07%	0.00%	4.63%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.78E+00	4.44E-01	0.00E+00	2.83E-02	0.00E+00	1.19E-01	0,00E+00
	3.89%	72.11%	18.02%	0.00%	1.15%	0.00%	4.84%	0,00%
Eutrophication (kg PO_4 Eq.)	3.82E-02	6.22E-01	2.83E-01	0.00E+00	5.25E-03	0.00E+00	1.73E+00	9.68E-01
	1.43%	23.24%	10.56%	0.00%	0.20%	0.00%	64.58%	100.00%
Eutrophication aquatic freshwater (kg P Eq.)	6.05E-03	3.31E-03	7.00E-02	0.00E+00	5.66E-04	0.00E+00	1.07E-02	0,00E+00
	6.67%	3.65%	77.20%	0.00%	0.62%	0.00%	11.85%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.88E-02	4.44E-01	7.00E-02	0.00E+00	8.43E-03	0.00E+00	1.22E+00	0,00E+00
	2.18%	24.91%	3.93%	0.00%	0.47%	0.00%	68.51%	0,00%
Eutrophication terrestrial (mol N eq.)	3.80E-01	4.92E+00	6.60E-01	0.00E+00	9.18E-02	0.00E+00	3.27E-01	0,00E+00
	5.96%	77.14%	10.35%	0.00%	1.44%	0.00%	5.12%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.64E-02	3.73E-02	1.64E-02	0.00E+00	9.08E-04	0.00E+00	9.11E-02	0,00E+00
	19.97%	20.48%	8.99%	0.00%	0.50%	0.00%	50.06%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	1.28E+00	1.86E-01	0.00E+00	2.74E-02	0.00E+00	2.34E-01	0,00E+00
	13.52%	64.10%	9.30%	0.00%	1.37%	0.00%	11.72%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	4.27E-05	1.48E-04	4.45E-05	0.00E+00	3.04E-05	0.00E+00	4.64E-05	0,00E+00
	13.71%	47.39%	14.27%	0.00%	9.75%	0.00%	14.88%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.55E+02	1.02E+03	9.27E+02	0.00E+00	1.05E+02	0.00E+00	2.14E+02	0,00E+00
	10.13%	40.49%	36.74%	0.00%	4.16%	0.00%	8.47%	0,00%
Water use	1.95E-01	3.78E-01	4.04E+00	0.00E+00	1.40E-02	0.00E+00	9.18E+00	0,00E+00
(m3 eq.)	1.44%	2.80%	29.90%	0.00%	0.10%	0.00%	67.91%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.68E+04	1.78E+05	8.21E+05	0.00E+00	3.09E+04	0.00E+00	4.31E+07	0,00E+00
	0.17%	0.40%	1.86%	0.00%	0.07%	0.00%	97.67%	0,00%
Human toxicity, cancer (cases)	1.97E-06	6.95E-06	7.98E-06	0.00E+00	6.72E-07	0.00E+00	2.09E-05	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Human toxicity, non-cancer (cases)	8.54E-07	5.15E-06	1.59E-05	0.00E+00	9.01E-07	0.00E+00	2.93E-04	0,00E+00
	0.27%	1.63%	5.02%	0.00%	0.29%	0.00%	92.79%	0,00%
Land use - (Dimensionless)	1.55E+05	1.11E+03	5.88E+02	0.00E+00	2.62E+01	0.00E+00	1.90E+02	0,00E+00
	98.78%	0.71%	0.37%	0.00%	0.02%	0.00%	0.12%	0,00%
Particulate matter (disease inc)	9.42E-07	3.29E-06	1.90E-06	0.00E+00	4.42E-07	0.00E+00	1.42E-06	0,00E+00
	11.79%	41.17%	23.78%	0.00%	5.53%	0.00%	17.73%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.80E+00	4.99E+00	7.20E-01	0.00E+00	5.80E-01	0.00E+00	1.44E+00	0,00E+00
	18.89%	52.37%	7.56%	0.00%	6.09%	0.00%	15.09%	0,00%

Table 15. *Resource use and waste flows for ASH THERMOWOOD Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits – LANDFILL SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.10E+00	2.96E+00	5.65E+00	0.00E+00	5.33E-01	0.00E+00	2.07E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.20E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.20E+04	0.00E+00
Primary energy resources (Renewable) – Total	1.20E+04	2.96E+00	5.65E+00	0.00E+00	5.33E-01	0.00E+00	-1.20E+04	0.00E+00
	49.99%	0.01%	0.02%	0.00%	0.00%	0.00%	-49.97%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.55E+02	1.02E+03	9.23E+02	0.00E+00	1.05E+02	0.00E+00	2.14E+02	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.55E+02	1.02E+03	9.23E+02	0.00E+00	1.05E+02	0.00E+00	2.14E+02	0.00E+00
	10.14%	40.55%	36.65%	0.00%	4.17%	0.00%	8.49%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.05E-01	4.08E-02	1.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
	7.34%	2.86%	89.80%	0.00%	0.00%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.46E-03	1.54E-03	4.33E-04	0.00E+00	2.84E-04	0.00E+00	7.64E-04	0,00%
	32.54%	34.44%	9.66%	0.00%	6.32%	0.00%	17.04%	0,00E+00
Non-hazardous waste disposed (kg)	1.51E+00	1.98E+01	4.81E+00	0.00E+00	4.29E+00	0.00E+00	6.77E+02	0,00%
	0.21%	2.80%	0.68%	0.00%	0.61%	0.00%	95.70%	0,00E+00
Radioactive waste disposed (kg)	1.80E-03	7.24E-03	3.58E-04	0.00E+00	7.38E-04	0.00E+00	1.19E-03	0,00%
	15.91%	63.93%	3.16%	0.00%	6.52%	0.00%	10.48%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,75+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 16. *Life Cycle Impact Assessment (LCIA) results for IROKO THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.81E+01	7.27E+01	8.97E+01	0.00E+00	7.03E+00	5.71E+00	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-1.16E+03	2.93E-01	1.01E+00	0.00E+00	6.27E-02	1.16E+03	0.00E+00	0.00E+00
Global Warming Potential – LULUC	7.74E-01	4.36E-02	6.81E-01	0.00E+00	3.31E-03	1.41E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.14E+03	7.31E+01	9.14E+01	0.00E+00	7.09E+00	1.17E+03	0.00E+00	0.00E+00
	-46.05%	2.95%	3.68%	0.00%	0.29%	47.04%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.15E-06	1.22E-05	2.33E-06	0.00E+00	1.24E-06	3.34E-07	0.00E+00	0,00E+00
	16.38%	63.31%	12.12%	0.00%	6.45%	1.74%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	6.96E-02	1.35E+00	4.74E-01	0.00E+00	2.15E-02	2.64E-02	0.00E+00	0,00E+00
	3.59%	69.49%	24.45%	0.00%	1.11%	1.36%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.00E-02	1.69E+00	5.50E-01	0.00E+00	2.77E-02	3.00E-02	0.00E+00	0,00E+00
	3.77%	70.74%	23.06%	0.00%	1.16%	1.26%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	3.73E-02	4.57E-01	3.03E-01	0.00E+00	5.13E-03	1.95E-02	0.00E+00	8.22E-01
	3.85%	47.22%	31.30%	0.00%	0.53%	2.02%	0.00%	100.00%
Eutrophication aquatic freshwater (kg P Eq.)	5.91E-03	3.19E-03	8.80E-01	0.00E+00	5.54E-04	5.63E-03	0.00E+00	0,00E+00
	0.66%	0.36%	98.29%	0.00%	0.06%	0.63%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.79E-02	4.21E-01	9.00E-02	0.00E+00	8.25E-03	5.78E-03	0.00E+00	0,00E+00
	6.73%	74.81%	15.98%	0.00%	1.46%	1.03%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.78E-01	4.67E+00	8.30E-01	0.00E+00	8.97E-02	5.00E-02	0.00E+00	0,00E+00
	6.28%	77.62%	13.78%	0.00%	1.49%	0.83%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.55E-02	3.54E-02	1.75E-02	0.00E+00	8.87E-04	1.10E-03	0.00E+00	0,00E+00
	39.26%	39.16%	19.39%	0.00%	0.98%	1.21%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.60E-01	1.22E+00	2.30E-01	0.00E+00	2.68E-02	1.30E-02	0.00E+00	0,00E+00
	14.87%	69.70%	13.15%	0.00%	1.53%	0.74%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	4.18E-05	1.42E-04	4.78E-05	0.00E+00	2.97E-05	1.70E-05	0.00E+00	0,00E+00
	14.99%	51.09%	17.17%	0.00%	10.66%	6.10%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.50E+02	9.79E+02	9.94E+02	0.00E+00	1.03E+02	6.51E+01	0.00E+00	0,00E+00
	10.45%	40.97%	41.57%	0.00%	4.30%	2.72%	0.00%	0,00%
Water use (m3 eq.)	1.91E-01	3.65E-01	4.28E+00	0.00E+00	6.40E-02	6.48E-01	0.00E+00	0,00E+00
	3.44%	6.57%	77.15%	0.00%	1.15%	11.68%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.51E+04	1.71E+05	8.80E+05	0.00E+00	3.02E+04	7.34E+04	0.00E+00	0,00E+00
	6.11%	13.90%	71.57%	0.00%	2.45%	5.97%	0.00%	0,00%
Human toxicity, cancer (cases)	1.93E-06	6.65E-06	8.58E-06	0.00E+00	6.57E-07	2.46E-06	0.00E+00	0,00E+00
	9.52%	32.77%	42.32%	0.00%	3.24%	12.14%	0.00%	0,00%
Human toxicity, non-cancer (cases)	8.34E-07	4.97E-06	1.70E-05	0.00E+00	8.81E-07	1.44E-06	0.00E+00	0,00E+00
	3.32%	19.77%	67.69%	0.00%	3.50%	5.73%	0.00%	0,00%
Land use (Dimensionless)	1.50E+05	1.10E+03	5.80E+02	0.00E+00	2.52E+01	1.86E-06	0.00E+00	0,00E+00
	98.88%	0.73%	0.38%	0.00%	0.02%	0.00%	0.00%	0,00%
Particulate matter (disease inc)	9.40E-07	3.00E-06	1.30E-06	0.00E+00	3.42E-07	1.00E-07	0.00E+00	0,00E+00
	14.05%	44.84%	19.43%	0.00%	5.11%	1.49%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.70E+00	4.70E+00	6.20E-01	0.00E+00	4.80E-01	3.02E+00	0.00E+00	0,00E+00
	15.17%	41.93%	5.53%	0.00%	4.28%	26.94%	0.00%	0,00%

Table 17. *Resource use and waste flows for IROKO THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.05E+00	2.85E+00	6.07E+00	0.00E+00	5.21E-01	3.32E+00	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.17E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.17E+04	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	1.17E+04	2.85E+00	6.07E+00	0.00E+00	5.21E-01	-1.17E+04	0.00E+00	0.00E+00
	48.88%	0.01%	0.03%	0.00%	0.00%	-48.86%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.50E+02	9.79E+02	9.90E+02	0.00E+00	1.03E+02	6.50E+01	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.50E+02	9.79E+02	9.90E+02	0.00E+00	1.03E+02	6.50E+01	0.00E+00	0.00E+00
	10.53%	41.28%	41.73%	0.00%	4.33%	2.74%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.02E-01	7.75E-02	1.43E+00	0.00E+00	1.37E-02	1.09E+00	0.00E+00	0,00E+00
	3.77%	2.85%	52.73%	0.00%	0.50%	40.14%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.43E-03	1.49E-03	4.65E-04	0.00E+00	2.77E-04	6.04E-05	0.00E+00	0,00%
	38.33%	40.11%	12.49%	0.00%	7.45%	1.62%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	1.47E+00	1.93E+01	5.16E+00	0.00E+00	4.20E+00	7.78E-01	0.00E+00	0,00%
	4.76%	62.49%	16.68%	0.00%	13.56%	2.51%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.76E-03	6.94E-03	3.86E-04	0.00E+00	7.21E-04	8.36E-04	0.00E+00	0,00%
	16.54%	65.19%	3.63%	0.00%	6.78%	7.86%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,60E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 18. *Life Cycle Impact Assessment (LCIA) results for IROKO THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.81E+01	7.27E+01	8.97E+01	0.00E+00	7.03E+00	3.30E+02	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-1.16E+03	2.93E-01	1.01E+00	0.00E+00	6.27E-02	1.16E+03	0.00E+00	0.00E+00
Global Warming Potential – LULUC	7.74E-01	4.36E-02	6.81E-01	0.00E+00	3.31E-03	1.00E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.14E+03	7.31E+01	9.14E+01	0.00E+00	7.09E+00	1.49E+03	0.00E+00	0.00E+00
	-40.72%	2.60%	3.26%	0.00%	0.25%	53.16%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.15E-06	1.22E-05	2.33E-06	0.00E+00	1.24E-06	1.93E-06	0.00E+00	0,00E+00
	15.13%	58.46%	11.19%	0.00%	5.96%	9.26%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	6.96E-02	1.35E+00	4.74E-01	0.00E+00	2.15E-02	1.41E-01	0.00E+00	0,00E+00
	3.39%	65.62%	23.09%	0.00%	1.05%	6.85%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.00E-02	1.69E+00	5.50E-01	0.00E+00	2.77E-02	2.09E-01	0.00E+00	0,00E+00
	3.51%	65.80%	21.45%	0.00%	1.08%	8.16%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	3.73E-02	4.57E-01	3.03E-01	0.00E+00	5.13E-03	2.08E-01	0.00E+00	8.22E-01
	3.23%	39.55%	26.22%	0.00%	0.44%	20.56%	0.00%	100.00%
Eutrophication aquatic freshwater (kg P Eq.)	5.91E-03	3.19E-03	8.80E-01	0.00E+00	5.54E-04	2.27E-02	0.00E+00	0,00E+00
	0.65%	0.35%	96.45%	0.00%	0.06%	2.49%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.79E-02	4.21E-01	9.00E-02	0.00E+00	8.25E-03	1.00E-01	0.00E+00	0,00E+00
	5.76%	64.05%	13.68%	0.00%	1.25%	15.26%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.78E-01	4.67E+00	8.30E-01	0.00E+00	8.97E-02	9.16E-01	0.00E+00	0,00E+00
	5.49%	67.86%	12.05%	0.00%	1.30%	13.30%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.55E-02	3.54E-02	1.75E-02	0.00E+00	8.87E-04	5.01E-03	0.00E+00	0,00E+00
	37.64%	37.54%	18.58%	0.00%	0.94%	5.30%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.60E-01	1.22E+00	2.30E-01	0.00E+00	2.68E-02	2.02E-01	0.00E+00	0,00E+00
	13.42%	62.90%	11.87%	0.00%	1.38%	10.42%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	4.18E-05	1.42E-04	4.78E-05	0.00E+00	2.97E-05	3.21E-04	0.00E+00	0,00E+00
	7.17%	24.44%	8.21%	0.00%	5.10%	55.07%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.50E+02	9.79E+02	9.94E+02	0.00E+00	1.03E+02	2.00E+02	0.00E+00	0,00E+00
	9.89%	38.78%	39.35%	0.00%	4.07%	7.91%	0.00%	0,00%
Water use (m3 eq.)	1.91E-01	3.65E-01	4.28E+00	0.00E+00	6.40E-02	3.44E+01	0.00E+00	0,00E+00
	0.49%	0.93%	10.88%	0.00%	0.16%	87.55%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.51E+04	1.71E+05	8.80E+05	0.00E+00	3.02E+04	2.84E+07	0.00E+00	0,00E+00
	0.25%	0.58%	2.98%	0.00%	0.10%	96.09%	0.00%	0,00%
Human toxicity, cancer (cases)	1.93E-06	6.65E-06	8.58E-06	0.00E+00	6.57E-07	3.27E-05	0.00E+00	0,00E+00
	3.82%	13.17%	17.00%	0.00%	1.30%	64.70%	0.00%	0,00%
Human toxicity, non-cancer (cases)	8.34E-07	4.97E-06	1.70E-05	0.00E+00	8.81E-07	1.78E-04	0.00E+00	0,00E+00
	0.41%	2.46%	8.44%	0.00%	0.44%	88.25%	0.00%	0,00%
Land use (Dimensionless)	1.50E+05	1.10E+03	5.80E+02	0.00E+00	2.52E+01	7.26E+01	0.00E+00	0,00E+00
	98.83%	0.72%	0.38%	0.00%	0.02%	0.05%	0.00%	0,00%
Particulate matter (disease inc)	9.40E-07	3.00E-06	1.30E-06	0.00E+00	3.42E-07	1.83E-06	0.00E+00	0,00E+00
	11.18%	35.69%	15.47%	0.00%	4.07%	24.71%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.70E+00	4.70E+00	6.20E-01	0.00E+00	4.80E-01	8.03E-01	0.00E+00	0,00E+00
	19.19%	53.05%	7.00%	0.00%	5.42%	9.68%	0.00%	0,00%

Table 19. *Resource use and waste flows for IROKO THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. INCINERATION SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.05E+00	2.85E+00	6.07E+00	0.00E+00	5.21E-01	0.00928714	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.17E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.17E+04	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	1.17E+04	2.85E+00	6.07E+00	0.00E+00	5.21E-01	-1.17E+04	0.00E+00	0.00E+00
	48.87%	0.01%	0.03%	0.00%	0.00%	-49.98%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.50E+02	9.79E+02	9.90E+02	0.00E+00	1.03E+02	188.808282	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.52%	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.50E+02	9.79E+02	9.90E+02	0.00E+00	1.03E+02	1.89E+02	0.00E+00	0.00E+00
	9.97%	39.09%	39.51%	0.00%	4.10%	7.53%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E+04	0.00E+00	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.02E-01	7.75E-02	1.43E+00	0.00E+00	1.37E-02	0.00E+00	0.00E+00	0,00E+00
	6.30%	4.77%	88.09%	0.00%	0.84%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.43E-03	1.49E-03	4.65E-04	0.00E+00	2.77E-04	2.01E-03	1.43E-03	0,00%
	25.17%	26.34%	8.20%	0.00%	4.89%	35.40%	25.17%	0,00E+00
Non-hazardous waste disposed (kg)	1.47E+00	1.93E+01	5.16E+00	0.00E+00	4.20E+00	3.21E+01	1.47E+00	0,00%
	2.36%	31.06%	8.29%	0.00%	6.74%	51.54%	2.36%	0,00E+00
Radioactive waste disposed (kg)	1.76E-03	6.94E-03	3.86E-04	0.00E+00	7.21E-04	6.76E-04	1.76E-03	0,00%
	16.79%	66.19%	3.68%	0.00%	6.89%	6.45%	16.79%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Materials for energy recovery (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,60E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
Exported energy, electricity (MJ)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1.17E+04	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100.00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 20. *Life Cycle Impact Assessment (LCIA) results for IROKO THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – LANDFILL SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.81E+01	7.27E+01	8.97E+01	0.00E+00	7.03E+00	0.00E+00	3.11E+01	0.00E+00
Global Warming Potential – Biogenic	-1.16E+03	2.93E-01	1.01E+00	0.00E+00	6.27E-02	0.00E+00	1.16E+03	0.00E+00
Global Warming Potential – LULUC	7.74E-01	4.36E-02	6.81E-01	0.00E+00	3.31E-03	0.00E+00	1.52E-02	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.14E+03	7.31E+01	9.14E+01	0.00E+00	7.09E+00	0.00E+00	1.19E+03	0.00E+00
	-45.58%	2.92%	3.65%	0.00%	0.28%	0.00%	47.57%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.15E-06	1.22E-05	2.33E-06	0.00E+00	1.24E-06	0.00E+00	1.82E-06	0,00E+00
	15.21%	58.77%	11.25%	0.00%	5.99%	0.00%	8.78%	0,00%
Acidification potential (kg SO_2 eq)	6.96E-02	1.35E+00	4.74E-01	0.00E+00	2.15E-02	0.00E+00	9.19E-02	0,00E+00
	3.47%	67.22%	23.65%	0.00%	1.07%	0.00%	4.59%	0,00%
Acidification potential (mol H+ Eq.)	9.00E-02	1.69E+00	5.50E-01	0.00E+00	2.77E-02	0.00E+00	1.09E-01	0,00E+00
	3.65%	68.47%	22.32%	0.00%	1.12%	0.00%	4.44%	0,00%
Eutrophication (kg PO_4 Eq.)	3.73E-02	4.57E-01	3.03E-01	0.00E+00	5.13E-03	0.00E+00	1.71E+00	8.22E-01
	1.39%	17.08%	11.32%	0.00%	0.19%	0.00%	68.04%	100.00%
Eutrophication aquatic freshwater (kg P Eq.)	5.91E-03	3.19E-03	8.80E-01	0.00E+00	5.54E-04	0.00E+00	9.75E-03	0,00E+00
	0.66%	0.35%	97.84%	0.00%	0.06%	0.00%	1.08%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.79E-02	4.21E-01	9.00E-02	0.00E+00	8.25E-03	0.00E+00	1.12E+00	0,00E+00
	2.26%	25.12%	5.36%	0.00%	0.49%	0.00%	66.77%	0,00%
Eutrophication terrestrial (mol N eq.)	3.78E-01	4.67E+00	8.30E-01	0.00E+00	8.97E-02	0.00E+00	2.27E-01	0,00E+00
	6.10%	75.41%	13.39%	0.00%	1.45%	0.00%	3.66%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.55E-02	3.54E-02	1.75E-02	0.00E+00	8.87E-04	0.00E+00	8.11E-02	0,00E+00
	20.84%	20.78%	10.29%	0.00%	0.52%	0.00%	47.58%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.60E-01	1.22E+00	2.30E-01	0.00E+00	2.68E-02	0.00E+00	2.14E-01	0,00E+00
	13.33%	62.50%	11.80%	0.00%	1.37%	0.00%	11.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	4.18E-05	1.42E-04	4.78E-05	0.00E+00	2.97E-05	0.00E+00	4.64E-05	0,00E+00
	13.56%	46.21%	15.53%	0.00%	9.64%	0.00%	15.05%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.50E+02	9.79E+02	9.94E+02	0.00E+00	1.03E+02	0.00E+00	2.04E+02	0,00E+00
	9.87%	38.72%	39.29%	0.00%	4.06%	0.00%	8.06%	0,00%
Water use (m3 eq.)	1.91E-01	3.65E-01	4.28E+00	0.00E+00	6.40E-02	0.00E+00	9.02E+00	0,00E+00
	1.37%	2.62%	30.74%	0.00%	0.46%	0.00%	64.81%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.51E+04	1.71E+05	8.80E+05	0.00E+00	3.02E+04	0.00E+00	4.11E+07	0,00E+00
	0.18%	0.40%	2.08%	0.00%	0.07%	0.00%	97.26%	0,00%
Human toxicity, cancer (cases)	1.93E-06	6.65E-06	8.58E-06	0.00E+00	6.57E-07	0.00E+00	1.09E-05	0,00E+00
	6.72%	23.13%	29.87%	0.00%	2.29%	0.00%	37.99%	0,00%
Human toxicity, non-cancer (cases)	8.34E-07	4.97E-06	1.70E-05	0.00E+00	8.81E-07	0.00E+00	1.93E-04	0,00E+00
	0.38%	2.29%	7.85%	0.00%	0.41%	0.00%	89.07%	0,00%
Land use (Dimensionless)	1.50E+05	1.10E+03	5.80E+02	0.00E+00	2.52E+01	0.00E+00	1.70E+02	0,00E+00
	98.77%	0.72%	0.38%	0.00%	0.02%	0.00%	0.11%	0,00%
Particulate matter (disease inc)	9.40E-07	3.00E-06	1.30E-06	0.00E+00	3.42E-07	0.00E+00	1.22E-06	0,00E+00
	11.76%	37.54%	16.27%	0.00%	4.28%	0.00%	17.90%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.70E+00	4.70E+00	6.20E-01	0.00E+00	4.80E-01	0.00E+00	1.24E+00	0,00E+00
	17.84%	49.33%	6.51%	0.00%	5.04%	0.00%	14.17%	0,00%

Table 21. *Resource use and waste flows for IROKO THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – LANDFILL SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.05E+00	2.85E+00	6.07E+00	0.00E+00	5.21E-01	0.00E+00	2.07E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.17E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.17E+04	0.00E+00
Primary energy resources (Renewable) – Total	1.17E+04	2.85E+00	6.07E+00	0.00E+00	5.21E-01	0.00E+00	-1.17E+04	0.00E+00
	48.88%	0.01%	0.03%	0.00%	0.00%	0.00%	-49.97%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.50E+02	9.79E+02	9.90E+02	0.00E+00	1.03E+02	0.00E+00	1.94E+02	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.50E+02	9.79E+02	9.90E+02	0.00E+00	1.03E+02	0.00E+00	1.94E+02	0.00E+00
	9.91%	38.87%	39.29%	0.00%	4.08%	0.00%	7.71%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.02E-01	7.75E-02	1.43E+00	0.00E+00	1.37E-02	0.00E+00	0.00E+00	0,00E+00
	6.30%	4.77%	88.09%	0.00%	0.84%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.43E-03	1.49E-03	4.65E-04	0.00E+00	2.77E-04	0.00E+00	7.14E-04	0,00%
	32.60%	34.12%	10.62%	0.00%	6.34%	0.00%	16.32%	0,00E+00
Non-hazardous waste disposed (kg)	1.47E+00	1.93E+01	5.16E+00	0.00E+00	4.20E+00	0.00E+00	6.17E+02	0,00%
	0.23%	2.99%	0.80%	0.00%	0.65%	0.00%	95.34%	0,00E+00
Radioactive waste disposed (kg)	1.76E-03	6.94E-03	3.86E-04	0.00E+00	7.21E-04	0.00E+00	1.09E-03	0,00%
	16.16%	63.69%	3.54%	0.00%	6.63%	0.00%	9.98%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,60E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 22. *Life Cycle Impact Assessment (LCIA) results for PINE THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. RECYCLING SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.96E+01	7.08E+01	7.17E+01	0.00E+00	5.86E+00	4.76E+00	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-9.68E+02	2.68E-01	8.06E-01	0.00E+00	5.23E-02	9.68E+02	0.00E+00	0.00E+00
Global Warming Potential – LULUC	6.57E-01	4.36E-02	5.44E-01	0.00E+00	2.76E-03	1.17E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-9.48E+02	7.11E+01	7.31E+01	0.00E+00	5.91E+00	9.73E+02	0.00E+00	0.00E+00
	-45.77%	3.44%	3.53%	0.00%	0.29%	46.98%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.41E-06	1.18E-05	1.85E-06	0.00E+00	1.03E-06	2.79E-07	0.00E+00	0,00E+00
	18.56%	64.20%	10.10%	0.00%	5.63%	1.52%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	8.90E-02	1.39E+00	3.79E-01	0.00E+00	1.79E-02	2.20E-02	0.00E+00	0,00E+00
	4.69%	73.25%	19.96%	0.00%	0.94%	1.16%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	1.20E-01	1.74E+00	4.40E-01	0.00E+00	2.30E-02	2.00E-02	0.00E+00	0,00E+00
	5.12%	74.27%	18.77%	0.00%	0.98%	0.85%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	3.41E-02	2.12E-01	2.42E-01	0.00E+00	4.28E-03	1.63E-02	0.00E+00	0,00E+00
	6.70%	41.62%	47.64%	0.00%	0.84%	3.20%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	5.00E-03	2.98E-03	7.03E-02	0.00E+00	4.61E-04	4.69E-03	0.00E+00	0,00E+00
	5.99%	3.57%	84.26%	0.00%	0.55%	5.62%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	4.84E-02	4.34E-01	7.00E-02	0.00E+00	6.87E-03	4.81E-03	0.00E+00	0,00E+00
	8.58%	76.93%	12.42%	0.00%	1.22%	0.85%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	5.01E-01	4.81E+00	6.60E-01	0.00E+00	7.48E-02	4.20E-02	0.00E+00	0,00E+00
	8.22%	79.02%	10.84%	0.00%	1.23%	0.69%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	1.32E-04	3.64E-02	1.40E-02	0.00E+00	2.23E-02	9.16E-04	0.00E+00	0,00E+00
	0.18%	49.31%	19.01%	0.00%	30.26%	1.24%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.67E-01	1.25E+00	1.80E-01	0.00E+00	7.39E-04	1.14E-02	0.00E+00	0,00E+00
	15.58%	73.19%	10.52%	0.00%	0.04%	0.67%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	3.55E-05	1.32E-04	3.81E-05	0.00E+00	2.47E-05	1.14E-01	0.00E+00	0,00E+00
	0.03%	0.12%	0.03%	0.00%	0.02%	99.80%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.71E+02	9.47E+02	7.94E+02	0.00E+00	8.56E+01	5.43E+01	0.00E+00	0,00E+00
	12.59%	43.99%	36.92%	0.00%	3.98%	2.52%	0.00%	0,00%
Water use (m3 eq.)	1.61E-01	3.38E-01	3.38E+00	0.00E+00	6.40E-02	5.40E-01	0.00E+00	0,00E+00
	3.60%	7.53%	75.41%	0.00%	1.43%	12.03%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.33E+04	1.61E+05	7.03E+05	0.00E+00	2.51E+04	6.12E+04	0.00E+00	0,00E+00
	7.16%	15.69%	68.71%	0.00%	2.46%	5.98%	0.00%	0,00%
Human toxicity, cancer (cases)	2.29E-06	6.54E-06	6.83E-06	0.00E+00	5.48E-07	2.05E-06	0.00E+00	0,00E+00
	12.55%	35.81%	37.41%	0.00%	3.00%	11.24%	0.00%	0,00%
Human toxicity, non-cancer (cases)	1.15E-06	4.56E-06	1.36E-05	0.00E+00	7.34E-07	1.20E-06	0.00E+00	0,00E+00
	5.42%	21.47%	64.00%	0.00%	3.45%	5.65%	0.00%	0,00%
Land use (Dimensionless)	2.00E+05	1.90E+03	9.80E+02	0.00E+00	3.52E+01	2.86E-06	0.00E+00	0,00E+00
	98.56%	0.94%	0.48%	0.00%	0.02%	0.00%	0.00%	0,00%
Particulate matter (disease inc)	1.09E-06	5.00E-06	1.30E-06	0.00E+00	3.42E-07	1.00E-07	0.00E+00	0,00E+00
	13.96%	63.81%	16.59%	0.00%	4.36%	1.28%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.80E+00	4.80E+00	6.20E-01	0.00E+00	4.80E-01	3.02E+00	0.00E+00	0,00E+00
	16.79%	44.78%	5.78%	0.00%	4.48%	28.17%	0.00%	0,00%

Table 23. *Resource use and waste flows for PINE THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.29E+00	2.66E+00	4.84E+00	0.00E+00	4.34E-01	2.76E+00	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	9.77E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.77E+03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	9.77E+03	2.66E+00	4.84E+00	0.00E+00	4.34E-01	-9.77E+03	0.00E+00	0.00E+00
	49.98%	0.01%	0.02%	0.00%	0.00%	-49.95%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.71E+02	9.46E+02	1.80E-02	0.00E+00	8.56E+01	5.41E+01	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.71E+02	9.46E+02	1.80E-02	0.00E+00	8.56E+01	5.41E+01	0.00E+00	0.00E+00
	19.95%	69.75%	0.00%	0.00%	6.31%	3.99%	0.00%	0.00E+00
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	6.00E-02	7.21E-02	1.09E+00	0.00E+00	1.14E-02	1.09E+00	0.00E+00	0,00E+00
	2.59%	3.11%	46.80%	0.00%	0.49%	47.01%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.08E-03	1.36E-03	3.70E-04	0.00E+00	0.00E+00	6.48E-01	0.00E+00	0,00%
	0.17%	0.21%	0.06%	0.00%	0.00%	99.57%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	1.87E+00	1.64E+01	4.12E+00	0.00E+00	0.00E+00	6.48E-01	0.00E+00	0,00%
	8.08%	71.26%	17.85%	0.00%	0.00%	2.81%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.92E-03	6.71E-03	3.10E-04	0.00E+00	0.00E+00	6.97E-04	0.00E+00	0,00%
	19.90%	69.64%	3.22%	0.00%	0.00%	7.24%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,50E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 24. *Life Cycle Impact Assessment (LCIA) results for PINE THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. INCINERATION SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.96E+01	7.08E+01	7.17E+01	0.00E+00	5.86E+00	3.20E+00	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-9.68E+02	2.68E-01	8.06E-01	0.00E+00	5.23E-02	1.48E+03	0.00E+00	0.00E+00
Global Warming Potential – LULUC	6.57E-01	4.36E-02	5.44E-01	0.00E+00	2.76E-03	9.00E-03	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO2 eq)	-9.48E+02	7.11E+01	7.31E+01	0.00E+00	5.91E+00	1.48E+03	0.00E+00	0.00E+00
	-36.78%	2.76%	2.84%	0.00%	0.23%	57.39%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.41E-06	1.18E-05	1.85E-06	0.00E+00	1.03E-06	1.90E-06	0.00E+00	0,00E+00
	17.05%	58.99%	9.28%	0.00%	5.18%	9.51%	0.00%	0,00%
Acidification potential (kg SO2 eq)	8.90E-02	1.39E+00	3.79E-01	0.00E+00	1.79E-02	1.31E-01	0.00E+00	0,00E+00
	4.43%	69.29%	18.88%	0.00%	0.89%	6.51%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	1.20E-01	1.74E+00	4.40E-01	0.00E+00	2.30E-02	2.01E-01	0.00E+00	0,00E+00
	4.75%	68.94%	17.42%	0.00%	0.91%	7.97%	0.00%	0,00%
Eutrophication (kg PO4 Eq.)	3.41E-02	2.12E-01	2.42E-01	0.00E+00	4.28E-03	2.02E-01	0.00E+00	0,00E+00
	4.91%	30.51%	34.92%	0.00%	0.62%	29.04%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	5.00E-03	2.98E-03	7.03E-02	0.00E+00	4.61E-04	2.67E-02	0.00E+00	0,00E+00
	4.74%	2.83%	66.65%	0.00%	0.44%	25.35%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	4.84E-02	4.34E-01	7.00E-02	0.00E+00	6.87E-03	1.09E-01	0.00E+00	0,00E+00
	7.24%	64.89%	10.47%	0.00%	1.03%	16.36%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	5.01E-01	4.81E+00	6.60E-01	0.00E+00	7.48E-02	8.95E-01	0.00E+00	0,00E+00
	7.21%	69.32%	9.51%	0.00%	1.08%	12.89%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	1.32E-04	3.64E-02	1.40E-02	0.00E+00	2.23E-02	5.00E-03	0.00E+00	0,00E+00
	0.17%	46.72%	18.02%	0.00%	28.67%	6.42%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.67E-01	1.25E+00	1.80E-01	0.00E+00	7.39E-04	1.99E-01	0.00E+00	0,00E+00
	14.04%	65.95%	9.48%	0.00%	0.04%	10.49%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	3.55E-05	1.32E-04	3.81E-05	0.00E+00	2.47E-05	2.91E-04	0.00E+00	0,00E+00
	6.81%	25.35%	7.30%	0.00%	4.75%	55.79%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.71E+02	9.47E+02	7.94E+02	0.00E+00	8.56E+01	1.91E+02	0.00E+00	0,00E+00
	11.84%	41.37%	34.72%	0.00%	3.74%	8.33%	0.00%	0,00%
Water use (m3 eq.)	1.61E-01	3.38E-01	3.38E+00	0.00E+00	6.40E-02	3.04E+01	0.00E+00	0,00E+00
	0.47%	0.98%	9.84%	0.00%	0.19%	88.52%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.33E+04	1.61E+05	7.03E+05	0.00E+00	2.51E+04	2.34E+07	0.00E+00	0,00E+00
	0.30%	0.66%	2.89%	0.00%	0.10%	96.05%	0.00%	0,00%
Human toxicity, cancer (cases)	2.29E-06	6.54E-06	6.83E-06	0.00E+00	5.48E-07	3.27E-05	0.00E+00	0,00E+00
	4.69%	13.38%	13.98%	0.00%	1.12%	66.83%	0.00%	0,00%
Human toxicity, non-cancer (cases)	1.15E-06	4.56E-06	1.36E-05	0.00E+00	7.34E-07	1.78E-04	0.00E+00	0,00E+00
	0.58%	2.30%	6.86%	0.00%	0.37%	89.88%	0.00%	0,00%
Land use (Dimensionless)	2.00E+05	1.90E+03	9.80E+02	0.00E+00	3.52E+01	7.06E+01	0.00E+00	0,00E+00
	98.53%	0.94%	0.48%	0.00%	0.02%	0.03%	0.00%	0,00%
Particulate matter (disease inc)	1.09E-06	5.00E-06	1.30E-06	0.00E+00	3.42E-07	1.63E-06	0.00E+00	0,00E+00
	11.68%	53.38%	13.88%	0.00%	3.65%	17.42%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.80E+00	4.80E+00	6.20E-01	0.00E+00	4.80E-01	7.10E-01	0.00E+00	0,00E+00
	21.40%	57.07%	7.37%	0.00%	5.71%	8.45%	0.00%	0,00%

Table 25. *Resource use and waste flows for PINE THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.29E+00	2.66E+00	4.84E+00	0.00E+00	4.34E-01	7.29E-03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	9.77E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.77E+03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	9.77E+03	2.66E+00	4.84E+00	0.00E+00	4.34E-01	-9.77E+03	0.00E+00	0.00E+00
	49.99%	0.01%	0.02%	0.00%	0.00%	-49.97%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.71E+02	9.46E+02	1.80E-02	0.00E+00	8.56E+01	1.79E+02	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	12.07%	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.71E+02	9.46E+02	1.80E-02	0.00E+00	8.56E+01	1.79E+02	0.00E+00	0.00E+00
	18.27%	63.87%	0.00%	0.00%	5.78%	12.08%	0.00%	0.00E+00
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.77E+03	0.00E+00	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	6.00E-02	7.21E-02	1.09E+00	0.00E+00	1.14E-02	0.00E+00	0.00E+00	0,00E+00
	4.89%	5.87%	88.32%	0.00%	0.93%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.08E-03	1.36E-03	3.70E-04	0.00E+00	0.00E+00	1.90E-03	0.00E+00	0,00%
	22.87%	28.87%	7.86%	0.00%	0.00%	40.40%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	1.87E+00	1.64E+01	4.12E+00	0.00E+00	0.00E+00	2.91E+01	0.00E+00	0,00%
	3.62%	31.92%	8.00%	0.00%	0.00%	56.46%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.92E-03	6.71E-03	3.10E-04	0.00E+00	0.00E+00	6.76E-04	0.00E+00	0,00%
	19.95%	69.79%	3.23%	0.00%	0.00%	7.04%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Materials for energy recovery (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,50E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
Exported energy, electricity (MJ)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9.77E+03	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100.00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 26. *Life Cycle Impact Assessment (LCIA) results for PINE THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. LANDFILL SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.96E+01	7.08E+01	7.17E+01	0.00E+00	5.86E+00	0.00E+00	2.11E+01	0.00E+00
Global Warming Potential – Biogenic	-9.68E+02	2.68E-01	8.06E-01	0.00E+00	5.23E-02	0.00E+00	9.68E+02	0.00E+00
Global Warming Potential – LULUC	6.57E-01	4.36E-02	5.44E-01	0.00E+00	2.76E-03	0.00E+00	1.52E-02	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-9.48E+02	7.11E+01	7.31E+01	0.00E+00	5.91E+00	0.00E+00	9.89E+02	0.00E+00
	-45.41%	3.41%	3.50%	0.00%	0.28%	0.00%	47.39%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.41E-06	1.18E-05	1.85E-06	0.00E+00	1.03E-06	0.00E+00	1.12E-06	0,00E+00
	17.74%	61.38%	9.66%	0.00%	5.39%	0.00%	5.83%	0,00%
Acidification potential (kg SO_2 eq)	8.90E-02	1.39E+00	3.79E-01	0.00E+00	1.79E-02	0.00E+00	7.19E-02	0,00E+00
	4.57%	71.38%	19.45%	0.00%	0.92%	0.00%	3.69%	0,00%
Acidification potential (mol H+ Eq.)	1.20E-01	1.74E+00	4.40E-01	0.00E+00	2.30E-02	0.00E+00	9.31E-03	0,00E+00
	5.14%	74.61%	18.86%	0.00%	0.99%	0.00%	0.40%	0,00%
Eutrophication (kg PO_4 Eq.)	3.41E-02	2.12E-01	2.42E-01	0.00E+00	4.28E-03	0.00E+00	1.01E+00	0,00E+00
	2.27%	14.10%	16.14%	0.00%	0.28%	0.00%	67.20%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	5.00E-03	2.98E-03	7.03E-02	0.00E+00	4.61E-04	0.00E+00	1.75E-03	0,00E+00
	6.21%	3.70%	87.34%	0.00%	0.57%	0.00%	2.17%	0,00%
Eutrophication aquatic marine (kg N eq.)	4.84E-02	4.34E-01	7.00E-02	0.00E+00	6.87E-03	0.00E+00	1.00E+00	0,00E+00
	3.10%	27.82%	4.49%	0.00%	0.44%	0.00%	64.15%	0,00%
Eutrophication terrestrial (mol N eq.)	5.01E-01	4.81E+00	6.60E-01	0.00E+00	7.48E-02	0.00E+00	2.66E-02	0,00E+00
	8.24%	79.22%	10.87%	0.00%	1.23%	0.00%	0.44%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	1.32E-04	3.64E-02	1.40E-02	0.00E+00	2.23E-02	0.00E+00	6.11E-02	0,00E+00
	0.10%	27.14%	10.47%	0.00%	16.66%	0.00%	45.63%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.67E-01	1.25E+00	1.80E-01	0.00E+00	7.39E-04	0.00E+00	1.51E-01	0,00E+00
	14.40%	67.65%	9.73%	0.00%	0.04%	0.00%	8.18%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	3.55E-05	1.32E-04	3.81E-05	0.00E+00	2.47E-05	0.00E+00	1.64E-05	0,00E+00
	14.38%	53.54%	15.42%	0.00%	10.03%	0.00%	6.63%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	2.71E+02	9.47E+02	7.94E+02	0.00E+00	8.56E+01	0.00E+00	1.91E+02	0,00E+00
	11.84%	41.36%	34.72%	0.00%	3.74%	0.00%	8.34%	0,00%
Water use (m3 eq.)	1.61E-01	3.38E-01	3.38E+00	0.00E+00	6.40E-02	0.00E+00	7.02E+00	0,00E+00
	1.47%	3.08%	30.85%	0.00%	0.58%	0.00%	64.01%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	7.33E+04	1.61E+05	7.03E+05	0.00E+00	2.51E+04	0.00E+00	3.11E+07	0,00E+00
	0.23%	0.50%	2.19%	0.00%	0.08%	0.00%	97.00%	0,00%
Human toxicity, cancer (cases)	2.29E-06	6.54E-06	6.83E-06	0.00E+00	5.48E-07	0.00E+00	9.18E-07	0,00E+00
	13.38%	38.18%	39.89%	0.00%	3.20%	0.00%	5.36%	0,00%
Human toxicity, non-cancer (cases)	1.15E-06	4.56E-06	1.36E-05	0.00E+00	7.34E-07	0.00E+00	1.93E-04	0,00E+00
	0.54%	2.14%	6.38%	0.00%	0.34%	0.00%	90.60%	0,00%
Land use (Dimensionless)	2.00E+05	1.90E+03	9.80E+02	0.00E+00	3.52E+01	0.00E+00	1.50E+02	0,00E+00
	98.49%	0.94%	0.48%	0.00%	0.02%	0.00%	0.07%	0,00%
Particulate matter (disease inc)	1.09E-06	5.00E-06	1.30E-06	0.00E+00	3.42E-07	0.00E+00	1.02E-06	0,00E+00
	12.50%	57.12%	14.85%	0.00%	3.91%	0.00%	11.62%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.80E+00	4.80E+00	6.20E-01	0.00E+00	4.80E-01	0.00E+00	1.02E+00	0,00E+00
	20.63%	55.02%	7.11%	0.00%	5.50%	0.00%	11.74%	0,00%

Table 26. *Resource use and waste flows for PINE THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.29E+00	2.66E+00	4.84E+00	0.00E+00	4.34E-01	0.00E+00	1.97E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	9.77E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.77E+03	0.00E+00
Primary energy resources (Renewable) – Total	9.77E+03	2.66E+00	4.84E+00	0.00E+00	4.34E-01	0.00E+00	-9.77E+03	0.00E+00
	49.99%	0.01%	0.02%	0.00%	0.00%	0.00%	-49.97%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	2.71E+02	9.46E+02	1.80E-02	0.00E+00	8.56E+01	0.00E+00	1.24E+02	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	2.71E+02	9.46E+02	1.80E-02	0.00E+00	8.56E+01	0.00E+00	1.24E+02	0.00E+00
	18.97%	66.34%	0.00%	0.00%	6.00%	0.00%	8.68%	0.00E+00
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	6.00E-02	7.21E-02	1.09E+00	0.00E+00	1.14E-02	1.09E+00	0.00E+00	0,00E+00
	2.59%	3.11%	46.80%	0.00%	0.49%	47.01%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.08E-03	1.36E-03	3.70E-04	0.00E+00	0.00E+00	0.00E+00	5.14E-04	0,00%
	32.42%	40.94%	11.15%	0.00%	0.00%	0.00%	15.49%	0,00E+00
Non-hazardous waste disposed (kg)	1.87E+00	1.64E+01	4.12E+00	0.00E+00	0.00E+00	0.00E+00	4.17E+02	0,00%
	0.42%	3.74%	0.94%	0.00%	0.00%	0.00%	94.90%	0,00E+00
Radioactive waste disposed (kg)	1.92E-03	6.71E-03	3.10E-04	0.00E+00	0.00E+00	0.00E+00	8.09E-04	0,00%
	19.68%	68.84%	3.18%	0.00%	0.00%	0.00%	8.30%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 27. *Life Cycle Impact Assessment (LCIA) results for AYOUS THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.09E+01	4.41E+01	6.57E+01	0.00E+00	4.26E+00	3.94E+00	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-6.99E+02	1.77E-01	7.38E-01	0.00E+00	3.80E-02	6.99E+02	0.00E+00	0.00E+00
Global Warming Potential – LULUC	4.69E-01	2.64E-02	4.99E-01	0.00E+00	2.00E-03	9.72E-03	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-6.88E+02	4.43E+01	6.69E+01	0.00E+00	4.30E+00	7.48E+02	0.00E+00	0.00E+00
	-44.33%	2.85%	4.31%	0.00%	0.28%	48.22%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	1.91E-06	7.38E-06	1.69E-06	0.00E+00	7.52E-07	2.31E-07	0.00E+00	0,00E+00
	15.97%	61.70%	14.12%	0.00%	6.29%	1.93%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	4.22E-02	8.16E-01	3.47E-01	0.00E+00	1.30E-02	1.82E-02	0.00E+00	0,00E+00
	3.41%	66.00%	28.06%	0.00%	1.05%	1.47%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	5.60E-02	1.02E+00	4.40E-01	0.00E+00	1.68E-02	3.20E-02	0.00E+00	0,00E+00
	3.57%	65.24%	28.08%	0.00%	1.07%	2.04%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	2.26E-02	2.77E-01	2.22E-01	0.00E+00	3.11E-03	1.35E-02	0.00E+00	0,00E+00
	4.20%	51.48%	41.24%	0.00%	0.58%	2.50%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	3.50E-03	1.93E-03	6.40E-02	0.00E+00	3.35E-04	5.75E-03	0.00E+00	0,00E+00
	4.63%	2.56%	84.75%	0.00%	0.44%	7.61%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	2.00E-02	2.55E-01	6.00E-02	0.00E+00	5.00E-03	5.91E-03	0.00E+00	0,00E+00
	5.78%	73.75%	17.33%	0.00%	1.44%	1.71%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	2.20E-01	2.83E+00	6.10E-01	0.00E+00	5.44E-02	5.00E-02	0.00E+00	0,00E+00
	5.84%	75.20%	16.19%	0.00%	1.44%	1.33%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	2.15E-02	2.15E-02	1.28E-02	0.00E+00	5.38E-04	7.58E-04	0.00E+00	0,00E+00
	37.68%	37.58%	22.47%	0.00%	0.94%	1.33%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	1.60E-01	7.39E-01	1.68E-02	0.00E+00	1.62E-02	1.41E-02	0.00E+00	0,00E+00
	16.92%	78.10%	1.78%	0.00%	1.72%	1.49%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	2.53E-05	8.63E-05	3.47E-05	0.00E+00	1.80E-05	1.17E-05	0.00E+00	0,00E+00
	14.38%	49.02%	19.70%	0.00%	10.23%	6.66%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	1.51E+02	5.94E+02	7.28E+02	0.00E+00	6.23E+01	4.49E+01	0.00E+00	0,00E+00
	9.58%	37.57%	46.06%	0.00%	3.94%	2.84%	0.00%	0,00%
Water use (m3 eq.)	1.16E-01	2.21E-01	3.06E+00	0.00E+00	3.88E-02	4.47E-01	0.00E+00	0,00E+00
	2.98%	5.68%	78.84%	0.00%	1.00%	11.50%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	4.55E+04	1.04E+05	6.44E+05	0.00E+00	1.83E+04	5.06E+04	0.00E+00	0,00E+00
	5.28%	12.01%	74.71%	0.00%	2.12%	5.88%	0.00%	0,00%
Human toxicity, cancer (cases)	1.17E-06	4.03E-06	6.23E-06	0.00E+00	3.98E-07	1.70E-06	0.00E+00	0,00E+00
	8.65%	29.79%	46.06%	0.00%	2.95%	12.56%	0.00%	0,00%
Human toxicity, non-cancer (cases)	5.06E-07	3.02E-06	1.24E-05	0.00E+00	5.34E-07	9.94E-07	0.00E+00	0,00E+00
	2.89%	17.23%	71.14%	0.00%	3.05%	5.68%	0.00%	0,00%
Land use (Dimensionless)	9.50E+04	9.10E+02	3.88E+02	0.00E+00	1.52E+01	9.03E-07	0.00E+00	0,00E+00
	98.64%	0.94%	0.40%	0.00%	0.02%	0.00%	0.00%	0,00%
Particulate matter (disease inc)	7.42E-07	3.09E-06	9.00E-07	0.00E+00	2.42E-07	1.17E-07	0.00E+00	0,00E+00
	11.09%	46.18%	13.45%	0.00%	3.62%	1.75%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.50E+00	3.99E+00	9.72E-02	0.00E+00	1.80E-01	2.89E+00	0.00E+00	0,00E+00
	13.38%	35.59%	0.87%	0.00%	1.61%	25.78%	0.00%	0,00%

Table 28. *Resource use and waste flows for AYOUS THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	1.24E+00	1.73E+00	4.42E+00	0.00E+00	3.16E-01	2.01E+00	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	7.10E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.10E+03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	7.11E+03	1.73E+00	4.42E+00	0.00E+00	3.16E-01	-7.10E+03	0.00E+00	0.00E+00
	49.97%	0.01%	0.03%	0.00%	0.00%	-49.95%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	1.51E+02	5.93E+02	7.25E+02	0.00E+00	6.22E+01	3.94E+01	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	1.51E+02	5.93E+02	7.25E+02	0.00E+00	6.22E+01	3.94E+01	0.00E+00	0.00E+00
	9.63%	37.77%	46.13%	0.00%	3.96%	2.51%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	6.21E-02	4.70E-02	9.36E-01	0.00E+00	8.31E-03	6.76E-02	0.00E+00	0,00E+00
	5.54%	4.19%	83.50%	0.00%	0.74%	6.03%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	8.65E-04	9.05E-04	3.39E-04	0.00E+00	1.68E-04	4.71E-01	0.00E+00	0,00%
	0.18%	0.19%	0.07%	0.00%	0.04%	99.52%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	8.93E-01	1.17E+01	3.77E+00	0.00E+00	2.54E+00	3.66E-05	0.00E+00	0,00%
	4.72%	61.94%	19.91%	0.00%	13.43%	0.00%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.07E-03	4.20E-03	2.78E-04	0.00E+00	4.37E-04	5.07E-04	0.00E+00	0,00%
	16.43%	64.74%	4.28%	0.00%	6.74%	7.81%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,00E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 29. *Life Cycle Impact Assessment (LCIA) results for AYOUS THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.09E+01	4.41E+01	6.57E+01	0.00E+00	4.26E+00	3.00E+02	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-7.00E+02	1.77E-01	7.38E-01	0.00E+00	3.80E-02	7.00E+02	0.00E+00	0.00E+00
Global Warming Potential – LULUC	4.69E-01	2.64E-02	4.99E-01	0.00E+00	2.00E-03	1.00E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-6.89E+02	4.43E+01	6.69E+01	0.00E+00	4.30E+00	1.00E+03	0.00E+00	0.00E+00
	-38.17%	2.45%	3.71%	0.00%	0.24%	55.43%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	1.91E-06	7.38E-06	1.69E-06	0.00E+00	7.52E-07	1.80E-06	0.00E+00	0,00E+00
	14.11%	54.54%	12.48%	0.00%	5.56%	13.31%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	4.22E-02	8.16E-01	3.47E-01	0.00E+00	1.30E-02	1.11E-01	0.00E+00	0,00E+00
	3.17%	61.41%	26.11%	0.00%	0.98%	8.32%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	5.60E-02	1.02E+00	4.40E-01	0.00E+00	1.68E-02	2.00E-01	0.00E+00	0,00E+00
	3.23%	58.93%	25.36%	0.00%	0.97%	11.52%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	2.26E-02	2.77E-01	2.22E-01	0.00E+00	3.11E-03	2.08E-01	0.00E+00	0,00E+00
	3.09%	37.83%	30.31%	0.00%	0.42%	28.35%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	3.50E-03	1.93E-03	6.40E-02	0.00E+00	3.35E-04	2.47E-02	0.00E+00	0,00E+00
	3.70%	2.04%	67.72%	0.00%	0.36%	26.18%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	2.00E-02	2.55E-01	6.00E-02	0.00E+00	5.00E-03	1.00E-01	0.00E+00	0,00E+00
	4.54%	57.94%	13.61%	0.00%	1.13%	22.77%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	2.20E-01	2.83E+00	6.10E-01	0.00E+00	5.44E-02	8.61E-01	0.00E+00	0,00E+00
	4.81%	61.88%	13.32%	0.00%	1.19%	18.80%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	2.15E-02	2.15E-02	1.28E-02	0.00E+00	5.38E-04	4.92E-03	0.00E+00	0,00E+00
	35.13%	35.03%	20.95%	0.00%	0.88%	8.02%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	1.60E-01	7.39E-01	1.68E-02	0.00E+00	1.62E-02	1.82E-01	0.00E+00	0,00E+00
	14.37%	66.33%	1.51%	0.00%	1.46%	16.34%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	2.53E-05	8.63E-05	3.47E-05	0.00E+00	1.80E-05	2.81E-04	0.00E+00	0,00E+00
	5.69%	19.39%	7.79%	0.00%	4.04%	63.09%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	1.51E+02	5.94E+02	7.28E+02	0.00E+00	6.23E+01	1.81E+02	0.00E+00	0,00E+00
	8.82%	34.60%	42.42%	0.00%	3.63%	10.53%	0.00%	0,00%
Water use (m3 eq.)	1.16E-01	2.21E-01	3.06E+00	0.00E+00	3.88E-02	2.94E+01	0.00E+00	0,00E+00
	0.35%	0.67%	9.32%	0.00%	0.12%	89.54%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	4.55E+04	1.04E+05	6.44E+05	0.00E+00	1.83E+04	2.14E+07	0.00E+00	0,00E+00
	0.20%	0.47%	2.90%	0.00%	0.08%	96.35%	0.00%	0,00%
Human toxicity, cancer (cases)	1.17E-06	4.03E-06	6.23E-06	0.00E+00	3.98E-07	2.97E-05	0.00E+00	0,00E+00
	2.82%	9.71%	15.01%	0.00%	0.96%	71.50%	0.00%	0,00%
Human toxicity, non-cancer (cases)	5.06E-07	3.02E-06	1.24E-05	0.00E+00	5.34E-07	1.18E-04	0.00E+00	0,00E+00
	0.38%	2.24%	9.25%	0.00%	0.40%	87.74%	0.00%	0,00%
Land use (Dimensionless)	9.50E+04	9.10E+02	3.88E+02	0.00E+00	1.52E+01	6.86E+01	0.00E+00	0,00E+00
	98.57%	0.94%	0.40%	0.00%	0.02%	0.07%	0.00%	0,00%
Particulate matter (disease inc)	7.42E-07	3.09E-06	9.00E-07	0.00E+00	2.42E-07	1.43E-06	0.00E+00	0,00E+00
	8.83%	36.76%	10.71%	0.00%	2.88%	22.35%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.50E+00	3.99E+00	9.72E-02	0.00E+00	1.80E-01	7.00E-01	0.00E+00	0,00E+00
	16.93%	45.03%	1.10%	0.00%	2.03%	10.82%	0.00%	0,00%

Table 30. *Resource use and waste flows for AYOUS THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	1.24E+00	1.73E+00	4.42E+00	0.00E+00	3.16E-01	5.29E-03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	7.10E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.10E+03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	7.11E+03	1.73E+00	4.42E+00	0.00E+00	3.16E-01	-7.10E+03	0.00E+00	0.00E+00
	49.98%	0.01%	0.03%	0.00%	0.00%	-49.97%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	1.51E+02	5.93E+02	7.25E+02	0.00E+00	6.22E+01	1.29E+02	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.76%	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	1.51E+02	5.93E+02	7.25E+02	0.00E+00	6.22E+01	1.29E+02	0.00E+00	0.00E+00
	9.11%	35.73%	43.65%	0.00%	3.75%	7.76%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.10E+03	0.00E+00	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	6.21E-02	4.70E-02	9.36E-01	0.00E+00	8.31E-03	0.00E+00	0.00E+00	0,00E+00
	5.89%	4.46%	88.86%	0.00%	0.79%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	8.65E-04	9.05E-04	3.39E-04	0.00E+00	1.68E-04	1.70E-03	0.00E+00	0,00%
	21.74%	22.75%	8.52%	0.00%	4.23%	42.76%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	8.93E-01	1.17E+01	3.77E+00	0.00E+00	2.54E+00	2.71E+01	0.00E+00	0,00%
	1.94%	25.47%	8.19%	0.00%	5.53%	58.87%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.07E-03	4.20E-03	2.78E-04	0.00E+00	4.37E-04	6.56E-04	0.00E+00	0,00%
	16.06%	63.29%	4.19%	0.00%	6.58%	9.88%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Materials for energy recovery (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,00E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
Exported energy, electricity (MJ)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7.10E+03	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100.00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 31. *Life Cycle Impact Assessment (LCIA) results for AYOUS THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – LANDFILL SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.09E+01	4.41E+01	6.57E+01	0.00E+00	4.26E+00	0.00E+00	2.11E+01	0.00E+00
Global Warming Potential – Biogenic	-7.00E+02	1.77E-01	7.38E-01	0.00E+00	3.80E-02	0.00E+00	7.00E+02	0.00E+00
Global Warming Potential – LULUC	4.69E-01	2.64E-02	4.99E-01	0.00E+00	2.00E-03	0.00E+00	1.52E-02	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-6.89E+02	4.43E+01	6.69E+01	0.00E+00	4.30E+00	0.00E+00	7.21E+02	0.00E+00
	-45.15%	2.90%	4.39%	0.00%	0.28%	0.00%	47.28%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	1.91E-06	7.38E-06	1.69E-06	0.00E+00	7.52E-07	0.00E+00	1.88E-06	0,00E+00
	14.03%	54.23%	12.41%	0.00%	5.53%	0.00%	13.81%	0,00%
Acidification potential (kg SO_2 eq)	4.22E-02	8.16E-01	3.47E-01	0.00E+00	1.30E-02	0.00E+00	7.19E-02	0,00E+00
	3.27%	63.25%	26.90%	0.00%	1.01%	0.00%	5.57%	0,00%
Acidification potential (mol H+ Eq.)	5.60E-02	1.02E+00	4.40E-01	0.00E+00	1.68E-02	0.00E+00	9.31E-03	0,00E+00
	3.63%	66.20%	28.49%	0.00%	1.09%	0.00%	0.60%	0,00%
Eutrophication (kg PO_4 Eq.)	2.26E-02	2.77E-01	2.22E-01	0.00E+00	3.11E-03	0.00E+00	9.31E-03	0,00E+00
	4.24%	51.88%	41.56%	0.00%	0.58%	0.00%	1.74%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	3.50E-03	1.93E-03	6.40E-02	0.00E+00	3.35E-04	0.00E+00	1.75E-03	0,00E+00
	4.89%	2.70%	89.49%	0.00%	0.47%	0.00%	2.44%	0,00%
Eutrophication aquatic marine (kg N eq.)	2.00E-02	2.55E-01	6.00E-02	0.00E+00	5.00E-03	0.00E+00	1.00E+00	0,00E+00
	1.49%	19.05%	4.48%	0.00%	0.37%	0.00%	74.61%	0,00%
Eutrophication terrestrial (mol N eq.)	2.20E-01	2.83E+00	6.10E-01	0.00E+00	5.44E-02	0.00E+00	2.66E-02	0,00E+00
	5.88%	75.67%	16.29%	0.00%	1.45%	0.00%	0.71%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	2.15E-02	2.15E-02	1.28E-02	0.00E+00	5.38E-04	0.00E+00	6.11E-02	0,00E+00
	18.32%	18.27%	10.93%	0.00%	0.46%	0.00%	52.02%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	1.60E-01	7.39E-01	1.68E-02	0.00E+00	1.62E-02	0.00E+00	1.51E-01	0,00E+00
	14.77%	68.19%	1.55%	0.00%	1.50%	0.00%	13.98%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	2.53E-05	8.63E-05	3.47E-05	0.00E+00	1.80E-05	0.00E+00	1.64E-05	0,00E+00
	14.01%	47.76%	19.20%	0.00%	9.97%	0.00%	9.06%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	1.51E+02	5.94E+02	7.28E+02	0.00E+00	6.23E+01	0.00E+00	1.91E+02	0,00E+00
	8.77%	34.39%	42.17%	0.00%	3.61%	0.00%	11.05%	0,00%
Water use (m3 eq.)	1.16E-01	2.21E-01	3.06E+00	0.00E+00	3.88E-02	0.00E+00	7.02E+00	0,00E+00
	1.11%	2.11%	29.29%	0.00%	0.37%	0.00%	67.12%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	4.55E+04	1.04E+05	6.44E+05	0.00E+00	1.83E+04	0.00E+00	3.11E+07	0,00E+00
	0.14%	0.32%	2.02%	0.00%	0.06%	0.00%	97.46%	0,00%
Human toxicity, cancer (cases)	1.17E-06	4.03E-06	6.23E-06	0.00E+00	3.98E-07	0.00E+00	9.18E-07	0,00E+00
	9.18%	31.61%	48.88%	0.00%	3.13%	0.00%	7.20%	0,00%
Human toxicity, non-cancer (cases)	5.06E-07	3.02E-06	1.24E-05	0.00E+00	5.34E-07	0.00E+00	1.93E-04	0,00E+00
	0.24%	1.44%	5.93%	0.00%	0.25%	0.00%	92.13%	0,00%
Land use (Dimensionless)	9.50E+04	9.10E+02	3.88E+02	0.00E+00	1.52E+01	0.00E+00	1.50E+02	0,00E+00
	98.48%	0.94%	0.40%	0.00%	0.02%	0.00%	0.15%	0,00%
Particulate matter (disease inc)	7.42E-07	3.09E-06	9.00E-07	0.00E+00	2.42E-07	0.00E+00	1.02E-06	0,00E+00
	9.29%	38.67%	11.26%	0.00%	3.03%	0.00%	16.97%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.50E+00	3.99E+00	9.72E-02	0.00E+00	1.80E-01	0.00E+00	1.02E+00	0,00E+00
	15.74%	41.88%	1.02%	0.00%	1.89%	0.00%	15.08%	0,00%

Table 32. *Resource use and waste flows for AYOUS THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. –LANDFILL SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	1.24E+00	1.73E+00	4.42E+00	0.00E+00	3.16E-01	0.00E+00	1.97E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	7.10E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-7.10E+03	0.00E+00
Primary energy resources (Renewable) – Total	7.11E+03	1.73E+00	4.42E+00	0.00E+00	3.16E-01	0.00E+00	-7.10E+03	0.00E+00
	49.99%	0.01%	0.03%	0.00%	0.00%	0.00%	-49.97%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	1.51E+02	5.93E+02	7.25E+02	0.00E+00	6.22E+01	0.00E+00	1.24E+02	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	1.51E+02	5.93E+02	7.25E+02	0.00E+00	6.22E+01	0.00E+00	1.24E+02	0.00E+00
	9.14%	35.84%	43.78%	0.00%	3.76%	0.00%	7.48%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	6.21E-02	4.70E-02	9.36E-01	0.00E+00	8.31E-03	0.00E+00	0.00E+00	0,00E+00
	5.89%	4.46%	88.86%	0.00%	0.79%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	8.65E-04	9.05E-04	3.39E-04	0.00E+00	1.68E-04	0.00E+00	7.64E-04	0,00%
	28.44%	29.76%	11.15%	0.00%	5.53%	0.00%	25.13%	0,00E+00
Non-hazardous waste disposed (kg)	8.93E-01	1.17E+01	3.77E+00	0.00E+00	2.54E+00	0.00E+00	6.77E+02	0,00%
	0.13%	1.68%	0.54%	0.00%	0.37%	0.00%	97.28%	0,00E+00
Radioactive waste disposed (kg)	1.07E-03	4.20E-03	2.78E-04	0.00E+00	4.37E-04	0.00E+00	1.19E-03	0,00%
	14.87%	58.61%	3.88%	0.00%	6.10%	0.00%	16.54%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 33. *Life Cycle Impact Assessment (LCIA) results for TULIPWOOD THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.25E+01	5.12E+01	7.17E+01	0.00E+00	4.11E+00	3.94E+00	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-8.01E+02	2.04E-01	8.06E-01	0.00E+00	3.05E-02	8.01E+02	0.00E+00	0.00E+00
Global Warming Potential – LULUC	5.34E-01	3.08E-02	5.44E-01	0.00E+00	1.56E-03	9.72E-03	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-7.88E+02	5.14E+01	7.31E+01	0.00E+00	4.14E+00	7.48E+02	0.00E+00	0.00E+00
	-47.34%	3.09%	4.39%	0.00%	0.25%	44.93%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	2.17E-06	8.57E-06	1.85E-06	0.00E+00	7.15E-07	2.31E-07	0.00E+00	0,00E+00
	16.05%	63.26%	13.70%	0.00%	5.28%	1.70%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	4.80E-02	9.56E-01	3.79E-01	0.00E+00	9.65E-03	1.82E-02	0.00E+00	0,00E+00
	3.40%	67.77%	26.85%	0.00%	0.68%	1.29%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.20E+00	4.44E-01	0.00E+00	2.83E-02	3.20E-02	0.00E+00	0,00E+00
	5.33%	66.62%	24.70%	0.00%	1.57%	1.78%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	2.57E-02	4.20E-01	2.42E-01	0.00E+00	3.11E-03	1.35E-02	0.00E+00	0,00E+00
	3.66%	59.57%	34.42%	0.00%	0.44%	1.91%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	6.05E-03	2.23E-03	7.00E-02	0.00E+00	5.66E-04	5.75E-03	0.00E+00	0,00E+00
	7.15%	2.64%	82.75%	0.00%	0.67%	6.80%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.88E-02	2.99E-01	7.00E-02	0.00E+00	8.43E-03	5.91E-03	0.00E+00	0,00E+00
	9.18%	70.84%	16.58%	0.00%	2.00%	1.40%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.80E-01	3.32E+00	6.60E-01	0.00E+00	9.18E-02	5.00E-02	0.00E+00	0,00E+00
	8.45%	73.73%	14.67%	0.00%	2.04%	1.11%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	2.45E-02	2.51E-02	1.40E-02	0.00E+00	4.66E-04	7.58E-04	0.00E+00	0,00E+00
	37.77%	38.74%	21.61%	0.00%	0.72%	1.17%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	8.65E-01	1.86E-01	0.00E+00	2.74E-02	1.41E-02	0.00E+00	0,00E+00
	19.85%	63.45%	13.65%	0.00%	2.01%	1.03%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	2.88E-05	9.95E-05	3.81E-05	0.00E+00	1.05E-05	1.17E-05	0.00E+00	0,00E+00
	15.27%	52.78%	20.18%	0.00%	5.55%	6.21%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	1.72E+02	6.89E+02	7.94E+02	0.00E+00	5.70E+01	4.49E+01	0.00E+00	0,00E+00
	9.80%	39.19%	45.21%	0.00%	3.24%	2.56%	0.00%	0,00%
Water use (m3 eq.)	1.32E-01	2.55E-01	3.38E+00	0.00E+00	2.50E-02	4.47E-01	0.00E+00	0,00E+00
	3.10%	6.01%	79.77%	0.00%	0.59%	10.54%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	5.18E+04	1.20E+05	7.03E+05	0.00E+00	1.53E+04	5.06E+04	0.00E+00	0,00E+00
	5.51%	12.72%	74.76%	0.00%	1.63%	5.38%	0.00%	0,00%
Human toxicity, cancer (cases)	1.33E-06	4.69E-06	6.83E-06	0.00E+00	3.02E-07	1.70E-06	0.00E+00	0,00E+00
	8.97%	31.55%	46.01%	0.00%	2.04%	11.44%	0.00%	0,00%
Human toxicity, non-cancer (cases)	5.75E-07	3.47E-06	1.36E-05	0.00E+00	4.89E-07	9.94E-07	0.00E+00	0,00E+00
	3.01%	18.15%	71.09%	0.00%	2.55%	5.20%	0.00%	0,00%
Land use (Dimensionless)	9.49E+04	9.05E+02	3.78E+02	0.00E+00	1.02E+01	9.03E-07	0.00E+00	0,00E+00
	98.66%	0.94%	0.39%	0.00%	0.01%	0.00%	0.00%	0,00%
Particulate matter (disease inc)	7.42E-07	3.09E-06	9.00E-07	0.00E+00	2.42E-07	1.17E-07	0.00E+00	0,00E+00
	11.09%	46.18%	13.45%	0.00%	3.62%	1.75%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.50E+00	3.99E+00	9.72E-02	0.00E+00	1.80E-01	2.89E+00	0.00E+00	0,00E+00
	13.38%	35.59%	0.87%	0.00%	1.61%	25.78%	0.00%	0,00%

Table 34. *Resource use and waste flows for TULIPWOOD THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	1.42E+00	6.88E+02	4.84E+00	0.00E+00	3.16E-01	2.01E+00	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	8.08E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.08E+03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	8.08E+03	6.88E+02	4.84E+00	0.00E+00	3.16E-01	-8.08E+03	0.00E+00	0.00E+00
	47.95%	4.08%	0.03%	0.00%	0.00%	-47.93%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	1.72E+02	1.99E+00	7.91E+02	0.00E+00	6.22E+01	3.94E+01	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	1.72E+02	1.99E+00	7.91E+02	0.00E+00	6.22E+01	3.94E+01	0.00E+00	0.00E+00
	16.14%	0.19%	74.15%	0.00%	5.83%	3.69%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	7.07E-02	5.42E-02	1.09E+00	0.00E+00	8.31E-03	6.76E-02	0.00E+00	0,00E+00
	5.49%	4.22%	84.39%	0.00%	0.65%	5.26%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	9.84E-04	1.04E-03	3.71E-04	0.00E+00	1.68E-04	0.00E+00	4.17E-05	0,00%
	37.76%	39.95%	14.23%	0.00%	6.45%	0.00%	1.60%	0,00E+00
Non-hazardous waste disposed (kg)	1.02E+00	1.34E+01	4.12E+00	0.00E+00	2.54E+00	0.00E+00	5.36E-01	0,00%
	4.71%	61.94%	19.09%	0.00%	11.78%	0.00%	2.48%	0,00E+00
Radioactive waste disposed (kg)	1.21E-03	4.88E-03	3.06E-04	0.00E+00	4.37E-04	0.00E+00	5.77E-04	0,00%
	16.38%	65.81%	4.13%	0.00%	5.90%	0.00%	7.78%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,55E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 35. *Life Cycle Impact Assessment (LCIA) results for TULIPWOOD THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.25E+01	5.12E+01	7.17E+01	0.00E+00	4.11E+00	3.00E+02	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-8.01E+02	2.04E-01	8.06E-01	0.00E+00	3.05E-02	8.01E+02	0.00E+00	0.00E+00
Global Warming Potential – LULUC	5.34E-01	3.08E-02	5.44E-01	0.00E+00	1.56E-03	1.00E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-7.88E+02	5.14E+01	7.31E+01	0.00E+00	4.14E+00	1.10E+03	0.00E+00	0.00E+00
	-39.06%	2.55%	3.62%	0.00%	0.21%	54.57%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	2.17E-06	8.57E-06	1.85E-06	0.00E+00	7.15E-07	1.80E-06	0.00E+00	0,00E+00
	14.38%	56.69%	12.27%	0.00%	4.73%	11.92%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	4.80E-02	9.56E-01	3.79E-01	0.00E+00	9.65E-03	1.11E-01	0.00E+00	0,00E+00
	3.19%	63.60%	25.20%	0.00%	0.64%	7.36%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.20E+00	4.44E-01	0.00E+00	2.83E-02	2.00E-01	0.00E+00	0,00E+00
	4.87%	60.93%	22.59%	0.00%	1.44%	10.17%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	2.57E-02	4.20E-01	2.42E-01	0.00E+00	3.11E-03	2.08E-01	0.00E+00	0,00E+00
	2.87%	46.69%	26.98%	0.00%	0.35%	23.12%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	6.05E-03	2.23E-03	7.00E-02	0.00E+00	5.66E-04	2.47E-02	0.00E+00	0,00E+00
	5.84%	2.15%	67.58%	0.00%	0.55%	23.88%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.88E-02	2.99E-01	7.00E-02	0.00E+00	8.43E-03	1.00E-01	0.00E+00	0,00E+00
	7.50%	57.89%	13.55%	0.00%	1.63%	19.43%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.80E-01	3.32E+00	6.60E-01	0.00E+00	9.18E-02	8.61E-01	0.00E+00	0,00E+00
	7.16%	62.47%	12.43%	0.00%	1.73%	16.21%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	2.45E-02	2.51E-02	1.40E-02	0.00E+00	4.66E-04	4.92E-03	0.00E+00	0,00E+00
	35.49%	36.41%	20.31%	0.00%	0.67%	7.12%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	8.65E-01	1.86E-01	0.00E+00	2.74E-02	1.82E-01	0.00E+00	0,00E+00
	17.68%	56.49%	12.15%	0.00%	1.79%	11.89%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	2.88E-05	9.95E-05	3.81E-05	0.00E+00	1.05E-05	2.81E-04	0.00E+00	0,00E+00
	6.29%	21.75%	8.32%	0.00%	2.29%	61.35%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	1.72E+02	6.89E+02	7.94E+02	0.00E+00	5.70E+01	1.81E+02	0.00E+00	0,00E+00
	9.10%	36.38%	41.97%	0.00%	3.01%	9.55%	0.00%	0,00%
Water use (m3 eq.)	1.32E-01	2.55E-01	3.38E+00	0.00E+00	2.50E-02	2.94E+01	0.00E+00	0,00E+00
	0.40%	0.77%	10.18%	0.00%	0.08%	88.58%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	5.18E+04	1.20E+05	7.03E+05	0.00E+00	1.53E+04	2.14E+07	0.00E+00	0,00E+00
	0.23%	0.54%	3.15%	0.00%	0.07%	96.01%	0.00%	0,00%
Human toxicity, cancer (cases)	1.33E-06	4.69E-06	6.83E-06	0.00E+00	3.02E-07	2.97E-05	0.00E+00	0,00E+00
	3.11%	10.94%	15.96%	0.00%	0.71%	69.28%	0.00%	0,00%
Human toxicity, non-cancer (cases)	5.75E-07	3.47E-06	1.36E-05	0.00E+00	4.89E-07	1.18E-04	0.00E+00	0,00E+00
	0.42%	2.55%	9.98%	0.00%	0.36%	86.69%	0.00%	0,00%
Land use (Dimensionless)	9.49E+04	9.05E+02	3.78E+02	0.00E+00	1.02E+01	6.86E+01	0.00E+00	0,00E+00
	98.59%	0.94%	0.39%	0.00%	0.01%	0.07%	0.00%	0,00%
Particulate matter (disease inc)	7.42E-07	3.09E-06	9.00E-07	0.00E+00	2.42E-07	1.43E-06	0.00E+00	0,00E+00
	8.83%	36.76%	10.71%	0.00%	2.88%	22.35%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.50E+00	3.99E+00	9.72E-02	0.00E+00	1.80E-01	7.00E-01	0.00E+00	0,00E+00
	16.93%	45.03%	1.10%	0.00%	2.03%	10.82%	0.00%	0,00%

Table 36. *Resource use and waste flows for TULIPWOOD THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	1.42E+00	6.88E+02	4.84E+00	0.00E+00	3.16E-01	5.29E-03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	8.08E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.08E+03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	8.08E+03	6.88E+02	4.84E+00	0.00E+00	3.16E-01	-8.08E+03	0.00E+00	0.00E+00
	47.95%	4.08%	0.03%	0.00%	0.00%	-47.94%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	1.72E+02	1.99E+00	7.91E+02	0.00E+00	6.22E+01	1.29E+02	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	11.14%	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	1.72E+02	1.99E+00	7.91E+02	0.00E+00	6.22E+01	1.29E+02	0.00E+00	0.00E+00
	14.89%	0.17%	68.41%	0.00%	5.38%	11.15%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.08E+03	0.00E+00	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	7.07E-02	5.42E-02	1.09E+00	0.00E+00	8.31E-03	0.00E+00	0.00E+00	0,00E+00
	5.80%	4.45%	89.07%	0.00%	0.68%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	9.84E-04	1.04E-03	3.71E-04	0.00E+00	1.68E-04	1.70E-03	0.00E+00	0,00%
	23.07%	24.41%	8.70%	0.00%	3.94%	39.88%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	1.02E+00	1.34E+01	4.12E+00	0.00E+00	2.54E+00	2.71E+01	0.00E+00	0,00%
	2.11%	27.77%	8.56%	0.00%	5.28%	56.28%	0.00%	0,00E+00
Radioactive waste disposed (kg)	1.21E-03	4.88E-03	3.06E-04	0.00E+00	4.37E-04	6.56E-04	0.00E+00	0,00%
	16.20%	65.11%	4.09%	0.00%	5.84%	8.76%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Materials for energy recovery (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,55E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
Exported energy, electricity (MJ)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8.08E+03	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100.00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 37. *Life Cycle Impact Assessment (LCIA) results for TULIPWOOD THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – LANDFILL SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	1.25E+01	5.12E+01	7.17E+01	0.00E+00	4.11E+00	0.00E+00	2.11E+01	0.00E+00
Global Warming Potential – Biogenic	-8.01E+02	2.04E-01	8.06E-01	0.00E+00	3.05E-02	0.00E+00	8.01E+02	0.00E+00
Global Warming Potential – LULUC	5.34E-01	3.08E-02	5.44E-01	0.00E+00	1.56E-03	0.00E+00	1.52E-02	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-7.88E+02	5.14E+01	7.31E+01	0.00E+00	4.14E+00	0.00E+00	8.22E+02	0.00E+00
	-45.32%	2.96%	4.20%	0.00%	0.24%	0.00%	47.28%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	2.17E-06	8.57E-06	1.85E-06	0.00E+00	7.15E-07	0.00E+00	1.12E-06	0,00E+00
	15.06%	59.37%	12.85%	0.00%	4.96%	0.00%	7.76%	0,00%
Acidification potential (kg SO_2 eq)	4.80E-02	9.56E-01	3.79E-01	0.00E+00	9.65E-03	0.00E+00	7.19E-02	0,00E+00
	3.28%	65.29%	25.87%	0.00%	0.66%	0.00%	4.91%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.20E+00	4.44E-01	0.00E+00	2.83E-02	0.00E+00	9.31E-03	0,00E+00
	5.40%	67.47%	25.01%	0.00%	1.59%	0.00%	0.52%	0,00%
Eutrophication (kg PO_4 Eq.)	2.57E-02	4.20E-01	2.42E-01	0.00E+00	3.11E-03	0.00E+00	1.01E+00	0,00E+00
	1.51%	24.68%	14.26%	0.00%	0.18%	0.00%	59.37%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	6.05E-03	2.23E-03	7.00E-02	0.00E+00	5.66E-04	0.00E+00	1.75E-03	0,00E+00
	7.51%	2.77%	86.85%	0.00%	0.70%	0.00%	2.17%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.88E-02	2.99E-01	7.00E-02	0.00E+00	8.43E-03	0.00E+00	1.00E+00	0,00E+00
	2.74%	21.11%	4.94%	0.00%	0.60%	0.00%	70.61%	0,00%
Eutrophication terrestrial (mol N eq.)	3.80E-01	3.32E+00	6.60E-01	0.00E+00	9.18E-02	0.00E+00	2.66E-02	0,00E+00
	8.49%	74.12%	14.75%	0.00%	2.05%	0.00%	0.59%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	2.45E-02	2.51E-02	1.40E-02	0.00E+00	4.66E-04	0.00E+00	6.11E-02	0,00E+00
	19.56%	20.07%	11.19%	0.00%	0.37%	0.00%	48.80%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	8.65E-01	1.86E-01	0.00E+00	2.74E-02	0.00E+00	1.51E-01	0,00E+00
	18.03%	57.64%	12.40%	0.00%	1.83%	0.00%	10.10%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	2.88E-05	9.95E-05	3.81E-05	0.00E+00	1.05E-05	0.00E+00	1.64E-05	0,00E+00
	14.91%	51.51%	19.70%	0.00%	5.41%	0.00%	8.47%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	1.72E+02	6.89E+02	7.94E+02	0.00E+00	5.70E+01	0.00E+00	1.91E+02	0,00E+00
	9.05%	36.19%	41.74%	0.00%	3.00%	0.00%	10.02%	0,00%
Water use (m3 eq.)	1.32E-01	2.55E-01	3.38E+00	0.00E+00	2.50E-02	0.00E+00	7.02E+00	0,00E+00
	1.22%	2.36%	31.28%	0.00%	0.23%	0.00%	64.91%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	5.18E+04	1.20E+05	7.03E+05	0.00E+00	1.53E+04	0.00E+00	3.11E+07	0,00E+00
	0.16%	0.37%	2.20%	0.00%	0.05%	0.00%	97.22%	0,00%
Human toxicity, cancer (cases)	1.33E-06	4.69E-06	6.83E-06	0.00E+00	3.02E-07	0.00E+00	9.18E-07	0,00E+00
	9.46%	33.30%	48.56%	0.00%	2.15%	0.00%	6.52%	0,00%
Human toxicity, non-cancer (cases)	5.75E-07	3.47E-06	1.36E-05	0.00E+00	4.89E-07	0.00E+00	1.93E-04	0,00E+00
	0.27%	1.64%	6.43%	0.00%	0.23%	0.00%	91.42%	0,00%
Land use (Dimensionless)	9.49E+04	9.05E+02	3.78E+02	0.00E+00	1.02E+01	0.00E+00	1.50E+02	0,00E+00
	98.50%	0.94%	0.39%	0.00%	0.01%	0.00%	0.16%	0,00%
Particulate matter (disease inc)	7.42E-07	3.09E-06	9.00E-07	0.00E+00	2.42E-07	0.00E+00	1.02E-06	0,00E+00
	9.29%	38.67%	11.26%	0.00%	3.03%	0.00%	16.97%	0,00%
Ionizing radiation, human health (kBq U235 eq)	1.50E+00	3.99E+00	9.72E-02	0.00E+00	1.80E-01	0.00E+00	1.02E+00	0,00E+00
	15.74%	41.88%	1.02%	0.00%	1.89%	0.00%	15.08%	0,00%

Table 38. *Resource use and waste flows for TULIPWOOD THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – LANDFILL SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	1.42E+00	6.88E+02	4.84E+00	0.00E+00	3.16E-01	0.00E+00	1.97E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	8.08E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.08E+03	0.00E+00
Primary energy resources (Renewable) – Total	8.08E+03	6.88E+02	4.84E+00	0.00E+00	3.16E-01	0.00E+00	-8.08E+03	0.00E+00
	47.95%	4.08%	0.03%	0.00%	0.00%	0.00%	-47.93%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	1.72E+02	1.99E+00	7.91E+02	0.00E+00	6.22E+01	0.00E+00	1.24E+02	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	1.72E+02	1.99E+00	7.91E+02	0.00E+00	6.22E+01	0.00E+00	1.24E+02	0.00E+00
	14.95%	0.17%	68.71%	0.00%	5.40%	0.00%	10.76%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	7.07E-02	5.42E-02	1.09E+00	0.00E+00	8.31E-03	1.09E+00	0.00E+00	0,00E+00
	3.06%	2.35%	47.01%	0.00%	0.36%	47.01%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	9.84E-04	1.04E-03	3.71E-04	0.00E+00	1.68E-04	0.00E+00	5.14E-04	0,00%
	31.97%	33.82%	12.05%	0.00%	5.46%	0.00%	16.70%	0,00E+00
Non-hazardous waste disposed (kg)	1.02E+00	1.34E+01	4.12E+00	0.00E+00	2.54E+00	0.00E+00	4.17E+02	0,00%
	0.23%	3.05%	0.94%	0.00%	0.58%	0.00%	95.20%	0,00E+00
Radioactive waste disposed (kg)	1.21E-03	4.88E-03	3.06E-04	0.00E+00	4.37E-04	0.00E+00	8.09E-04	0,00%
	15.88%	63.81%	4.00%	0.00%	5.72%	0.00%	10.58%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 39. *Life Cycle Impact Assessment (LCIA) results for OAK THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	2.32E+01	7.59E+01	8.32E+01	0.00E+00	7.19E+00	5.62E+00	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-1.14E+03	3.03E-01	9.36E-01	0.00E+00	6.42E-02	1.14E+03	0.00E+00	0.00E+00
Global Warming Potential – LULUC	7.63E-01	4.57E-02	6.38E-01	0.00E+00	3.38E-03	1.39E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.12E+03	7.63E+01	8.48E+01	0.00E+00	7.26E+00	1.15E+03	0.00E+00	0.00E+00
	-45.93%	3.13%	3.48%	0.00%	0.30%	47.15%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.80E-06	1.27E-05	2.06E-06	0.00E+00	1.27E-06	3.29E-07	0.00E+00	0,00E+00
	18.86%	63.00%	10.21%	0.00%	6.29%	1.63%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	1.06E-01	1.42E+00	4.40E-01	0.00E+00	2.20E-02	2.60E-02	0.00E+00	0,00E+00
	5.25%	70.49%	21.88%	0.00%	1.09%	1.29%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.78E+00	4.44E-01	0.00E+00	2.83E-02	3.20E-02	0.00E+00	0,00E+00
	4.03%	74.75%	18.68%	0.00%	1.19%	1.35%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	2.26E-02	5.99E-01	2.82E-01	0.00E+00	3.11E-03	1.92E-02	0.00E+00	0,00E+00
	2.44%	64.71%	30.44%	0.00%	0.34%	2.08%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	5.60E-03	3.31E-03	8.80E-01	0.00E+00	5.54E-04	5.63E-03	0.00E+00	0,00E+00
	0.63%	0.37%	98.31%	0.00%	0.06%	0.63%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.20E-02	4.44E-01	9.00E-02	0.00E+00	8.25E-03	5.78E-03	0.00E+00	0,00E+00
	5.52%	76.53%	15.53%	0.00%	1.42%	1.00%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.10E-01	4.92E+00	8.30E-01	0.00E+00	8.97E-02	5.00E-02	0.00E+00	0,00E+00
	5.00%	79.36%	13.39%	0.00%	1.45%	0.81%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.51E-02	3.73E-02	1.63E-02	0.00E+00	9.08E-04	1.08E-03	0.00E+00	0,00E+00
	38.71%	41.14%	17.95%	0.00%	1.00%	1.19%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	1.28E+00	1.86E-01	0.00E+00	2.74E-02	1.41E-02	0.00E+00	0,00E+00
	15.19%	72.03%	10.45%	0.00%	1.54%	0.79%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	5.45E-05	1.48E-04	4.26E-05	0.00E+00	3.04E-05	1.67E-05	0.00E+00	0,00E+00
	18.67%	50.60%	14.58%	0.00%	10.41%	5.74%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	3.20E+02	1.02E+03	9.22E+02	0.00E+00	1.05E+02	6.41E+01	0.00E+00	0,00E+00
	13.16%	41.99%	37.90%	0.00%	4.32%	2.64%	0.00%	0,00%
Water use (m3 eq.)	2.15E-01	3.78E-01	3.38E+00	0.00E+00	1.40E-02	6.39E-01	0.00E+00	0,00E+00
	4.65%	8.16%	73.09%	0.00%	0.30%	13.79%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	1.08E+05	1.78E+05	8.14E+05	0.00E+00	3.09E+04	7.23E+04	0.00E+00	0,00E+00
	8.96%	14.76%	67.70%	0.00%	2.57%	6.01%	0.00%	0,00%
Human toxicity, cancer (cases)	2.40E-06	6.95E-06	7.64E-06	0.00E+00	6.72E-07	2.43E-06	0.00E+00	0,00E+00
	11.96%	34.59%	38.03%	0.00%	3.35%	12.07%	0.00%	0,00%
Human toxicity, non-cancer (cases)	1.48E-06	5.15E-06	1.57E-05	0.00E+00	9.01E-07	1.42E-06	0.00E+00	0,00E+00
	6.03%	20.93%	63.61%	0.00%	3.66%	5.77%	0.00%	0,00%
Land use (Dimensionless)	1.90E+05	1.80E+03	9.50E+02	0.00E+00	2.82E+01	2.06E-06	0.00E+00	0,00E+00
	98.56%	0.93%	0.49%	0.00%	0.01%	0.00%	0.00%	0,00%
Particulate matter (disease inc)	1.74E-06	5.09E-06	9.00E-07	0.00E+00	2.92E-07	2.17E-07	0.00E+00	0,00E+00
	21.14%	61.76%	10.92%	0.00%	3.54%	2.63%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	2.10E+00	4.30E+00	6.72E-02	0.00E+00	2.28E-01	3.09E+00	0.00E+00	0,00E+00
	21.47%	43.94%	0.69%	0.00%	2.33%	31.57%	0.00%	0,00%

Table 40 *Resource use and waste flows for OAK THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – RECYCLING SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.84E+00	2.96E+00	6.02E+00	0.00E+00	5.33E-01	3.27E+00	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.15E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.15E+04	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	1.15E+04	2.96E+00	6.02E+00	0.00E+00	5.33E-01	-1.15E+04	0.00E+00	0.00E+00
	49.99%	0.01%	0.03%	0.00%	0.00%	-49.97%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	3.44E+02	1.02E+03	1.01E+03	0.00E+00	1.05E+02	6.40E+01	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	3.44E+02	1.02E+03	1.01E+03	0.00E+00	1.05E+02	6.40E+01	0.00E+00	0.00E+00
	13.55%	40.17%	39.63%	0.00%	4.13%	2.52%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.03E-01	4.08E-02	1.28E+00	0.00E+00	0.00E+00	1.10E-01	0.00E+00	0,00E+00
	6.72%	2.65%	83.49%	0.00%	0.00%	7.14%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.56E-03	1.54E-03	4.23E-04	0.00E+00	2.84E-04	5.95E-05	0.00E+00	0,00%
	40.35%	39.87%	10.93%	0.00%	7.32%	1.54%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	4.12E+00	1.98E+01	4.73E+00	0.00E+00	4.29E+00	7.66E-01	0.00E+00	0,00%
	12.22%	58.77%	14.02%	0.00%	12.72%	2.27%	0.00%	0,00E+00
Radioactive waste disposed (kg)	2.12E-03	7.24E-03	3.34E-04	0.00E+00	7.38E-04	8.24E-04	0.00E+00	0,00%
	18.84%	64.31%	2.97%	0.00%	6.56%	7.32%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,50E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 41. *Life Cycle Impact Assessment (LCIA) results for OAK THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	2.32E+01	7.59E+01	8.32E+01	0.00E+00	7.19E+00	3.30E+02	0.00E+00	0.00E+00
Global Warming Potential – Biogenic	-1.14E+03	3.03E-01	9.36E-01	0.00E+00	6.42E-02	1.14E+03	0.00E+00	0.00E+00
Global Warming Potential – LULUC	7.63E-01	4.57E-02	6.38E-01	0.00E+00	3.38E-03	1.00E-02	0.00E+00	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.12E+03	7.63E+01	8.48E+01	0.00E+00	7.26E+00	1.47E+03	0.00E+00	0.00E+00
	-40.53%	2.77%	3.07%	0.00%	0.26%	53.36%	0.00%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.80E-06	1.27E-05	2.06E-06	0.00E+00	1.27E-06	1.93E-06	0.00E+00	0,00E+00
	17.47%	58.37%	9.46%	0.00%	5.83%	8.87%	0.00%	0,00%
Acidification potential (kg SO_2 eq)	1.06E-01	1.42E+00	4.40E-01	0.00E+00	2.20E-02	1.41E-01	0.00E+00	0,00E+00
	4.97%	66.69%	20.70%	0.00%	1.03%	6.61%	0.00%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.78E+00	4.44E-01	0.00E+00	2.83E-02	2.09E-01	0.00E+00	0,00E+00
	3.75%	69.56%	17.38%	0.00%	1.11%	8.20%	0.00%	0,00%
Eutrophication (kg PO_4 Eq.)	2.26E-02	5.99E-01	2.82E-01	0.00E+00	3.11E-03	2.08E-01	0.00E+00	0,00E+00
	2.03%	53.76%	25.29%	0.00%	0.28%	18.64%	0.00%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	5.60E-03	3.31E-03	8.80E-01	0.00E+00	5.54E-04	2.27E-02	0.00E+00	0,00E+00
	0.61%	0.36%	96.47%	0.00%	0.06%	2.49%	0.00%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.20E-02	4.44E-01	9.00E-02	0.00E+00	8.25E-03	1.00E-01	0.00E+00	0,00E+00
	4.75%	65.80%	13.35%	0.00%	1.22%	14.89%	0.00%	0,00%
Eutrophication terrestrial (mol N eq.)	3.10E-01	4.92E+00	8.30E-01	0.00E+00	8.97E-02	9.16E-01	0.00E+00	0,00E+00
	4.39%	69.64%	11.74%	0.00%	1.27%	12.96%	0.00%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.51E-02	3.73E-02	1.63E-02	0.00E+00	9.08E-04	5.01E-03	0.00E+00	0,00E+00
	37.11%	39.43%	17.21%	0.00%	0.96%	5.29%	0.00%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	1.28E+00	1.86E-01	0.00E+00	2.74E-02	2.02E-01	0.00E+00	0,00E+00
	13.74%	65.16%	9.45%	0.00%	1.39%	10.26%	0.00%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	5.45E-05	1.48E-04	4.26E-05	0.00E+00	3.04E-05	3.21E-04	0.00E+00	0,00E+00
	9.14%	24.78%	7.14%	0.00%	5.10%	53.83%	0.00%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	3.20E+02	1.02E+03	9.22E+02	0.00E+00	1.05E+02	2.00E+02	0.00E+00	0,00E+00
	12.46%	39.77%	35.90%	0.00%	4.09%	7.77%	0.00%	0,00%
Water use (m3 eq.)	2.15E-01	3.78E-01	3.38E+00	0.00E+00	1.40E-02	3.44E+01	0.00E+00	0,00E+00
	0.56%	0.98%	8.81%	0.00%	0.04%	89.61%	0.00%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	1.08E+05	1.78E+05	8.14E+05	0.00E+00	3.09E+04	2.84E+07	0.00E+00	0,00E+00
	0.36%	0.60%	2.76%	0.00%	0.10%	96.17%	0.00%	0,00%
Human toxicity, cancer (cases)	2.40E-06	6.95E-06	7.64E-06	0.00E+00	6.72E-07	3.27E-05	0.00E+00	0,00E+00
	4.77%	13.81%	15.18%	0.00%	1.34%	64.90%	0.00%	0,00%
Human toxicity, non-cancer (cases)	1.48E-06	5.15E-06	1.57E-05	0.00E+00	9.01E-07	1.78E-04	0.00E+00	0,00E+00
	0.74%	2.56%	7.78%	0.00%	0.45%	88.48%	0.00%	0,00%
Land use (Dimensionless)	1.90E+05	1.80E+03	9.50E+02	0.00E+00	2.82E+01	7.26E+01	0.00E+00	0,00E+00
	98.52%	0.93%	0.49%	0.00%	0.01%	0.04%	0.00%	0,00%
Particulate matter (disease inc)	1.74E-06	5.09E-06	9.00E-07	0.00E+00	2.92E-07	1.83E-06	0.00E+00	0,00E+00
	17.68%	51.65%	9.13%	0.00%	2.96%	18.58%	0.00%	0,00%
Ionizing radiation, human health (kBq U235 eq)	2.10E+00	4.30E+00	6.72E-02	0.00E+00	2.28E-01	8.03E-01	0.00E+00	0,00E+00
	28.01%	57.34%	0.90%	0.00%	3.04%	10.71%	0.00%	0,00%

Table 42. *Resource use and waste flows for OAK THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – INCINERATION SCENARIO*

Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.84E+00	2.96E+00	6.02E+00	0.00E+00	5.33E-01	9.29E-03	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.15E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.15E+04	0.00E+00	0.00E+00
Primary energy resources (Renewable) – Total	1.15E+04	2.96E+00	6.02E+00	0.00E+00	5.33E-01	-1.15E+04	0.00E+00	0.00E+00
	49.99%	0.01%	0.03%	0.00%	0.00%	-49.97%	0.00%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	3.44E+02	1.02E+03	1.01E+03	0.00E+00	1.05E+02	1.89E+02	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.08%	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	3.44E+02	1.02E+03	1.01E+03	0.00E+00	1.05E+02	1.89E+02	0.00E+00	0.00E+00
	12.91%	38.29%	37.78%	0.00%	3.94%	7.08%	0.00%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E+04	0.00E+00	0,00E+00
	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.03E-01	4.08E-02	1.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
	7.24%	2.86%	89.90%	0.00%	0.00%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.56E-03	1.54E-03	4.23E-04	0.00E+00	2.84E-04	2.01E-03	0.00E+00	0,00%
	26.85%	26.53%	7.27%	0.00%	4.87%	34.47%	0.00%	0,00E+00
Non-hazardous waste disposed (kg)	4.12E+00	1.98E+01	4.73E+00	0.00E+00	4.29E+00	3.21E+01	0.00E+00	0,00%
	6.34%	30.48%	7.27%	0.00%	6.59%	49.32%	0.00%	0,00E+00
Radioactive waste disposed (kg)	2.12E-03	7.24E-03	3.34E-04	0.00E+00	7.38E-04	6.76E-04	0.00E+00	0,00%
	19.09%	65.17%	3.01%	0.00%	6.65%	6.09%	0.00%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Materials for energy recovery (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,50E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
Exported energy, electricity (MJ)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1.15E+04	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100.00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Table 43. *Life Cycle Impact Assessment (LCIA) results for OAK THERMOWOOD. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits. – DISPOSAL SCENARIO*

	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Potential environmental impacts								
Global Warming Potential – Fossil	2.32E+01	7.59E+01	8.32E+01	0.00E+00	7.19E+00	0.00E+00	3.11E+01	0.00E+00
Global Warming Potential – Biogenic	-1.14E+03	3.03E-01	9.36E-01	0.00E+00	6.42E-02	0.00E+00	1.14E+03	0.00E+00
Global Warming Potential – LULUC	7.63E-01	4.57E-02	6.38E-01	0.00E+00	3.38E-03	0.00E+00	1.52E-02	0.00E+00
Global Warming Potential – Total (kg CO_2 eq)	-1.12E+03	7.63E+01	8.48E+01	0.00E+00	7.26E+00	0.00E+00	1.17E+03	0.00E+00
	-45.46%	3.10%	3.45%	0.00%	0.30%	0.00%	47.70%	0.00%
Ozone Depletion Potential (kg CFC11-eq)	3.80E-06	1.27E-05	2.06E-06	0.00E+00	1.27E-06	0.00E+00	1.82E-06	0,00E+00
	17.56%	58.67%	9.51%	0.00%	5.86%	0.00%	8.40%	0,00%
Acidification potential (kg SO_2 eq)	1.06E-01	1.42E+00	4.40E-01	0.00E+00	2.20E-02	0.00E+00	9.19E-02	0,00E+00
	5.08%	68.25%	21.18%	0.00%	1.06%	0.00%	4.42%	0,00%
Acidification potential (mol H+ Eq.)	9.58E-02	1.78E+00	4.44E-01	0.00E+00	2.83E-02	0.00E+00	1.09E-01	0,00E+00
	3.90%	72.40%	18.09%	0.00%	1.15%	0.00%	4.45%	0,00%
Eutrophication (kg PO_4 Eq.)	2.26E-02	5.99E-01	2.82E-01	0.00E+00	3.11E-03	0.00E+00	1.71E+00	0,00E+00
	0.87%	22.90%	10.77%	0.00%	0.12%	0.00%	65.34%	0,00%
Eutrophication aquatic freshwater (kg P Eq.)	5.60E-03	3.31E-03	8.80E-01	0.00E+00	5.54E-04	0.00E+00	9.75E-03	0,00E+00
	0.62%	0.37%	97.86%	0.00%	0.06%	0.00%	1.08%	0,00%
Eutrophication aquatic marine (kg N eq.)	3.20E-02	4.44E-01	9.00E-02	0.00E+00	8.25E-03	0.00E+00	1.12E+00	0,00E+00
	1.89%	26.19%	5.31%	0.00%	0.49%	0.00%	66.12%	0,00%
Eutrophication terrestrial (mol N eq.)	3.10E-01	4.92E+00	8.30E-01	0.00E+00	8.97E-02	0.00E+00	2.27E-01	0,00E+00
	4.86%	77.16%	13.01%	0.00%	1.41%	0.00%	3.55%	0,00%
Formation potential of tropospheric ozone (kg ethene-Eq.)	3.51E-02	3.73E-02	1.63E-02	0.00E+00	9.08E-04	0.00E+00	8.11E-02	0,00E+00
	20.56%	21.85%	9.53%	0.00%	0.53%	0.00%	47.53%	0,00%
Photochemical ozone formation (kg NMVOC Eq.)	2.71E-01	1.28E+00	1.86E-01	0.00E+00	2.74E-02	0.00E+00	2.14E-01	0,00E+00
	13.66%	64.75%	9.39%	0.00%	1.38%	0.00%	10.83%	0,00%
Abiotic depletion potential - Elements (kg Sb-Eq.)	5.45E-05	1.48E-04	4.26E-05	0.00E+00	3.04E-05	0.00E+00	4.64E-05	0,00E+00
	16.95%	45.94%	13.24%	0.00%	9.45%	0.00%	14.42%	0,00%
Abiotic depletion potential - Fossil Fuels (MJ)	3.20E+02	1.02E+03	9.22E+02	0.00E+00	1.05E+02	0.00E+00	2.04E+02	0,00E+00
	12.44%	39.71%	35.85%	0.00%	4.08%	0.00%	7.92%	0,00%
Water use (m3 eq.)	2.15E-01	3.78E-01	3.38E+00	0.00E+00	1.40E-02	0.00E+00	9.02E+00	0,00E+00
	1.66%	2.90%	26.01%	0.00%	0.11%	0.00%	69.33%	0,00%
Freshwater ecotoxicity (PAF.m3.day)	1.08E+05	1.78E+05	8.14E+05	0.00E+00	3.09E+04	0.00E+00	4.11E+07	0,00E+00
	0.26%	0.42%	1.93%	0.00%	0.07%	0.00%	97.32%	0,00%
Human toxicity, cancer (cases)	2.40E-06	6.95E-06	7.64E-06	0.00E+00	6.72E-07	0.00E+00	1.09E-05	0,00E+00
	8.41%	24.32%	26.73%	0.00%	2.35%	0.00%	38.19%	0,00%
Human toxicity, non-cancer (cases)	1.48E-06	5.15E-06	1.57E-05	0.00E+00	9.01E-07	0.00E+00	1.93E-04	0,00E+00
	0.69%	2.38%	7.23%	0.00%	0.42%	0.00%	89.29%	0,00%
Land use (Dimensionless)	1.90E+05	1.80E+03	9.50E+02	0.00E+00	2.82E+01	0.00E+00	1.70E+02	0,00E+00
	98.47%	0.93%	0.49%	0.00%	0.01%	0.00%	0.09%	0,00%
Particulate matter (disease inc)	1.74E-06	5.09E-06	9.00E-07	0.00E+00	2.92E-07	0.00E+00	1.22E-06	0,00E+00
	18.85%	55.08%	9.74%	0.00%	3.16%	0.00%	13.17%	0,00%
Ionizing radiation, human health (kBq U235 eq)	2.10E+00	4.30E+00	6.72E-02	0.00E+00	2.28E-01	0.00E+00	1.24E+00	0,00E+00
	26.47%	54.20%	0.85%	0.00%	2.87%	0.00%	15.61%	0,00%

Table 44. *Resource use and waste flows for OAK THERMOWOOD. Results reported in MJ are calculated using higher heating values. All values are rounded to three significant digits. – DISPOSAL SCENARIO*

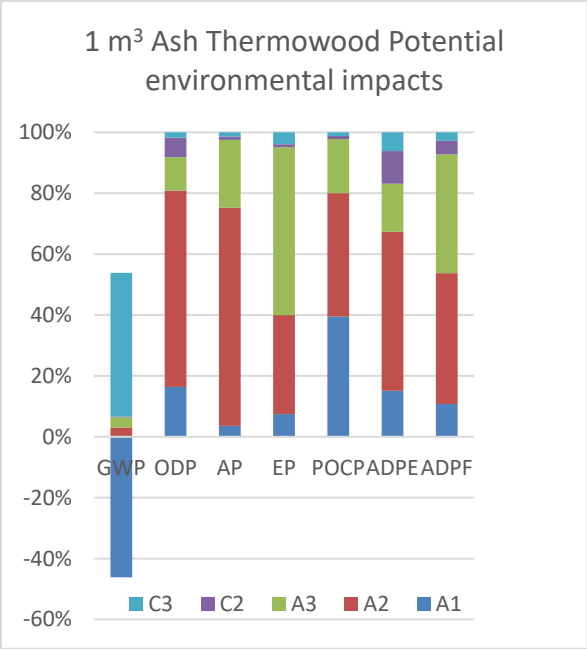
Impact Category	Production stage (A1-A3)			End of life cycle stage (C1-C4)				Next Product System (D)
	Raw material Supply	Transport to Manufacturer	Manufacturing	Deconstruction / demolition	Transport to EoL	Waste Processing	Disposal	Potential benefits
Resources								
Primary energy resources (Renewable) – Use as energy carrier	2.84E+00	2.96E+00	6.02E+00	0.00E+00	5.33E-01	0.00E+00	2.07E+00	0.00E+00
Primary energy resources (Renewable) – Used as raw materials	1.15E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.15E+04	0.00E+00
Primary energy resources (Renewable) – Total	1.15E+04	2.96E+00	6.02E+00	0.00E+00	5.33E-01	0.00E+00	-1.15E+04	0.00E+00
	49.99%	0.01%	0.03%	0.00%	0.00%	0.00%	-49.97%	0.00%
Primary energy resources (Non-renewable) – Use as energy carrier	3.44E+02	1.02E+03	1.01E+03	0.00E+00	1.05E+02	0.00E+00	1.94E+02	0.00E+00
Primary energy resources (Non-renewable) – Used as raw materials	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources (Non-renewable) – Total	3.44E+02	1.02E+03	1.01E+03	0.00E+00	1.05E+02	0.00E+00	1.94E+02	0.00E+00
	12.89%	38.22%	37.71%	0.00%	3.93%	0.00%	7.26%	0.00%
Secondary material (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Renewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Nonrenewable secondary fuels (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
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0,00%
Net use of fresh water (m^3)	1.03E-01	4.08E-02	1.28E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0,00E+00
	7.24%	2.86%	89.90%	0.00%	0.00%	0.00%	0.00%	0,00%
Wastes								
Hazardous waste disposed (kg)	1.56E-03	1.54E-03	4.23E-04	0.00E+00	2.84E-04	0.00E+00	7.14E-04	0,00%
	34.52%	34.11%	9.35%	0.00%	6.26%	0.00%	15.77%	0,00E+00
Non-hazardous waste disposed (kg)	4.12E+00	1.98E+01	4.73E+00	0.00E+00	4.29E+00	0.00E+00	6.17E+02	0,00%
	0.63%	3.05%	0.73%	0.00%	0.66%	0.00%	94.93%	0,00E+00
Radioactive waste disposed (kg)	2.12E-03	7.24E-03	3.34E-04	0.00E+00	7.38E-04	0.00E+00	1.09E-03	0,00%
	18.41%	62.85%	2.90%	0.00%	6.41%	0.00%	9.44%	0,00E+00
Output Flows								
Components for reuse (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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Material for recycling (kg)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,50E+02	0,00E+00	0,00E+00
	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
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
	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

6. LCA: Interpretation

According to calculated results, environmental impacts source from transportation primarily. The only main material is wood, and wood causes environmental effects during the raw material extraction stage.

The main material that causes environmental effects in the raw material extraction stage is wood. Biogenic carbon enters the forest crop system (module A1) and is assumed to leave the crop system at the end-of-life stage (module C) for calculation purposes. The benefits of biogenic carbon in reduced effects on GWP. In the end-of-life stage, it is assumed that wood is 100% recycled. Benefits from recycling are calculated in module D.

Figure 4. *Contribution analysis chart for Ash Thermowood*

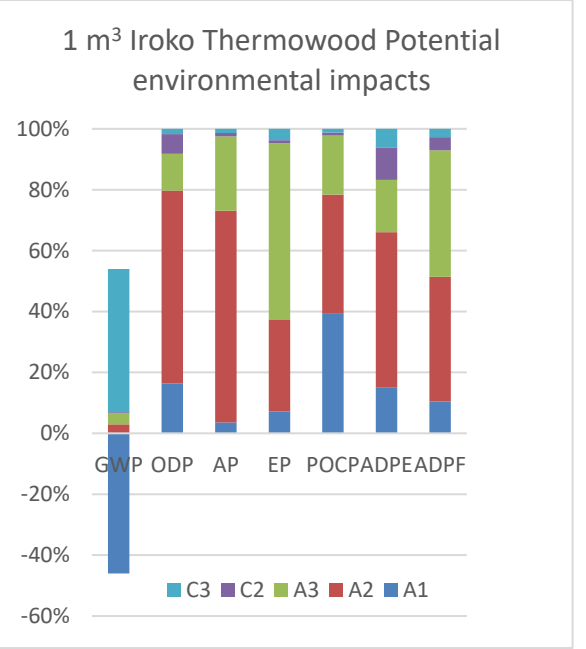


Environmental impacts from the transport have the most impact. More sustainable transportation strategies may be planned to decrease the impacts.

Biogenic carbon enters the product system in forest (module A1) and it is assumed to leave latest from the product system in the end-of-life stage. So, GWP is relatively higher in C3. Wood is mainly raw material that is affected GWP in module A1. Wood is obtained from sustainably managed forest so, environmental effects of wood extraction are low.

ADPfossil is because of module A2 which has the biggest share. In module A2, the impact is because of oceanic freight and road transport Renewable energy sources as an alternative may be used for manufacturing and transportation to decrease.

Figure 5. *Contribution analysis chart for Iroko Thermowood*

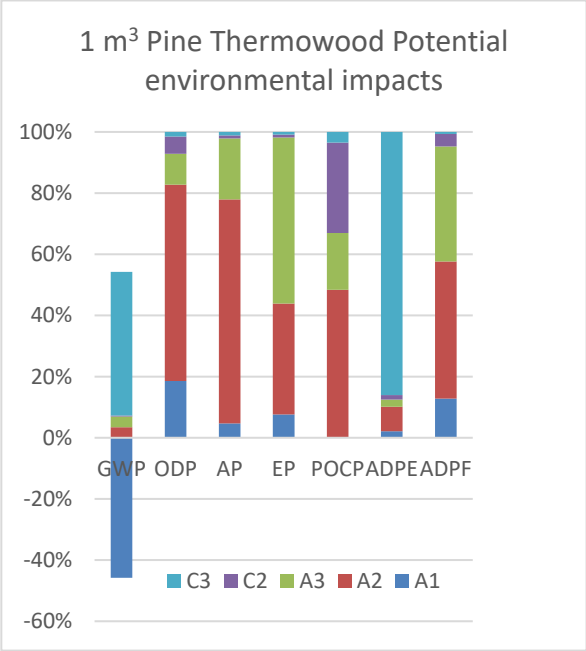


Environmental impacts from the transport have the most impact. More sustainable transportation strategies may be planned to decrease the impacts.

Biogenic carbon enters the product system in forest (module A1) and it is assumed to leave latest from the product system in the end-of-life stage. So, GWP is relatively higher in C3. Wood is mainly raw material that is affected GWP in module A1. Wood is obtained from sustainably managed forest so, environmental effects of wood extraction are low.

ADPfossil is because of module A3 which has the biggest share. Mostly electricity and natural gas usage in Module A3 affects ADPfossil. In module A2 ADPfossil is because of oceanic freight and road transport. Renewable energy sources as an alternative may be used for manufacturing and transportation to decrease.

Figure 6. *Contribution analysis chart for Pine Thermowood*

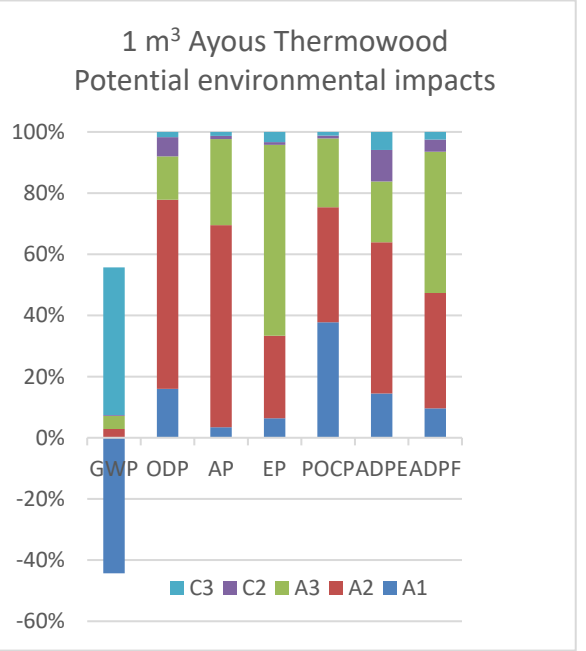


Environmental impacts from the transport have the most impact. More sustainable transportation strategies may be planned to decrease the impacts.

Biogenic carbon enters the product system in forest (module A1) and for calculation purpose it is assumed to leave latest from the product system in the end-of-life stage. So, GWP is relatively higher in C3 than in other modules. Wood is obtained from sustainably managed forest so, environmental effects of wood extraction are low.

ADPfossil is because of module A2 which has the biggest share. In module A2, the impact is because of oceanic freight and road transport Renewable energy sources as an alternative may be used for manufacturing and transportation to decrease. 36,92% of ADPfossil is because of module A3. Mostly electricity and natural gas usage in Module A3 affects ADPF.

Figure 7. *Contribution analysis chart for Ayous Thermowood*

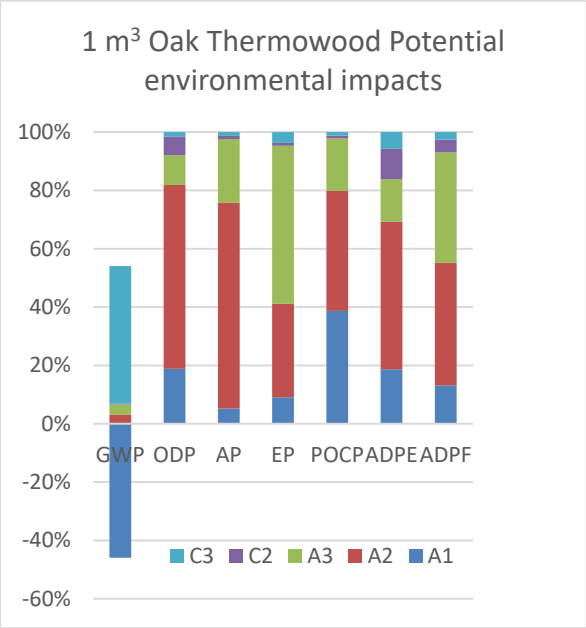


Environmental impacts from the transport have the most impact. More sustainable transportation strategies may be planned to decrease the impacts.

Biogenic carbon enters the product system in forest (module A1) and for calculation purpose it is assumed to leave latest from the product system in the end-of-life stage. So, GWP is relatively higher in C3 than in other modules. Wood is obtained from sustainably managed forest so, environmental effects of wood extraction are low.

ADPfossil is because of module A3 which has the biggest share. Mostly electricity and natural gas usage in Module A3 affects ADPfossil. In module A2 ADPfossil is because of oceanic freight and road transport. Renewable energy sources as an alternative may be used for manufacturing and transportation to decrease.

Figure 8. *Contribution analysis chart for Tulipwood Thermowood*

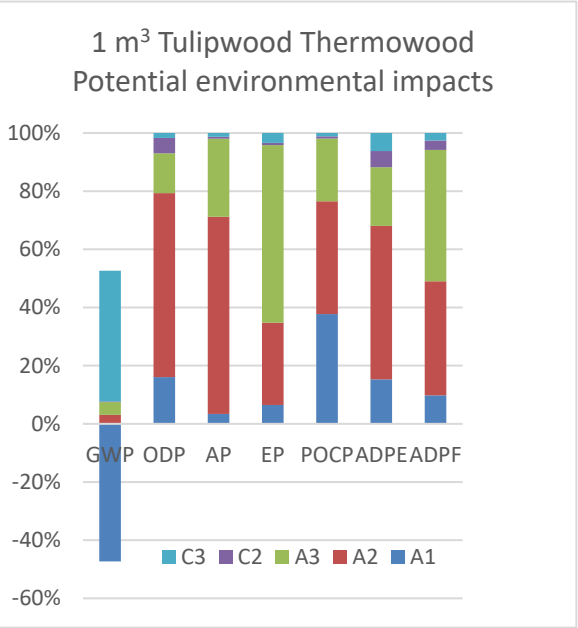


Environmental impacts from the transport have the most impact. More sustainable transportation strategies may be planned to decrease the impacts.

Biogenic carbon enters the product system in forest (module A1) and for calculation purpose it is assumed to leave latest from the product system in the end-of-life stage. So, GWP is relatively higher in C3 than in other modules. Wood is obtained from sustainably managed forest so, environmental effects of wood extraction are low.

ADPfossil is because of module A3 which has the biggest share. Mostly electricity and natural gas usage in Module A3 affects ADPfossil. In module A2 ADPfossil is because of oceanic freight and road transport. Renewable energy sources as an alternative may be used for manufacturing and transportation to decrease.

Figure 9. *Contribution analysis chart for Oak Thermowood*



Environmental impacts from the transport have the most impact. More sustainable transportation strategies may be planned to decrease the impacts.

Biogenic carbon enters the product system in forest (module A1) and for calculation purpose it is assumed to leave latest from the product system in the end-of-life stage. So, GWP is relatively higher in C3 than in other modules. Wood is obtained from sustainably managed forest so, environmental effects of wood extraction are low.

ADPfossil is because of module A2 which has the biggest share. In module A2, the impact is because of oceanic freight and road transport Renewable energy sources as an alternative may be used for manufacturing and transportation to decrease. 36,92% of ADPfossil is because of module A3. Mostly electricity and natural gas usage in Module A3 affects ADPF.

7. Additional Environmental Information

The sequestration of carbon dioxide (CO_2) is unique to renewable materials. Biogenic carbon content of a renewable material is an outcome of the CO_2that has effectively been removed from the atmosphere by photosynthesis of growing trees and other plants, and turned into sugars (carbon) and oxygen. The quantity of atmospheric CO_2 has thus been reduced. The longer the CO_2 is not in the atmosphere but stays stored in a material, the greater the environmental benefit.

Biogenic carbon of wood is calculated according to the EN 16485 and 16449 standards. Half of the dry mass of wood is carbon. Each kg of stored biogenic carbon is equal to ~3.67 kg of CO_2, which is effectively removed from the atmosphere. Biogenic carbon enters the product system in forest (module A1) and for calculation purpose it is assumed to leave latest from the product system in the end-of-life stage (module C). This assumption can be made when wood is sourced from sustainably managed forest.

Table 45. *Biogenic carbon content*

Biogenic carbon content	Unit (expressed per declared unit)	
Biogenic carbon content in 1 m^3 Novathermowood Ash	1,186 kg CO_2	323 kg C
Biogenic carbon content in 1 m^3 Novathermowood Ayous	1,162 kg CO_2	316 kg C
Biogenic carbon content in 1 m^3 Novathermowood Pine	968 kg CO_2	263 kg C
Biogenic carbon content in 1 m^3 Novathermowood Ayous	700 kg CO_2	190 kg C
Biogenic carbon content in 1 m^3 Novathermowood Tulipwood	801 kg CO_2	218 kg C
Biogenic carbon content in 1 m^3 Novathermowood Oak	1,142 kg CO_2	311 kg C

Table 46. *Additional Environmental Information*

Environment (100 % natural) (recycleable) (from renewable forests)						
	Ash	Iroko	Pine	Ayous	Tulipwood	Oak
FSC certified	OK	OK	OK	OK	OK	OK
100 % natural	OK	OK	OK	OK	OK	OK
100 % recyclable and biodegradable	OK	OK	OK	OK	OK	OK
Low processing energy demand	OK	OK	OK	OK	OK	OK
Sustainable development and a low carbon future	OK	OK	OK	OK	OK	OK

Thermowood products contain no environmental or health hazards. They are produced from renewable forests, they are environmentally friendly, sanitary, recyclable and durable. The wood is free from resin and chemicals. No chemicals are used during the production process.

Credentials have the ability to contribute to various credits in green and healthy building certification systems, especially in the LEED® and BREEAM green building programs.

LEED v4-v4.1	Materials and Resources	Environmental Product Declarations	1 Point
		Sourcing of Raw Materials	1 - 2
		Material Ingredients	1 - 2
	Innovation	Innovation	1

Breeam v6	Management	Legally harvested and traded timber	Req
	Materials and Resources	Environmental Product Declarations	1 Point
		Responsible sourcing of construction products	1 - 3

8. References

1. LCA Report of Novawood Novathermowood
2. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
3. ISO 14040: 2006/Amd 1:2020 Environmental Management – Life cycle assessment – Principles and Framework
4. ISO 14044: 2006/Amd 1:2017/ Amd 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. SCS Type III Environmental Declaration Program: Program Operator Manual. V11.0 November 2021. SCS Global Services.
6. Product Category Rules for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, Version 1.1, 2021
7. Part B: Requirements on the EPD for Solid wood products, 12.2018

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