Environmental Product Declaration

according to ISO 14025 and EN 15804

MRPI
milieu relevante product informatie

This declaration is for:

Sicut Composite Sleeper, type SCS13252600

Provided by:

Sicut Enterprises Ltd

SICUT
SUSTAINABLE | COMPOSITE | STRUCTURAL

program operator
Stichting MRPI®
publisher
Stichting MRPI®
www.mrpi.nl

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ECO PLATFORM
EPD
VERIFIED

COMPANY INFORMATION

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PRODUCT

Sicut Composite Sleeper, type SCS13252600

DECLARED UNIT/FUNCTIONAL UNIT

1 piece

DESCRIPTION OF PRODUCT

The functional unit (FU) for the study was “One Sicut Composite Sleeper, type SCS13252600” with a mass of 72 kg. The data on this EPD is also representative for other product types varying in size and weight (see section "Representativeness").

VISUAL PRODUCT

MRPI® REGISTRATION

1.1.00318.2022

DATE OF ISSUE

17-06-2022

EXPIRY DATE

17-06-2027

MORE INFORMATION

https://sicut.co.uk/standard-sleeper-tie/

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Niels Jonkers, Pluk sustainability.**
The LCA study has been done by **Bob Roijen, SGS.**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2/Bepalingsmethode. It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2/Bepalingsmethode. Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

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ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR[a]
Independent verification of the declaration and data, according to EN ISO 14025:2010: internal: external: X
Third party verifier: Niels Jonkers, Pluk sustainability
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

The Sicut Composite Sleeper is a polymer composite railway sleeper produced by proprietary extrusion moulding of a unique blend of recycled Polyolefin and GF sourced from the post consumer and industrial sources blended with a small amount of virgn material additives for colour, UV stabilisation and processing.

Based on readily available laboratory and track data and accelerated weather testing, Sicut has been able to demonstrate a service life of well in excess of 50 years for the purposes of LCA modelling. However, in order that this study is able to mirror other similar assessments, the reference service life of the Sicut composite railway sleepers was assumed to be just 50 years.

COMPONENT (> 1%)	[kg / %]
Recycled Polyolefin and GF from the post consumer and industrial sources	99
Colour, UV stabiliser and processing Additives	1

(*) > 1% of total mass

SCOPE AND TYPE

The EPD follows the European standard EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products . To allow the EPD to be used for tenders in the Netherlands the requirements in the “Bepalingsmethode Milieuprestatie Bouwwerken” has also been followed.

This means that the underlying standards ISO 14040:2006/AMD 1:2020 “Environmental management – Life cycle analysis – Principles and framework” and ISO 14044:20065/AMD 2:2020 “Environmental management. Life cycle assessment – Requirements and Guidelines” have been followed.

These standards are also based on ISO 21930:2017 “Sustainability in building construction – Environmental declaration of building products” and ISO 14025:2006 “Environmental labels and declarations – Type III environmental declarations”.

The is a product specific EPD for Sicut Composite Sleepers produced by Sicut Enterprises Limited in the UK and supplied internationally.

The LCA calculations were made using Simapro and Ecoinvent v3.6 software.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	ND	ND	ND	ND	ND	ND	X	X	X	X	X

X = Modules Assessed

ND = Not Declared

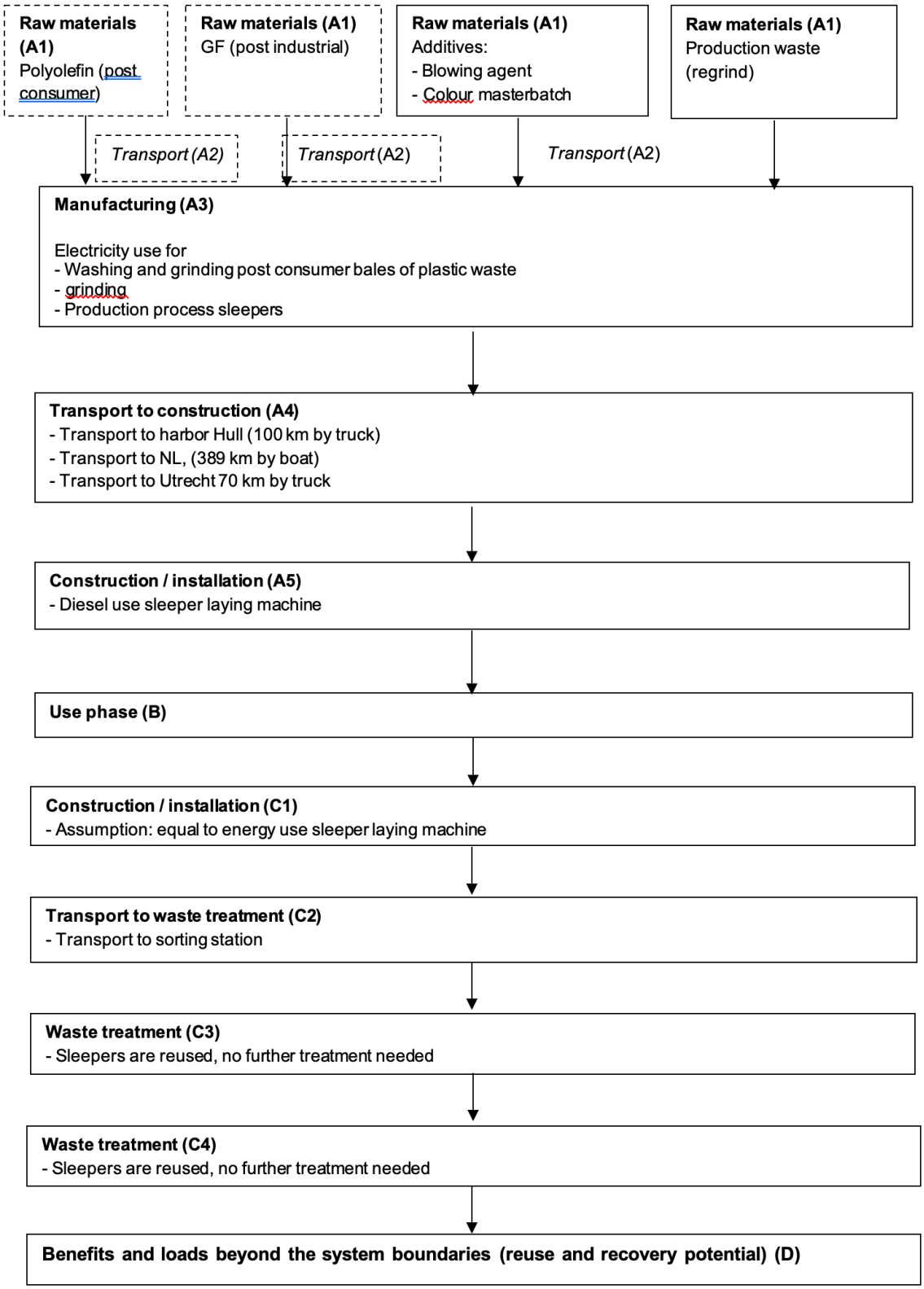

Figure 1 *Process tree of life cycle Sicut Composite Sleeper*

Figure: LCA process diagram according to EN 15804 (7.2.1)

REPRESENTATIVENESS

Sicut manufactures a range of composite sleepers for different applications and because these products are all identical in formulation and production, and only differ in dimensions and mass, the values calculated for the Functional Unit can be used to provide representative LCA and EPD values for these other products. For other products the values in the environmental profile can be converted on a mass basis.

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
ADPE	kg Sb eq.	8.96 E-5	4.16 E-7	3.49 E-4	4.39 E-4	4.38 E-5	2.21 E-7	0.00	2.21 E-7	1.23 E-5	0.00	0.00	-2.94 E-4
ADPF	MJ	4.07 E+1	2.48 E-1	3.65 E+2	4.07 E+2	2.83 E+1	1.98 E+0	0.00	1.98 E+0	7.33 E+0	0.00	0.00	-2.72 E+2
GWP	kg CO2 eq.	1.89 E+0	1.62 E-2	1.45 E+1	1.64 E+1	1.90 E+0	1.43 E-1	0.00	1.43 E-1	4.82 E-1	0.00	0.00	-1.10 E+1
ODP	kg CFC11 eq.	4.93 E-7	2.89 E-9	2.01 E-6	2.50 E-6	3.33 E-7	2.48 E-8	0.00	2.48 E-8	8.54 E-8	0.00	0.00	-1.68 E-6
POCP	kg ethene eq.	1.22 E-3	9.83 E-6	3.10 E-3	4.33 E-3	1.33 E-3	1.46 E-4	0.00	1.46 E-4	2.91 E-4	0.00	0.00	-2.91 E-3
AP	kg SO2 eq.	9.75 E-3	7.16 E-5	4.08 E-2	5.07 E-2	1.40 E-2	1.08 E-3	0.00	1.08 E-3	2.12 E-3	0.00	0.00	-3.39 E-2
EP	kg (PO4)3- eq.	3.05 E-3	1.40 E-5	5.60 E-3	8.67 E-3	2.17 E-3	2.45 E-4	0.00	2.45 E-4	4.16 E-4	0.00	0.00	-5.80 E-3

Toxicity indicators for Dutch market

HTP	kg DCB eq.	7.58 E-1	6.85 E-3	5.58 E+0	6.35 E+0	8.37 E-1	5.29 E-2	0.00	5.29 E-2	2.03 E-1	0.00	0.00	-4.26 E+0
FAETP	kg DCB eq.	1.83 E-2	2.00 E-4	5.50 E-2	7.35 E-2	2.26 E-2	7.36 E-4	0.00	7.36 E-4	5.92 E-3	0.00	0.00	-4.93 E-2
MAETP	kg DCB eq.	7.31 E+1	7.20 E-1	2.20 E+2	2.94 E+2	8.38 E+1	2.56 E+0	0.00	2.56 E+0	2.13 E+1	0.00	0.00	-1.97 E+2
TETP	kg DCB eq.	3.49 E-3	2.42 E-5	4.24 E-2	4.59 E-2	2.87 E-3	8.70 E-5	0.00	8.70 E-5	7.16 E-4	0.00	0.00	-3.07 E-2
ECI	Euro	2.43 E-1	1.96 E-3	1.49 E+0	1.74 E+0	2.60 E-1	1.91 E-2	0.00	1.91 E-2	5.80 E-2	0.00	0.00	-1.17 E+0
ADPF	kg Sb. eq.	2.06 E-2	1.19 E-4	1.20 E-1	1.41 E-1	1.36 E-2	9.40 E-4	0.00	9.40 E-4	3.54 E-3	0.00	0.00	-9.48 E-2

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources expressed in [kg Sb-eq.]

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1.93 E+0	1.64 E-2	1.47 E+1	1.66 E+1	1.92 E+0	1.44 E-1	0.00	1.44 E-1	4.86 E-1	0.00	0.00	-1.11 E+1
GWP-fossil	kg CO2 eq.	1.93 E+0	1.64 E-2	1.46 E+1	1.66 E+1	1.92 E+0	1.44 E-1	0.00	1.44 E-1	4.86 E-1	0.00	0.00	-1.11 E+1
GWP-biogenic	kg CO2 eq.	3.57 E-4	7.58 E-6	2.35 E-2	2.38 E-2	6.83 E-4	4.01 E-5	0.00	4.01 E-5	2.24 E-4	0.00	0.00	-1.60 E-2
GWP-luluc	kg CO2 eq.	1.64 E-3	6.01 E-6	2.04 E-2	2.20 E-2	7.88 E-4	1.14 E-5	0.00	1.14 E-5	1.78 E-4	0.00	0.00	-1.47 E-2
ODP	kg CFC11 eq.	5.14 E-7	3.62 E-9	1.57 E-6	2.08 E-6	4.18 E-7	3.12 E-8	0.00	3.12 E-8	1.07 E-7	0.00	0.00	-1.40 E-6
AP	mol H+ eq.	1.20 E-2	9.52 E-5	5.14 E-2	6.35 E-2	1.82 E-2	1.51 E-3	0.00	1.51 E-3	2.82 E-3	0.00	0.00	-4.25 E-2
EP-freshwater	kg PO4 eq.	6.75 E-5	1.66 E-7	3.44 E-4	4.11 E-4	1.77 E-5	5.25 E-7	0.00	5.25 E-7	4.90 E-6	0.00	0.00	-2.76 E-4
EP-marine	kg N eq.	6.21 E-3	3.35 E-5	1.02 E-2	1.65 E-2	5.48 E-3	6.66 E-4	0.00	6.66 E-4	9.93 E-4	0.00	0.00	-1.10 E-2
EP-terrestrial	mol N eq.	2.33 E-2	3.70 E-4	1.29 E-1	1.52 E-1	6.07 E-2	7.31 E-3	0.00	7.31 E-3	1.09 E-2	0.00	0.00	-1.02 E-1
POCP	kg NMVOC eq.	6.37 E-3	1.06 E-4	3.08 E-2	3.72 E-2	1.67 E-2	2.01 E-3	0.00	2.01 E-3	3.13 E-3	0.00	0.00	-2.49 E-2
ADP-minerals & metals	kg Sb eq.	8.94 E-5	4.16 E-7	3.49 E-4	4.39 E-4	4.38 E-5	2.21 E-7	0.00	2.21 E-7	1.23 E-5	0.00	0.00	-2.94 E-4
ADP-fossil	MJ, net calorific value	4.06 E+1	2.48 E-1	3.66 E+2	4.07 E+2	2.83 E+1	1.99 E+0	0.00	1.99 E+0	7.33 E+0	0.00	0.00	-2.72 E+2
WDP	m3 world eq. deprived	1.95 E+0	8.86 E-4	6.23 E-1	2.58 E+0	9.41 E-2	2.66 E-3	0.00	2.66 E-3	2.62 E-2	0.00	0.00	-1.73 E+0

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenic
GWP-luluc = Global Warming Potential land use and land use change
ODP = Depletion potential of the stratospheric ozone layer
AP = Acidification Potential, Accumulated Exceedence
EP-freshwater = Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine = Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial = Eutrophication Potential, Accumulated Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals = Abiotic Depletion Potential for non fossil resources [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

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.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PM	Disease incidence	1.24 E-7	1.48 E-9	2.15 E-7	3.40 E-7	1.56 E-7	4.00 E-8	0.00	4.00 E-8	4.36 E-8	0.00	0.00	-2.27 E-7
IRP	kBq U235 eq.	8.47 E-2	1.04 E-3	6.30 E+0	6.38 E+0	1.19 E-1	8.51 E-3	0.00	8.51 E-3	3.07 E-2	0.00	0.00	-4.28 E+0
ETP-fw	CTUe	4.29 E+2	2.20 E-1	1.94 E+2	6.23 E+2	2.44 E+1	1.19 E+0	0.00	1.19 E+0	6.53 E+0	0.00	0.00	-4.17 E+2
HTP-c	CTUh	1.62 E-9	7.16 E-12	7.38 E-9	9.04 E-9	8.70 E-10	4.19 E-11	0.00	4.19 E-11	2.12 E-10	0.00	0.00	-6.04 E-9
HTP-nc	CTUh	4.15 E-8	2.41 E-10	1.26 E-7	1.68 E-7	2.60 E-8	1.03 E-9	0.00	1.03 E-9	7.15 E-9	0.00	0.00	-1.12 E-7
SQP	---	5.94 E+0	2.14 E-1	2.20 E+2	2.26 E+2	2.20 E+1	2.54 E-1	0.00	2.54 E-1	6.36 E+0	0.00	0.00	-1.51 E+2

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]

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.

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PERE	MJ	1.66 E+0	3.10 E-3	6.96 E+1	7.13 E+1	3.35 E-1	1.07 E-2	0.00	1.07 E-2	9.13 E-2	0.00	0.00	-4.78 E+1
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	1.66 E+0	3.10 E-3	6.96 E+1	7.13 E+1	3.35 E-1	1.07 E-2	0.00	1.07 E-2	9.13 E-2	0.00	0.00	-4.78 E+1
PENRE	MJ	4.36 E+1	2.63 E-1	3.85 E+2	4.29 E+2	3.00 E+1	2.11 E+0	0.00	2.11 E+0	7.78 E+0	0.00	0.00	-2.87 E+2
PENRM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	4.36 E+1	2.63 E-1	3.85 E+2	4.29 E+2	3.00 E+1	2.11 E+0	0.00	2.11 E+0	7.78 E+0	0.00	0.00	-2.87 E+2
SM	MJ	8.17 E+1	0.00	0.00	8.17 E+1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.48 E+1
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m3	4.79 E-2	3.01 E-5	6.95 E-2	1.18 E-1	3.21 E-3	1.02 E-4	0.00	1.02 E-4	8.96 E-4	0.00	0.00	-7.87 E-2

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable energy resources used as raw materials
PENRM = Use of non-renewable primary energy resources used as raw materials
PENRT = Total use of non-renewable primary energy resources
SM = Use of secondary materials
RSF = Use of renewable secondary fuels
NRSF = Use of non renewable secondary fuels
FW = Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
HWD	kg	3.26 E-5	6.27 E-7	0.00	3.32 E-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.22 E-5
NHWD	kg	2.01 E-1	1.57 E-2	0.00	2.17 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.46 E-1
RWD	kg	9.04 E-5	1.62 E-6	3.10 E-3	3.19 E-3	1.87 E-4	1.38 E-5	0.00	1.38 E-5	4.81 E-5	0.00	0.00	-2.13 E-3
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ETE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
BCCpr	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Data Collection, Quality, Validation of Economic Flows and Cut off Criteria

Primary data at the production location were collected in 2020. No materials or processes have been excluded from the study – Cut off rule is well below 1%.

Sicut collected data on the production of the life cycle of the sleepers including the pre-processing of the raw materials (recycled Polyolefin and GF) and process data on the production of the sleepers in particular the electricity and raw material use for production.

Database Use

The LCA calculations are made using the Ecoinvent database v3.6. Infrastructure processes in Ecoinvent processes have been included, long term emissions in Ecoinvent processes have been excluded from the LCA calculations.

Electricity Grid Mix

The electricity grid mix in Ecoinvent 3.6 is based on 2016 data on electricity generation. The UK electricity grid mix has changed over the last years as the use of coals has been reduced and more renewable sources are used to generate electricity. Therefore, the electricity mix (high voltage level only) has been adapted to Ecoinvent v 3.7 data on electricity generation to use the most recent Ecoinvent dataset available.
Even with this adaptation the amount of fossil fuels is large compared to the actual grid mix (2020 data). For most of the environmental indicators it can therefore be expected that the contribution from the production process is overestimated.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

The life cycle phases that have been modelled are confined by system boundaries, which determine which stages and processes in the life cycle are included.

Product Stage (A1-A3)

The main constituents of the sleepers are recycled Polyolefin and glass fibre (GF).
A small amount of virgin colour masterbatch and additives is blended with the main constituents for colour, UV stability and processing. The raw materials are blended, heated and extruded through a bespoke proprietary moulding system consuming electricity. Infrastructure processes for the production of the sleepers were included based on Ecoinvent process: Extrusion, plastic pipes {RER}| extrusion, plastic pipes | Cut-off.

A small amount of production waste is produced, which is ground up and fed into the process again.

This regrind is an additional loop in the production process and since no material is lost, no extra materials need to be accounted for and only the additional electricity consumption for grinding is included in the LCA.

Products are cooled using water contained within a closed loop system.

Transport to Construction (A4)
For the purposes of the LCA the default transportation scenario according to the "assessment method" was used which assumed the sleepers were transported by truck and by boat to a construction site in Utrecht. The following transportation modes and distances were used:

- Sicut to harbour Hull UK by truck: 100 km.
- Hull to Rotterdam by boat: 389 km.
- Rotterdam to Utrecht by truck: 70 km.

Construction process (A5)
Only the diesel use for a mechanised sleeper laying machine was included in the construction process stage (A5) and estimated to be 0,05 l diesel per sleeper. According Environmental life-cycle assessment of railway track beds. Kiani, Mohamad, Parry, Tony and Heather, Ceney. s.l. : Engineering Sustainability, 2008, Engineering Sustainability the diesel use of the sleeper laying machine is 5 l/hr, the speed of the machine is 14 hr/km and 1500 sleepers per km.

Use phase (B)
There are no environmental burdens to be expected during the use phase of the sleepers since no (during normal use) no maintenance or replacements are to be expected.

End of Life Stage (C1-D)
It was assumed that the sleepers are removed from the construction at end of life. It was assumed that the energy use for this process was equal to the energy use in the construction phase (C1). The sleepers would be transported to a sorting station which was calculated with the default scenario from the assessment method (50 km by truck) (C2). At the end of service life, it is already the intention of Sicut's customers that all sleepers will be reused, ideally in railways in the same application or in other applications already trialled by Sicut's customers, such as retaining walls or rail bridge abutments. No further processing is needed, after being transported to the recycling station the end-of-waste point is reached. The beneficial effect of reuse is included in Module D using a quality factor based on the default value for plastic recycling in the 'processendatabase".

DECLARATION OF SVHC

No substances that are listed in the latest “Candidate List of Substances of Very High Concern for authorisation” are included in the product that exceeds the limit for registration.

REFERENCES

•EN 15804:2012+A2:2019 en. - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products. 1 November 2019.
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REMARKS

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