

**Background data to RIVM letter report 2020-0181**  
**Corrections and revision of background data from RIVM**  
Safety and sustainability analysis of railway sleeper alternatives – Application of  
JTK Quik, E Dekker, MHMM Montforts  
12/17/2020

L

4 letter report 2020-0126

the Safe and Sustainable Material Loops framework

Name

Treated wood (oak)

id\_code

SSML\_DL002

Contributors

Erik Dekker, Mark Montforts, Joris Quik

### General

Functional unit

100m of railroad track for 50 years

### Safety

#### Tier 1 (content)

Life cycle_x	Substance type	Presence
	ZZS	Yes
	Biocides	Yes
	Others	No

#### Tier 2 (Leaching/exposure)

Life cycle_x	Substance type	Substance name
1	Biocides	copper
2	Biocides	tebuconazole
3	Biocides	propiconazole
Life cycle_x	Substance type	Substance name
1	Biocides	copper
2	Biocides	tebuconazole
3	Biocides	propiconazole

### Sustainability

#### Tier 1

Circularity	Circularity improved
Recycling options	No
Potential supply concern? (>1% market share)	Yes

#### Tier 2

Environmental Impact	Impact (A1 + A3 +A5)
Carbonfootprint	1.34E+01
Landuse footprint	2.31E+04
Circularity	Value
SSML-R-1	0.70
SSML-R+1	0.24
MCI	0.05

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**Certainty/data quality References (; delimit Comments, e.g. Substance names**

Product data	<a href="https://ec.europa.eu/tra">https://ec.europa.eu/tra</a>	tebuconazole, propiconazole
Product data	<a href="https://echa.europa.eu">https://echa.europa.eu</a>	copper, tebuconazole, propiconazole
Product data		

**Exposure Soil Units and other info Certainty/data qualReferences (; delin**

3.13	mg/kg wwt	Product data	<a href="https://ec.europa.">https://ec.europa.</a>
0.001	mg/kg wwt	Product data	<a href="https://ec.europa.">https://ec.europa.</a>
0.002	mg/kg wwt	Product data	<a href="https://ec.europa.">https://ec.europa.</a>

**Exposure groundwaterUnits and other info Certainty/data qualReferences (; delin**

0.35	µg/L	Product data	<a href="https://ec.europa.">https://ec.europa.</a>
<0.1	µg/L	Product data	<a href="https://ec.europa.">https://ec.europa.</a>
<0.1	µg/L	Product data	<a href="https://ec.europa.">https://ec.europa.</a>

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**Certainty/data quality References (; delimited)**

Material data	
Material data	EuroStat (2020), EU production Sawlogs and veneer logs non-co

**Benefit (D) Units and other info Certainty/data qualLCA method**

1.50E+01	ton CO2-eq	Material data	Simplified SSML-M2
	m2a crop-eq	Material data	Simplified SSML-M2

**Units and other info Certainty/data quality Method References (; delin**

-	Material data	CB'23: %secondary content; %renewabl
-	Material data	SSML: Recyclability
-	Material data	Madaster Material Circularity Indicator

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Safety treshold	treshold_Reference
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40.35	<a href="https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-">https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-</a>
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0.1	<a href="https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-">https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-</a>
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0.2	<a href="https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-">https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-</a>
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Safety treshold	treshold_Reference
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15.00	<a href="https://rvs.rivm.nl/">https://rvs.rivm.nl/</a>
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0.1	BPR 528/2012
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0.1	BPR 528/2012
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niferous under bark

**References (; delimited)**

ivl (2018), Comparative LCA of Railway Sleepers; 1 kg Cleft timber, measured as dry mass {Rc  
1 kg Cleft timber, measured as dry mass {RoW}| hardwood forestry, oak, sustainable forest ma

ited)

e content

211-F1-EN-MAIN-PART-6.PDF  
211-F1-EN-MAIN-PART-6.PDF  
211-F1-EN-MAIN-PART-6.PDF

W}| hardwood forestry, oak, sustainable forest management | Cut-off, U (of project Ecoinvent 3 -  
nagement | Cut-off, U (of project Ecoinvent 3 - allocation, cut-off by classification - unit)

allocation, cut-off by classification - unit); co2emissiefactoren.nl

Name

Untreated wood

id\_code

SSML\_DL001

Contributors

Erik Dekker, Mark Montforts, Joris Quik

## General

Functional unit

100m of railroad track for 50 years

## Safety

### Tier 1 (content)

Life cycle_x	Substance type	Presence
	ZZS	No
	Biocides	No
	Others	yes

### Tier 2 (Leaching/exposure)

Life cycle_x	Substance type	Substance name
1	Others	
2		
3		

## Sustainability

### Tier 1

Circularity	Circularity improved
Recycling options	No
Potential supply concern? (>1% market share)	Yes

### Tier 2

Environmental impact	Impact (A1 + A3 +A5)
Carbonfootprint	1.90E+01
Landuse footprint	4.52E+04

Circularity	Value
SSML-R-1	0.70
SSML-R+1	0.25
MCI	0.00



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**Certainty/data quality References (; delimit Comments, e.g. Substance names**

Product data		ZZS refers to substance properties. How
Product data		By definition natural wood is not treated v
Material data	Szczepkowski, A. and D.	Heavy metals

**Leaching/exposure Units and other info Certainty/data qualReferences (; delin**

			Szczepkowski, A. ar

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**Certainty/data quality References (; delimited)**

Material data		
Material data	EuroStat (2020), EU production	Sawlogs and veneer logs non-co

**Benefit (D) Units and other info Certainty/data qualLCA method**

2.33E+01	ton CO2-eq	Material data	Simplified SSML-M2
	m2a crop-eq	Material data	Simplified SSML-M2

**Units and other info Certainty/data quality Method References (; delin**

-	Material data	CB'23: %secondary content; %renewabl
-	Material data	SSML: Recyclability
-	Material data	Madaster Material Circularity Indicator

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<p>ever, natural wood is not placed on the market as a mixture, hence exempt from REACH registration with wood preservatives or other biocides</p>	
<p><b>Safety threshold</b></p>	<p><b>threshold_Reference</b></p>
<p>and D. Nicewicz (2008). "The content of heavy metals in the wood of healthy and dying oak trees</p>	

mixture, hence exempt from REACH registration with wood preservatives or other biocides

<p>niferous under bark</p>	
<p><b>References (; delimited)</b></p>	
<p>ivl (2018), Comparative LCA of Railway Sleepers; 1 kg Cleft timber, measured as dry mass {RoW} hardwood forestry, oak, sustainable forest management</p>	
<p><b>ited)</b></p>	
<p>e content</p>	

niferous under bark

<p>ited)</p>	
<p>e content</p>	

ited)

ration.

(*Quercus robur* L., *Q. Petraea* (Matt.) Liebl.)" *Acta Scientiarum Polonorum* 7(4): 55-65

W}| hardwood forestry, oak, sustainable forest management | Cut-off, U (of project Ecoinvent 3 -  
nagement | Cut-off, U (of project Ecoinvent 3 - allocation, cut-off by classification - unit)

allocation, cut-off by classification - unit); co2emissiefactoren.nl

Name

Concrete (NS90)

id\_code

SSML\_DL003

Contributors

Erik Dekker, Mark Montforts, Joris Quik

### General

Functional unit

100m of railroad track for 50 years

### Safety

Tier 1 (content)

Life cycle\_x

Substance type

Presence

ZZS

Unknown

Biocides

Unknown

Others

Yes

Tier 2 (Leaching/exposure)

Life cycle\_x

Substance type

Substance name

1

Others

metals

2

3

### Sustainability

Tier 1

Circularity

Circularity improved

Recycling options

No

Potential supply concern?  
(>1% market share)

No

Tier 2

Environmental impact

Impact (A1 + A3 +A5)

Carbonfootprint

1.85E+01

Landuse footprint

1.05E+02

Circularity

Value

SSML-R-1

0.00

SSML-R+1

0.30

MCI

0.03

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**Certainty/data quality References (; delimit Comments, e.g. Substance names**

High uncertainty		Metals

**Leaching/exposure Units and other info Certainty/data qualReferences (; delin**

			Verschoor et al. (200

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**Certainty/data quality References (; delimited)**

Material data	

Benefit (D)	Units and other info	Certainty/data qual	LCA method
5.21E+00	ton CO2-eq	Product data	EN15804 based
	m2a crop-eq	Material data	Simplified SSML-M2

Units and other info	Certainty/data quality	Method	References (; delin
-	Product data		
-	Material data		
-	Combi		

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Safety treshold	treshold_Reference
06)	Appendix A of the Soil Quality Decree

**References (; delimited)**  
 SGS Search Consultancy (2019), Ongetoetst LCA rapport voor Dwarsligger NS90

ited)

Name

Sulphur concrete

id\_code

SSML\_DL004

Contributors

Erik Dekker, Mark Montforts, Joris Quik

## General

**Functional unit** 100m of railroad track for 50 years

## Safety

### Tier 1 (content)

Life cycle_x	Substance type	Presence
	<b>ZZS</b>	Unknown
	<b>Biocides</b>	Unknown
	<b>Others</b>	Yes

### Tier 2 (Leaching/exposure)

Life cycle_x	Substance type	Substance name
1	<b>Others</b>	metals
2		
3		

## Sustainability

### Tier 1

Circularity	Circularity improved
<b>Recycling options</b>	Yes
<b>Potential supply concern? (&gt;1% market share)</b>	Unknown

### Tier 2

Environmental impact	Impact (A1 + A3 +A5)
<b>Carbonfootprint</b>	7.34E+00
<b>Landuse footprint</b>	unknown

Circularity	Value
<b>SSML-R-1</b>	0.00
<b>SSML-R+1</b>	0.95
<b>MCI</b>	0.48



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**Certainty/data quality References (; delimit Comments, e.g. Substance names**

High uncertainty		Metals

**Leaching/exposure Units and other info Certainty/data qualReferences (; delin**

			(Mohamed and El-G

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**Certainty/data quality References (; delimited)**

Product data	

**Benefit (D) Units and other info Certainty/data qualLCA method**

3.95E+00	ton CO2-eq	Product data	EN15804 based
unknown	m2a crop-eq		

**Units and other info Certainty/data quality Method References (; delin**

-	Product data	CB'23: %secondary content; %renewabl	
-	Product data	SSML: Recyclability	
-	Product data	Madaster Material Circularity Indicator	

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Safety treshold	treshold_Reference
amal, 2010)	Appendix A of the Soil Quality Decree

**References (; delimited)**  
De Bonte (2018), Thiotrack test met EoL

**ited)**  
e content

Name

Recycled PE

id\_code

SSML\_DL006

Contributors

Erik Dekker, Mark Montforts, Joris Quik

## General

Functional unit

100m of railroad track for 50 years

## Safety

### Tier 1 (content)

Life cycle\_x

Substance type

Presence

ZZS

Yes

Biocides

Yes

Others

Yes

### Tier 2 (Leaching/exposure)

Life cycle\_x

Substance type

Substance name

1

Others

Sb, As, Ba, Cd, Cr, Pb,

2

ZZS

all ZZS

3

## Sustainability

### Tier 1

Circularity

Circularity improved

Recycling options

Yes

Potential supply concern?  
(>1% market share)

Yes

### Tier 2

Environmental impact

Impact (A1 + A3 +A5)

Carbonfootprint

2.23E+01

Landuse footprint

Circularity

Value

SSML-R-1

0.63

SSML-R+1

0.94

MCI

0.82

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**Certainty/data quality References (; delimit Comments, e.g. Substance names**

High uncertainty	Groh KJ, Backhaus T, Carne	DEHP, PBDE
High uncertainty	Groh KJ, Backhaus T, Carne	triclosan
High uncertainty	Groh KJ, Backhaus T, Carne	DEP; metals

**Leaching/exposure Units and other info Certainty/data qualReferences (; delin**

<1	mg/kg (leaching)	Material data	Lankhorst (2019) Proeft
	% (w/w)	High uncertainty	Groh KJ, Backhaus T, Ca

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**Certainty/data quality References (; delimited)**

Product data	
	Ce Delft (2019), Plasticgebruik en verwerking van plastic afval in

Benefit (D)	Units and other info	Certainty/data qual	LCA method
2.83E+01	ton CO2-eq	Product data	EN15804 based
	m2a crop-eq	Material data	Simplified SSML-M2

Units and other info	Certainty/data quality	Method	References (; delin
		CB'23: %secondary	content; %renewabl
-		SSML: Recyclability	
		Madaster Material C	Circularity Indicator

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Safety treshold	treshold_Reference
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>=25	European standard EN 71 specifies safety requirements for toys. EN 71-3:
0.1	REACH. See <a href="https://lap3.nl/beleidskader/deel-b-afvalbeheer/b14-zeer/">https://lap3.nl/beleidskader/deel-b-afvalbeheer/b14-zeer/</a>

Nederland; Kawecki et al. (2018), Probabilistic Material Flow Analysis of Seven Commodity Pl

**Referenties (; tussen meerdere)**

ivl (2018), Comparative LCA of Railway Sleepers; Tauw (2018), Sneek, Lankhorst CO2-Footpri

ited)

e content

Specification for migration of certain elements.

astics in Europe; Afvalfonds Verpakkingen (2018), Resultaten inzameling en recycling

int voor KLP materiaal

Name

Virgin PE

id\_code

SSML\_DL005

Contributors

Erik Dekker, Mark Montforts, Joris Quik

## General

Functional unit

100m of railroad track for 50 years

## Safety

### Tier 1 (content)

Life cycle_x	Substance type	Presence
	ZZS	Yes
	Biocides	Yes
	Others	Yes

### Tier 2 (Leaching/exposure)

Life cycle_x	Substance type	Substance name
1	Others	Sb, As, Ba, Cd, Cr, Pb,
2	ZZS	all ZZS
3		

## Sustainability

### Tier 1

Circularity	Circularity improved
Recycling options	Yes
Potential supply concern? (>1% market share)	No

### Tier 2

Environmental impact	Impact (A1 + A3 +A5)
Carbonfootprint	3.50E+01
Landuse footprint	3.45E+02

Circularity	Value
SSML-R-1	0.00
SSML-R+1	0.94
MCI	0.53

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**Certainty/data quality References (; delimit) Comments, e.g. Substance names**

High uncertainty	Groh KJ, Backhaus T, Carne	DEHP, PBDE
High uncertainty	Groh KJ, Backhaus T, Carne	triclosan
High uncertainty	Groh KJ, Backhaus T, Carne	DEP; metals

**Leaching/exposure Units and other info Certainty/data qualReferences (; delin**

<1	mg/kg (leaching)	Material data	Lankhorst (2019) Proeft
	% (w/w)	High uncertainty	Groh KJ, Backhaus T, Ca

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**Certainty/data quality References (; delimited)**

Material data	

**Benefit (D) Units and other info Certainty/data qualLCA method**

2.83E+01	ton CO2-eq	Material data	Simplified SSML-M2
	m2a crop-eq	Material data	Simplified SSML-M2

**Units and other info Certainty/data quality Method References (; delin**

-		CB'23: %secondary	content; %renewabl
-		SSML: Recyclability	
-		Madaster Material C	Circularity Indicator

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Safety treshold	treshold_Reference
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>=25	European standard EN 71 specifies safety requirements for toys. EN 71-3:
0.1	REACH. See <a href="https://lap3.nl/beleidskader/deel-b-afvalbeheer/b14-zeer/">https://lap3.nl/beleidskader/deel-b-afvalbeheer/b14-zeer/</a>

**References (; delimited)**

EcolInvent v3

EcolInvent v3

ited)

e content

Specification for migration of certain elements.

Name

PU + glassfibre

id\_code

SSML\_DL007

Contributors

Erik Dekker, Mark Montforts, Joris Quik

### General

Functional unit

100m of railroad track for 50 years

### Safety

Tier 1 (content)

Life cycle\_x

Substance type

Presence

ZZS

Unknown

Biocides

Unknown

Others

Unknown

Tier 2 (Leaching/exposure)

Life cycle\_x

Substance type

Substance name

1

Others

2

3

### Sustainability

Tier 1

Circularity

Circularity improved

Recycling options

Yes

Potential supply concern?  
(>1% market share)

No

Tier 2

Environmental impact

Impact (A1 + A3 +A5)

Carbonfootprint

4.26E+01

Landuse footprint

8.71E+02

Circularity

Value

SSML-R-1

0.00

SSML-R+1

0.98

MCI

0.54

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**Certainty/data quality References (; delimit Comments, e.g. Substance names**

High uncertainty		
High uncertainty		
High uncertainty		

**Leaching/exposure Units and other info Certainty/data qualReferences (; delin**


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**Certainty/data quality References (; delimited)**

Product data	

**Benefit (D) Units and other info Certainty/data qualLCA method**

2.98E+01	ton CO2-eq	Product data	EN15804 based
	m2a crop-eq	Material data	Simplified SSML-M2

**Units and other info Certainty/data quality Method References (; delin**

		CB'23: %secondary content; %renewabl	
		SSML: Recyclability	
		Madaster Material Circularity Indicator	

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**Safety treshold    treshold\_Reference**


**References (; delimited)**

SGS search (2020), LCA Background report FFU sleepers

**ited)**

e content

## Uitleg/interpretatie

### Presence

Yes	Gemeten in product of materiaal type dat in product wordt gebruikt.
No	Niet aangetoond bij metingen in product of materiaal type (kan ook recycle)
Others	Geen informatie gevonden of beschikbaar mbt metingen ZZS, gebruik bio

### Substance type

ZZS

Biocides

Others

### Zekerheid

High uncertainty	Slechts 1 meting, of geen kwantitatieve info, Expert judgement etc.
Material data	Er zijn data of metingen beschikbaar voor dit materiaal type ongeacht toep
Product data	Er zijn data of metingen beschikbaar voor materiaal in dit specifieke produ

### Certainty/data quality LCA

Material data	Gebruik van generieke data uit openbare databases
Product data	Data van LCA met gebruik van NL bepalingmethode GWW
Combi	Combi van beide type data
High uncertainty	Still high uncertainty no actual proof

### Circularity improved

Yes

No

Unknown

### LCA method

EN15804 based

Simplified SSML-M2

Other

ed PE zijn)  
ciden.

passing (gebruikt in product/dwarsligger)  
ct (bijv. De dwarsligger)