epd-norge
Global program operatør

Environmental product declaration

In accordance with 14025 and EN15804+A2

Leca® Lettklinker 0/32, Leca Norway

The Norwegian EPD Foundation

Owner of the declaration:
Leca International

Product:
Leca® Lettklinker 0/32, Leca Norway

Declared unit:
1 m3

This declaration is based on Product Category Rules:
CEN Standard EN 15804:2012+A2:2019 serves as core PCR.
NPCR 012:2018 Part B for Thermal insulation products

Program operator:
The Norwegian EPD Foundation

Declaration number:

NEPD-4411-3639-EN

Registration number:

NEPD-4411-3639-EN

Issue date: 02.05.2023

Valid to: 02.05.2028

EPD Software:
LCA.no EPD generator ID: 55338

General information

Product

Leca® Lettklinker 0/32, Leca Norway

Owner of the declaration:

Leca International
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Program operator:

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The Norwegian EPD Foundation
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Manufacturer:

Leca International
Årnesvegen 1
2009 Nordby, Norway

Declaration number: NEPD-4411-3639-EN

Place of production:

Leca, Rælingen
Årnesvegen 1
N-2009 Nordby, Norway

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR.
NPCR 012:2018 Part B for Thermal insulation products

Management system:

ISO 14001ISO 9001

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Organisation no:

918 799 141

Declared unit:

1 m3 Leca® Lettklinker 0/32, Leca Norway

Issue date: 02.05.2023

Declared unit with option:

A1,A2,A3,A4,A5,C1,C2,C3,C4,D

Valid to: 02.05.2028

Year of study:

2021

Functional unit:

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804:2012+A2:2019 and seen in a building context.

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Individualthird party verification of each EPD is not required when the EPD tool is iintegrated into the company's environmental management system, iithe procedures for use of the EPD tool are approved by EPDNorway, and iiithe proccess is reviewed annualy. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools.

Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Ana Raquel Fernandes

Reviewer of company-specific input data and EPD: Tone Storbråten

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Elisabet Amat - GREENIZE projects

(no signature required

Approved:

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

Leca® Lettklinker 0/32 lightweight expanded clay aggregate is a porous, ceramic material made from natural clay. Organic matter is mixed into raw clay, which is pelletized, dried and heated in a rotary kiln at about 1150 °C and the unsorted output has 0/32 mm grading. The process expands the material into granules with 5x times the volume of the original clay. Leca® Lettklinker 0/32 has a dry bulk density of 275 kg/m^3 and is normally transported in bulk.

Product specification

This EPD describes the performance for the production of Leca® Lettklinker 0/32 lightweight expanded clay aggregate, grading 0/32 mm, produced at Leca Rælingen in Norway. The grading vs. densities list stated in the technical data section can be used for calculations of the environmental impact of other gradings.
Intended use:
Leca® Lettklinker 0/32 is intended to be used as thermal insulation layer, drainage material and weight-reducing backfill in infrastructure. The material is suited in road and railroad embankments and other geotechnical applications. Leca® Lettklinker 0/32 can be used in local water management solutions the for handling of stormwater and for climate adaptation purposes. Leca® products are also used as aggregate in lightweight masonry blocks and as aggregate for lightweight concrete.

Materials	Value	Unit
Clay	98,0	%
Waste raw materials	0,7	%
Dolomite	1,3	%

Technical data:

Characteristic values for Leca® Lettklinker 0/32:
Loose bulk density (NS-EN 1097-3): 275 kg/m^3
Grading (NS-EN 933-1): 0/32 mm
Compressive strength, 10% (NS-EN 13055-1): 1,3 MPa
Compressive strength, 2% (NS-EN 13055-1): 0,5 MPa
Thermal conductivity (NS-EN 14063-1), dry: 0,12 W/mK
Reaction to fire (NS-EN 13820): Eurocode A1
Resistance to dynamic loads (NS-EN 15732): < 1,0 % (120 kPa, 2 000 000 cycles)
For additional information, visit www.leca.no

Market:

Norway

Reference service life, product

Not relevant.

Reference service life, building or construction works

Not relevant.

LCA: Calculation rules

Declared unit:

1 m3 Leca® Lettklinker 0/32, Leca Norway

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804+A2. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Data quality:

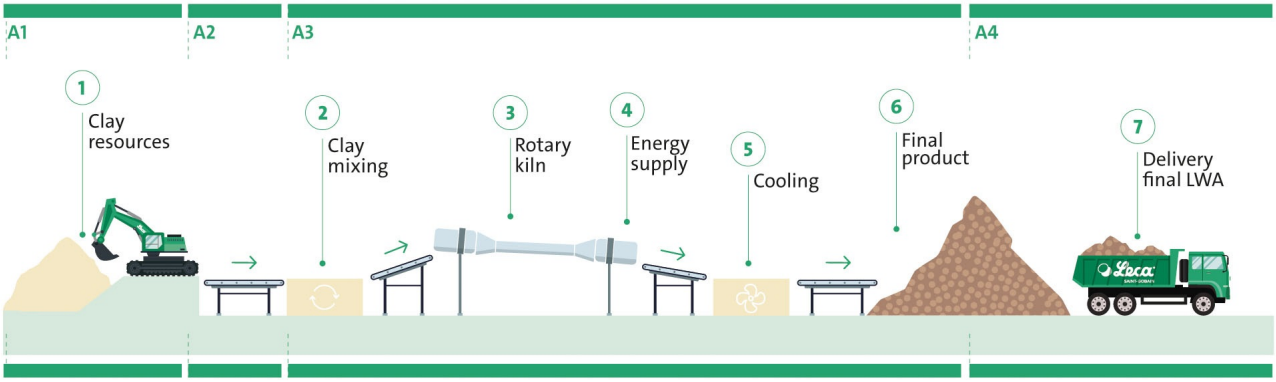
Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Additives	ecoinvent 3.6	Database	2019
Dolomite	ecoinvent 3.6	Database	2019
Oxygen	ecoinvent 3.6	Database	2019
Clay	LCA.no	Database	2021

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	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	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

System boundary:



Additional technical information:

Leca® Lettklinker 0/32 is resistant to degradation, frost and high temperatures. The compound is ceramic and chemically inert.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

The material has an indefinite service life and require no maintenance during its utilization. Leca® Lettklinker 0/32 can be excavated and re-used in fillings in other construction projects.

Transport from production site to user (A4): Assuming 50 km transportation distance with a full size truck to the construction site. The weight of Leca® Lettklinker 0/32 is low, and the loading capacity is therefore limited by the maximum transportation volume of the truck, not its weight capacity.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, over 32 tonnes, EURO 6 (km)	53,3 %	50	0,023	l/tkm	1,15

Assembly (A5)	Unit	Value			
Blowing, Machine operation, diesel, > 18.64 kW (per hour)	h/DU	0,03			
Bulldozer, Machine operation, diesel, >=74.57 kW (per hour)	h/DU	0,02			
Crane, Machine operation, diesel, >=74.57 kW (per hour)	h/DU	0,01			
Vibrating plate (per liter diesel)	L/DU	0,01			

De-construction demolition (C1)	Unit	Value			
Removal of LWA, Machine operation, diesel, >= 74.57 kW (per hour)	h/DU	0,04			
Sorting per kg of LWA, for waste treatment after removal (kg)	kg/DU	275,00			

Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 16-32 tonnes, EURO 5 (km)	36,7 %	50	0,044	l/tkm	2,20

Waste processing (C3)	Unit	Value			
Waste treatment, reuse of LWA (kg)	kg	206,25			

Disposal (C4)	Unit	Value			
Disposal, landfilling of waste LWA (kg)	kg	68,75			

Benefits and loads beyond the system boundaries (D)	Unit	Value			
Substitution of primary expanded clay (kg)	kg	206,25			

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact												
	Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	GWP-total	kg CO_2 -eq	1,93E+00	5,45E-01	5,56E+01	1,20E+00	1,27E+00	8,67E-01	2,29E+00	0,00E+00	5,65E-01	-5,18E+01
	GWP-fossil	kg CO_2 -eq	1,89E+00	5,45E-01	5,56E+01	1,20E+00	1,27E+00	8,67E-01	2,29E+00	0,00E+00	5,64E-01	-5,17E+01
	GWP-biogenic	kg CO_2 -eq	3,20E-02	2,25E-04	3,89E-03	5,13E-04	2,39E-04	1,61E-04	9,35E-04	0,00E+00	6,58E-04	-1,27E-01
	GWP-luluc	kg CO_2 -eq	3,77E-03	1,60E-04	3,66E-03	3,65E-04	9,96E-05	6,79E-05	8,01E-04	0,00E+00	1,39E-04	-2,02E-02
	ODP	kg CFC11 -eq	2,29E-07	1,26E-07	4,23E-07	2,89E-07	2,73E-07	1,86E-07	5,23E-07	0,00E+00	2,13E-07	-3,04E-06
	AP	mol H+ -eq	1,53E-02	2,23E-03	2,30E-01	3,86E-03	5,70E-03	3,16E-03	9,37E-03	0,00E+00	5,02E-03	-4,12E-01
	EP-FreshWater	kg P -eq	1,53E-04	4,17E-06	3,22E-03	9,53E-06	4,60E-06	3,13E-06	1,80E-05	0,00E+00	6,39E-06	-2,57E-03
	EP-Marine	kg N -eq	2,43E-03	6,56E-04	1,04E-01	8,44E-04	2,09E-03	1,05E-03	2,78E-03	0,00E+00	1,86E-03	-5,15E-02
	EP-Terrestial	mol N -eq	4,31E-02	7,26E-03	1,15E+00	9,42E-03	2,31E-02	1,16E-02	3,07E-02	0,00E+00	2,06E-02	-6,21E-01
	POCP	kg NMVOC -eq	7,57E-03	2,37E-03	2,95E-01	3,70E-03	6,70E-03	3,56E-03	9,41E-03	0,00E+00	5,89E-03	-1,68E-01
	ADP-minerals&metals[1]	kg Sb -eq	2,19E-05	9,35E-06	1,09E-05	2,13E-05	1,94E-06	1,32E-06	6,21E-05	0,00E+00	5,08E-06	-6,84E-04
	ADP-fossil[1]	MJ	4,10E+01	8,51E+00	4,14E+02	1,95E+01	1,74E+01	1,18E+01	3,46E+01	0,00E+00	1,55E+01	-5,24E+02
	WDP[1]	m^3	1,39E+03	6,53E+00	-4,10E+02	1,49E+01	3,70E+00	2,52E+00	3,30E+01	0,00E+00	9,57E+01	-9,69E+02

GWP total Global Warming Potential total; GWP fossil Global Warming Potential fossil fuels ; GWP biogenic Global Warming Potential biogenic; GWP luluc Global W Potential land use change; ODP Ozone Depletion; AP Acidification; EP freshwater Eutrophication aquatic freshwater; EP marine Eutrophication aquatic marine; EP terrestrial Eutrophication terrestrial ;POCP Photochemical zone formation; ADPE Abiotic Depletion Potential minerals and metals; ADPf Abiotic Depletion Potential fossil fuels;

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

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

Remarks to environmental impacts

The clay is excavated from a local clay fields that are close to the factories. Consequently, the production transportation (A2) emissions and costs are minimized. After depletion all clay fields are remediated back into their original state, e.g. farmlands or natural areas.
Due to polluter-pay-principle, the emissions from waste are not included.
Biogenic carbon from biofuels are balanced to zero since they have their input and output in the same module.

Additional environmental impact indicators

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	PM	Disease incidence	8,16E-08	4,82E-08	1,16E-06	1,10E-07	9,99E-08	6,20E-08	1,65E-07	0,00E+00	1,07E-07	-3,84E-06
	IRP[2]	kgBq U235 -eq	3,62E-01	3,72E-02	2,19E-01	8,50E-02	7,45E-02	5,08E-02	1,51E-01	0,00E+00	7,08E-02	-1,09E+00
	ETP-fw[1]	CTUe	4,76E+01	6,23E+00	6,70E+02	1,42E+01	9,52E+00	6,48E+00	2,55E+01	0,00E+00	8,47E+00	-1,27E+03
	HTP-c[1]	CTUh	5,84E-09	0,00E+00	1,24E-09	0,00E+00	1,08E-09	7,22E-10	0,00E+00	0,00E+00	3,44E-10	-2,31E-08
	HTP-nc[1]	CTUh	2,62E-08	6,02E-09	3,72E-08	1,38E-08	8,04E-09	5,15E-09	2,75E-08	0,00E+00	6,12E-09	-6,26E-07
	SQP[1]	dimensionless	9,88E+00	9,77E+00	4,40E+01	2,23E+01	2,21E+00	1,50E+00	2,38E+01	0,00E+00	5,97E+01	-7,29E+02

PM Particulate Matter emissions; IRP Ionizing radiation – human health; ETP-fw Eco toxicity – freshwater; HTP-c Human toxicity – cancer effects; HTP-nc Human toxicity – non cancer effects; SQP Soil Quality (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator
2. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure 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.

Resource use												
Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	PERE	MJ	9,14E+00	1,07E-01	6,30E+01	2,45E-01	9,41E-02	6,41E-02	4,88E-01	0,00E+00	5,56E-01	-1,42E+02
	PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PERT	MJ	9,14E+00	1,07E-01	6,30E+01	2,45E-01	9,41E-02	6,41E-02	4,88E-01	0,00E+00	5,56E-01	-1,42E+02
	PENRE	MJ	4,34E+01	8,52E+00	4,14E+02	1,95E+01	1,74E+01	1,18E+01	3,46E+01	0,00E+00	1,55E+01	-5,24E+02
	PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PENRT	MJ	4,34E+01	8,52E+00	4,14E+02	1,95E+01	1,74E+01	1,18E+01	3,46E+01	0,00E+00	1,55E+01	-5,24E+02
	SM	kg	6,43E-01	0,00E+00	2,67E-02	0,00E+00	8,54E-03	5,82E-03	0,00E+00	0,00E+00	6,73E-03	-7,74E-01
	RSF	MJ	4,34E-01	3,75E-03	7,14E-03	8,56E-03	2,32E-03	1,58E-03	1,75E-02	0,00E+00	1,15E-02	-3,75E+00
	NRSF	MJ	7,84E-02	1,26E-02	4,74E+02	2,87E-02	3,41E-02	2,32E-02	6,23E-02	0,00E+00	2,49E-02	-2,93E+00
	FW	m^3	8,29E-02	9,70E-04	4,56E-02	2,21E-03	8,95E-04	6,10E-04	3,64E-03	0,00E+00	1,91E-02	-3,48E-01

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

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Waste

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	HWD	kg	1,61E-02	4,66E-04	1,28E-02	1,06E-03	5,12E-04	3,49E-04	1,76E-03	0,00E+00	1,09E-03	-5,77E-02
	NHWD	kg	2,12E-01	7,41E-01	3,25E-01	1,69E+00	2,06E-02	1,40E-02	1,65E+00	0,00E+00	6,88E+01	-3,64E+00
	RWD	kg	2,66E-04	5,81E-05	2,08E-04	1,33E-04	1,21E-04	8,22E-05	2,36E-04	0,00E+00	1,01E-04	-1,56E-03

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed;

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Output flow

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	4,31E-03	0,00E+00	5,39E-02	0,00E+00	8,26E-03	5,71E-03	0,00E+00	2,06E+02	6,13E-03	-6,28E-01
	MER	kg	5,84E-01	0,00E+00	8,80E-04	0,00E+00	1,55E-04	1,77E-05	0,00E+00	0,00E+00	1,16E-04	-3,76E-02
	EEE	MJ	1,15E-02	0,00E+00	2,24E-02	0,00E+00	8,92E-05	6,07E-05	0,00E+00	0,00E+00	9,54E-03	-8,19E-02
	EET	MJ	1,74E-01	0,00E+00	3,39E-01	0,00E+00	1,35E-03	9,19E-04	0,00E+00	0,00E+00	1,44E-01	-1,24E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported energy Thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

Biogenic Carbon Content

Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

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

Additional Norwegian requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Data source	Amount	Unit
Renewable electricity Saint-Gobain, based on 100% hydro power, with Guarantee of Origin from LOS 2021 (kWh)	ecoinvent 3.6	4,26	g CO2-eq/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

Indoor environment

Not relevant, see intended uses.

Additional Environmental Information

Environmental impact indicators EN 15804+A1 and NPCR Part A v2.0											
Indicator	**Unit**	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 -eq	1,97E+00	5,39E-01	5,40E+01	1,19E+00	1,26E+00	8,61E-01	2,27E+00	0,00E+00	5,52E-01	-5,05E+01
ODP	kg CFC11 -eq	2,77E-07	1,02E-07	3,65E-07	2,34E-07	2,16E-07	1,47E-07	4,13E-07	0,00E+00	1,72E-07	-2,57E-06
POCP	kg C_2H_4 -eq	6,03E-04	7,00E-05	3,74E-02	1,47E-04	2,06E-04	1,32E-04	3,03E-04	0,00E+00	1,30E-04	-1,53E-02
AP	kg SO_2 -eq	1,10E-02	1,09E-03	1,53E-01	2,50E-03	1,84E-03	1,26E-03	4,50E-03	0,00E+00	1,54E-03	-3,39E-01
EP	kg PO_4^{3-} -eq	1,72E-03	1,19E-04	4,30E-02	2,71E-04	2,05E-04	1,40E-04	4,80E-04	0,00E+00	1,81E-04	-2,65E-02
ADPM	kg Sb -eq	2,19E-05	9,35E-06	1,09E-05	2,13E-05	1,94E-06	1,32E-06	6,21E-05	0,00E+00	5,08E-06	-6,84E-04
ADPE	MJ	2,51E+01	8,36E+00	4,10E+02	1,91E+01	1,73E+01	1,18E+01	3,39E+01	0,00E+00	1,49E+01	-4,99E+02
GWPIOBC	kg CO_2 -eq	9,19E-01	5,45E-01	6,57E+00	1,20E+00	1,99E-01	1,98E-01	2,29E+00	0,00E+00	0,00E+00	-5,18E+01

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources; GWP-IOBC/GHG Global warming potential calculated according to the principle of instantanious oxidation (except emissions and uptake of biogenic carbon)

Bibliography

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ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines.
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