SGS

BUILDING MATERIALS

LIFE CYCLE ASSESSMENT ENVIRO-MAT®

Report for review

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SGS INTRON

COLOFON

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SUMMARY

Introduction

Mammoet HDP produces Enviro-Mat®, that tis applied in in situ soil stabilization. Mammoet HDP has commissioned SGS INTRON to do a LCA in order to get its own validated environmental product information. An important incentive for the LCA is that clients ask frequently for such data for sustainable procurement.

Aim

Set up the LCA of Enviro-Mat®

Work done

SGS INTRON has done the LCA according to the Bepalingsmethode Milieuprestaties Gebouwen en GWW-werken versie 3.0, which is based on EN 15804 with Ecoinvent 3.5. Based on the environmental profile the environmental cost indicator MKI was calculated per m^2 Enviro-Mat for varying layer thicknesses. The CO_2-footprint, one of the environmental indicators is presented explicitly.

Conclusions

The calculated MKI of Enviro-Mat® is presented at varying layer thickness:

Layer thickness		*MKI (euro/m^2)*	
30	*cm*	*1,415*	
35	*cm*	*1,651*	
40	*cm*	*1,887*	
45	*cm*	*2,123*	
50	*cm*	*2,358*	

MKI of 1 m^3 Enviro-Mat®:

Without lime (sandy soil): 4,72 euro
With lime (clay soil): 6,58 euro

The largest contribution to the MKI en the CO_2 footprint is from the cement (CEM III/B).

1. INTRODUCTION

1.1. General

Mammoet Heavy Duty Pavements (Mammoet HDP) produces Enviro-Mat®, which is applied in the in-situ stabilization of soil.
Mammoet HDP has commissioned SGS INTRON for an LCA in order to get its own validated environmental product information. An important incentive fort he LCA is that clients increasingly ask for such data for sustainable procurement. Clients may use this information to set up an environmental calculation for their project in which the Enviro-Mat is applied.

1.2. Commissioner

The commissioner for this study is Mammoet HDP.

1.3. Aim and target group

The aim of the study is to provide validated environmental information to clients and other stakeholders. The results of the LCA may be presented in a MRPI-EPD (Milieu Relevante Product Informatie - Environmental Product Declaration). The EPD is issued by Stichting MRPI, the Dutch EPD program coordinator. Stichting MRPI is a member of Eco-Platform. This ensures that the EPD's are accepted in Europe.

If required, the results may be put in the Dutch National Environmental Database (NMD) and form this database in the calculation tool , that is used by Rijkswaterstaat and other parties in infrastructure to calculate the sustainability of infrastructural projects.

1.4. Procedure

For the LCA in this report the rules from the SBK Bepalingsmethode Milieuprestatie Gebouwen en GWW-werken [1] have been followed. Thereby, the LCA complies with the methodological requirements from NEN-EN-ISO 14040 [2], NEN-EN-ISO 14044 [3] and the requirements from EN 15804 [4].

1.5. Execution and guidance of the study

The LCA has been conducted by SGS INTRON in collaboration with SGS Search. The study has been executed by Bianca Baetens (SGS INTRON), Martijn van den Hövell (SGS Search) and Ulbert Hofstra (SGS INTRON).

As representative of Mammoet Martin van Noordt has guided the data collection.

1.6. Status of this report

This report is ready for review.

1.7. Structure of the report

In chapter 2 the background and starting points of the study are described. It contains the calculation unit, the product description, the system boundaries with the corresponding processes and some methodological starting points.

Chapter 3 describes the life cycle inventory wit hall input data and thee corresponding processes.

Chapter 4 presents the results of the LCA with a main points analysis and a sensitivity analysis for the inclusion of liming.

2. BACKGROUND AND STARTING POINTS

2.1. Product description

Enviro-Mat® is a soil stabilisation product. It provides a strong and durable foundation for transport or for buildings. Enviro-Mat is produced by mixing cement and an additive (Geosta®) through the soil on location.
The production process of the Enviro-Mat® consists of a number of steps:

1. (in clay soil) spreading lime and mixing through the clay
2. (not part of the system) taking to the correct height, profiling, compaction
3. spreading water for the optimum water content
4. spreading Geosta®
5. spreading cement
6. mixing through the soil (stabilization)
7. compaction with a steel wheel roller and levelling with a grader
8. compaction of the top layer with a tire roller
9. (in combination with asphalt or as sealant) application of spray

N.B.: the steps 1 and 2 are not always necessary

2.2. Functional unit

The functional unit is 1 m^2 Enviro-Mat stabilisation layer with an indicated layer thickness and a reference service life of 100 years.

2.3. Phases from the life cycle and system boundaries

The processes in the LCA are defined by the socalled system boundaries. Th system boundaries indicate which phases and processes from the life cycle of Enviro-Mat have been considered in the LCA.

In this study the following life cycle phases have been considered:

- The production / extraction of raw materials for Enviro-Mat.
- The transport tot the production location of these raw materials.
- The application of Enviro-Mat.
- Demolition.
- Waste processing

In the use phase of thee product there are no processes that contribute to the environmental

In figure 2.1 the process tree is presented.

2.4. Cut-off criteria for inputs en outputs

There are no indications that relevant inputs or outputs have been neglected. The definition of relevant inputs of par. 2.6.3.5 of the Bepalingsmethode has been applied. In addition, the criteria for relevant inputs and outputs have been applied from the Bepalingsmethode, paragraph 2.6.3.4 and the NEN-EN 15804, paragraph 6.2.

In the applied background processes at least the following processes have been included in the analysis:

- Emissions to air when using thermal energy of CO2, CO, NOx (N2), SO2, CxHx and fine dust (PM10 particles < 10µm).
- Emissions to water of CVZ, BZV, P-total, N-total and solid particles (PM10: particles < 10µm).
- Emissions to soil of PAH and heavy metals.

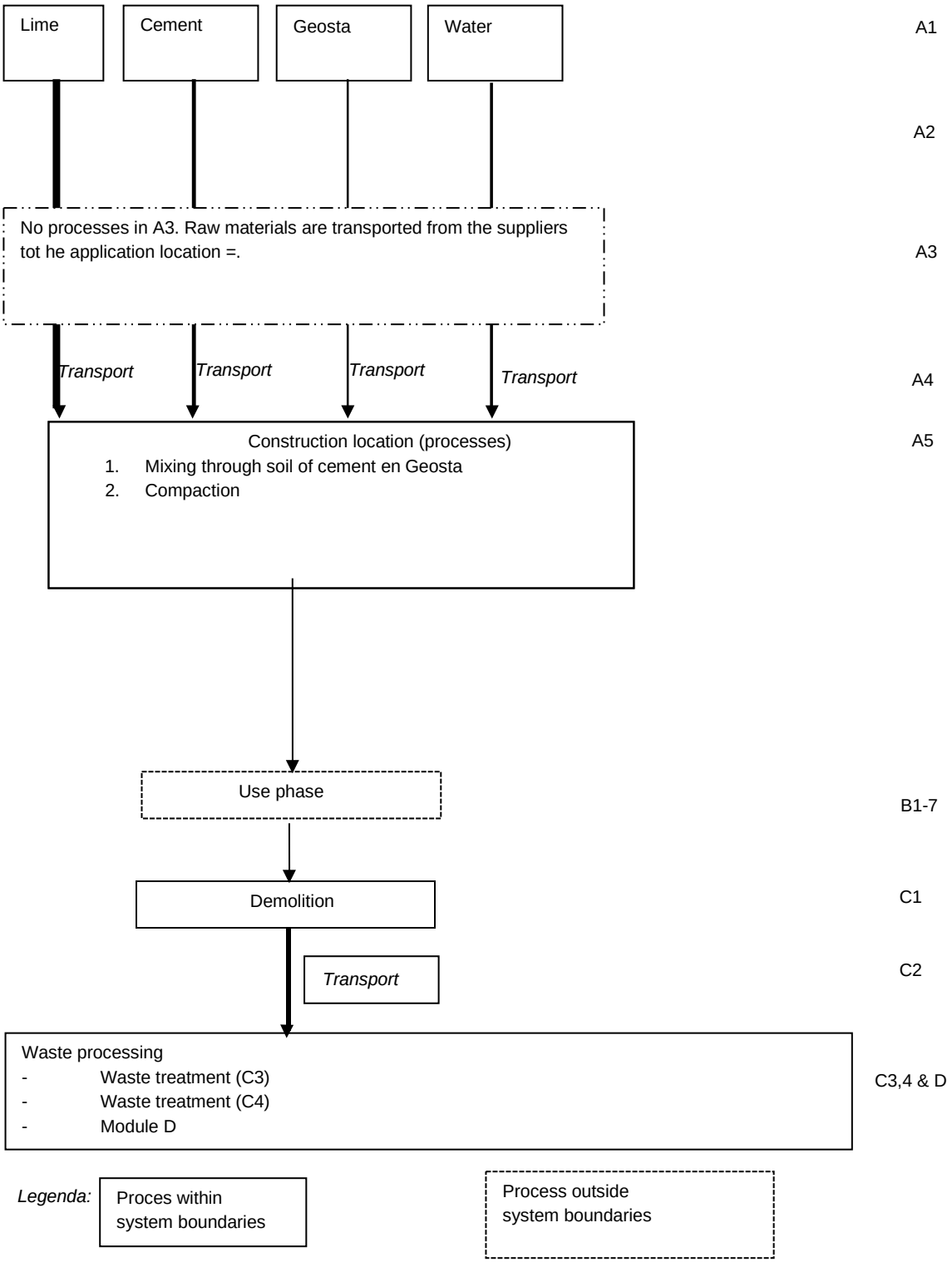

Figure 2.1 *Process tree*

3. LIFE CYCLE INVENTORY

3.1. Data collection

In the following paragraphs the materials, processes and references which have been used, are indicated, as well as a short motivation for the chosen references and the sources for the calculated amounts per functional unit. The tables provide a complete overview of all materials and processes that have been applied in the life cycle phases of this LCA-study.

The life cycle phases A1 to A5 have been conducted based on data from Mammoet HDP. The transport and waste process have been calculated based on fixed values from the Bepalingsmethode (v 3.0).

3.2. A1 Raw materials

Table 1 shows the materials that are used in 1m^3 Enviro-Mat.

Table 1 Quantities and reference profiles (A1)

Material	Quantity	Reference	Database	Source
Lime	31 kg	0046-fab&lime, e, slaked lime, hydrated lime, raw material for masonry lime	EI 3.5	By producer
Cement	150 kg	CEM III/B 42,5 N, ENCI c1	SBK NMD	By producer
Geosta	1,5 kg	Geosta LCA		Geosta LCA – SGS INTRON 2016 [5]
Bitumen spray	0,3 kg	0169-fab&Bitumen (obv Bitumen adhesive compound, hot {GLO}| market for | Cut-off, U)	EI 3.5	By producer

3.3. A2 Transport to producer

Table 2 shows the transport of materials tot he producer.

Table 2 Transport to producer (A2)

Proces	Hoeveelheid	Referentie	Database	Onderbouwing
Transport cement	12 tonkm	0001-tra&Transport, vrachtwagen (o.b.v. Transport, freight, lorry, unspecified {GLO}| market for | Cut-off, U)	SBK NMD	fixed value as described in Bepalingsmethode 80 km Ijmuiden-Schiedam
Transport Geosta	0,315 tonkm	0001-tra&Transport, vrachtwagen (o.b.v. Transport, freight, lorry, unspecified {GLO}| market for | Cut-off, U)	SBK NMD	Heerlen Schiedam

For lime and bitumenspray no additional transport was used in the calculation.

3.4. A3 Production at the producer

The life cycle phase is empty, because the production of Enviro-Mat takes place on the project location.

3.5. A4 Transport to the construction site

Table 3 shows the transport of materials from the producer to the construction site. Transport distances are taken form the fixed values as described in the Bepalingsmethode (v 3.0).

Table 3 Transport to construction site (A4)

Proces	Hoeveelheid	Referentie	Database	Onderbouwing
Transport lime, cement, geosta en bitumenspray to construction site	27,4 tkm	0001-tra&Transport, Transport, freight, lorry, unspecified {GLO}| market for | Cut-off, U)	SBK NMD	fixed value 150 km as described in Bepalingsmethode (v 3.0)

3.6. A5 Construction

Table 4 below shows the processes that apply to the construction of the Enviro-Mat. In this life cycle phase some waste is generated. In conformity with the Bepalingsmethode (v3.0.) we have assumed 5% waste. Therefore, in this phase 5% of the environmental burden of the phases A1-4 en C2-4 is added.

Table 4 Construction (A5)

Proces	Hoeveelheid	Referentie	Database	Onderbouwing
Spreading lime	0,0222 l	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBk NMD	Spreader LC68 Werklust Data contractor
Mixing lime and soil	0,1208 l	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SKB NMD	LD59 WR 250 Data contractor
Premoisture with water car	0,02995 l	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	LW 56 werklust Data constractor
Geoasta additive spreader	0,00568 l	0095-pro&Diesel, gasolii use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	Additive spreader + John Deere 5515 Data contractor
Spreading cement	0,0222 l	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	Spreider LC68 Werklust Data contractor
Mixing through soil	0,12086 l	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	LD59 WR 250 Data contractor
Compaction	0,1454 l	0095-pro&Diesel, gasoil use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	Trilrol LT 66 Ammann Trilrol LT 67 Bomag BVC 213 Grader LG 74 Case Bandenwals LA59 Ammann Data contractor
Spray applicationn	0,01768	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	Bandenwals LA59 Ammann Data contractor

3.7. B1-7 Use and maintenance

During the service life of the Enviro-Mat no maintenance is required. Therefore this phase is empty in the LCA.

3.8. C1 Demolition

Demolition processes are shown in table 6. Demolition takes place with a cutter and produces granular material.

Table 5 Demolition (C1)

Proces	Hoeveelheid	Referentie	Database	Onderbouwing
Cutting	0,12086 l	0095-pro&Diesel, gasoil, use, liter (o.b.v. 35,8 MJ Diesel, burned in building machine {GLO}| processing | Cut-off, U)	SBK NMD	Menger LD59 WR 250

3.9. C2 Transport to waste processor

Table 6 shows the transport of waste from the construction site tot he waste processor. For the calculation of the amount of transport and the waste processing we have assumed a product density of 2100 kg/m^3. Transport distances are calculated with the fixed values as described in the Bepalingsmethode (v 3.0). We have calculated fully loaded to waste processor and empty return transport.

Table 6 Transport naar afvalbewerking (C2)

Process	Quantity	Referece	Database	Source
Transport to waste processor	43,5 tkm	0001-tra&Transport,. Transport, freight, lorry, unspecified {GLO}| market for | Cut-off, U)	SBK NMD	Fixed value as described in the Bepalingsmethode (v 3.0)

3.10. C3 Waste processing

In the demolition process the material is already crushed to fineness, so that no additional crushing process is required.

3.11. C4 Final waste processing

Processes that represent the final waste processing are presented in table 7. The waste scenarios are based on the fixed values as described in the Bepalingsmethode (v 3.0).

Table 7 Final waste processing (C4)

Process	Quantity	Reference	Database	Source
Landfill concrete	21 kg	0240-sto& v. Waste concrete {Europe without Switzerland}| treatment of waste concrete, inert material landfill | Cut-off, U)	SBK NMD	1% landfill concrete

3.12. D Burdens and benefits outside the system boundaries

In Table 8 the burdens and benefits outside the system boundaries are presented. The amount of material that is recycled is calculated with the fixed values from the Bepalingsmethode (v 3.0).
It should be noted that the recycling and energy production from waste that is produced in phase A5 is also calculated in module D.

Energy production by burning in a waste incinerator is calculated based on the lower heating values (LHV) of the incinerated materials, these values ate taken from the EcoInvent 3.5 database. s

Table 8 Burdens and profits outside the system boundaries (D)

Material	Quantity	Reference	Database	source
Recycling aggregate. Application for elevation	2100 kg	Nieuw: 0xxx -reD&Module D, concrete, per kg NETTO supplied sand	SBK NMD	Recycling concrete 99%

4. RESULTS

4.1. Environmental profile of Enviro-Mat

The calculations of the environmental profiles have been made according to he requirements from the SBK Bepalingsmethode Milieuprestaties Gebouwen en GWW-werken. The values of the environmental indicators have been calculated by:

1. Assignment of the environmental effects to the effect categories.
2. Multiplying the effects per category with the characterization factors.
3. Addition of the calculated values per effect category.

The calculations of the environmental effects have been done with the CML-2 method [8]. The calculation of the other indicators has been done as described in the SBK Bepalingsmethode.

Because liming is not always required (only for clay soil), the results with and without liming are presented,

4.2. Weighing

Weighing is a process in which the results of different impact categories are combined using numerical transformation factors. An aggregation of impact scores takes place. For this study we have applied the environmental cost indicator (MKI) to weigh the different impact categories to a single score. The MKI indicative and the justification for its use is given in the report “Toxicity has its price” by TNO 2004,

In the tables 9 and 10 the calculated MKI-scores are given for the Enviro-Mat. The values for the environmental indicator global warming (CO2-footprint), one of the indicators contributing to the MKI-score, are added.

Table 9 MKI scores and global warming per m^2 Enviro-Mat (30 cm layer thickness)

Life cycle phase	MKI in Euro's	%	Global warming (kgCO2-eq)	%
A1 – A3 Raw material, transport	1,022	72%	13,0	78%
A4 Transport	0,106	8%	0,892	5%
A5 Construction	0,124	9%	1,22	7%
B1-7 Use fase	0,000	0%	0	0%
C1 Demolition	0,016	1%	0,119	1%
C2 Transport	0,493	35%	4,14	25%
C3 Waste processing	0,000	0%	0	0%
C4 Final waste processing	0,005	0%	0,033	0%
D Burdens and profits outside system boundaries	-0,3513	25%	-2,75	17%
Total	1,415	100%	16,6	100%

Table 10 MKI scores per m^2 Enviro-Mat (30 cm layer thickness) with added liming

Life cycle phase	MKI in Euro's	%
A1 – A3 Raw material, transport	1,515	77%
A4 Transport	0,128	6%
A5 Construction	0,168	9%
B1-7 Use fase	0,000	0%
C1 Demolition	0,016	1%
C2 Transport	0,493	25%
C3 Waste processing	0,000	0%
C4 Final waste processing	0,005	0%
D Burdens and profits outside system boundaries	-0,3513	18%
Total	1,974	100%

4.3. Major contributions analysis

From table 9 we notice that the largest contribution to the weighted indicator MKI is attributed to the production phases, A1–A3.

For the individual environmental indicators this is presented in figure 4.1, again, the production phases A1-A3 show the largest contribution to the environmental burden. The processes on the construction site have only a minor effect.

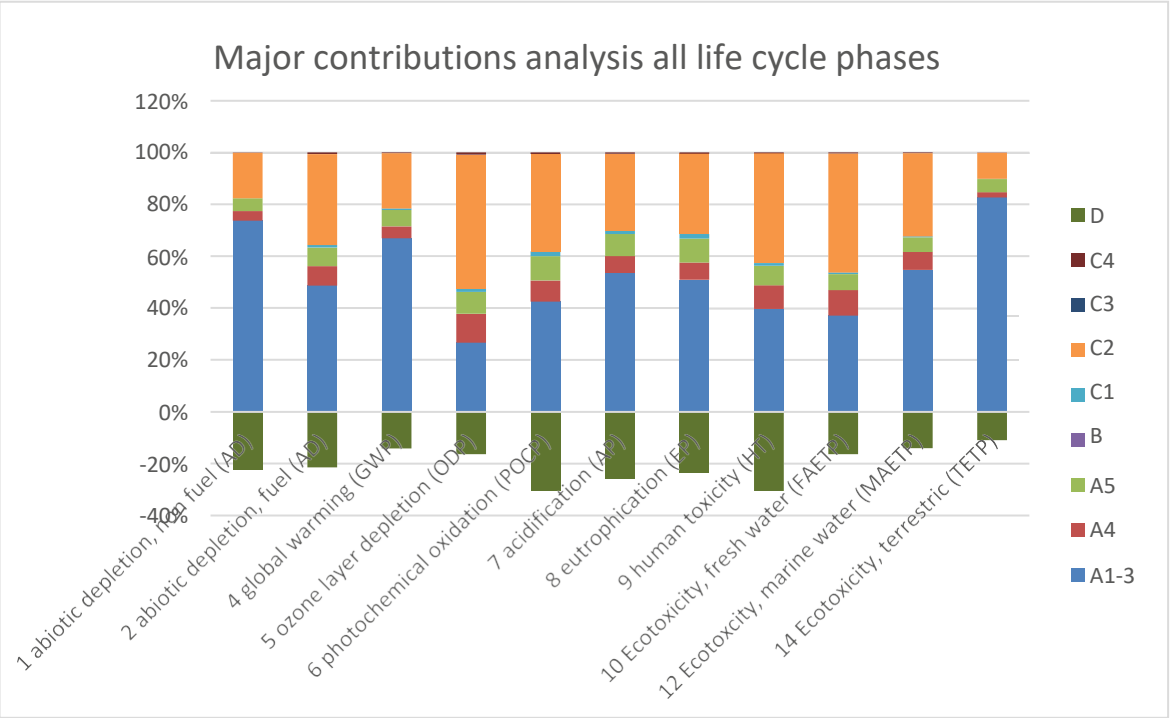

Figure 4.1. Major contributions analysis of all environmental indicators

In figure 2 the environmental burden of production phase A1-A3 is linked to the environmental effects and to the individual raw materials and processes.
By far the largest contribution to the MKI is from the environmental indicator global warming.

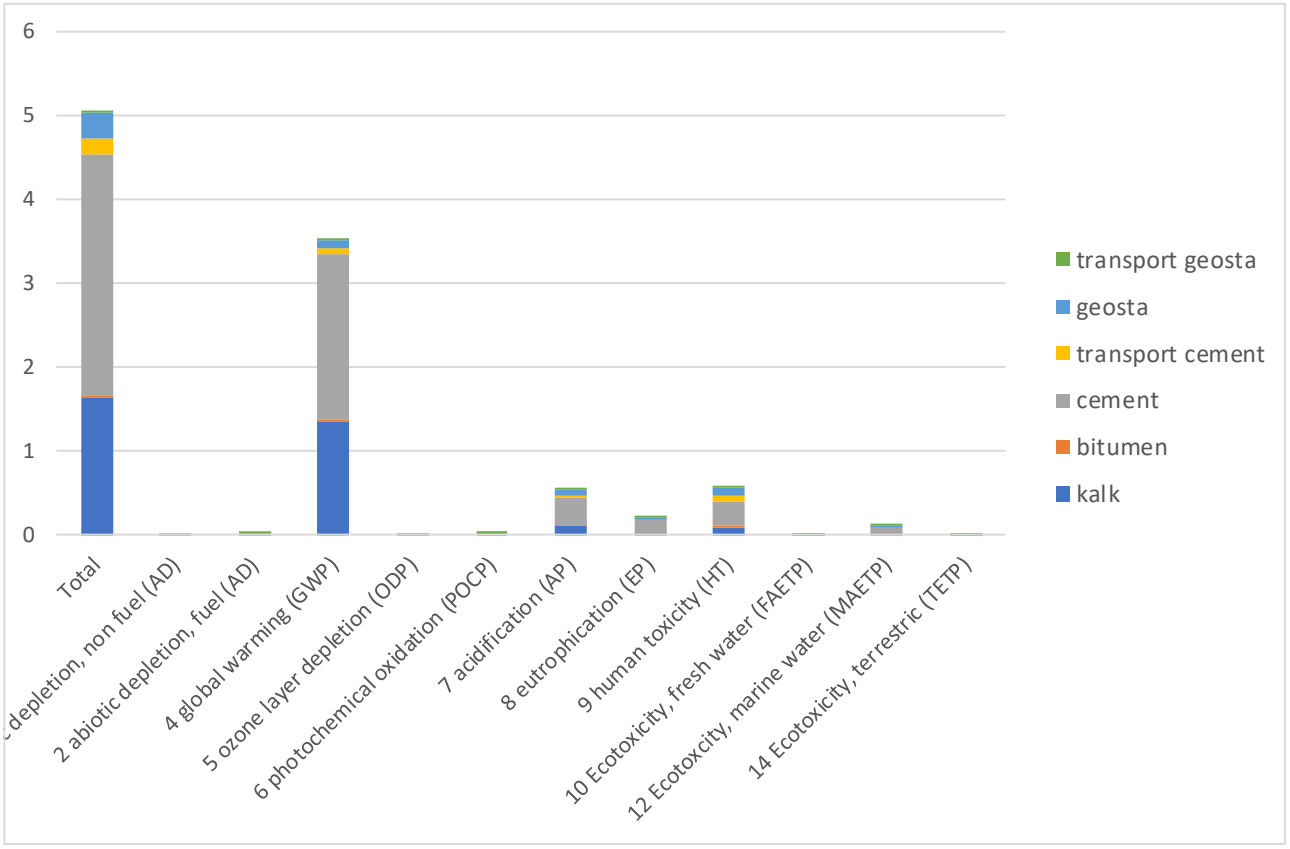

Figure 4.2. Major contributions analysis of all environmental indicators (with liming). Total is MKI.

Figure 4.2 shows that the largest contribution to the global warming and thereby to the MKI is from cement. A smaller contribution is from lime (if applicable).

The choice of cement is therefore relevant tot he environmental profile of Enviro-Mat. If a CEM I cement is selected in stead of the present CEM III/B the environmental burden will strongly increase. The raw material cement (excluding the transport of the cement) contributes 42% to the MKI.

5. REFERENCES

[1] SBK, Bepalingsmethode voor de milieuprestatie van Gebouwen en GWW werken, versie 3.0, Januari 2019; met wijzingsblad 1 januari 2020.
[2] ISO, 2006. “Environmental management. Life cycle assessment - Principles and framework”. ISO 14040:2006.
[3] ISO, 2006. “Environmental management. Life cycle assessment – Requirements and Guidelines”. ISO 14044:2006.
[4] NEN-EN 15804:2012+A1:2013 Duurzaamheid van bouwwerken - Milieuverklaringen van producten - Basisregels voor de productgroep bouwproducten.
[5] SGS INTRON rapport A886640-R20160139, Cradle-to-gate milieuprofiel Geosta, april 2016.

APPENDIX A. ENVIRONMENTAL PROFILE ENVIROMAT (30 CM) WITHOUT LIMING

Impact category	Eenheid	Totaal	A1 -A3	A4	A5	B	C1	C2	C3	C4	D
1 abiotic depletion, non-fuel (AD)	kg Sb eq.	5,23E-05	4,98E-05	2,54E-06	3,32E-06	0	4,02E-08	1,18E-05	0	3,75E-08	-1,52E-05
2 abiotic depletion, fuel (AD)	kg Sb eq.	6,93E-02	4,29E-02	6,68E-03	6,28E-03	0	8,24E-04	3,10E-02	0	4,86E-04	-1,89E-02
4 global warming (GWP)	kg CO2 eq.	1,66E+01	1,30E+01	8,92E-01	1,22E+00	0	1,19E-01	4,14E+00	0	3,33E-02	-2,75E+00
5 ozone layer depletion (ODP)	kg CFC-11 eq.	1,26E-06	4,01E-07	1,67E-07	1,26E-07	0	2,16E-08	7,76E-07	0	1,20E-08	-2,46E-07
6 photochemical oxidation (POCP)	kg C2H4	4,55E-03	2,78E-03	5,29E-04	6,17E-04	0	1,21E-04	2,46E-03	0	3,62E-05	-1,99E-03
7 acidification (AP)	kg SO2 eq.	4,49E-02	3,25E-02	3,86E-03	5,17E-03	0	9,03E-04	1,79E-02	0	2,51E-04	-1,58E-02
8 eutrophication (EP)	kg PO4--- eq.	8,92E-03	5,94E-03	7,79E-04	1,07E-03	0	2,03E-04	3,62E-03	0	4,74E-05	-2,74E-03
9 human toxicity (HT)	kg 1,4-DB eq.	2,78E+00	1,59E+00	3,66E-01	3,00E-01	0	4,29E-02	1,70E+00	0	1,45E-02	-1,23E+00
10 Ecotoxicity, fresh water (FAETP)	kg 1,4-DB eq.	8,98E-02	3,98E-02	1,06E-02	6,63E-03	0	5,98E-04	4,94E-02	0	3,50E-04	-1,76E-02
12 Ecotoxcity, marine water (MAETP)	kg 1,4-DB eq.	4,71E+02	3,00E+02	3,79E+01	3,12E+01	0	2,02E+00	1,76E+02	0	1,23E+00	-7,68E+01
14 Ecotoxicity, terrestric (TETP)	kg 1,4-DB eq.	5,23E-02	4,85E-02	1,26E-03	2,97E-03	0	7,10E-05	5,87E-03	0	3,61E-05	-6,41E-03
101 Energy, primary, renewable (MJ)	MJ	-1,27E+00	9,80E-02	1,46E-01	7,53E-02	0	1,01E-02	7,08E-01	0	8,37E-03	-2,32E+00
102 Energy, primary, non-renewable (MJ)	MJ	7,16E+01	1,30E+01	1,48E+01	9,89E+00	0	1,85E+00	6,89E+01	0	1,09E+00	-3,80E+01
103 Energy, primary (MJ)	MJ	-3,01E+00	6,02E-03	7,88E-03	4,78E-03	0	7,59E-04	3,72E-02	0	3,52E-03	-3,07E+00
104 Water, fresh water use (m3)	m3	1,20E-05	6,18E-06	8,86E-06	4,95E-06	0	7,76E-07	4,12E-05	0	6,84E-07	-5,07E-05
105 Waste, non-hazardous (kg)	kg	1,18E+01	4,61E-01	8,48E-01	5,83E-01	0	1,85E-03	3,95E+00	0	6,30E+00	-3,59E-01
106 Waste, hazardous (kg)	kg	5,39E-04	8,42E-05	9,38E-05	6,39E-05	0	1,21E-05	4,38E-04	0	6,76E-06	-1,60E-04

APPENDIX B. ENVIRONMENTAL PROFILE ENVIROMAT (30 CM) WITH LIMING

Impact category	Eenheid	Totaal	A1 -A3	A4	A5	B	C1	C2	C3	C4	D
1 abiotic depletion, non-fuel (AD)	kg Sb eq.	5,37E-05	5,06E-05	3,06E-06	3,43E-06	0	4,02E-08	1,18E-05	0	3,75E-08	-1,52E-05
2 abiotic depletion, fuel (AD)	kg Sb eq.	8,84E-02	5,88E-02	8,04E-03	8,12E-03	0	8,24E-04	3,10E-02	0	4,86E-04	-1,89E-02
4 global warming (GWP)	kg CO2 eq.	2,56E+01	2,12E+01	1,07E+00	1,78E+00	0	1,19E-01	4,14E+00	0	3,33E-02	-2,75E+00
5 ozone layer depletion (ODP)	kg CFC-11 eq.	1,78E-06	8,39E-07	2,01E-07	1,75E-07	0	2,16E-08	7,76E-07	0	1,20E-08	-2,46E-07
6 photochemical oxidation (POCP)	kg C2H4	6,67E-03	4,55E-03	6,37E-04	8,54E-04	0	1,21E-04	2,46E-03	0	3,62E-05	-1,99E-03
7 acidification (AP)	kg SO2 eq.	5,52E-02	4,05E-02	4,65E-03	6,68E-03	0	9,03E-04	1,79E-02	0	2,51E-04	-1,58E-02
8 eutrophication (EP)	kg PO4--- eq.	1,05E-02	7,04E-03	9,39E-04	1,37E-03	0	2,03E-04	3,62E-03	0	4,74E-05	-2,74E-03
9 human toxicity (HT)	kg 1,4-DB eq.	3,27E+00	1,93E+00	4,40E-01	3,71E-01	0	4,29E-02	1,70E+00	0	1,45E-02	-1,23E+00
10 Ecotoxicity, fresh water (FAETP)	kg 1,4-DB eq.	1,07E-01	5,34E-02	1,28E-02	8,13E-03	0	5,98E-04	4,94E-02	0	3,50E-04	-1,76E-02
12 Ecotoxcity, marine water (MAETP)	kg 1,4-DB eq.	5,25E+02	3,41E+02	4,56E+01	3,60E+01	0	2,02E+00	1,76E+02	0	1,23E+00	-7,68E+01
14 Ecotoxicity, terrestric (TETP)	kg 1,4-DB eq.	5,43E-02	5,01E-02	1,52E-03	3,15E-03	0	7,10E-05	5,87E-03	0	3,61E-05	-6,41E-03
101 Energy, primary, renewable (MJ)	MJ	3,96E+00	5,04E+00	1,76E-01	3,36E-01	0	1,01E-02	7,08E-01	0	8,37E-03	-2,32E+00
102 Energy, primary, non-renewable (MJ)	MJ	1,17E+02	5,11E+01	1,78E+01	1,41E+01	0	1,85E+00	6,89E+01	0	1,09E+00	-3,80E+01
103 Energy, primary (MJ)	MJ	-3,00E+00	1,68E-02	9,49E-03	6,30E-03	0	7,59E-04	3,72E-02	0	3,52E-03	-3,07E+00
104 Water, fresh water use (m3)	m3	2,87E-05	1,94E-05	1,07E-05	6,62E-06	0	7,76E-07	4,12E-05	0	6,84E-07	-5,07E-05
105 Waste, non-hazardous (kg)	kg	1,21E+01	6,10E-01	1,02E+00	6,01E-01	0	1,85E-03	3,95E+00	0	6,30E+00	-3,59E-01
106 Waste, hazardous (kg)	kg	8,56E-04	3,54E-04	1,13E-04	9,26E-05	0	1,21E-05	4,38E-04	0	6,76E-06	-1,60E-04

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WHEN YOU NEED TO BE SURE