Climate benefits from recycling flooring waste

Tarkett report

22th September, 2021
Version 2.0

Tarkett

Content

Foreword

Acting on climate change is an imperative for all of us, and at Tarkett we're accelerating our efforts in the areas where we can make the biggest positive impact. Recycling our flooring waste is essential to reducing climate impact. It saves virgin raw materials and places less of a burden on the world's resources, avoids valuable waste heading to landfill or incineration and it has a substantial contribution to reducing GHG (greenhouse gas) emissions.

This document describes how GHG reduction, from recycling, can be calculated. It also gives examples of GHG reductions resulting from the recycling of various types of flooring waste that can be collected via Tarkett's ReStart® take-back and recycling programme. It is aimed at property owners, facility managers, sustainability consultants and other stakeholders who are interested in calculating GHG reductions from recycling i.e. when managing carbon budgets for building and renovation projects.

The methodology used considers a scenario where the post-use material is recycled and used as raw material, which replaces virgin/fossil raw material instead of being incinerated. This methodology is based on the model presented in IVL's report "Avoided greenhouse gas emissions by recycling of flooring materials" No. U 6450 April 2021.

The calculations are, in most cases, based on figures from Tarkett's 3rd party certified product specific EPDs and the underlying report or estimated based on data from the LCA software SimaPro.

The resulting benefits from recycling do not include the emissions from transport of post-use material since the distance varies between the take-back projects' location and the recycling center. Still, some general guidelines are presented in this document on how these emissions can be estimated.

Methodology to calculate GHG emission reduction when recycling flooring waste

Scenario assumption

GHG-reduction from recycling are calculated based on the scenario that the waste material is used as raw material replacing virgin/fossil raw material instead of being incinerated.

Background data

The calculations are in most cases based on figures from Tarkett's 3rd party certified product specific EPDs and the underlying background report or estimated based on data from the LCA software SimaPro.

The different life cycle stages (A–D) in an EPD we refer to in this report are explained in the graph on page 5.

Why the D-stage in an EPD does not represent the actual GHG reduction

In some EPDs, the climate benefit value for recycling is already declared in the D-stage as "Benefits outside system boundaries" and doesn't have to be calculated. However, in some cases the benefits in the D-stage do not represent the "general" GHG-reduction from recycling since it relates to the specific product and not to raw materials in general. As an example, in a product-specific EPD it is assumed that recycling of bio-attributed PVC or Econyl replaces the same type of (bio-based/recycled) raw material, which already has a lower carbon footprint than the virgin/fossil equivalent. In reality, the most likely scenario is that the recycled PVC from iQ Natural or PA6 from an Econyl carpet tile will end up replacing the virgin (fossil based) equivalent to these raw materials. Hence the climate gains will be calculated according to the principles below:

GHG savings from recycling can be divided into two parts:

a. Reduced emissions due to no incineration.

This value is taken from the C-stage of the EPD (if the incineration scenario is presented). If an incineration scenario is not presented, an estimated value will be calculated based on data from the LCA software SimaPro.

b. Reduced emissions due to the fact that virgin raw materials are not extracted/produced and transported.

This value is assumed to be the same as A1+A2 in an EPD.

Biogenic carbon

For products containing biogenic carbon capture, only GHG emissions in raw material extraction should be included – i.e. carbon binding cannot be included twice as it only happens once (when the raw material has grown). The amount of emissions during raw material extraction can be difficult to separate from carbon sequestration in an EPD. One method to obtain a value is to subtract incineration emissions from A1 – which gives a reasonably accurate picture of extractive emissions – at least, when virtually, the entire product consists of renewable raw materials (since all captured carbon departs as CO_2eq during incineration).

Products that are only partially recycled

For products where only part of the material can be recycled, the reduction of GHG emissions during incineration is calculated only for the recycled parts (e.g. a carpet tile where only the yarn can be recycled).

1. Reduced emissions due to no incineration shall be counted only on the yarn.

To calculate reduced emissions due to the fact that virgin raw material does not need to be used.

2. Only the yarn part is included.

Benefits outside system boundaries

Any "benefits outside system boundaries" i.e. "climate gains" from incineration (e.g. when floor materials replace other fuels in electricity and/or heat production) are not included in the calculations.

Emissions from the recycling process

Emissions from the recycling process itself are not included. These climate emissions are often very low compared to climate gains. However, for some materials, such as PA6, recycling produces relatively large emissions (when the polymer has to be depolymerized to produce new yarn). In the case of carpet tiles with PA6 yarns, data on GHG emissions are used for both virgin and recycled PA6 and the "benefit" is the difference between these two values.

Emissions from the transportation of waste

GHG-emissions from the transportion of extracted/collected materials are also not included as they vary greatly depending on the load efficiency, mode of transportion and distance from the project to the recycling plant. In addition, the material would in many cases still be transported if it was sent for incineration. For those who want to calculate the project-specific transport emissions, an average value for truck transport in Sweden of 120[1)] grams of CO_2eq/tonne-kilometre can be used.

References
1) Report from Trafikanalys, "Lastbilars klimateffektivitet och utsläpp", Figure 2.5 in chapter 2.4 (2015).

Life cycle stages (A – D) in an EPD

Product stage	**A1**	Raw material supply
	A2	Transport
	A3	Manufacturing
Construction process stage	**A4**	Transport from the gate to the site
	A5	Installation
Use stage	**B1**	Use
	B2	Maintenance
	B3	Repair
	B4	Replacement
	B5	Refurbishment
	B6	Operational energy use
	B7	Operational water use
End-of-life stage	**C1**	Deconstruction/demolition
	C2	Transport
	C3	Waste processing
	C4	Disposal
Benefits and loads beyond the system boundaries	**D**	Reuse / Recovery / Recycling-potential

Reduced impact
with linoleum installation waste recycling

Example product

Tarkett linoleum floor 2.5 mm with surface weight 3.0 kg/sqm

Total GHG savings

▷ **7.1** kg CO_2eq/sqm

▷ **2.3 kg CO_2eq/kg**

Reduced emissions due to no incineration

5.02 kg CO_2eq/sqm (primarily biogenic CO_2)
1.67 kg CO_2eq/kg

▷ *Comment*

LCA data used in the background report to Tarkett's EPD[2)]. The jute backing isn't recycled and instead sent to incineration. The benefit from the jute backing has therefore been excluded.

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction
1.73 kg CO_2eq/sqm
0.58 kg CO_2eq/kg

▷ *Comment*

The installation waste can replace all raw materials in new linoleum floors except the jute backing. The presented value is based on LCA data for a Tarkett 2.5 mm linoleum floor with surface weight 3.0 kg/sqm[2)].

A2 – Transport
0.37 kg CO_2eq/sqm
0.12 kg CO_2eq/kg

▷ *Comment*

Based on A2 value in background report[2)] to Tarkett's EPD "Linoleum Flooring".

References

2) LCA data from Tarkett, Narni (background data for Tarkett's EPD "Linoleum Flooring", Registration number 4789356590.101.1).

Reduced impact
with homogeneous vinyl installation waste recycling

Example product

Mixed vinyl floors
with surface weight 2.75 kg/sqm

Total GHG savings

▷ **10.0** kg CO_2eq/sqm

▷ **3.6 kg CO_2eq/kg**

Reduced emissions due to no incineration

4.4 kg CO_2eq/sqm
1.6 kg CO_2eq/kg

▷ *Comment*

These values can be read directly from the IVL report[3) – and correspond quite well with the values in ERFMI:s generic EPD for incineration of homogeneous PVC floors indicating 5.00 kg for a HO weighing 3.25 kg/sqm).

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction
5.6 kg CO_2eq/sqm
2.0 kg CO_2eq/kg

▷ *Comment*

Values can be extracted using the IVL report[3) while assuming full recycling (100% efficiency in the process, 100% material value and 1 ton of waste is recycled). These figures correspond quite well to the A1-stage of Tarkett's EPD for homogeneous PVC floors.

A2 – Transport
0.034 kg CO_2eq/sqm
0.012 kg CO_2eq/kg

▷ *Comment*

Based on the A2 value in the background report[4) for Tarkett's EPD "iQ Range homogeneous vinyl flooring".

References
3) IVL report No C453 "Separate collection and recycling of PVC flooring installation residue in Sweden".
4) Background report related to Tarkett's EPD "iQ Range Homogeneous vinyl floorings", EPD registration code: S-P-01346 (https://www.environdec.com/).

Reduced impact
with post-use linoleum floors recycling

Example product

Tarkett linoleum floor 2.5 mm
with surface weight 3.0 kg/sqm

Total GHG savings

▷ **5.4** kg CO_2eq/sqm

▷ **1.8 kg CO_2eq/kg**

Reduced emissions due to no incineration

5.02 kg CO_2eq/sqm (primarily biogenic CO_2)
1.67 kg CO_2eq/kg

▷ *Comment*

LCA data used in the background report to Tarkett's EPD[5]. The jute backing isn't recycled and instead sent to incineration. The benefit from the jute backing has therefore been excluded.

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction
0.02 kg CO_2eq/sqm
~0.00 kg CO_2eq/kg

▷ *Comment*

The old linoleum floors can only replace the mineral filler in new products. This is because of the hardened state of old linoleum. The climate impact from mineral fillers is low compared to other components e.g. linseed oil. The resulting benefit from replacing the mineral filler is therefore relatively low. The presented values are based on LCA data[5] for a Tarkett 2.5 mm linoleum floor with surface weight 3.0 kg/sqm.

A2 – Transport
0.37 kg CO_2eq/sqm
0.12 kg CO_2eq/kg

▷ *Comment*

Based on A2 value in background report[5] for Tarkett's EPD "Linoleum Flooring".

References
5) LCA data from Tarkett, Narni (background data for Tarkett's EPD For linoleum flooring, Registration number 4789356590.101.1).

Reduced impact
with post-use phthalate-free homogeneous vinyl floors recycling

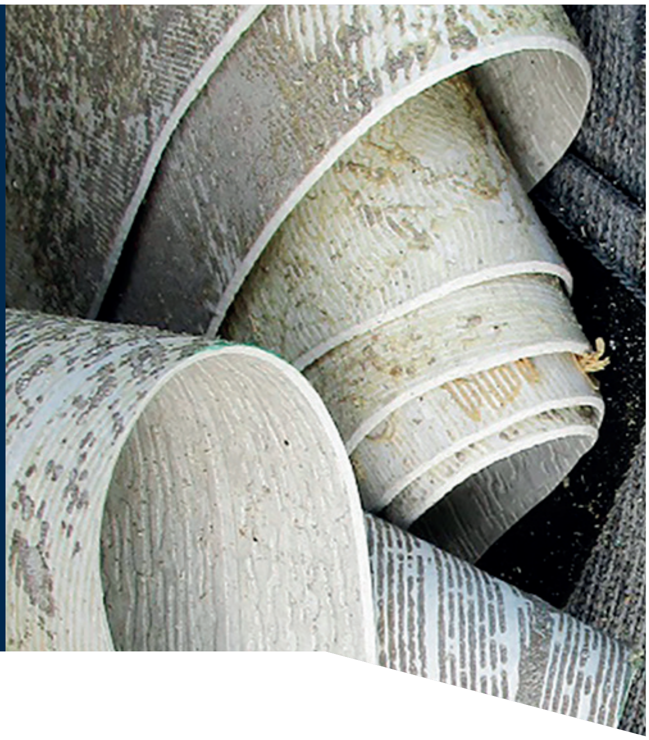
Example product

Tarkett 2.0 mm iQ floor with surface weight 2.75 kg/sqm

Total GHG savings

▷ **11.8** kg CO_2eq/sqm

▷ **4.3 kg CO_2eq/kg**



Reduced emissions due to no incineration

6.35 kg CO_2eq/sqm
2.31 kg CO_2eq/kg

▷ *Comment*

Values from Tarkett's EPD "iQ Range Homogeneous vinyl floorings".[6)]

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction
5.51 kg CO_2eq/sqm
2.00 kg CO_2eq/kg

▷ *Comment*

Based on A1 values from the Background report connected to the EPD. The values are derived from the A1 GWP fossil and A1 GWP Luluc.[7)]

A2 – Transport
0.034 kg CO_2eq/sqm
0.12 kg CO_2eq/kg

▷ *Comment*

Based on A2 values from the Background report connected to the EPD. The values are derived from the A2 GWP fossil and A2 GWP Luluc.[7)]

References

7) Background report related to Tarkett's EPD "iQ Range Homogeneous vinyl floorings", EPD registration code: S-P-01346 (https://www.environdec.com/).
6) Tarkett EPD «iQ Range Homogeneous vinyl floorings», page 18, EPD registration code: S-P-01346 (https://www.environdec.com/).

Reduced impact
with post-use Excellence Genius floors recycling

Example product

Acczent Excellence Genius (loose-lay) with surface weight 3.4 kg/sqm

Total GHG savings

▷ **12.4** kg CO_2eq/sqm

▷ **3.6 kg CO_2eq/kg**

Reduced emissions due to no incineration

5.7 kg CO_2eq/sqm

1.7 kg CO_2eq/kg

▷ *Comment*

Calculations based on SimaPro data for incineration values of the raw material[8].

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction

6.59 kg CO_2eq/sqm

1.94 kg CO_2eq/kg

▷ *Comment*

Based on A1 value from the background report to Tarkett's EPD[9] for Acczent Excellence Genius flooring.

A2 – Transport

0.15 kg CO_2eq/sqm

0.04 kg CO_2eq/kg

▷ *Comment*

Based on A2 value from the background report to Tarkett's EPD[9] for Acczent Excellence Genius flooring.

References

8) Calculations based on SimaPro data for incineration values of the raw material. Done by Vincent Monti, Eco-design project leader, Tarkett.

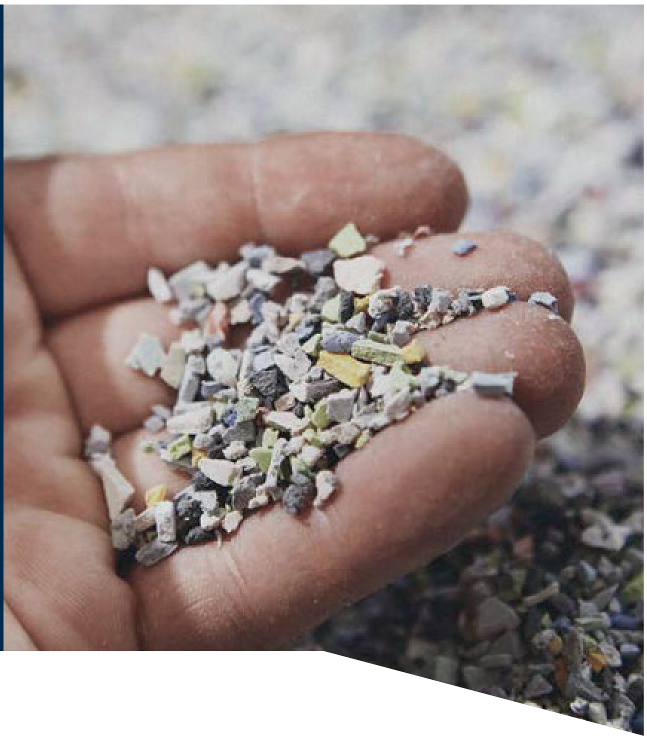
9) Background report for the EPD, "Acczent Excellence Genius heterogeneous vinyl flooring", figure 6 in chapter 5.2, table 28 in Appendix 7.1.

Reduced impact
with post-use iD Square floors recycling

Example product
iD Square (Loose-lay)
with surface weight 5.2 kg/sqm

Total GHG savings

▷ **16.9** kg CO_2eq/sqm
▷ **3.2 kg CO_2eq/kg**



Reduced emissions due to no incineration

7.4 kg CO_2eq/sqm
1.4 kg CO_2eq/kg

▷ *Comment*

Calculation based on SimaPro data for incineration values of the raw material[10).

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction
9.35 kg CO_2eq/sqm
1.80 kg CO_2eq/kg

▷ *Comment*

Based on A1 value from the background report to Tarkett's EPD[11) for LVT Loose-lay flooring.

A2 – Transport
0.21 kg CO_2eq/sqm
0.04 kg CO_2eq/kg

▷ *Comment*

Based on A2 value from the background report to Tarkett's EPD[11) for LVT Loose-lay flooring.

References
10) Calculations based on SimaPro data for incineration values of the raw material. Done by Vincent Monti, Eco-design project leader, Tarkett.
11) Background report for the EPD, "LVT Loose-lay modular flooring", figure 5, table 27 in chapter 5.2.

Reduced impact
with post-use LVT Click floors recycling

Example product
iD Inspiration Click/Starfloor Click 55 with surface weight 8.0 kg/sqm

Total GHG savings

▷ **21.2** kg CO_2eq/sqm

▷ **2.6 kg CO_2eq/kg**

Reduced emissions due to no incineration

9.50 kg CO_2eq/sqm
1.19 kg CO_2eq/kg

▷ *Comment*

Calculation based on SimaPro data for incineration values of the raw material[12).

Reduced emissions as recycled materials replace virgin materials

A1 – Extraction
10.71 kg CO_2eq/sqm
1.34 kg CO_2eq/kg

▷ *Comment*

Based on A1 value from the background report to Tarkett's EPD[13) for LVT Click flooring.

A2 – Transport
1.02 kg CO_2eq/sqm
0.13 kg CO_2eq/kg

▷ *Comment*

Based on A2 value from the background report to Tarkett's EPD[13) for LVT Click flooring.

References
12) Calculations based on SimaPro data for incineration values of the raw material. Done by Vincent Monti, Eco-design project leader, Tarkett.
13) Background report for the EPD, LVT Click modular flooring, figure 7 in chapter 5.2, table 26 in appendix 7.

Reduced impact
with post-use carpet tiles with PA6 yarn and bitumen backing recycling

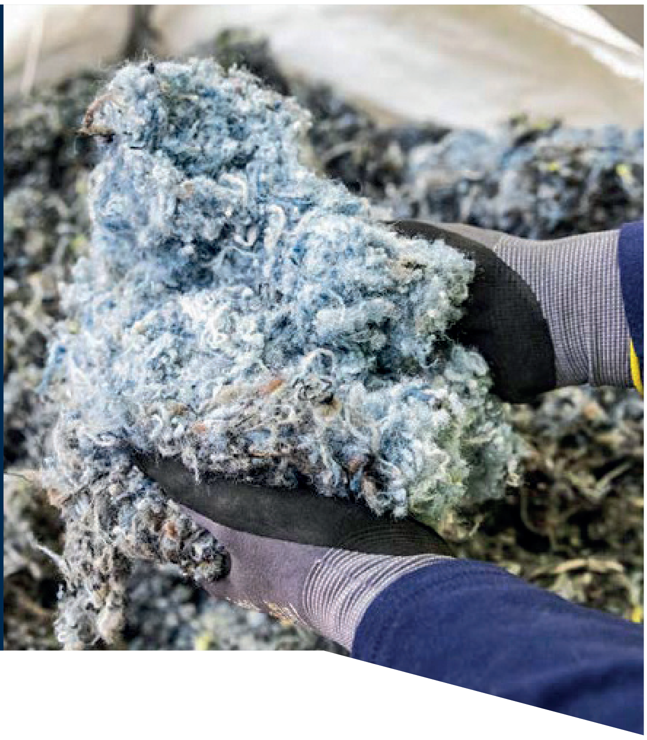
Example product

Carpet tile with bitumen backing and PA6 yarn.
Yarn weight 600 gr/sqm, surface weight 4.2 kg/sqm.

Total GHG savings

▷ **6.0** kg CO_2eq/sqm

▷ **1.4 kg CO_2eq/kg**



Reduced emissions due to no incineration (only PA6 yarn)

1.40 kg CO_2eq/sqm
2.34 kg CO_2eq/kg yarn

▷ *Comment*

According to the publication "Natural fibres, Biopolymers and Biocomposites"[14], PA6 contains 2.34 kg embodied CO_2/kg yarn, which corresponds to the incineration emissions. When recycling carpet tiles with bitumen backing only the PA6 fibres are recycled. The backing is sent to coprocessing in the cements industry where the backing is used as fuel and the mineral fillers function as raw materials in the cement process. No benefits from this process are included in these calculations.

Reduced emissions as recycled materials replace virgin materials (only PA6 yarn)

A1 – Extraction

4.68 kg CO_2eq/sqm
7.80 kg CO_2eq/kg yarn

▷ *Comment*

The average emission from producing the virgin PA6 yarns used at Tarkett's carpet factory amounts to 9.5 kg CO_2/kg yarn[15] while recycling (depolymerisation and production of new yarn) emits 1.7 kg[16]. The difference is 7.8 kg and corresponds to the "profit" when recycling 1 kg PA6 yarn.

A2 – Transport

▷ *Comment*

Recycled yarn needs to be transported to the recycling plant. The emissions produced during this transport is equivalent to the emissions produced during raw material transportation to the carpet factory. This means that there's no emission reduction during transportation of yarn because of recycling.

References

14) "Natural fibres, Biopolymers and Biocomposites" (Mohanty, Misra, Drzal, 2005).
15) Calculations based on product specific EPD:s, Ecoinvent data and purchasing data. Done by Vincent Monti, Eco-design project leader, Tarkett.
16) Aquafil, EPD "Econyl bulk continuous filament (BCF) reprocessed yarns (Produced in Europe)", Page 15, EPD registration code: S-P-00767 (https://www.environdec.com/).

Reduced impact
with post-use carpet tiles with PA6 yarn and EcoBase backing recycling

Example product

Carpet tile with EcoBase backing and PA6 yarn.
Yarn weight 600 gr/sqm, surface weight 4.0 kg/sqm.

Total GHG savings

▷ **10.0** kg CO_2eq/sqm

▷ 2.5 kg CO_2eq/kg

When recycling old carpet tiles with EcoBase backing, the PA6 yarn and the EcoBase backing can be recycled. Hence the calculation is divided into two parts: yarn and backing.

RECYCLING OF PA6 YARN

Reduced emissions due to no incineration (only PA6 yarn)

1.40 kg CO_2eq/sqm
2.34 kg CO_2eq/kg yarn

▷ *Comment*

According to the publication "Natural fibres, Biopolymers and Biocomposites"[17)] (Mohanty, Misra, Drzal, 2005), PA6 contains "2.34 kg embodied CO_2/kg yarn" which correspond to the incineration emissions.

Total GHG savings (only PA6 yarn)

▷ **6.0 kg CO_2eq/sqm**

▷ 10.1 kg CO_2eq/kg yarn

Reduced emissions as recycled materials replace virgin materials (only PA6 yarn)

A1 – Extraction

4.68 kg CO_2eq/sqm
7.80 kg CO_2eq/kg yarn

▷ *Comment*

The average emission from producing the virgin PA6 yarns used at Tarkett's carpet factory amounts to 9.5 kg CO_2/kg yarn[18)] while recycling (depolymerisation and production of new yarn) emits 1.7 kg[19)]. The difference is 7.8 kg and corresponds to the "profit" when recycling 1 kg PA6 yarn.

A2 – Transport

▷ *Comment*

Recycled yarn needs to be transported to the recycling plant. The emissions produced during this transport is equivalent to the emissions produced during raw material transportation to the carpet factory. This means that there's no emission reduction during transportation of yarn because of recycling.

References

17) "Natural fibres, Biopolymers and Biocomposites" (Mohanty, Misra, Drzal, 2005).
18) Calculations based on product specific EPD:s, Ecoinvent data and purchasing data. Done by Vincent Monti, Eco-design project leader, Tarkett.
19) Aquafil, EPD "Econyl bulk continuous filament (BCF) reprocessed yarns (Produced in Europe)", Page 15, EPD registration code: S-P-00767 (https://www.environdec.com/).

Reduced impact
with post-use carpet tiles
with PA6 yarn and EcoBase backing recycling

Example product

Carpet tile with EcoBase backing and PA6 yarn.
Yarn weight 600 gr/sqm, surface weight 4.0 kg/sqm.

When recycling old carpet tiles with EcoBase backing, the PA6 yarn and the EcoBase backing can be recycled. Hence the calculation is divided into two parts: yarn and backing.

RECYCLING OF ECOBASE BACKING

Reduced emissions due to no incineration (only EcoBase backing)

2.44 kg CO_2eq/sqm
1.01 kg CO_2eq/kg Ecobase

▷ *Comment*

Calculation based on SimaPro data for incinerating PET, PE, PP and the remaining substances (paraffin and other chemicals) taken into account their relative weight in 1 sqm EcoBase backing. This includes chalk, which has a GHG emission of 1 kg CO_2eq/kg when incinerated[20].

Total GHG savings (only EcoBase backing)

▷ **4.0 kg CO_2eq/sqm**
▷ 1.7 kg CO_2eq/kg Ecobase

Reduced emissions as recycled materials replace virgin materials (only EcoBase backing)

A1 – Extraction
1.35 kg CO_2eq/sqm
0.55 kg CO_2eq/kg Ecobase

▷ *Comment*

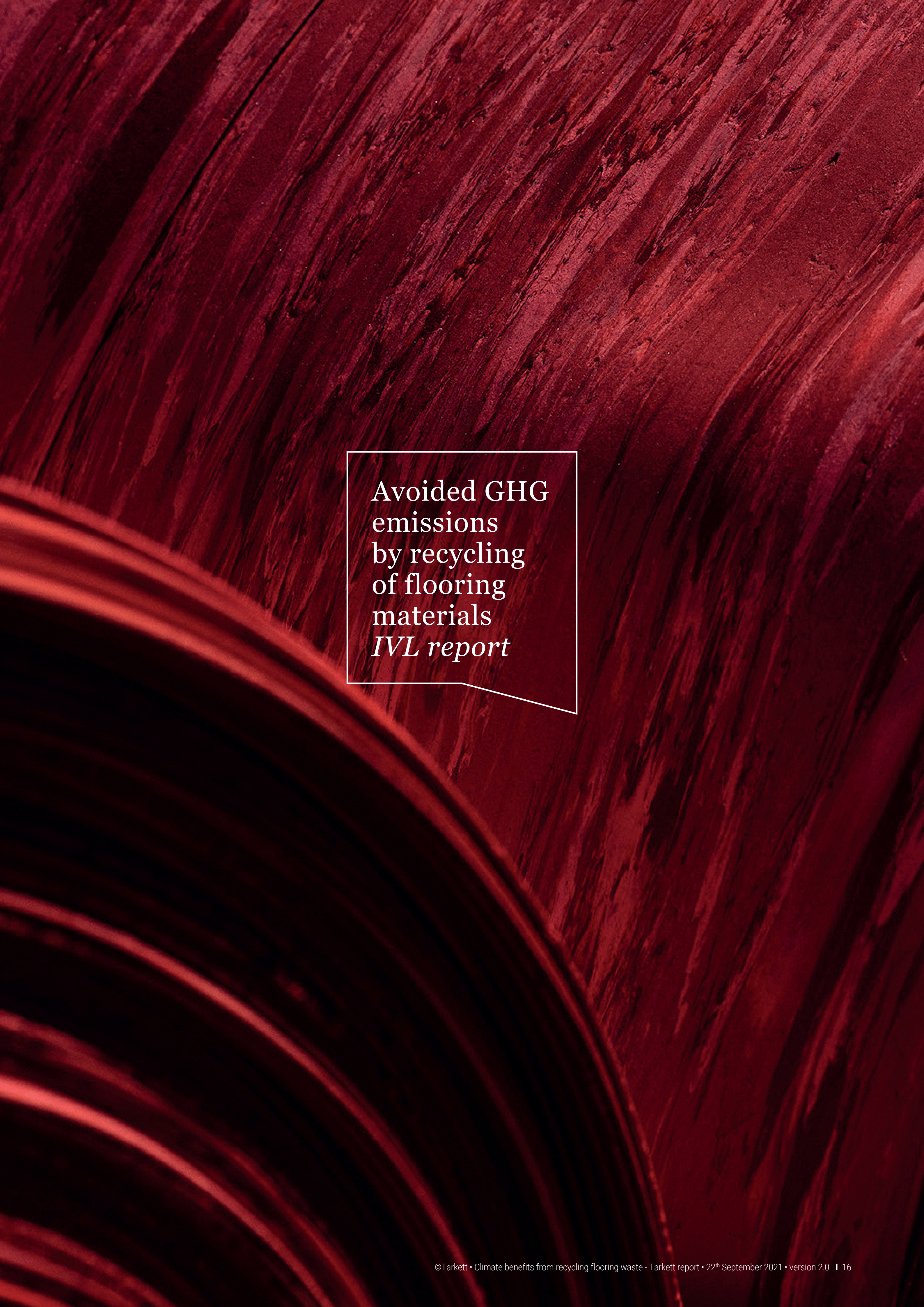
Calculation based on SimaPro data for raw material extraction for PET, PE, PP and most of the remaining substances (paraffin and other chemicals) taken into account their relative weight in 1 sqm EcoBase backing. Glass scrim and the non-woven PP backing are not recycled and are therefore not part of the benefit from recycling[21].

A2 – Transport
0.211 kg CO_2eq/sqm
0.087 kg CO_2eq/kg Ecobase

▷ *Comment*

Based on A2 value for 500-600g yarn products from the background report[21] for Tarkett's EPD Carpet flooring Desso Ecobase backing, 100% recycled yarn. Loss of benefit because glass scrim and non- woven PP isn't recycled hasn't been considered. It is assumed to be close to zero.

References
20) Calculations based on product specific EPD:s, Ecoinvent data and purchasing data. Done by Vincent Monti, Eco-design project leader, Tarkett.
21) Background report for the EPD, "Carpet flooring Desso Ecobase backing, 100% recycled yarn", figure 6 in chapter 5.2, table 26 in appendix 7.



Avoided GHG emissions by recycling of flooring materials *IVL report*

No. U 6450
April 2021

Avoided greenhouse gas emissions by recycling of flooring materials

Commissioned by Tarkett

Adam Lewrén & Fredrik Tegstedt

Author: Adam Lewrén & Fredrik Tegstedt
Commissioned by: Tarkett
Report number: U 6450

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IVL Swedish Environmental Research Institute Ltd.,
P.O Box 210 60, S-100 31 Stockholm, Sweden
Phone +46-(0)10-788 65 00 // www.ivl.se

This report has been reviewed and approved in accordance with IVL's audited and approved management system.

Table of contents

Background

At request from Tarkett, IVL, the Swedish Environmental Research Institute, has described and illustrated a model for how Tarkett can account for environmental benefits as a result of recycling projects of flooring.

This report aims to provide a good understanding of how recycling of products can contribute to savings of environmental impact such as greenhouse gas (GHG) emissions. The outcome of this project can be used by Tarkett as a reference for their calculations of GHG benefits from recycling projects of flooring and in communication with internal and external stakeholders. Compared to the format of Environmental Product Declaration (EPD) on construction products, the model focus on the total potential savings of GHG in a project instead of presenting the results separately on the different life cycle stages, also referred to as modules, in the product life cycle. For stakeholders that do not have experience on Life Cycle Assessments (LCA) and EPD, the model can facilitate the communication on the environmental benefits since it has a more holistic perspective and use a terminology that everyday consumer understands.

The model is derived from a research project by IVL in collaboration with Inrego AB and SIVL with a focus on the environmental benefits from the reuse of IT-products [1]. As the original model was based on the concept of reuse and on a different product category, some changes were necessary to adapt the model to the purpose of this project.

Methodology

The model that forms the basis for the calculations can be used for various types of construction products (see Figure 1). It is based on the assumption that recycled products replace the need for new materials. This leads to avoided emissions of greenhouse gases as the product does not need to undergo waste management and no new materials need to be extracted and transported. Thus, the prerequisite for the model is that the recycling of materials from a product leads to no demand of new materials.

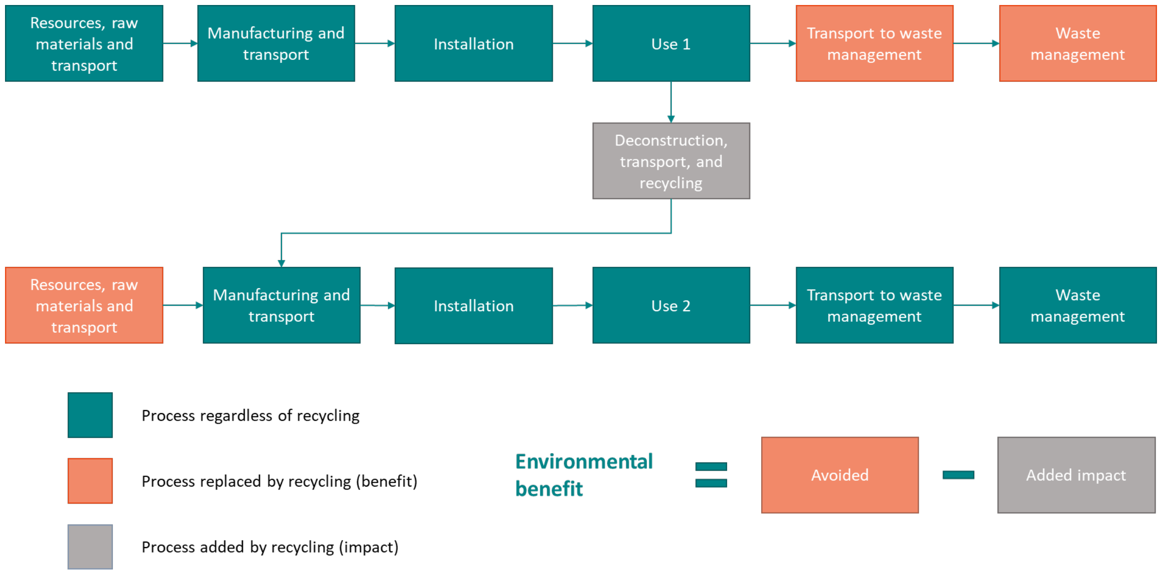

Figure 1. *Processes along the life cycle of a recycled product that contribute (positively or negatively) to climate change. The figure also shows that some processes are not affected by the recycling of products.*

The model in Figure 1 can be extended and applied for products which are being recycled several times. To use the model and calculate the environmental benefits - and thereby the avoided greenhouse gas emissions - that recycling of a product can result in, the following equation can be used:

$$Environmental\ benefits = PROD + TRP_p + WMGT + TRP_w - DECON - TRP_{re} - REC \qquad (1)$$

- PROD = Environmental impact of avoided production of materials.
- TRP_p = Environmental impact of avoided transport associated with the production of materials.
- WMGT = Environmental impact of avoided waste management (for the product replaced by recycling).
- TRP_w = Environmental impact from avoided transport to waste management.
- DECON = Environmental impact from deconstruction of the product.
- TRPre = Environmental impact of transportation associated with recycling.
- REC = Environmental impact from recycling of the product.

As shown in Figure 1 and Equation 1, the recycling of construction products may involve additional processes to the product life cycle such as deconstruction/dismantling, transportation, and recycling. It is to be noted that these processes influence the result of the environmental benefits negatively which could theoretically lead to that the entire benefit of recycling is eliminated.

How can avoided emissions be accounted for?

Recycling of products often involves several stakeholders who may all be interested in knowing how much of the greenhouse gas emission savings they can count as theirs. However, the result for this model do not allocate between different users or other stakeholders. The result represents the total avoidance of greenhouse gas emissions that recycling of a product contributes.

IVL recommends that allocation of the savings of greenhouse gas emissions as a result of recycling should be avoided if possible. This is in line with several standards in life cycle analysis where it is preliminary recommended to avoid allocation of environmental impact. Consequently, the risk for misinterpretation of the result is minimized and it helps the user to avoid incorrect conclusions.

If for some reason, the environmental benefits from recycling need to be allocated among stakeholders, IVL recommends sharing the benefit equally between users, through the 50/50 method [1]. This means in practice that half of the savings of greenhouse gas emissions is accounted for by the first owner and the remaining half is allocated the second. In this way, potential middlemen cannot account any of the benefits themselves, even though they contribute to that recycling occurs.

IVL recommends using the 50/50 method for distributing savings of greenhouse gas emissions as a result of recycling since:

1. it is a simple rule of thumb and comprehensible
2. both users must make active choices for recycling to occur
3. it provides both users an incentive to actively seek potentials of recycling

References

IVL-report: B2372: Wranne, J (2020) Product databases: the environmental benefits of reuse - The climate benefits of reusing IT products and the method for creating data bases. Web: https://www.ivl.se/download/18.4c0101451756082fbad193d/1603899258637/B2372E.pdf

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IVL Swedish Environmental Research Institute Ltd.
P.O. Box 210 60 // S-100 31 Stockholm // Sweden
Phone +46-(0)10-7886500 // www.ivl.se

Contact

Dag Duberg
Nordic Sustainability Manager
dag.duberg@tarkett.com

Peter Nicander
Key Account Manager, Sweden
peter.nicander@tarkett.com

Nils Säving
Nordic Environmental Specialist
nils.saving@tarkett.com

Vincent Monti
Ecodesign Project Leader
Vincent.Monti@tarkett.com

Marcelo Martins Meira
Sustainability Manager
Marcelo.MartinsMeira@tarkett.com

■ **WESTERN EUROPE: Austria:** Tarkett Holding GmbH, Niederlassung Wien – Tel. +43 1 47 88 062 ▪ **Belgium:** Tarkett Belux Sprl – Tel. +32 16 35 98 80 ▪ **Denmark:** Tarkett A/S – Tel. +45 43 90 60 11 ▪ **Finland:** Tarkett Oy – Tel. +358 9 4257 9000 ▪ **France:** Tarkett SAS – Tel. +33 1 41 20 42 49 ▪ **Germany:** Tarkett Holding GmbH – Tel. +49 62 33 810 ▪ **Greece:** Tarkett Monoprosopi Ltd – Tel. +30 210 6745 340 ▪ **Italy:** Tarkett S.p.A. – Tel. +39 0744 7551 ▪ **Luxembourg:** Tarkett GDL SA – Tel. +352 949 211 8804 ▪ **Netherlands:** Tarkett BV – Tel. +31 416 685 491 ▪ **Norway:** Tarkett AS – Tel. +47 32 20 92 00 ▪ **Portugal:** Tarkett SA – Tel. +351 21 427 64 20 ▪ **Spain:** Tarkett Floors S.L – Tel. +34 91 358 00 35 ▪ **Sweden:** Tarkett Sverige AB – Tel. +46 771 25 19 00 ▪ **Switzerland:** Tarkett Holding GmbH – Tel. +41 043 233 79 24 ▪ **Turkey:** Tarkett Aspen - Tel. +90 212 213 65 80 ▪ **United Kingdom:** Tarkett Ltd – Tel. +44 (0) 1622 854 040 ■ **EASTERN EUROPE: Baltic Countries:** Tarkett Baltics: Tel. +370 37 262 220 ▪ **Czech Republic:** Tarkett org. složka – Tel: +420 271 001 600 ▪ **Hungary:** Tarkett Polska SP Z.O.O. magyarországi fióktelepe – Tel. +36 1 437 8150 ▪ **Poland:** Tarkett Polska Sp. z o. o. – Tel. +48 22 16 09 231 ▪ **Russian Federation:** ZAO Tarkett RUS - Tel. +7 495 775 3737 ▪ **Slovakia:** Tarkett Polska, organizačná zlozka – Tel. +421 2 48291 317 ▪ **South East Europe:** Tarkett SEE – Tel. +381 21 7557 649 (44) 569 12 21 ▪ **Ukraine:** Tarkett UA – Tel: +38 (0) 44 569 12 21 ■ **ASIA AND OCEANIA: Australia:** Tarkett Australia Pty Ltd – Tel. +61 2 88 53 12 00 ▪ **China:** Tarkett Floor Covering (Shanghai) Co. Ltd. – Tel. +86 (21) 60 95 68 38 ext 841 ▪ **North East Asia:** Tarkett Hong Kong Limited – Tel. +852 2511 8716 ▪ **India:** Tarkett Flooring India Pvt. Ltd. – Bangalore - Tel. +91 80 4130 3793 – New Delhi - Tel. +91 11 4352 4073 – Mumbai - Tel. +91 22 2648 8750 ▪ **South East Asia:** Tarkett Flooring Singapore Pte. Ltd. – Tel: +65 6346 1585 ■ **AFRICA: Tarkett International:** Tel. +33 1 41 20 41 01 ■ **MIDDLE EAST: Tarkett Middle East:** Tel. +961 1 51 3363/4 ▪ **Israël:** Tarkett International: Tel. +33 1 41 20 41 01 ■ **NORTH AMERICA: USA:** Tarkett Inc. – Tel. +1 713 869 5811 / Johnsonite – Tel. + 1 440 543 8916 ▪ **Canada:** Tarkett Inc. – Tel. +1 450 293 173 ■ **LATIN AMERICA: Brazil:** Tarkett - Tel. 55 12 3954 7108 ▪ **Argentina - Chile - Uruguay:** Tarkett Latam Mercosur - Tel. +54 11 47 08 07 72 / +54 9 11 44 46 88 82 ▪ **Bolivia - Colombia - Ecuador - Panama - Paraguay - Peru - Trinidad and Tobago - Venezuela:** Tarkett - Tel. +55 11 9 8410 9310 / +55 11 95494 0069 ▪ **Mexico /Central America:** Tarkett Latam Mexico - Tel. +55 11 98410 9310

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