Horn Bordplader A/S

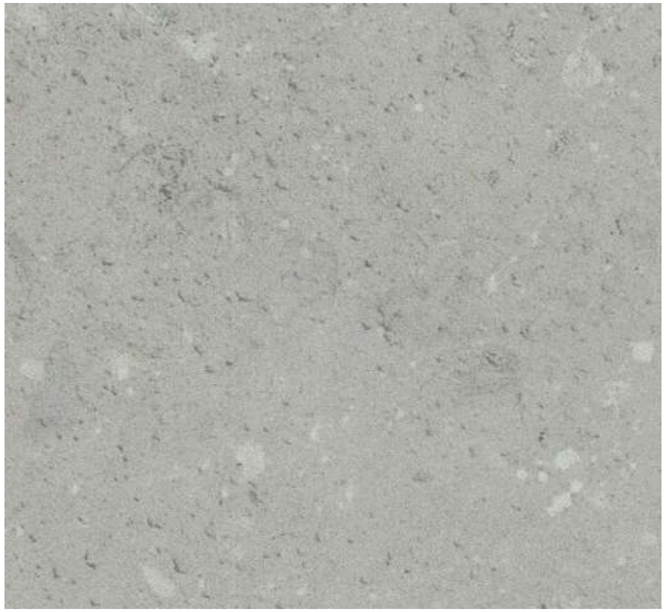
LCA Report

Kompaktlaminat, March, 2024

Life Cycle Assessment

Of Kompaktlaminat

By Mediator A/S



Title: Life Cycle Assessment of Kompaktlaminat

Date: March, 2024

Ordered by: HORN Bordplader 2024

Name of database: Ecoinvent 3.8

Author: Mediator A/S

Life Cycle Assessment

Ordered by Horn bordplader A/S

HORN Bordplader A/S is a Danish company founded in 1998. They specialize in supplying furniture solutions, including tabletops for kitchen areas, with a product range covering 10 different materials.

They strive to deliver high quality products with an expected life service of minimum 30 years.

HORN strives to keep developing, focusing on new solutions and sustainability.

Issued by Mediator A/S.

Mediator is a consultancy company active in the fields of chemistry, environmental aspects, dangerous goods, etc. with a focus on finding dynamic and flexible solutions for our customers. The team comprises 17 employees – all with a comprehensive knowledge within their field of expertise. Mediator provides the service of estimating and implementing the methodology Life Cycle Analysis (LCA), in order to evaluate environmental aspects. The LCA methodology establishes the basis for modelling simple, as well as complex, products/process/systems of aspects for a credible assessment of potential environmental effects.

Content

Genererel

Holder

HORN Borplader A/S

Farvervej 40

7490, Aulum

Denmark

CVR: 25798902

Issued, March 2024, Valid to March 2026.

Indented use

The intended use of the report is to communicate scientifically based environmental information for the process to/from professional stakeholders, with the aim of being able to assess environmental impacts for building material.

Declared unit

1 m2 (17 kg) Kompaktlaminat tabletop (compact laminate tabletop).

Review period

This LCA is based on in house data for 2021-2022 obtained from HORN Bordplader A/S.

Basis of calculation

The life cycle assessment report complies to the requirements set in the ISO 14040, ISO 14044, ISO 14025 and EN15804+A2:2019.

Comparability

Processes may not be comparable, if they do not comply with the requirements of the standards. Data may not be comparable unless all datasets used, are developed according to EN 15804 and the background systems are based on the same database.

LCA participators

LCA Mediator A/S, Centervej 2E, 6000 Kolding

This LCA has not been 3rd party verified.

Introduction

This Life Cycle Assessment (LCA) has been commissioned by HORN Bordplader A/S and is authored by Mediator A/S. The report is dated March 2024 and complies to the requirements set in the standards ISO 14040 [1], ISO 14044 [2], ISO 14025 [3] and, in case of construction materials, EN-15804+A2:2019 [4]. The report can be verified by a qualified independent verifier, experienced in LCA.

Software Mobius version 1.0.198 and Ecoinvent 3.8 has been used in the preparation of this report. The report is valid until 2 years after initial publication. The results of the process assessment and resulting LCA in this report are only comparable to others, if they also comply with the norms and standards used in this report, and as set out above.

The product being assessed in this report is a tabletop called Kompaktlaminat. It is made of compact laminate which is compressed paper which is then covered in impregnated laminate. It is being used for interior design in e.g. kitchen and bathrooms. It is available in various colours and sizes are made to order [6].

Life Cycle Assessment

In order to provide a better understanding of a product or a process sources of pollution and thus how to prioritize the practices of sustainable business a LCA can be created. A LCA presents the quantitative environmental information of the product or process [5].

A LCA provides an overview of where it is most obvious to implement new practices and where efforts can be made to improve a company's environmental footprint, introduce sustainable business practices and can be used to market the product or process from a sustainability perspective. The data obtained from the LCA is therefor ideal to incorporate into a company's responsibility program [5].

Figure 1 illustrates the general cycle of a LCA for a given product/system.

Figure 1; Stages of a product Life Cycle, showing the raw material extraction, manufacturing, transport, use and the End-Of-Life phases.

Goal

This LCA has been carried out in order to:

”Apply environmental data in LCA calculations for sustainable construction works. This is essential to enable valid and verifiable comparability of environmental data.

The outcome of this study will be used for both business-to-business and business-to-consumer communication. The intended company internal audience of this study consists of stakeholders, such as marketers, product innovators, purchasers and process managers. External stakeholders could be clients and suppliers with an interest in environmental profiling, governments and environmental NGO’s.” [5]

The LCA report could also be used to get the assessed product verified under the EPD system.

Kompaktlaminat

Product description/product definition

Kompaktlaminat from HORN Bordplader A/S.

Kompaktlaminat is tabletop made from compact laminate used for interior design.

Application

Kompaktlaminat is used for constructing surfaces/tabletops for primarily kitchen and bathroom areas.

Technical characteristics

This LCA covers 1 m2, corresponding to 17 kg.

Base materials/ancillary materials

Based on the information provided by HORN Bordplader A/S, the following applies:

1) The product/at least one partial product contain substances on the ECHA list of substances of very high concern (SVHC) (date July 8, 2021) above 0.1% by mass: No.

2)The product/at least one partial product contain further CMR substances in category 1A or 1B that are not on the candidate list, above 0.1% by mass in at least one partial product: No.

3) The construction product have had biocidal product added to them, or they has been treated with biocidal product (they are therefore a treated article as per the Biocidal product Regulation (EU) no. 528/2012): No.

Manufacturing and delivery

Kompaktlaminat is made to order. The boards are cut to the correct sizes. Before transport Kompaktlaminat is packed using laths, paper/cardboard, plastic corners and plastic wrap. Transportation is by HORN Bordplader A/S own fleet of trucks.

Scope

The reference unit for a LCA study can be presented in two ways: either as a functional unit or as a declared unit. The definition of a functional and declared unit is according to DS/EN 15804:2012+A2:2019 [4]. When a product unit fulfils a specific function or purpose it is defined as a functional unit, meaning that a specific function or scenario is known. This could e.g. be a door [4].

A declared unit is a product or scenario where a specific function has not been specified, e.g., a litre of paint. It can be used if a functional unit cannot be defined [4].

The functional unit is 1 m2 of Kompaktlaminat.

The LCA covers Kompaktlaminat. Packaging has been included in this LCA. The expected life service of Kompaktlaminat is minimum 30 years [6]. Even though the Kompaktlaminat tabletop is available in various colours, the LCA covers a general estimation, assuming all the colour variations will contribute with the same environmental impact.

This LCA study covers modules A1-A4, C1-C4+D. The remaining modules (A5, B1-B7) have been omitted due to lack of data, since these modules are very dependent on how and where the product is used.

In figure 2 and 3 the LCA stages and the flow of the production of the product is presented.

Scope

	Stage; production			Stage; Construction		Stage; Use							Stage; End-of-Le				Stage; Ressource recovery
	Material supply	Transport	Manufacturing	Transport	Construction / Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse/Recovery/Recycling Potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X
Geography	Global	Global	Denmark	Denmark	-	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Generic (G) or Specific (S) data use	S	S	S	S	-	-	-	-	-	-	-	-	G	G	G	G	G

X = Included
MND = Module Not Declared
MNR = Module Not Relevant

Figure 2; LCA modules overview. The modules included in this LCA is shown.

Scope

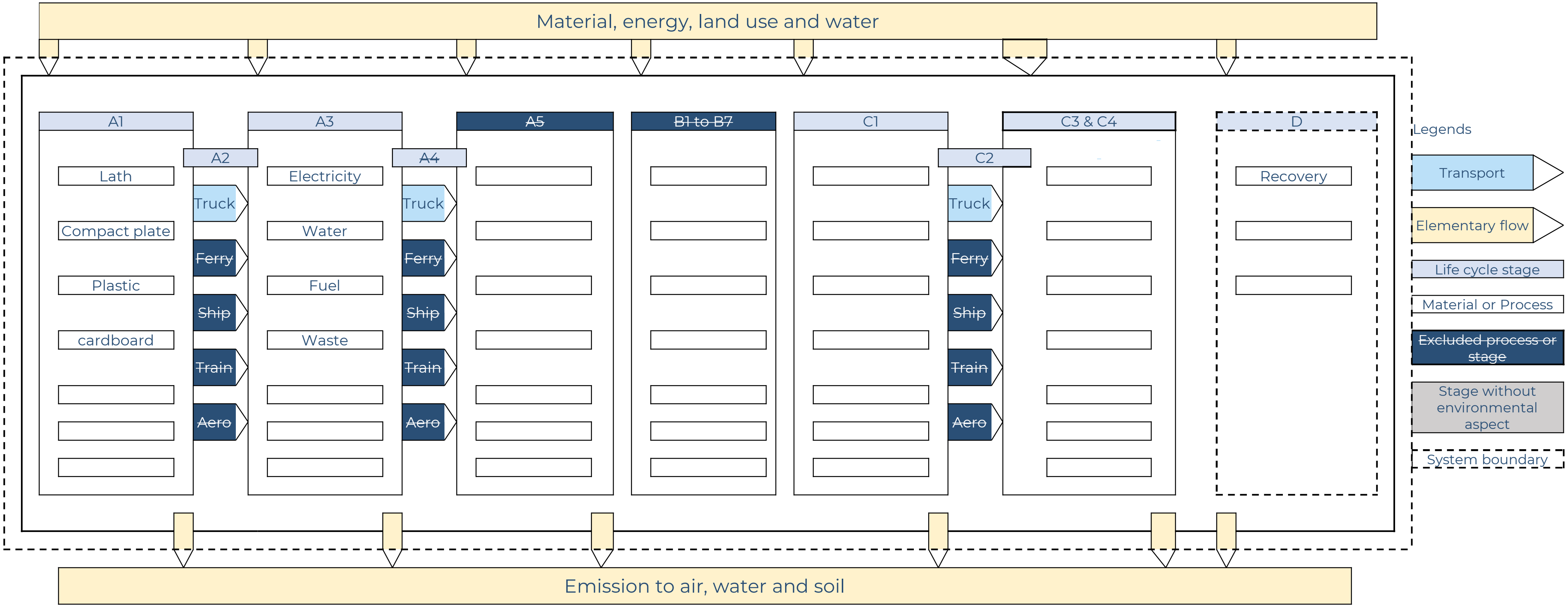


Figure 3; Flowchart of system. The flowchart shows the input and output included in this LCA. The input and output is shown according to modules A1-A4, C1-C4+D.

System Boundaries

The LCA is of type: 2

1 = Cradle-to-gate

2 = Cradle-to-grave except module A5 to B7

3 = Cradle to gate with optional modules

The following describes the entire life cycle, although the system boundary cuts-off parts of the results.

The general rules for the omission of inputs and outputs in the LCA follow the provisions of EN 15804, where the total omission of input flow per module must be no more than 5% of energy consumption and mass, and max 1% per unit process [4]. Key assumptions for the system boundary are described for each life cycle stage below.

The product phase (A1-A3):

The product phase includes the provision of all raw materials, product and energy, transport to the production site, mixing process, internal transportation and waste treatment until "end-of-waste" or final disposal.

The modules A1, A2 and A3 can be considered as a combined module called A1-A3. This means that the results for the product phase can be given in a combined form. The compact laminate boards are made by pressing resin coated paper after which it is coated with melamine impregnated colored laminate. This process takes place at the supplier of the boards.

The construction process phase (A4-A5):

The tabletop is transported using HORN Bordplader's own fleet of trucks. The transportation in phase A4 has therefore been included in this LCA. Phase A5 has not been included since there is no data due to the installation process being dependent on who and where the product is installed.

The use phase (B1-B7):

Light maintenance, including cleaning, is expected for the product to last its estimated lifetime. However, the amount of maintenance and the environmental impact depends on the user. The use phases has not been included in this LCA since there is no data.

System Boundaries

End of service life and Reuse phase (C1-C4 / D):

At the End-of-Life (EoL) the product is dismantled and disposed of.

An overview of which elements are included or excluded is presented in table 1.

System Boundaries

For defining the allocation, the method chosen is described as the cut-off method.

The cut-off method is defined by allocating the various loads caused by a product to only that product.

Environmental aspects and processes which is estimated to have a contribution of less than 1% it does not have to be included, when using the cut-off method [8].

A generic overview of processes that are included or excluded is presented in Table 1.

Included	Excluded
Production of raw materials	Installation, construction, use
Transportation of the raw materials to manufacturing facilities + transport of product to customers	
Resources (gas, electricity, water, diesel)	
Packaging	
Waste from manufacturing	
Waste treatment, reuse	

Table 1; Overview of the included and excluded parts in the LCA.

System Boundaries

The input and output can be allocated based on the number of resources used per year to produce 1 m2 Kompaktlaminat per year (output of 2021-2022). It is therefore possible to use the yearly production to make the allocation. The allocation can be seen in figure 3, showing the input products, the process and the output products for 1 m2 of Kompaktlaminat.

Assumptions

Assumptions that are general to the entire LCA are:

• Choice of energy model: (e.g. regional averages obtained from the Ecoinvent LCI database or according to specific conditions).

• Choice of transport model: (e.g. regional averages from Ecoinvent).

• Transport distances have been decided based on Google Maps for road transportation and a port routing tool (e.g. Sea Distances or Port World) for sea transports. Possible different routes have not been included in the calculations.

• Ecoinvent references that contain market funds such as: "market for hydrochloric acid, without water, in 30% solution state | hydrochloric acid, without water, in 30% solution state | Cutoff, U" contains generic shipments from producer to end customer. Therefore, these data sets have no further transport.

• It is assumed that various color variations have the same environmental contribution. In this LCA there is therefore no distinction between the different variants, and they are counted as a common quantity.

LCA Software and Standard

The software chosen to perform the LCA is Mobius, version 1.0.198 from Ecochain. It has been chosen since it refers to the Ecoinvent database and ISO standards below.

LCA software; Mobius, version 1.0.198, Ecoinvent database.

ISO 14040 DS/EN ISO 14040:2008 – " Environmental management – Life cycle assessment – Principles and framework".

ISO 14044 DS/EN ISO 14044:2008 – " Environmental management – Life cycle assessment – Requirements and guidelines".

ISO 14025 DS/EN ISO 14025:2010 – " Environmental labels and declarations – Type III environmental declarations – Principles and procedures".

EN 15804 DS/EN 15804 + A2:2019 - "Sustainability of construction works – Environmental product declarations – Core rules for the products category of construction products".

Process Description/Manufacturing

Manufacturing

The compact laminate boards are constructed by the supplier. At HORN Bordplader A/S, the boards are cut using power driven equipment. The recipe of the Kompaktlaminat can be seen in table 2.

Raw materials	Percentage [%]
Compact laminate	100

Packing material	Percentage [%]
Wooden laths	35.8
Plastic edges	2.1
Plastic wrap	3.6
Paper/cardboard	48.5

Table 2; Showing the raw materials used for making 1 m2 Kompaktlaminat and the amount of packaging used. The recipe is based on information obtained from HORN Bordplader A/S.

Process Description/Manufacturing

Figure 4 illustrates the production flow, showing the input raw materials, and resources used to create 1 m2 of Kompaktlaminat.

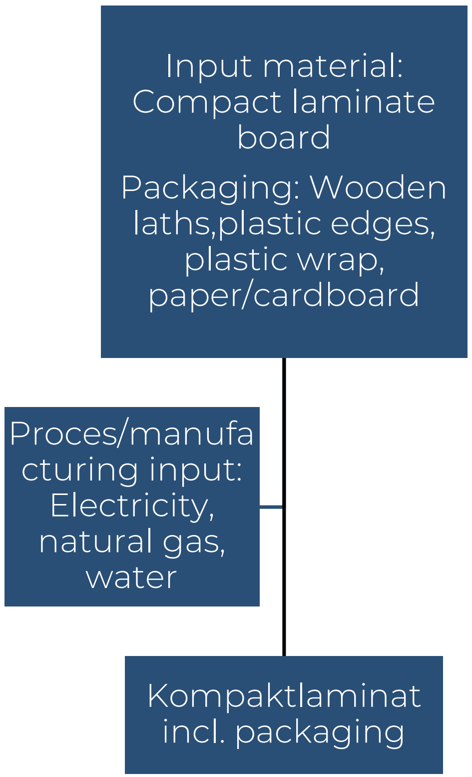


Figure 4; Flow sheet.

Data Collection and Procedures

Contacts that have supplied the data input are listed in table 3.

Owner	HORN Bordplader A/S
Name	Thomas Thisted
E-mail	tth@hornbordplader.dk
Phone	+45 8180 4047
Position	Head of Quality & Customer Service
Data	Raw material data

Table 3; Data provider.

Data Collection and Procedures

The data collected and procedures used for analysing stages (A1-A4, C1-C4+D) is presented in the following.

In order to look into module A1 relevant suppliers of HORN Bordplader A/S raw materials were requested to send LCA related product information for this assessment. In case such information was available, the suppliers delivered this data in the shape of an EPD, safety data sheets, certification, other written information or energy documentation. Based on this information, representative background data have been selected.

For Kompaktlaminat, the manufacturing is estimated from information in table 4, provided by HORN Bordplader A/S. It shows the amount of raw material used for 1 m2 of Kompaktlaminat. In 2021-2022 9248.4 m2 of Kompaktlaminat tabletop was produced.

Raw material	Kompaktlaminat / 1 m2 [kg]
Compact laminate	17
Wooden laths	1
Plastic edges	0.06
Plastic wrap	0.1
Paper/cardboard	1.63

Table 4; Bill of Material for making 1 m2 of Kompaktlaminat, for 2021-2022.

Data Collection and Procedures

References used for raw material in module A1 is listed in table 5.

The references are from Ecoinvent, except the compact laminate, for which an EPD [9], as can be seen in table 5.

Material	Database	LCI database reference	Place
Compact laminate	EPD-ICL-20220237-CBE1-EN	-	-
Wooden laths (packaging)	Ecoinvent 3.8	market for sawnwood, lath, softwood, raw, dried (u=20%) | sawnwood, lath, softwood, raw, dried (u=20%) | Cutoff, U	Europe without Switzerland
Paper/cardboard (packaging)	Ecoinvent 3.8	market for containerboard, linerboard | containerboard, linerboard | Cutoff, U	Europe
Plastic wrap (packaging)	Ecoinvent 3.8	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, U	Europe
Plastic edges (packaging)	Ecoinvent 3.8	polycarbonate production | polycarbonate | Cutoff, U	Europe

Table 5; Reference for raw material.

Data Collection and Procedures

All relevant transport to the HORN Bordplader A/S manufacturing site have been included in this study for A2. The references for the transport are according to EN15804+A2:2019. The LCA database references calculate with an average load factory of 50%, in other words fully loaded transport towards the customer with empty returns. The transport of raw materials to HORN Bordplader A/S have been by truck from Europe. The transport distances are calculated from the location of the supplier to the HORN Bordplader A/S manufacturing site in Denmark. Transport distances has been provided by HORN Bordplader A/S.

The impacts have been calculated using Ecoinvent references for freight per truck based on material used for 1 m2 of the final product.

Please see suppliers and delivery distances in table 6. The input data reference can be seen in table 7.

Data Collection and Procedures

Country	Factory to factory – Truck [km]	Raw material	Supplier
Denmark	100	Compact laminate	Riisfort
Germany	705	Compact laminate	Pfleider
Denmark	62	Wooden lath	Bygma
Denmark	297	Plastic wrap	Ubro
Denmark	60	Plastic edges	Podeplast
Denmark	297	Paper/cardboard	Ubro
Denmark	28	Paper/cardboard	KD Emballage

Table 6; Transport of raw material from supplier country.

Data Collection and Procedures

References used for transport in module A2 is listed in table 7. All references are from the Ecoinvent 3.8 database.

Transport	Database	LCI database reference	Place
Truck	Ecoinvent 3.8	market for transport, freight, lorry, unspecified | transport, freight, lorry, unspecified | Cutoff, U	Europe

Table 7; References for transport.

Data Collection and Procedures

Relevant processes in the production phase A3 have been included in this study.

The manufacturing information obtained from HORN Bordplader A/S describes the processes when making the Kompaktlaminat tabletop. The resources used, electricity, water and natural gas, is based on the yearly consumption for the production site. From the data the resources used for making 1 m2 of Kompaktlaminat tabletop has then been estimated. The amount of diesel used for transport has also been included in this study. All the resources and impacts used for analysing the A3 can be seen in table 8.

Data Collection and Procedures

Data concerning the manufacturing resources and transport of the product to the consumer, A3 and A4, have been provided by HORN Bordplader A/S. The data represented in table 8 shows both the amount of resources used for one year of production of Kompaktlaminat and also the amount of resources used for 1 m2 of Kompaktlaminat, which the further analysis is based upon. Table 8 also shows the amount of diesel used for transport of Kompaktlaminat. In 2021-2022 9248.4 m2 of Kompaktlaminat tabletop was produced.

Resource	Kompaktlaminat / 2021-2022	Kompaktlaminat / 1 m2
Electricity	109178.4 kWh	12 kWh
Natural gas	4833.4 m3	0.52 m3
Water	40.7 m3	0.004 m3
Diesel, trucks	3906.5 l	0.42 l
Diesel, van	4603.7 l	049 l

Table 8; Resources used during the manufacturing process.

Data Collection and Procedures

References used for the manufacturing in production in module A3 and the transportation in A4 are listed in table 9.

Type	Database	LCI database reference	Place
Electricity	Ecoinvent 3.8	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U	Denmark
Natural gas	Ecoinvent 3.8	market group for natural gas, high pressure | natural gas, high pressure | Cutoff, U	Europe without Switzerland
Water	Ecoinvent 3.8	market group for tap water | tap water | Cutoff, U	Europe
Diesel, trucks	Ecoinvent 3.8	market for diesel | diesel | Cutoff, U	Europe without Switzerland
Diesel, van	Ecoinvent 3.8	market group for diesel | diesel | Cutoff, U	Europe

Table 9; Reference for manufacturing.

Data collection and Procedures

Production loses have been included in this study.

The production loses are presented in table 10. It shows both the loses for the year 2021-2022 and the estimated production loses per 1 m2 Kompaktlaminat.

The production waste for Kompaktlaminat has been estimated based on data on the total production waste for 2021-2022.

Production loss	Kompaktlaminat / 2021-2022	Kompaktlaminat / 1 m2
Paper/cardboard	3772.1 kg	0.40 kg
Plastic	691.2 kg	0.074 kg
Steel/iron	48.4 kg	0.005 kg
Hazardous waste	589.8 kg	0.063 kg
Wood	717.8 kg	0.077 kg

Table 10; References for manufacturing resources.

Data Collection and Procedures

References used for production loss is listed in table 11.

Type	Database	LCI database reference	Place
Paper/cardboard	Ecoinvent 3.8	treatment of waste paper, unsorted, sorting | waste paper, sorted | Cutoff, U	Europe without Switzerland
Plastic	Ecoinvent 3.8	treatment of waste polyethylene, municipal incineration | waste polyethylene | Cutoff, U	Rest-of-World
Steel/iron	Ecoinvent 3.8	sorting and pressing of iron scrap | iron scrap, sorted, pressed | Cutoff, U	Europe
Hazardous waste	Ecoinvent 3.8	treatment of hazardous waste, hazardous waste incineration | hazardous waste, for incineration | Cutoff, U	Europe without Switzerland
Wood	Ecoinvent 3.8	treatment of waste wood, untreated, municipal incineration | waste wood, untreated | Cutoff, U	Rest-of-World

Table 11; Reference for production loss/waste.

Data Collection and Procedures

Data concerning the demolition, transport to waste treatment, waste treatment, stages C1-C4, are based on best guess. It has not been possible to obtain specific data since it is based on who and how the product is being dismantled and disposed of. The best guess is based on assumptions on how the product primarily will be dismantled and disposed of. It is also assumed that the average distance to a waste treatment facility in Denmark will be 50 km for most consumers. The data represented in table 12 shows the estimated resource use for 1 m2 of Kompaktlaminat.

For the demolition it is estimated to approximately 10 min use of a power tool.

Resource	
Electricity (power tool)	0.75 kWh
Transport to waste treatment	50 km
Waste treated	1 m2

Table 12; Data for demolition, transport to waste treatment, waste treatment.

Data Collection and Procedures

References used for demolition, transport to waste treatment, waste treatment in module C1-C4 is listed in table 13.

Type	Database	LCI database reference	Place
Electricity (power tool)	Ecoinvent 3.8	market group for electricity, low voltage | electricity, low voltage | Cutoff, U	Europe
Truck	Ecoinvent 3.8	market for transport, freight, lorry, unspecified | transport, freight, lorry, unspecified | Cutoff, U	Europe
Ceramic	Ecoinvent 3.8	rock crushing | rock crushing | Cutoff, U	Europe
Paper/cardboard	Ecoinvent 3.8	treatment of waste paperboard, unsorted, sorting | waste paperboard, sorted | Cutoff, U	Europe without Switzerland
Wooden laths	Ecoinvent 3.8	treatment of waste wood, untreated, municipal incineration | waste wood, untreated | Cutoff, U	Rest-of-World
Plastic wrap	Ecoinvent 3.8	treatment of waste polyethylene, municipal incineration | waste polyethylene | Cutoff, U	Rest-of-World

Table 13; Reference for demolition, transport to waste treatment, waste treatment.

Data Collection and Procedures

Data concerning the reuse, stage D, is based on assumptions. It has not been possible to obtain specific data since it is based on who and how the product is being reused, however, the assumption is made based on the most like way of reusing the product. Here it is assumed that the compact laminate at End-of-Life will be incinerated and replace fossil fuel. The data represented in table 14 shows the resources used for reusing the product.

Resource	Kompakt laminate / 2021-2022	Kompakt laminate/ 1 m2
Replacement of fossil fuel	9248.4 m2	17 kg

Table 14; Data for reuse.

Data Collection and Procedures

Reference used for energy recovery is listed in table 15.

Type	Database	LCI database reference	Place
Energy recovery	EPD-ICL-20220237-CBE1-EN	-	-

Table 15; Reference for energy recovery.

Product Result

In this part, from page 37 to 47 the results for the product are presented.

For the product there is first a presentation of the GWP impact divided into the phases A1-A4, C1-C4 + D. Hereafter is each product impact categories presented. The result section also includes 3 tables (1.1-1.3) showing the data of the estimated results.

Kompaktlaminat

From page 38 – 50 the results, interpretation and sensitivity analysis for Kompaktlaminat are presented.

Graph 1.1; $CO_{2\ eq.}$ breakdown

The $CO_{2\ eq.}$ impact breakdown for 1 m2 into the phase contributors

Kompaktlaminat

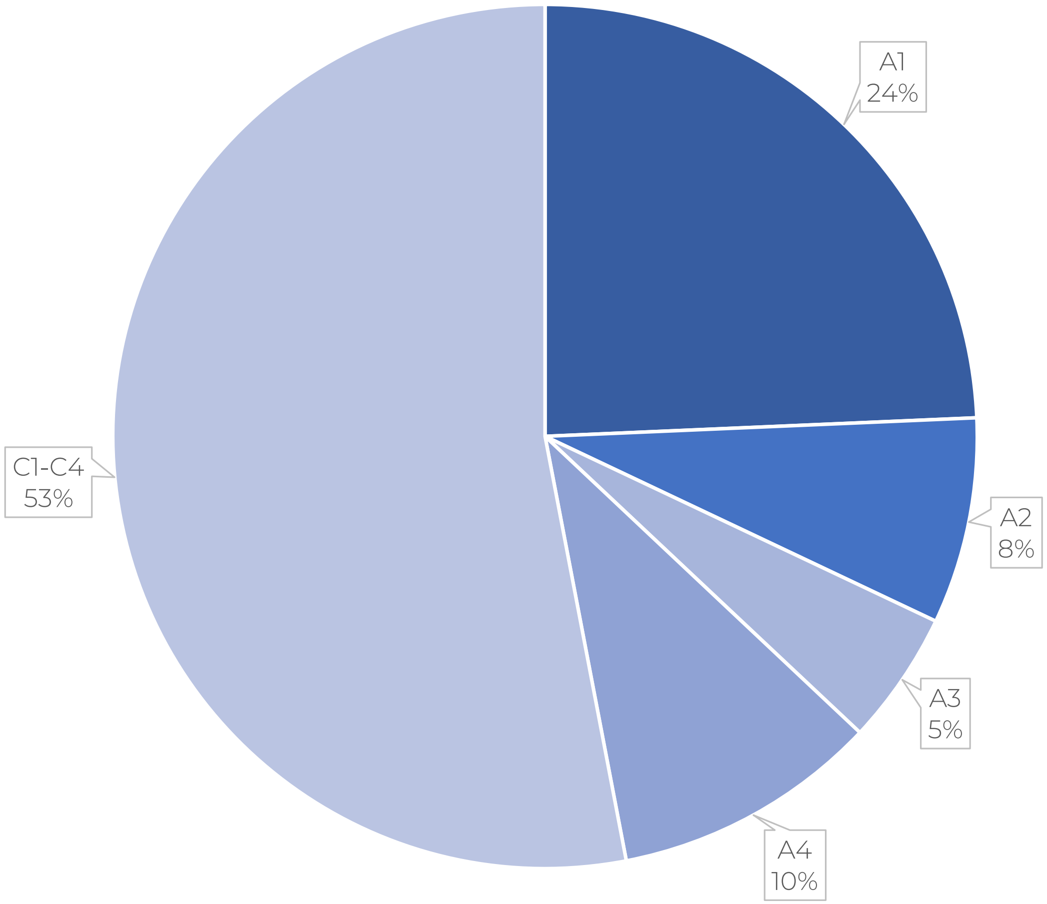


Table 1.1; Environmental impact

Parameters

GWP-t = Climate Change [kg CO2 eq]
GWP-f = Climate change - Fossil [kg CO2 eq]
GWP-b = Climate Change - Biogenic [kg CO2 eq]
GWP-luluc = Climate Change Land use & change [kg CO2 eq]
ODP = Ozone depletion [kg CFC11 eq]
AP = Acidization [mol H+ eq]
EP-fw = Eutrophication, freshwater [kg P eq]
EP-m = Eutrophication, marine [kg N eq]
EP-T = Eutrophication, terrestrial [mol N eq]
POCP = Photochemical ozone formation [kg NMVOC eq]
ADP-mm = Resource use, minerals and metals [kg Sb eq]
ADP-f = Resource use, fossils [MJ]
WDP = Water use [m3 depriv.]
PM = Particulate matter [disease inc.]
IR = Ionizing radiation [kBq U-235 eq]
ETP = Ecotoxicity, freshwater [CTUe]
ETF-i = Ecotoxicity, freshwater – inorganics [CTUe]
ETF-o = Ecotoxicity, freshwater – organics [CTUe]
ETF-m = Ecotoxicity, freshwater - metals [CTUe]
HTNC-m = Human toxicity, non-cancer – metals [CTUh]
HTC-m = Human toxicity, cancer – metals [CTUh]
HTC = Human toxicity, cancer [CTUh]
HTNC = Human toxicity, non-cancer [CTUh]
HTNC-i = Human toxicity, non-cancer – inorganics [CTUh]
HTNC-o = Human toxicity, non-cancer – organics [CTUh]
HTC-i = Human toxicity, cancer – inorganics [CTUh]
HTC-o = Human toxicity, cancer – organics [CTUh]
SQP = Land use [Pt]

Kompaktlaminat

Impact	Unit	A1	A2	A3	A4	C1-C4	Total		D
GWP-t	kg CO2 eq.	8.42E+00	2.67E+00	1.72E+00	3.45E+00	1.84E+01	3.46E+01		-8.31E+00
GWP-f	kg CO2 eq.	2.89E+01	2.67E+00	1.55E+00	3.45E+00	8.19E-01	3.74E+01		-8.26E+00
GWP-b	kg CO2 eq.	-2.05E+01	2.61E-03	1.73E-01	2.11E-03	1.75E+01	-2.89E+00		-4.25E-02
GWP-luluc	kg CO2 eq.	3.32E-02	1.09E-03	1.99E-03	4.31E-04	1.84E-04	3.69E-02		-9.13E-04
ODP	kg CFC11 eq.	1.56E-07	6.26E-07	2.38E-07	1.31E-06	4.42E-08	2.37E-06		-5.62E-11
AP	mol H+ eq.	1.05E-01	1.51E-02	4.58E-03	3.66E-02	1.61E-02	1.78E-01		-1.09E-02
EP-fw	kg P eq.	3.63E-04	1.96E-05	8.38E-05	1.37E-05	5.09E-06	4.85E-04		-1.14E-05
EP-m	kg N eq.	3.38E-02	5.44E-03	9.39E-04	1.47E-02	7.50E-03	6.23E-02		-2.96E-03
EP-t	mol N eq.	3.01E-01	5.99E-02	1.19E-02	1.61E-01	8.64E-02	6.20E-01		-3.16E-02
POCP	kg NMVOC eq.	8.82E-02	1.71E-02	3.12E-03	4.52E-02	1.99E-02	1.74E-01		-8.28E-03
ADP-mm	kg Sb eq.	7.56E-06	8.95E-06	4.51E-06	2.09E-06	1.26E-06	2.44E-05		0.00E+00
ADP-f	MJ	6.43E+02	4.11E+01	3.61E+01	8.15E+01	1.17E+01	8.14E+02		-1.41E+02
WDP	m3 depriv.	4.18E+00	1.35E-01	3.61E-01	7.21E-02	2.97E+00	7.72E+00		-8.86E-01
PM	disease inc.	1.47E-06	2.95E-07	2.70E-08	8.80E-07	7.35E-08	2.74E-06		-9.05E-08
IR	kBq U235 eq.	1.58E+00	1.78E-01	1.15E-01	3.50E-01	7.91E-02	2.30E+00		-1.89E+00
ETF	CTUe	2.52E+02	3.26E+01	2.48E+01	4.55E+01	7.42E+00	3.63E+02		-3.10E+01
ETF-i	CTUe	1.48E+01	8.64E+00	3.34E+00	1.36E+01	6.99E-01	4.10E+01		0.00E+00
ETF-m	CTUe	1.87E+01	2.14E+01	2.13E+01	2.67E+01	3.38E+00	9.15E+01		0.00E+00
ETF-o	CTUe	1.80E+00	2.47E+00	1.17E-01	5.17E+00	2.42E-01	9.80E+00		0.00E+00
HTC	CTUh	1.29E-08	1.30E-09	5.56E-10	1.12E-09	1.66E-09	1.76E-08		-1.42E-09
HTC-i	CTUh	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00
HTC-m	CTUh	5.85E-10	5.45E-10	3.85E-10	5.55E-10	1.12E-10	2.18E-09		0.00E+00
HTC-o	CTUh	3.50E-10	7.53E-10	1.71E-10	5.68E-10	1.35E-09	3.19E-09		0.00E+00
HTNC	CTUh	3.99E-07	3.75E-08	1.30E-08	2.25E-08	1.81E-08	4.90E-07		-5.46E-08
HTNC-i	CTUh	8.61E-09	7.34E-09	2.81E-09	1.43E-08	5.11E-09	3.81E-08		0.00E+00
HTNC-m	CTUh	1.92E-08	2.58E-08	1.00E-08	7.60E-09	4.90E-09	6.76E-08		0.00E+00
HTNC-o	CTUh	1.18E-09	4.41E-09	3.74E-10	7.65E-10	6.10E-10	7.34E-09		0.00E+00
SQP	Pt	2.98E+03	3.51E+01	1.69E+01	1.03E+01	4.28E+00	3.05E+03		-2.52E+01

Table 1.2; Ressource use

Parameters

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials [MJ];
PERM = Use of renewable primary energy resources used as raw materials [MJ];
PERT = Total use of renewable primary energy resources [MJ];
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ];
PENRM = Use of non-renewable primary energy resources used as raw materials [MJ];
PENRT = Total use of non-renewable primary energy resources [MJ];
PET = Total energy [MJ];
SM = Use of secondary material [kg];
RSF = Use of renewable secondary fuels [MJ];
NRSF = Use of non-renewable secondary fuels [MJ];
FW = Use of net fresh water [m3]

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Impact	Unit	A1	A2	A3	A4	C1-C4	Total		D
PERE	MJ	6.70E+02	6.70E+02	6.70E+02	6.70E+02	6.70E+02	3.35E+03		-3.89E+01
PERM	MJ	1.98E+02	1.98E+02	1.98E+02	1.98E+02	1.98E+02	9.92E+02		0.00E+00
PERT	MJ	4.72E+02	4.72E+02	4.72E+02	4.72E+02	4.72E+02	2.36E+03		-3.89E+01
PENRE	MJ	7.94E+02	4.36E+01	3.93E+01	8.65E+01	-1.30E+02	8.33E+02		-1.41E+02
PENRM	MJ	1.48E+02	0.00E+00	0.00E+00	0.00E+00	-1.42E+02	5.82E+00		0.00E+00
PENRT	MJ	6.46E+02	4.36E+01	3.93E+01	8.65E+01	1.19E+01	8.27E+02		-1.41E+02
PET	MJ	7.89E+01	4.42E+01	5.04E+01	8.69E+01	3.65E+00	2.64E+02		0.00E+00
SM	kg	4.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.34E+00		0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00
FW	m3	1.64E-01	4.90E-03	4.05E-02	2.84E-03	7.05E-02	2.83E-01		-3.73E-02

Table 1.3; Output flows and waste categories

Impact	Unit	A1	A2	A3	A4	C1-C4	Total		D
HWD	kg	7.89E+01	4.42E+01	5.04E+01	8.69E+01	3.65E+00	2.64E+02		0.00E+00
NHWD	kg	4.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.34E+00		0.00E+00
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00
MFR	kg	1.64E-01	4.90E-03	4.05E-02	2.84E-03	7.05E-02	2.83E-01		-3.73E-02
MER	kg	3.11E-05	1.05E-04	3.82E-05	2.20E-04	8.27E-06	4.02E-04		-1.90E-08
EET	MJ	1.13E+00	2.74E+00	1.34E-01	7.55E-02	1.58E-01	4.24E+00		-7.13E-02
EEE	MJ	8.80E-03	2.77E-04	7.76E-05	5.70E-04	2.22E-05	9.74E-03		-1.11E-02

Parameters

HWD = Hazardous waste disposed [kg]
NHWD = Non-hazardous waste disposed [kg]
RWD = Radioactive waste disposed [kg]
CRU = Components for re-use [kg]
MFR = Materials for recycling [kg]
MER = Materials for energy recovery [kg]
EET = Exported energy thermic [MJ]
EEE = Exported energy electric [MJ]

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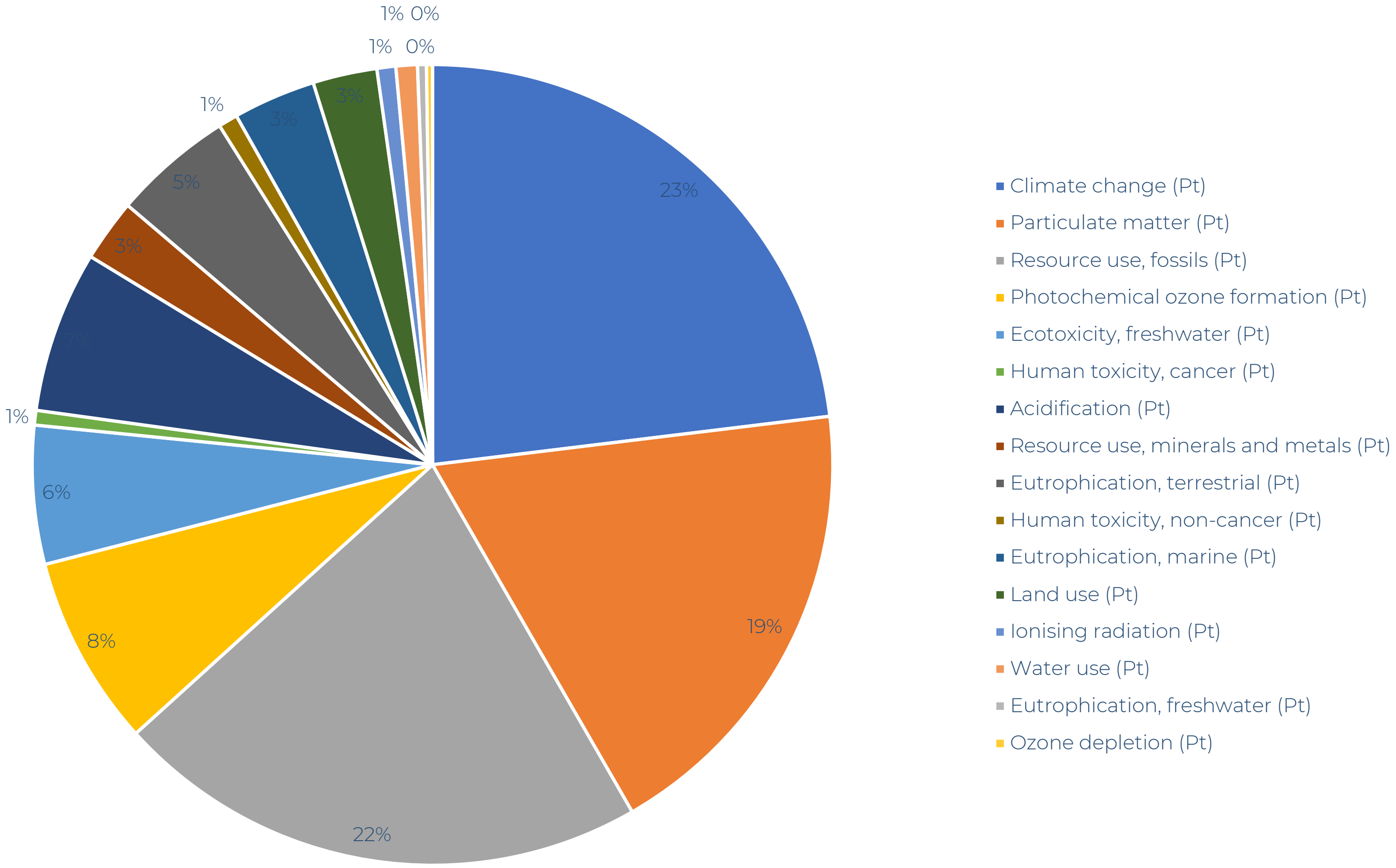
Graph 1.2; Environmental Footprint Endpoint (A1-A4 + C1-C4)

Environmental Footprint endpoint, singlescore per category



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The environmental footprint endpoint shows the contribution of each environmental impact category to the total environmental impact.

Graph 1.3; Environmental Footprint Endpoint (A1)

Environmental Footprint endpoint, singlescore per category

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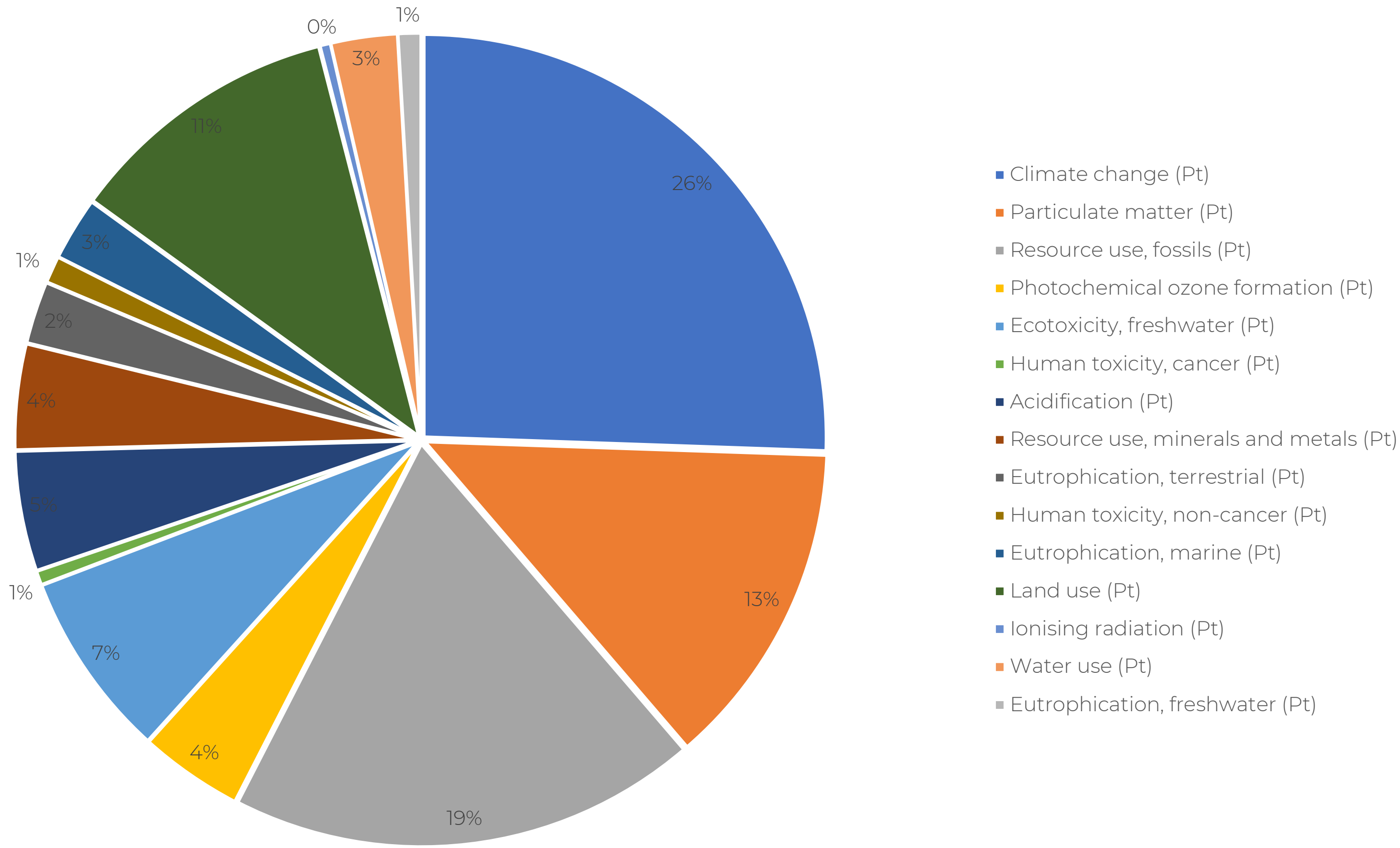
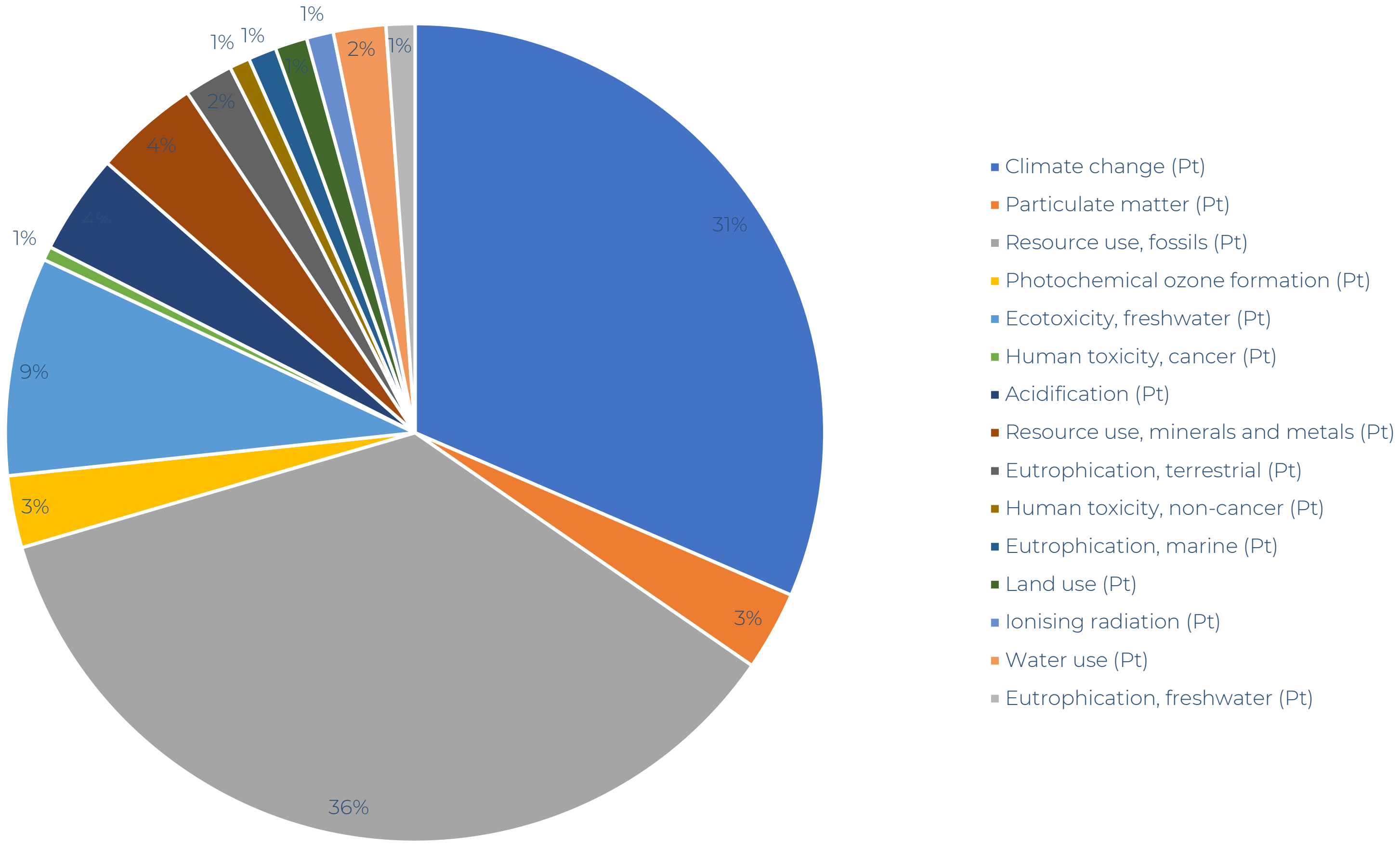
The environmental footprint endpoint shows the contribution of each environmental impact category to the total environmental impact.



Graph 1.4; Environmental Footprint Endpoint (A3)

Environmental Footprint endpoint, singlescore per category



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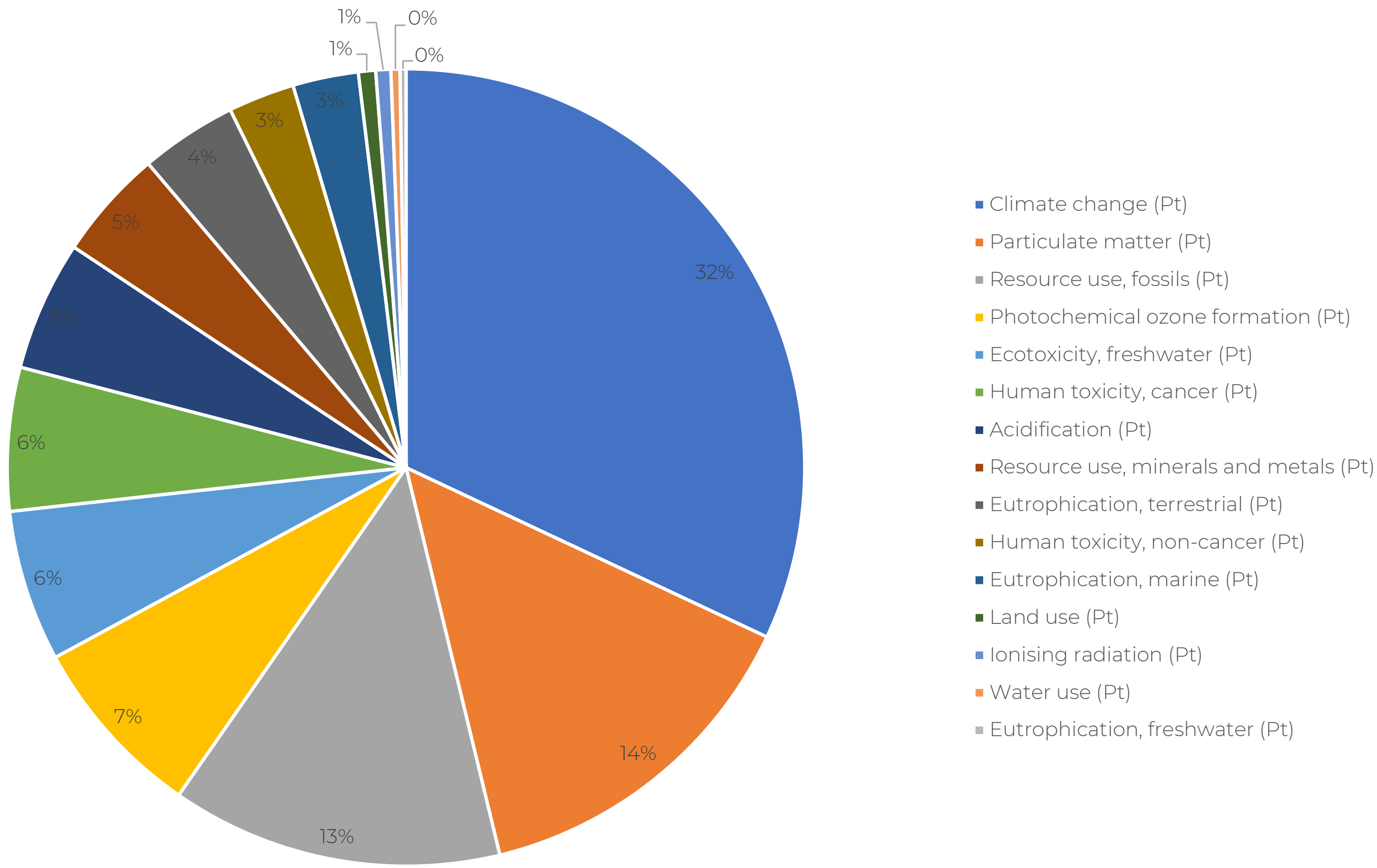
The environmental footprint endpoint shows the contribution of each environmental impact category to the total environmental impact.

Graph 1.5; Environmental Footprint Endpoint (C1-C4)

Environmental Footprint endpoint, singlescore per category



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The environmental footprint endpoint shows the contribution of each environmental impact category to the total environmental impact.

Graph 1.6; Environmental Footprint Endpoint (Raw material)

Environmental Footprint endpoint, singlescore per category

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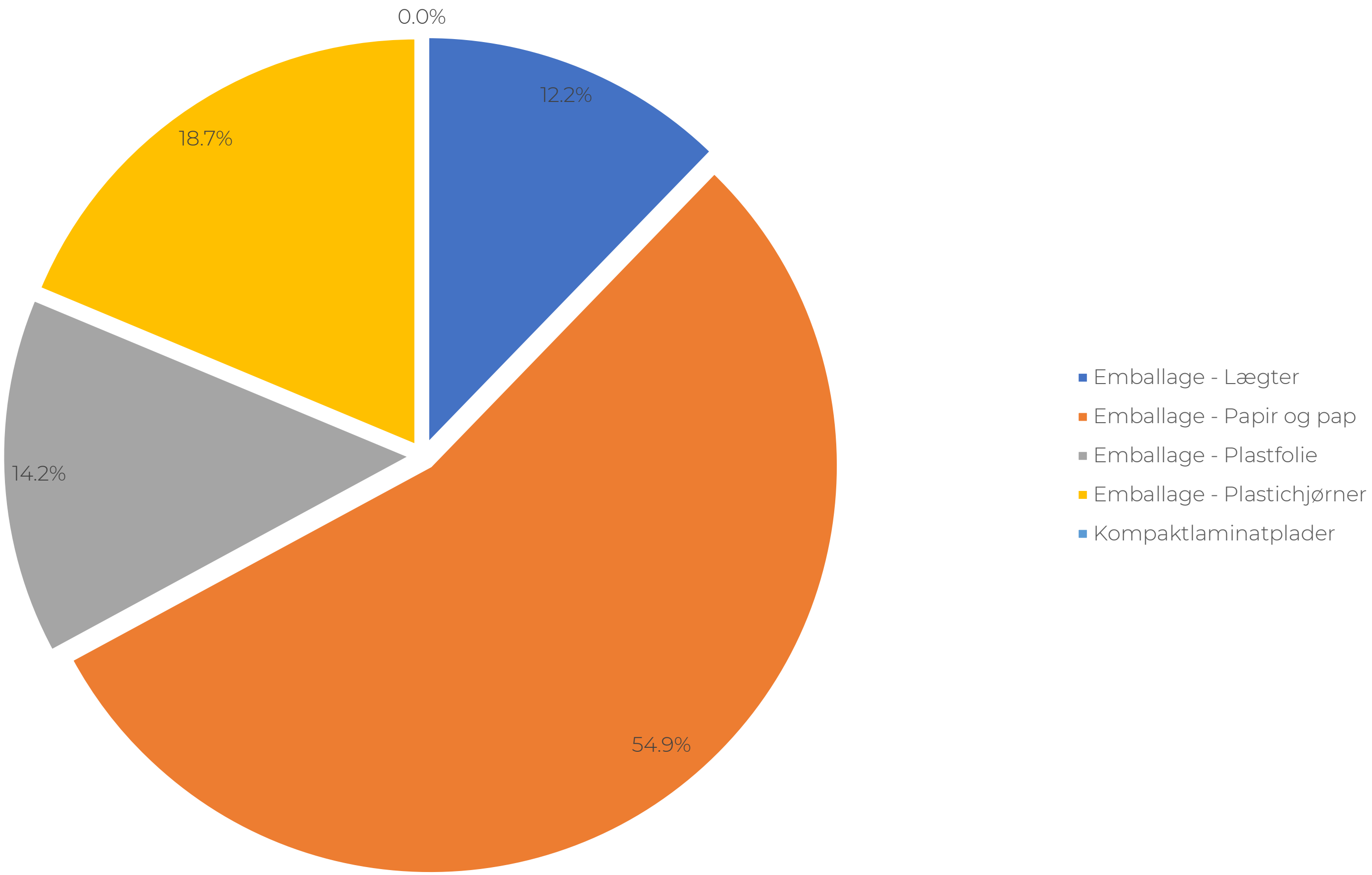
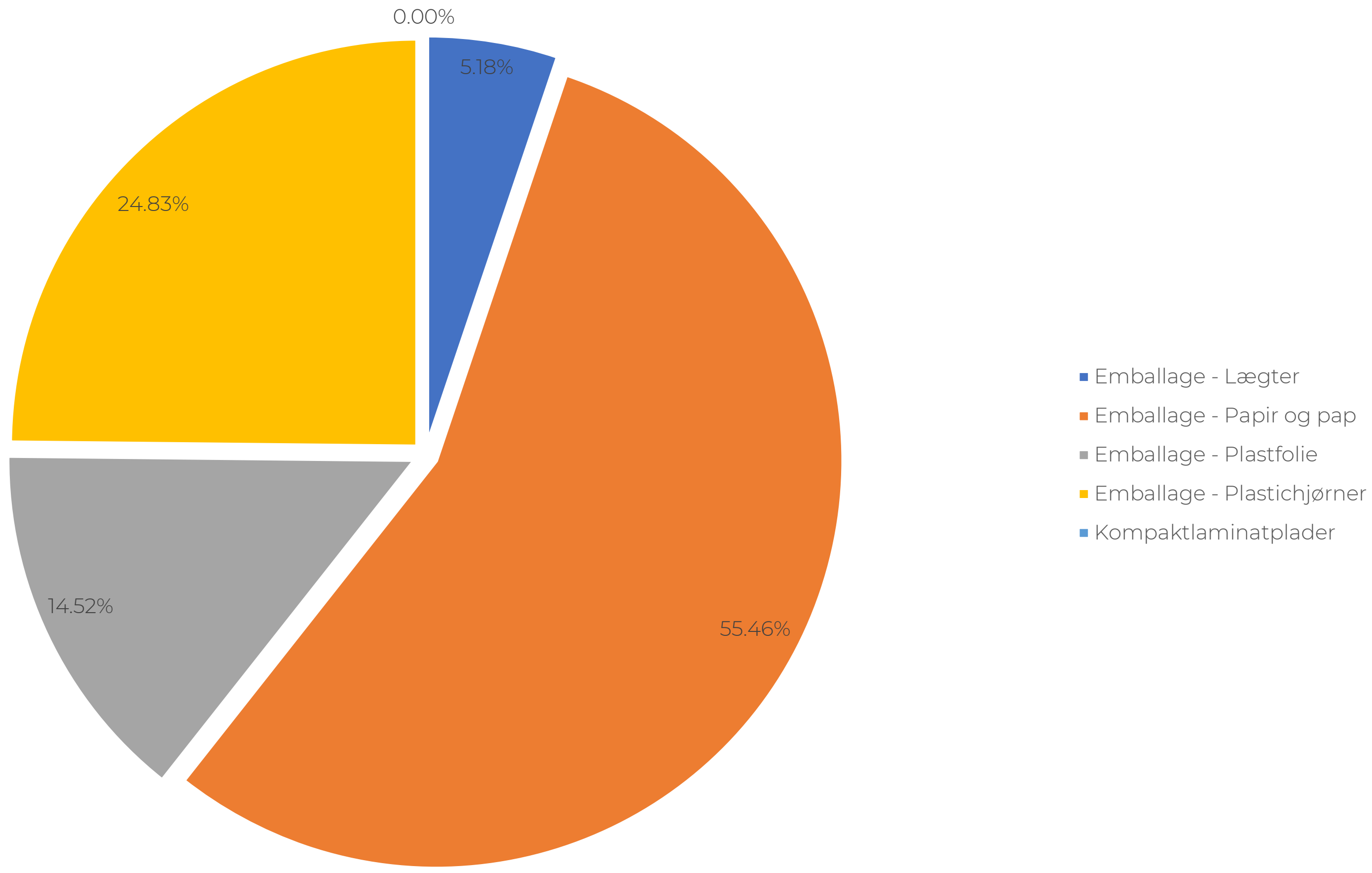
The environmental footprint endpoint shows the contribution of each environmental impact category to the total environmental impact.



Graph 1.7; Environmental Footprint Endpoint (Raw material)

Environmental Footprint endpoint, climate change per category



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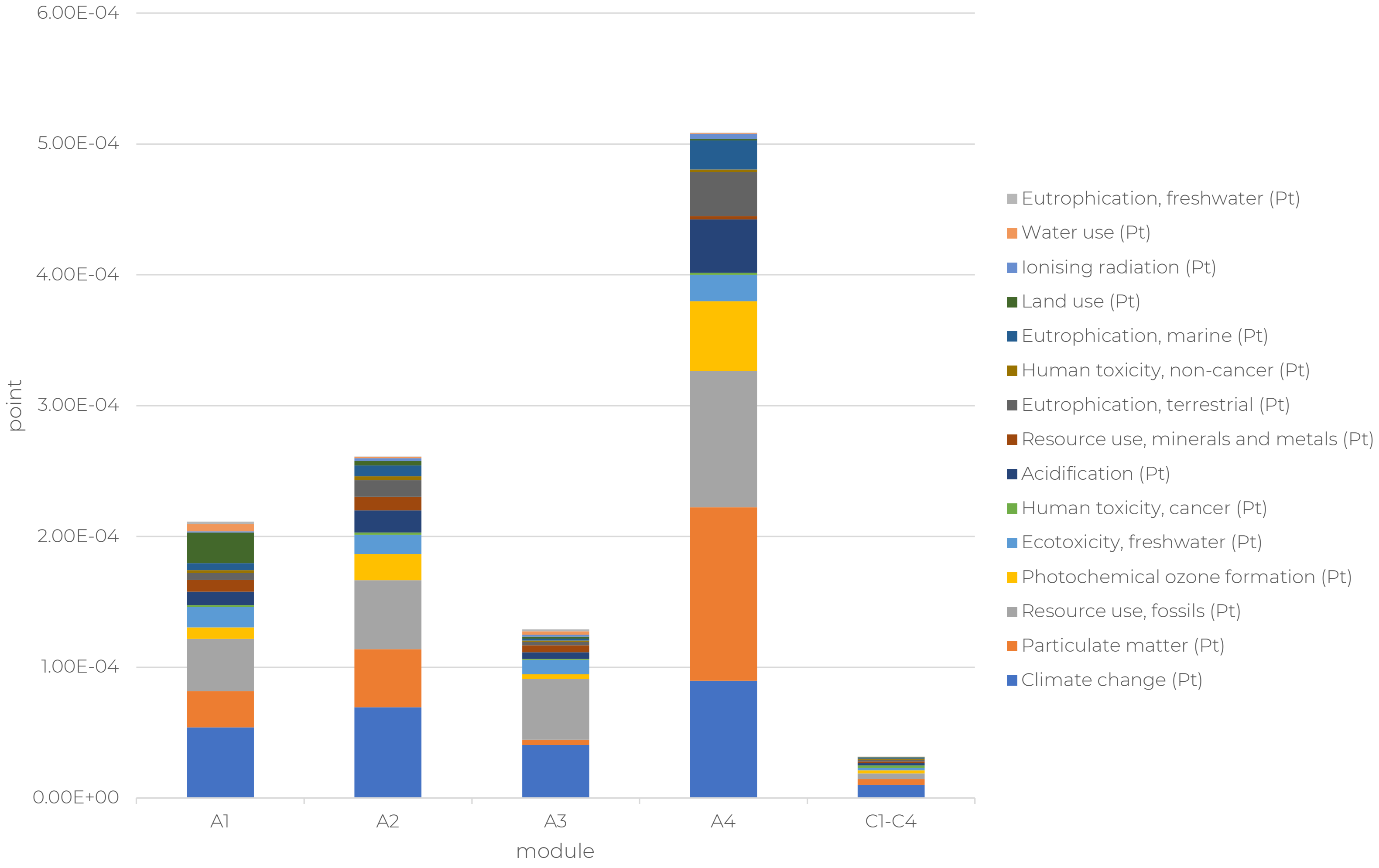
The environmental footprint endpoint shows the contribution of each environmental impact category to the total environmental impact.

Graph 1.7, Environmental Footprint Endpoint (a-c)

Environmental Footprint endpoint, singlescore



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Share of environmental impact per impact category

Interpretation

In this chapter the results of the LCA calculations of the product are highlighted and discussed.

The environmental profile consists of 15 environment impact categories, 11 resources use and 8 output flows and waste categories. The impact categories can be expressed using a common unit [5].
This is done since the impacts of the emissions are similar, but the type of emission varies a great deal. In order to unite the various emissions, they have been collected into impact categories [5]. The data of the impact categories are presented on pages 37-48.

The values of the impact categories are calculated in the following manner: all environmental emissions from the inventory are multiplied by the characterization factors from the CML-VLCA impact assessment method, after which these values are added up to provide the total environmental impact per impact category. These LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The LCA profile of the product is presented in the previous section.

Interpretation

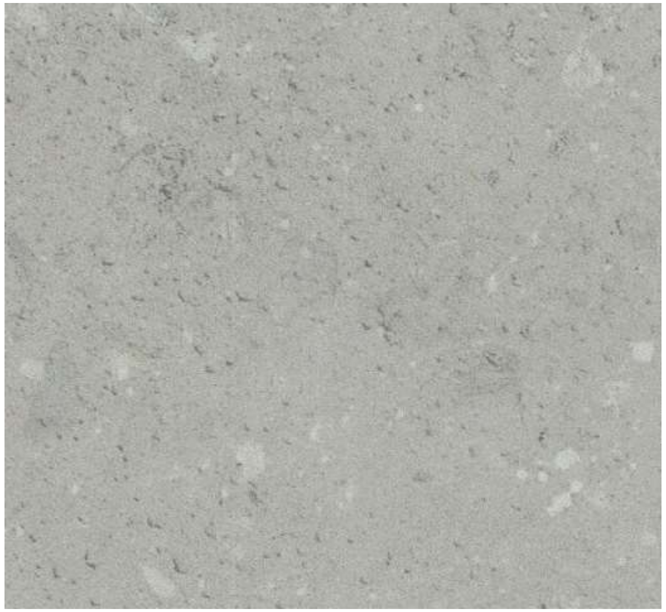
The total environmental impact, GWP-t, has been estimated to 3.46E+01 kg CO_2 eq.

Dominant phase of the lifecycle

The environmental impact, of the product in a lifecycle perspective, comes mainly from A1 and C1-C4. The typical GWP impact of A1 is approx. 24 % of the total GWP where C1-C4 contributes with 53 %, as seen in graph 1.1.

Dominant single component

Of the raw materials, the largest contribution comes from the compact laminate plates with 8.56 kg CO_2 eq. and the overall largest contributor is the waste treatment of the compact laminate plates, with a contribution of 17.63 kg CO_2 eq.



Sensitivity Analysis

Based on the analysis results it can be seen that the compact laminate board itself have a large impact on the total GWP of the product with 8.56 kg CO2 eq.

In order to examine the impact of compact laminate board in the product, a sensitivity analysis was conducted with a change in the amount of compact laminate board .

The amount of compact laminate board was changed from 17 kg to 16.15 kg and 17.85 kg, respectively. The results of the analysis can be seen in table 16.

The result for GWP is approx. +-4 % change when the compact laminate board amount used is change with +-5 %.

Since the compact laminate board is the product, reducing this, by e.g. making thinner tabletops, in order to provide a significant reduction, would likely influence the quality of the product.

Produktnavn	GWP in end product [kg]	Deviation [%]
Compact laminate board reduced with 5 % (16.15 kg)	23.65	-4
17 kg Compact laminate board pr. 1 m2 Kompaktlaminat	24.59	//
Compact laminate board increased with 5 % (17.85 kg)	25.54	+4

Table 16; Result of sensitivity analysis.

Summary

This LCA report is based on data that gives the manufacture and overview of the environmental impact of the product Kompaktlaminat. The total environmental impact, GWP-t, has been estimated to 3.46E+01 kg CO_2 eq.

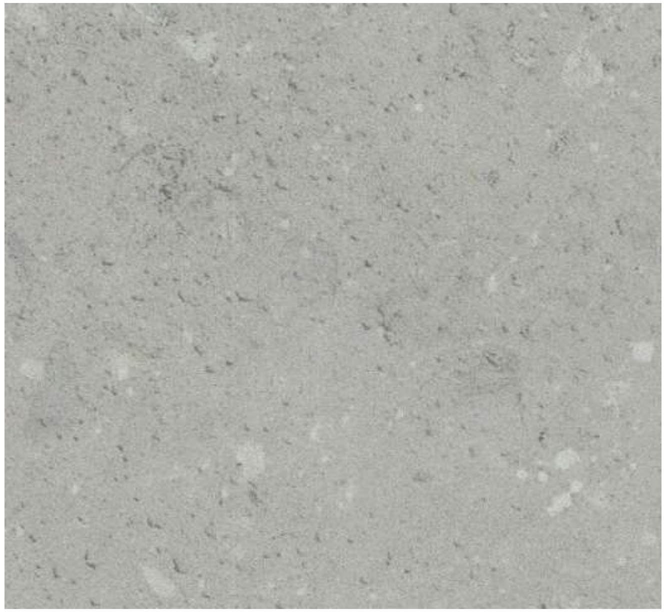
The data foundation in this LCA can be used to upgrade Kompaktlaminat to an EPD.

Data has been received but not controlled and verified.

This part will be mandatory for a 3. part independent verification.

An EPD can be required for product/article that are used directly in construction work of a building.

Kompaktlaminat is part of a product/article and do not require an EPD.



References

1] ISO 14040 DS/EN ISO 14040:2008 – " Environmental management – Life cycle assessment – Principles and framework".

[2] ISO 14044 DS/EN ISO 14044:2008 – " Environmental management – Life cycle assessment – Requirements and guidelines".

[3] ISO 14025 DS/EN ISO 14025:2010 – " Environmental labels and declarations – Type III environmental declarations – Principles and procedures".

[4] EN 15804 DS/EN 15804 + A2:2019 - "Sustainability of construction works – Environmental product declarations – Core rules for the products category of construction products".

[5] Ecochain 4.0.3, 2023, web http://app.Ecochain.com.

[6] Horn Bordplader A/S 2023, web https://www.hornbordplader.dk/dk/

[8] The Hitch Hiker's Guide to LCA: An Orientation in Life Cycle Assessment Methodology and Application, H. Baumann and A. M. Tillman, 2004

[9] EPD https://www.pfleiderer.com/file_pim/Dokumente/environmental-product-declaration-epd-im0028809.pdf

Clarification of expressions and abbreviations used in the report

WDP – Water Deprivation Potential
ADP – Abiotic depletion potential
CO_2 eq. – Carbon dioxide equivalents
EPD – Environmental products Declaration
GWP – Global Warming Potential
ISO – International Organization for Standardization
IPCC – Intergovernmental Panel on Climate Change
LCA – Life Cycle Assessment
LCI – Life Cycle Inventory Analysis
LCIA – Life Cycle Impact Assessment
LULUC - Land Uses and Land-use Changes
PCR - products Category Rules
RER – The European region
RoW – Rest of the world
GLO – Global
CTUe – Comparative Toxic Unit equivalent
CTUh – Comparative Toxic Unit for human
NMVOC – Non-Methane Volatile Organic Compounds
POCP – Photochemical ozone creation potential
APOS – Allocation at the point of substitution (system model in ecoinvent)
SQP – Potential soil quality index

Cut-off – Allocation cut off by classification (system model in ecoinvent)
Environmental aspect - An activity that might contribute to an environmental effect, for example, "electricity usage".
Environmental effect - An outcome that might influence the environment negatively (Environmental impact), for example, "Acidification", "Eutrophication" or "Climate change".
Environmental impact - The damage to a safeguarding object (i.e., human health, ecosystems, health, and natural resources).
Life Cycle Inventory (LCI) data – Inventory of input and output flows for a products system

Environment Impact Parameters

Climate change (GWP)

This indicator refers to the increase in the average global temperatures as result of greenhouse gas (GHG) emissions. The greatest contributor is generally the combustion of fossil fuels such as coal, oil, and natural gas. The global warming potential of all GHG emissions is measured in kilogram of carbon dioxide equivalent (kg CO_2 eq), namely all GHG are compared to the amount of the global warming potential of 1 kg of CO_2 .

Particulate Matter (PM)

This indicator measures the adverse impacts on human health caused by emissions of Particulate Matter (PM) and its precursors (e.g. NO_x , SO_2). Usually, the smaller the particles, the more dangerous they are, as they can go deeper into the lungs. The potential impact of is measured as the change in mortality due to PM emissions, expressed as disease incidence per kg of PM2.5 emitted.

Ionising radiation (IR)

The exposure to ionising radiation (radioactivity) can have impacts on human health. The Environmental Footprint only considers emissions under normal operating conditions (no accidents in nuclear plants are considered). The potential impact on human health of different ionising radiations is converted to the equivalent of kilobequerels of Uranium 235 (kg U235 eq).

Eutrophication, terrestrial (EP-t)

Eutrophication impacts ecosystems due to substances containing nitrogen (N) or phosphorus (P). These nutrients cause a growth of algae or specific plants and limit growth in the original ecosystem. The potential impact of substances contributing to terrestrial eutrophication is converted to the equivalent of moles of nitrogen (mol N eq).

Eutrophication, freshwater (EP-fw)

Eutrophication impacts ecosystems due to substances containing nitrogen (N) or phosphorus (P). If algae grows too rapidly, it can leave water without enough oxygen for fish to survive. Nitrogen emissions into the aquatic environment are caused largely by fertilizers used in agriculture, but also by combustion processes. The most significant sources of phosphorus emissions are sewage treatment plants for urban and industrial effluents and leaching from agricultural land. The potential impact of substances contributing to freshwater eutrophication is converted to the equivalent of kilograms of phosphorus (kg P eq).

Ozone depletion (ODP)

The stratospheric ozone (O_3) layer protects us from hazardous ultraviolet radiation (UV-B). Its depletion increases skin cancer cases in humans and damage to plants. The potential impacts of all relevant substances for ozone depletion are converted to their equivalent of kilograms of trichlorofluoromethane (also called Freon11 and R-11), hence the unit of measurement is in kilogram of CFC-11 equivalent (kg CFC-11 eq).

Acidification (AP)

Acidification has contributed to a decline of coniferous forests and an increase in fish mortality. Acidification can be caused by emissions getting into the air, water and soil. The most significant sources are combustion processes in electricity, heating production, and transport. The contribution to acidification is greatest when the fuels contain a high level of sulphur. The potential impact of substances contributing to acidification is converted to the equivalent of moles of hydron (general name for a cationic form of atomic hydrogen, mol H^+ eq).

Eutrophication, marine (EP-m)

Eutrophication impacts ecosystems due to substances containing nitrogen (N) or phosphorus (P). As a rule, the availability of one of these nutrients will be a limiting factor for growth in the ecosystem, and if this nutrient is added, the growth of algae or specific plants will be increased. For the marine environment this will be mainly due to an increase of nitrogen (N). Nitrogen emissions are caused largely by the agricultural use of fertilizers, but also by combustion processes. The potential impact of substances contributing to marine eutrophication is converted to the equivalent of kilograms of nitrogen (kg N eq).

Human toxicity, non-cancer (HTNC)

This indicator refers to potential impacts on human health caused by absorbing substances through the air, water, and soil. Direct effects of products on humans are currently not measured. The unit of measurement is Comparative Toxic Unit for humans (CTUh). This is based on a model called USEtox.

Photochemical ozone formation (POCP)

Ozone (O_3) on the ground (in the troposphere) is harmful: it attacks organic compounds in animals and plants, it increases the frequency of respiratory problems when photochemical smog ("summer smog") is present in cities. The potential impact of substances contributing to photochemical ozone formation is converted into the equivalent of kilograms of Non-Methane Volatile Organic Compounds (e.g. alcohols, aromatics, etc.; kg NMVOC eq).

Ressource use, fossils (ADP-f)

The earth contains a finite amount of nonrenewable resources, such as fossil fuels like coal, oil and gas. The basic idea behind this impact category is that extracting resources today will force future generations to extract less or different resources. For example, the depletion of fossil fuels may lead to the non-availability of fossil fuels for future generations. The amount of materials contributing to resource use, fossils, are converted into MJ.

Ecotoxicity, freshwater (ETF)

This indicator refers to potential toxic impacts on an ecosystem, which may damage individual species as well as the functioning of the ecosystem. Some substances have a tendency to accumulate in living organisms. The unit of measurement is Comparative Toxic Unit for ecosystems (CTUe). This is based on a model called USEtox.

Human toxicity, cancer (HTC)

This indicator refers to potential impacts on human health caused by absorbing substances through the air, water and soil. Direct effects of products on humans are currently not measured. The unit of measurement is Comparative Toxic Unit for humans (CTUh). This is based on a model called USEtox.

Water use (WDP)

The withdrawal of water from lakes, rivers or groundwater can contribute to the 'depletion' of available water. The impact category considers the availability or scarcity of water in the regions where the activity takes place, if this information is known. The potential impact is expressed in cubic metres (m3) of water use related to the local scarcity of water.

Land Use (SQP)

Use and transformation of land for agriculture, roads, housing, mining or other purposes. The impacts can vary and include loss of species, of the organic matter content of soil, or loss of the soil itself (erosion). This is a composite indicator measuring impacts on four soil properties (biotic productsion, erosion resistance, groundwater regeneration and mechanical filtration), expressed in points (Pts).

Resource use, minerals and metals (ADP-mm)

The basic idea behind this impact category is the same as the one behind the impact category resource use, fossils (namely, extracting a high concentration of resources today will force future generations to extract lower concentration or lower value resources). The amount of materials contributing to resource depletion are converted into equivalents of kilograms of antimony (kg Sb eq).

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