AMORIM SPORTS

Life Cycle Assessment of Amorim Organic Infills

Independent life cycle analysis (LCA) conducted by Itecons. This LCA was conducted in accordance with the Product Environmental Footprint (PEF) methodology.

Life Cycle Model

Product characteristics	Infill | Amorim Organic 201	Infill | Amorim Organic 202
Particle size (mm)	1 - 3	1 - 3
Density (kg/m^3)	590 +/- 6%	450 +/- 10%
Moisture content (%)	<20	<20

Context and Objective of the LCA Study

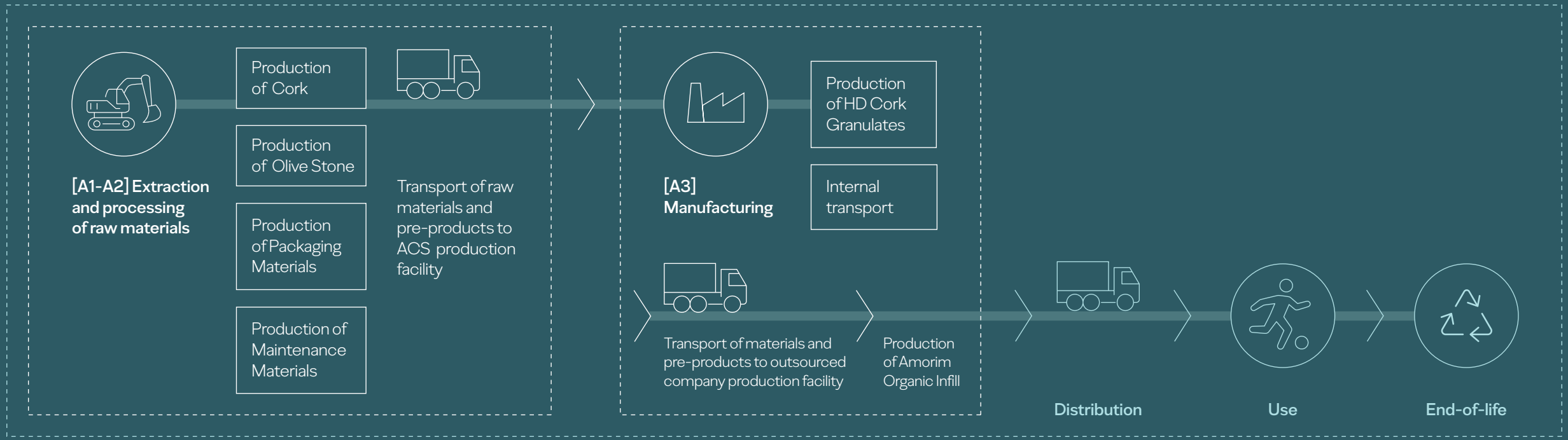
Goals

- To quantify the environmental footprint of Amorim infills, according to PEF method.

Declared unit

- 1 kg of Amorim Infill for artificial turf (packaging included).

System boundaries · Cradle-to-gate

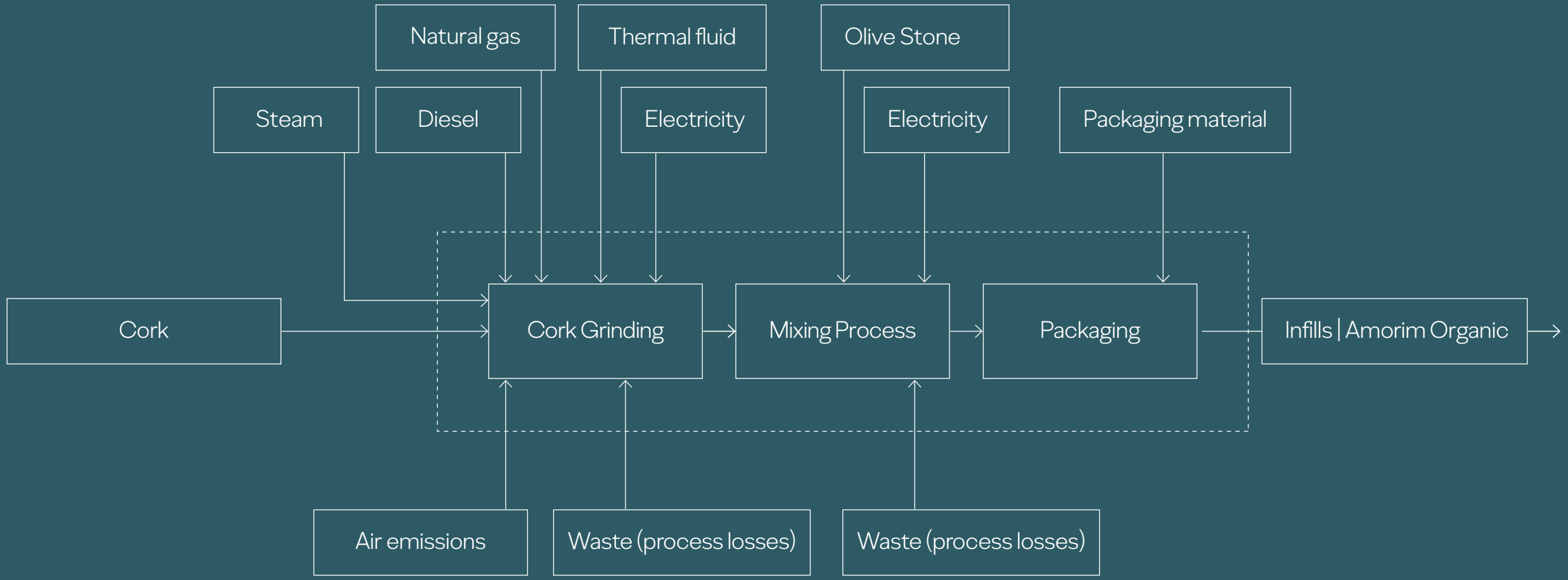


Main Assumptions

ACV cradle-to-gate:

- Modules A1-A3 cover the extraction, production and acquisition of the main raw materials and pre-products, as well as electricity and fuel production. Transport of all raw materials considered in module A1 to the factory gate and production of the final products including waste and emissions.
- A percentage of additional material (by mass) was considered to include losses in the production process.
- The content of CO_2 was calculated according to standard EN 16449.

Production Process · Amorim Nature Infills



Life cycle Inventory

Biogenic Carbon Content at Factory Gate and Recycled Content

Impact category	Infill | Amorim Organic 201	Infill | Amorim Organic 202
Carbon fraction in cork (c_f)	0,55	0,55
Carbon fraction in olive stone (c_f)	0,45	0,45
Product volume (v_w)	1,00	1,00
Moisture content ($_w$)	0,20	0,20
Density (p_w)	590,00	440,00
Amount of CO_2 stored (kg CO_2 /m^3)	812,16	778,43
Amount of CO_2 stored (kg CO_2 /kg)	1,40	1,41
Biogenic carbon content (kg C)	0,38	0,39

Recycled content (R1):

64% of the cork used is recycled (i.e. by-products from other production processes and waste from end users).

Life cycle Impacts Assessment

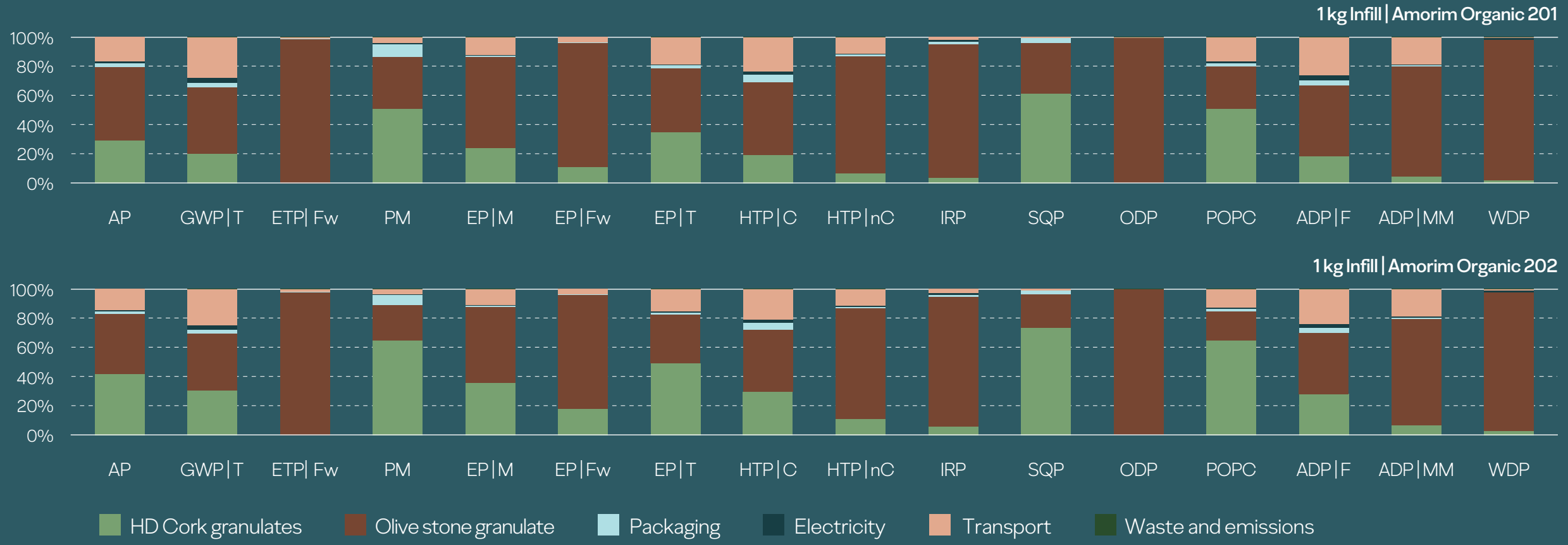
EF Impact Category	Impact Category Indicator	Unit	Characterisation model
Acidification (AP)	Accumulated Exceedance (AE)	mol H^+ eq.	Accumulated Exceedance (Seppälä et al. 2006; Posch et al. 2008)
Climate change (GWP|T)	Global Warming Potential (GWP100)	kg CO_2 eq.	Baseline model of 100 years of the IPCC (based on IPCC 2021)
Ecotoxicity, freshwater (ETP|Fw)	Comparative Toxic Unit for ecosystems (CTUe)	CTUe	Based on USEtox 2.1 model (Fantke et al. 2017), adapted as in (Saouter et al. 2018)
Particulate matter (PM)	Impact on human health	disease inc.	PM model (Fantke et al. 2016) in (UNEP2016)
Eutrophication, marine (EP|M)	Fraction of nutrients reaching marine end compartment (N)	kg N eq.	EUTREND model (Struijs et al. 2009) as applied in ReCiPe
Eutrophication, freshwater (EP|Fw)	Fraction of nutrients reaching freshwater end compartment (P)	kg P eq.	EUTREND model (Struijs et al. 2009) as applied in ReCiPe
Eutrophication, terrestrial (EP|T)	Accumulated Exceedance (AE)	mol N eq.	Accumulated Exceedance (Seppälä et al. 2006; Posch et al. 2008)
Human toxicity, cancer (HTP|C)	Comparative Toxic Unit for humans (CTUh)	CTUh	Based on USEtox 2.1 model (Fantke et al. 2017), adapted as in (Saouter et al. 2018)
Human toxicity, non-cancer (HTP|nC)	Comparative Toxic Unit for humans (CTUh)	CTUh	Based on USEtox 2.1 model (Fantke et al. 2017), adapted as in (Saouter et al. 2018)
Ionising radiation (IRP)	Human exposure efficiency relative to U^{235}	kBq U^{235} eq.	Human health effect model as developed by Dreicer et al. 1995 (Frischknecht et al. 2000)
Land use (SQP)	Soil quality index	Pt	Soil quality index based on LANCA model (De Laurentiis et al. 2019) and on LANCA CF version 2.5 (Horn and Maier 2018)
Ozone depletion (ODP)	Ozone Depletion Potential (ODP)	kg CFC-11 eq.	EDIP model based on the ODPs of the World Meteorological Organisation (WMO) over an infinite time horizon (WMO 2014 + integrations)
Photochemical ozone formation (POPC)	Tropospheric ozone concentration increase	kg NMVOC eq.	LOTOS-EUROS model (van Zelm et al. 2008) as applied in ReCiPe 2008
Resource use, fossils (ADP|F)	Abiotic resource depletion – fossil fuels (ADP-fossil)	MJ	van Oers et al. 2002 as in CML 2002 method v4.8
Resource use, minerals and metals (ADP|MM)	Abiotic resource depletion (ADP ultimate reserves)	kg Sb eq.	van Oers et al. 2002 as in CML 2002 method v4.8
Water use (WDP)	User deprivation potential (deprivation-weighted water consumption)	m^3 world eq. deprived	Available WAter REmaining (AWARE) model (Boulay et al. 2018; UNEP 2016)

Database: EF Database v3.1 · Software: SimaPro v10.2

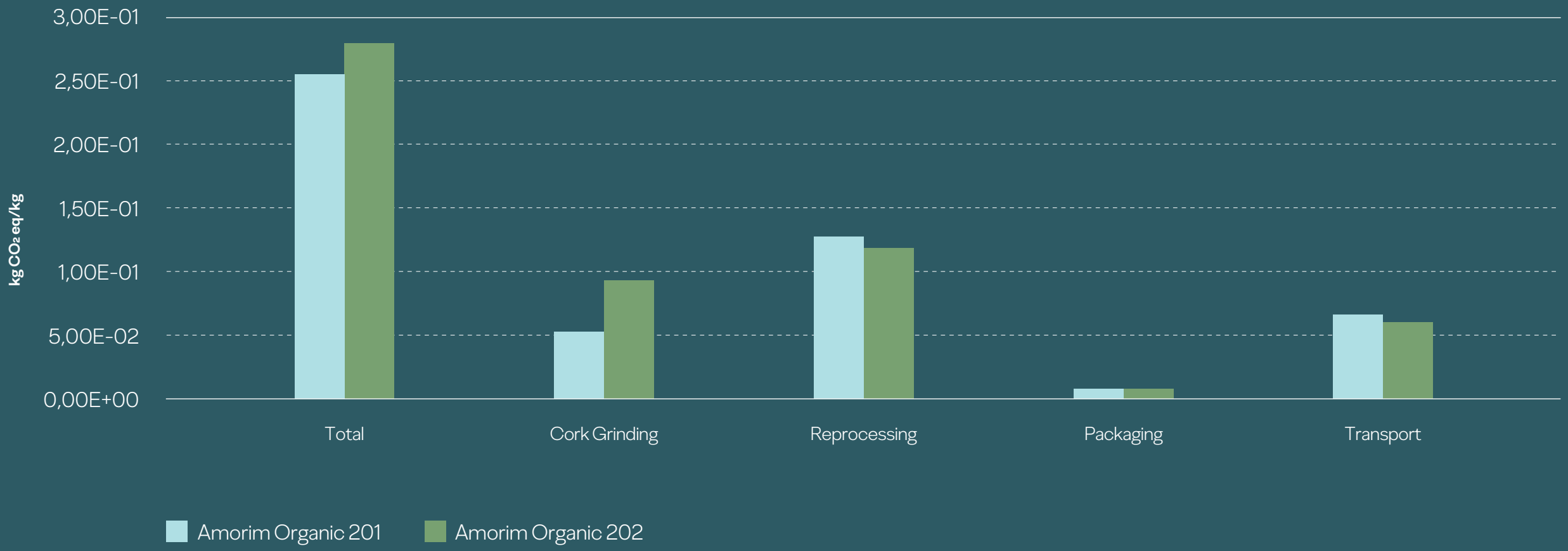
Cradle-to-gate · For Inventory Element

Inventory elements that most contribute to the environmental impact is:

- HD cork granules
- Olive stone granulate



Cradle-to-gate · GWP



Conclusions Amorim Organic Infills

With this study it was concluded that:

- The most important impact categories are Ecotoxicity – freshwater, Water use, Climate change, Land use, Resource use – fossil and Particulate matter.
- The most relevant life cycle stage is [A1-A2] Raw material acquisition and preprocessing.
- There was 1 most relevant process identified for ecotoxicity – freshwater and water use, 2 for land use, 3 for climate change and resource use – fossil, 4 (Organic 201)/3 (Organic 202) for particulate matter. The most relevant processes are Olive Stone, Cork, Transport and Direct Emissions from Grinding process.

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Thank you!

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