LIFE CYCLE ANALYSIS

EVA BIO PHOENIX

Developed by:

INESCOP
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ABBREVIATED TERMS

LCA	Life Cycle Assessment
$CO_{2\,eq}$	Carbon dioxide equivalent
LC	Life Cycle
EF	Environmental Footprint
EI	Environmental Impact
EF	Emission Factor
GHG	Greenhouse Gases
CFP	Carbon Footprint of a Product
LCI	Life Cycle Inventory
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
FU	Functional Unit

DEFINITIONS

Life cycle Assessment (LCA): Methodology used to evaluate the environmental impacts derived from the different phases of a product's life cycle (from the extraction of the raw materials that make up the product, through its manufacture, distribution and use to the end-of-life treatment at the end of its useful life, among other phases).

Environmental aspect: An element of an organisation's activities, products or services that interacts or can interact with the environment (ISO 14001: 2015).

Climate change: Climate change is an impact affecting the environment on a global scale. The consequences include increased average global temperatures and sudden regional climatic changes. All inputs or outputs that result in greenhouse gas emissions.

Characterisation: Calculation of the magnitude of the contribution of each classified input/output to their respective EF impact categories, and aggregation of contributions within each category. This requires a linear multiplication of the inventory data with characterisation factors for each substance and EF impact category of concern. For example, with respect to the EF impact category "climate change", CO_2 is chosen as the reference substance and kg CO_2-equivalents as the reference unit.

Life cycle (LC): Consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal.

CO_2 equivalent (CO_2eq): Quantitative measure of the carbon footprint. It represents the total Greenhouse Gas (GHG) emissions)

Cradle to Gate: A partial product supply chain, from the extraction of raw materials (cradle) up to the manufacturer's "gate". The distribution, storage, use and end of life stages of the supply chain are omitted.

Extrapolated Data: Refers to data from a given process that is used to represent a similar process for which data is not available, on the assumption that it is reasonably representative.

Carbon Footprint of a Product (CFP): Sum of greenhouse gas emissions and removals in a product system, expressed as CO_2 equivalents and based on a life cycle assessment CV.

Environmental impact: Any change to the environment, whether adverse or beneficial, that wholly or partially results from an organisation's activities, products, or services.

Life cycle inventory (ICV): Document describing and quantifying the material and energy input and output flows that occur throughout the life cycle of a product.

Environmental Footprint (EF) Impact Assessment method: Protocol for quantitative translation of life cycle inventory data into contributions to an environmental impact of concern.

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Normalisation: After the characterisation step, normalisation is the step in which the life cycle impact assessment results are multiplied by normalisation factors that represent the overall inventory of a reference unit (e.g., a whole country or an average citizen). Normalised life cycle impact assessment results express the relative shares of the impacts of the analysed system in terms of the total contributions to each impact category per reference unit. When displaying the normalised life cycle impact assessment results of the different impact topics next to each other, it becomes evident which impact categories are affected most and least by the analysed system. Normalised life cycle impact assessment results reflect only the contribution of the analysed system to the total impact potential, not the severity/relevance of the respective total impact. Normalised results are dimensionless, but not additive.

Functional unit: The functional unit defines the qualitative and quantitative aspects of the function(s) and/or service(s) provided by the product being evaluated.

1. SUMMARY

This Life Cycle Assessment report shows the results of the environmental footprint study carried out by INESCOP on sustainable EVA pellets as compared to conventional pellets, both intended for footwear soles and accessories and produced by TECNIFOAM, VAT ID No.: B02370765, domiciled in Calle Colón, 69, 02660 Caudete, Albacete (Spain).

The aim of the study is to analyse all the environmental impacts at the different stages of the life cycle in order to identify the "hot spots" and thus improve the environmental performance of the model by means of eco-design, thus making the environmental friendliness an additional feature of the product and reducing the environmental impacts derived from its life cycle.

To carry out the LCA, the SimaPro tool and the Ecoinvent database were used, which incorporates the emission factors (EF) associated with the processes and materials, together with the data provided by the manufacturer and collected in the LCI; the data gaps were filled in accordance with the indications given in the literature and in agreement with the manufacturer.

This study was carried out by INESCOP in the framework of the IVACE ACVSHOES-IMDEEA/2020/41 project, according to the documents listed in the bibliography.

Technical data sheets of the components under study

Table 1: Summary data sheets of the components under study

Type of product: pellets	
Functional unit: 1 kg of pellets	Functional unit: 1 kg of pellets
Calculation period: October-November 2020	Calculation period: October-November 2020
FU weight (g): 1,000g	FU weight (g): 1,000g
Carbon Footprint: 2.83 Kg CO_{2eq}	Carbon Footprint: 2.27 Kg CO_{2eq}
	
Product details: conventional EVA pellets developed by Tecnifoam from various virgin raw materials.	Product details: EVA BIO PHOENIX pellets of renewable and recycled origin, developed by Tecnifoam from biobased EVA obtained from sugar cane and waste from shoe soles.

2. GENERAL

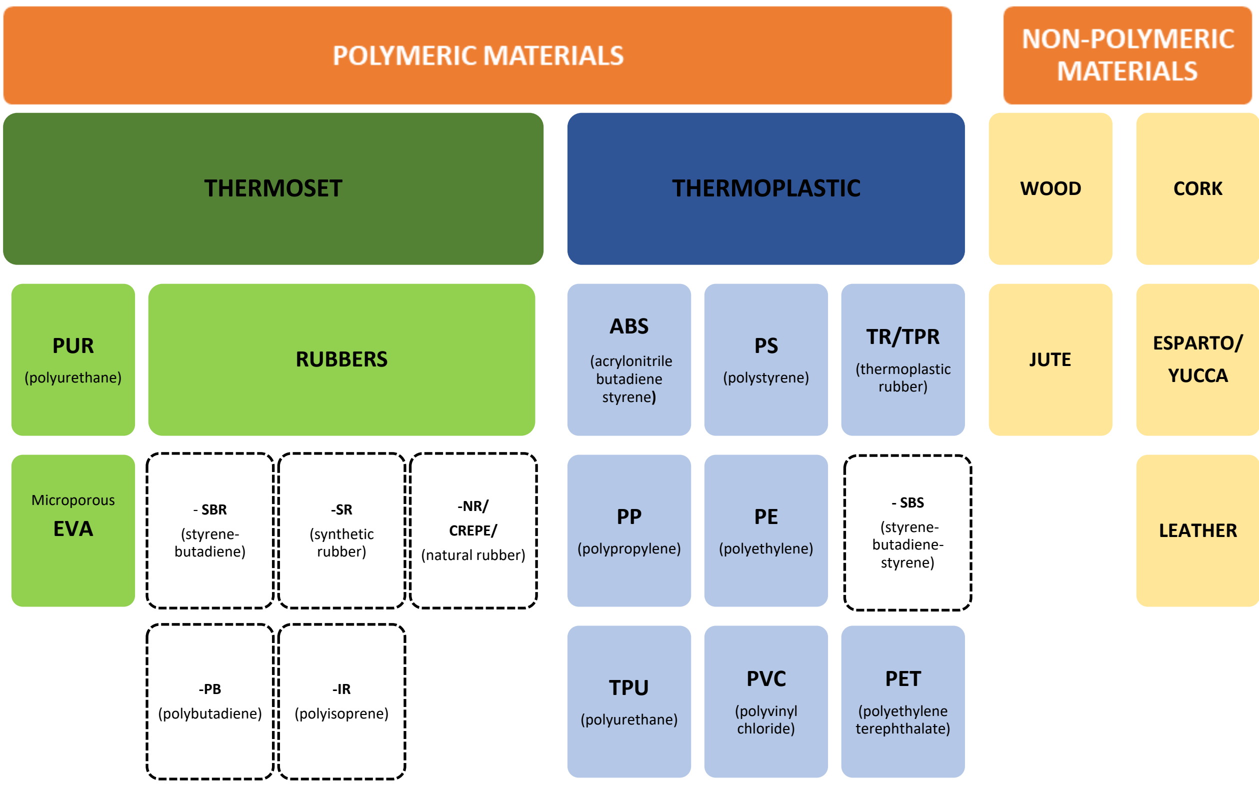
As concern for sustainability grows in society, the environment is regaining its place in industry. With the aim of implementing sustainable development, new ways of measuring and evaluating, both qualitatively and quantitatively, the environmental impact of products, services and organisations are emerging.

This report should not be used for a communication on the overall environmental superiority of a product over another product that has not followed the same method and considerations.

This report summarises the results of the Life Cycle Assessment (LCA) obtained by INESCOP for conventional and sustainable EVA pellets obtained from the manufacturing process conducted by TECNIFOAM, according to the rules set out in the Product Environmental Footprint Category Rules (PEFCR). The calculations were made using the SimaPro software and the Ecoinvent database, and the emission factors (EF) used in the calculation were mainly based on the "EF method 2.0".

EVA (ethylene-vinyl acetate) is a thermosetting polymer material, widely used in the footwear industry as a soling material due to its lightweight and flexible properties.

Figure 1: Most commonly used materials in shoe soles



3. GOAL OF THE STUDY

The goal of this study is to quantify the environmental performance of the product and more specifically to identify the "hot spots", i.e., those stages and processes of the life cycle where the environmental impacts are most significant.

To this end, the environmental impact of all stages of the life cycle from cradle to gate in the different categories of environmental impact was evaluated. For better understanding, in addition to the complete analysis in the various impact categories, an exhaustive study was carried out of the effects on climate change in terms of greenhouse gas (GHG) emissions through the carbon footprint indicator expressed in kg of CO_{2eq} emitted. Knowing the environmental impact of the product by means of a recognised method and tools allows an objective and reliable evaluation of the sustainability of the product.

This report was prepared in the framework of the **ACVSHOES** project, which seeks to analyse and demonstrate the environmental improvement of sustainable footwear components over those used conventionally and serve as a basis for developing efficient solutions for eco-designing, manufacturing, and recycling, in order to obtain shoes with a smaller environmental footprint. The objectives of the project are aligned with the design, innovation, and development of sustainable footwear components that TECNIFOAM is carrying out.

With this report, TECNIFOAM can identify, analyse, assess, and propose improvements in the environmental performance of their product and the company, since the results obtained identify the production stages and unit processes that cause the greatest environmental impacts and allow for the greatest opportunities for improvement in order to reduce emissions.

4. SCOPE OF THE STUDY

4.1. Functional unit and reference flow

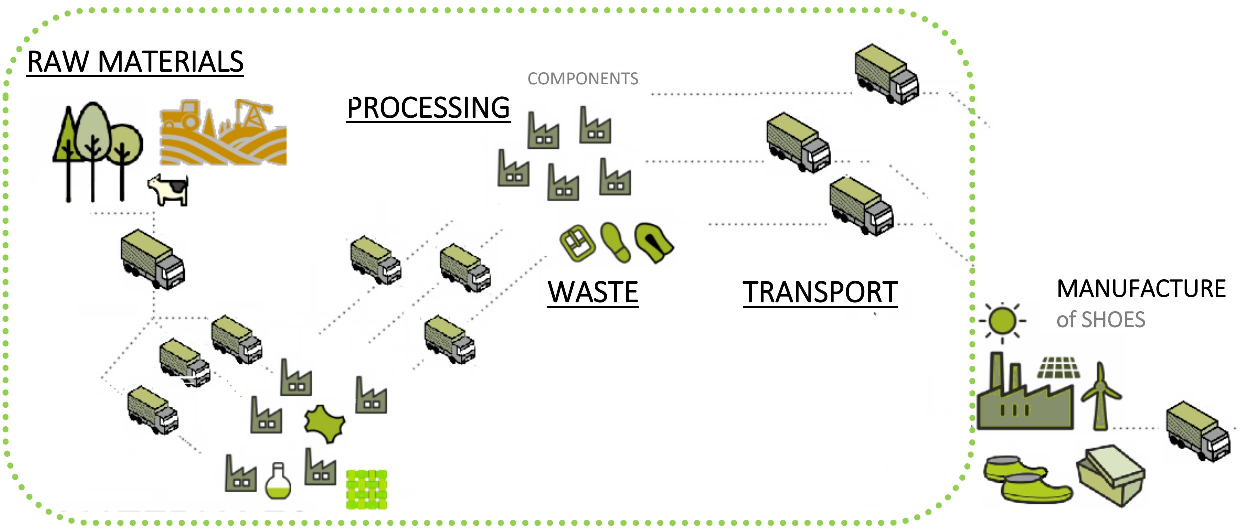
The product assessed corresponds to EVA pellets used to produce footwear components. The table below defines the key aspects used to define the Functional Unit (FU)

Functional Unit (FU)

1 kg of pellets

The reference flow has been defined as "1 kg of pellets" from the extraction of the raw materials and their pre-processing (cradle) to the production, distribution, and sale (gate), as shown in the following diagram:

Figure 2: LCA reference flow



4.2. System boundaries

The system boundaries were defined, and an inventory (LCI) was completed with the data provided by the producing company. The data gaps were filled with generic data from the literature and the assumptions made were in accordance with the indications given by the manufacturers.

System boundaries include transport between life cycle stages, as well as inputs and outputs of materials and energy, co-products, and waste.

4.3. Environmental Footprint Impact Categories

LCA results are shown for different categories of environmental impact. This allows one to know how the product behaves with respect to different environmental aspects, such as its interaction with water resources, with the depletion of the ozone layer or with the GHG (Greenhouse Gas) emissions into the atmosphere.

Table 2: Environmental Footprint impact categories chosen for the LCA

EF Impact Category	Impact Category Indicator	Unit
Climate Change, total	Radiative forcing as global warming potential (GWP100)	kg CO_2 eq
Ozone depletion	Ozone Depletion Potential (ODP)	kg CFC-11 $_{eq}$
Human toxicity, cancer	Comparative Toxic Units for humans (CTUh)	CTUh
Human toxicity, non-cancer	Comparative Toxic Units for humans (CTUh)	CTUh
Particulate matter	Impact on human health	disease incidence
Ionising radiation, human health	Human exposure efficiency relative to U^{235}	kBq $U^{235}{}_{eq}$
Photochemical ozone formation, human health	Tropospheric ozone concentration increase	kg NMVOC $_{eq}$
Acidification	Accumulated Exceedance (AE)	Mol $H^+{}_{eq}$
Eutrophication, terrestrial	Accumulated Exceedance (AE)	Mol N $_{eq}$
Eutrophication, freshwater	Fraction of nutrients reaching freshwater end compartment (P)	kg P $_{eq}$
Eutrophication, marine	Fraction of nutrients reaching marine end compartment (N)	kg N $_{eq}$
Land use	Soil quality index Biotic production Erosion resistance Mechanical filtration Groundwater replenishment	Dimensionless (pt) kg biotic production kg soil m^3 water m^3 ground water
Water use	User deprivation potential (deprivation-weighted water consumption)	m^3 world eq
Resource use, minerals and metals	Abiotic resource depletion (ADP ultimate reserves)	kg Sb $_{eq}$
Resource use, fossils	Abiotic resource depletion – fossil fuels (ADP – fossil)	MJ

Annex II shows a brief description of these categories.

The calculations were made using the reference software SimaPro, the Ecoinvent database and the EU's EF2.0 calculation method, including the toxicity categories. This makes the study **transparent**, **objective**, and **repeatable**.

4.4. Assumptions and limitations

In order to analyse such a complex production system, it is necessary to establish premises that allow a reliable approach. The following are the premises adopted, as well as the main limitations and assumptions made.

The absence of a final version of PEFCRs (Product Environmental Footprint Category Rules) for footwear, i.e., product environmental footprint category rules that allow the use of harmonised considerations for footwear: For this study the current draft of the PEFCR for footwear was used as a guide, in accordance with the indications given by SAC (Sustainable Apparel Coalition) in the current development of the PEF document for footwear products.

The absence of some secondary data in the composition of materials, waste and transport used in the production of the material under study: In order to fill these data gaps, generic data were used in accordance with the manufacturer's indications, always following the principle of conservation: when in doubt as to the choice of a process, material, etc., the most unfavourable option with the greatest impact is always chosen. The distribution and sale of sheets was calculated according to TECNIFOAM’s indications.

The calculations of the biobased sugar cane pellets were based on the producer's data, where the process and the impacts derived from the sugar cane cultivation in Brazil, the extraction process, and the adequacy of the obtained bioethanol, as well as the following processing steps of this material and the necessary transport to the point of production of the EVA BIO PHOENIX pellets were taken into account.

The recycled material from footwear soles and outsoles was verified through traceability of materials, certifications and documentation provided by TECNIFOAM. The process of adaptation of SBR waste from soles and outsoles and its transport to TECNIFOAM's facilities was considered.

5. IMPACT ASSESSMENT RESULTS

The values obtained from the LCA for the different impact categories at each stage of the product life cycle are shown below, as well as a graphic representation of the overall results.

By assessing different categories, it is possible to know how the product interacts with different environmental aspects, such as water resources, ozone layer depletion or GHG (Greenhouse Gas) emissions. A breakdown of the climate change category into Climate Change, fossil; Climate Change, biogenic; Climate Change, land use and transformation, is shown below.

Table 3: Overall LCA results for each impact category and for the different stages of the conventional product

Company	TECNIFOAM	
Component	EVA pellets	
ID	Conventional EVA	
Weight	1,000 g	
Composition	EVA pellets from virgin raw material developed by TECNIFOAM	Product image

Impact Category	Unit	Total	Raw materials	Processing	Waste	Transport
Climate change	*kg CO2 eq*	**2,83158**	2,33181	0,34259	0,04105	0,11613
Ozone depletion	*kg CFC11 eq*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Ionising radiation	*kBq U-235 eq*	**0,36325**	0,13366	0,21852	0,00221	0,00886
Photochemical ozone formation	*kg NMVOC eq*	**0,01034**	0,00809	0,00137	0,00014	0,00073
Respiratory inorganics	*disease inc.*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Non-cancer human health effects	*CTUh*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Cancer human health effects	*CTUh*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Acidification, terrestrial and freshwater	*mol H+ eq*	**0,01360**	0,00957	0,00319	0,00017	0,00066
Eutrophication, freshwater	*kg P eq*	**0,00065**	0,00048	0,00015	0,00001	0,00001
Eutrophication, marine	*kg N eq*	**0,00276**	0,00199	0,00049	0,00004	0,00023
Eutrophication, terrestrial	*mol N eq*	**0,02812**	0,02000	0,00519	0,00037	0,00256
Ecotoxicity, freshwater	*CTUe*	**1,82675**	1,35848	0,11904	0,03475	0,31447
Land use	*Pt*	**16,86468**	11,72981	2,53853	0,33912	2,25723
Water scarcity	*m3 depriv.*	**1,66304**	1,43625	0,18848	0,02537	0,01294
Resource use, energy carriers	*MJ*	**78,66490**	68,27437	7,48296	1,11407	1,79350
Resource use, mineral and metals	*kg Sb eq*	**0,00001**	0,00001	0,00000	0,00000	0,00000
Climate change - fossil	*kg CO2 eq*	***2,80394***	*2,30927*	*0,33875*	*0,03986*	*0,11606*
Climate change - biogenic	*kg CO2 eq*	***0,00500***	*0,00416*	*0,00072*	*0,00008*	*0,00003*
Climate change - land use and transformation	*kg CO2 eq*	***0,02264***	*0,01838*	*0,00311*	*0,00111*	*0,00004*

Table 4: Overall LCA results for each impact category and for the different stages of the sustainable product

Company	TECNIFOAM	
Component	EVA pellets	
ID	EVA BIO PHOENIX	
Weight	1,000 g	
Composition	Biobased and recycled EVA pellets obtained from sugar cane and recycled footwear materials	Product image

Impact Category	Unit	Total	Raw materials	Processing	Waste	Transport
Climate change	*kg CO2 eq*	**2,26966**	1,77862	0,34259	0,03232	0,11613
Ozone depletion	*kg CFC11 eq*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Ionising radiation	*kBq U-235 eq*	**0,40817**	0,17787	0,21852	0,00291	0,00886
Photochemical ozone formation	*kg NMVOC eq*	**0,00904**	0,00681	0,00137	0,00012	0,00073
Respiratory inorganics	*disease inc.*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Non-cancer human health effects	*CTUh*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Cancer human health effects	*CTUh*	**0,00000**	0,00000	0,00000	0,00000	0,00000
Acidification, terrestrial and freshwater	*mol H+ eq*	**0,01494**	0,01090	0,00319	0,00019	0,00066
Eutrophication, freshwater	*kg P eq*	**0,00066**	0,00049	0,00015	0,00001	0,00001
Eutrophication, marine	*kg N eq*	**0,00385**	0,00307	0,00049	0,00006	0,00023
Eutrophication, terrestrial	*mol N eq*	**0,03782**	0,02955	0,00519	0,00052	0,00256
Ecotoxicity, freshwater	*CTUe*	**2,52470**	2,04558	0,11904	0,04560	0,31447
Land use	*Pt*	**72,55281**	66,55232	2,53853	1,20474	2,25723
Water scarcity	*m3 depriv.*	**1,52416**	1,29953	0,18848	0,02321	0,01294
Resource use, energy carriers	*MJ*	**40,90312**	31,09956	7,48296	0,52710	1,79350
Resource use, mineral and metals	*kg Sb eq*	**0,00001**	0,00001	0,00000	0,00000	0,00000
Climate change - fossil	*kg CO2 eq*	**1,85580**	*1,37587*	*0,33875*	*0,02512*	*0,11606*
Climate change - biogenic	*kg CO2 eq*	**0,03212**	*0,03086*	*0,00072*	*0,00051*	*0,00003*
Climate change - land use and transformation	*kg CO2 eq*	**0,38174**	*0,37190*	*0,00311*	*0,00669*	*0,00004*

5.1. Result interpretation

In order to be able to compare the environmental impact categories with each other, it is necessary to normalise and weight the results. An analysis of the impact categories is shown in the following table.:

Table 5: Comparison of most relevant impact categories for the conventional component. Normalised and weighted results.

Impact Category	Total	Raw materials	Processing	Waste	Transport
Climate change	0,00768	0,00633	0,00093	0,00011	0,00032
Ozone depletion	0,00006	0,00005	0,00001	0,00000	0,00001
Ionising radiation	0,00043	0,00016	0,00026	0,00000	0,00001
Photochemical ozone formation	0,00122	0,00095	0,00016	0,00002	0,00009
Respiratory inorganics	0,00158	0,00130	0,00011	0,00002	0,00015
Non-cancer human health effects	0,00108	0,00081	0,00017	0,00003	0,00007
Cancer human health effects	0,00138	0,00112	0,00019	0,00002	0,00005
Acidification, terrestrial and freshwater	0,00152	0,00107	0,00036	0,00002	0,00007
Eutrophication, freshwater	0,00071	0,00053	0,00016	0,00001	0,00001
Eutrophication, marine	0,00029	0,00021	0,00005	0,00000	0,00002
Eutrophication, terrestrial	0,00059	0,00042	0,00011	0,00001	0,00005
Ecotoxicity, freshwater	0,00030	0,00022	0,00002	0,00001	0,00005
Land use	0,00010	0,00007	0,00002	0,00000	0,00001
Water scarcity	0,00123	0,00106	0,00014	0,00002	0,00001
Resource use, energy carriers	0,01002	0,00870	0,00095	0,00014	0,00023
Resource use, mineral and metals	0,00182	0,00172	0,00003	0,00003	0,00004

Table 6: Comparison of most relevant impact categories for the sustainable component. Normalised and weighted results.

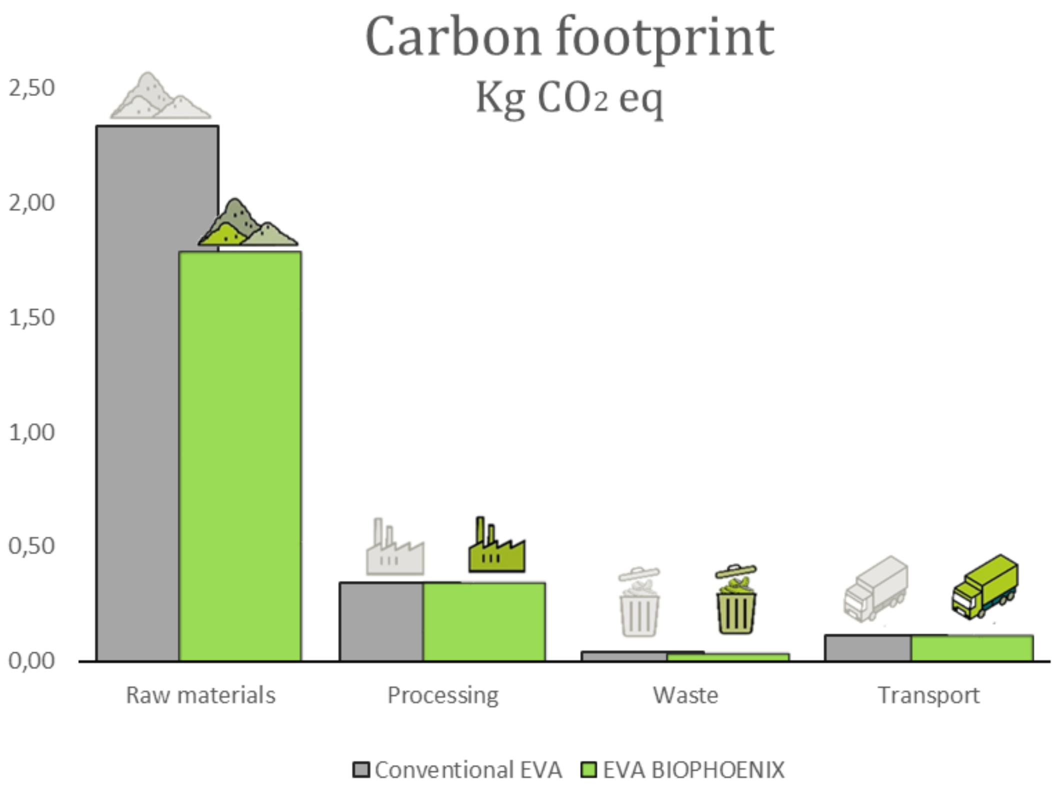
Impact Category	Total	Raw materials	Processing	Waste	Transport
Climate change	0,00616	0,00483	0,00093	0,00009	0,00032
Ozone depletion	0,00007	0,00005	0,00001	0,00000	0,00001
Ionising radiation	0,00048	0,00021	0,00026	0,00000	0,00001
Photochemical ozone formation	0,00106	0,00080	0,00016	0,00001	0,00009
Respiratory inorganics	0,00223	0,00193	0,00011	0,00003	0,00015
Non-cancer human health effects	0,00357	0,00326	0,00017	0,00007	0,00007
Cancer human health effects	0,00169	0,00143	0,00019	0,00003	0,00005
Acidification, terrestrial and freshwater	0,00167	0,00122	0,00036	0,00002	0,00007
Eutrophication, freshwater	0,00072	0,00054	0,00016	0,00001	0,00001
Eutrophication, marine	0,00040	0,00032	0,00005	0,00001	0,00002
Eutrophication, terrestrial	0,00079	0,00062	0,00011	0,00001	0,00005
Ecotoxicity, freshwater	0,00041	0,00033	0,00002	0,00001	0,00005
Land use	0,00043	0,00040	0,00002	0,00001	0,00001
Water scarcity	0,00113	0,00096	0,00014	0,00002	0,00001
Resource use, energy carriers	0,00521	0,00396	0,00095	0,00007	0,00023
Resource use, mineral and metals	0,00181	0,00172	0,00003	0,00003	0,00004

As can be seen in the analysis of environmental categories, the category of climate change and the use of energy resources stand out in the conventional product, at the stage of extraction and pre-processing of raw materials, due to the dependence on oil. A description of the different impact categories assessed can be found in Annex II.

5.1. Carbon Footprint comparison

As this is the most relevant and most widely understood category, the environmental performance of the product at the different stages of the life cycle is analysed in terms of contribution to the climate change impact category. In this aspect, the contribution of each stage to the **Product Carbon Footprint**. (Kg CO_{2eq}) can be determined.

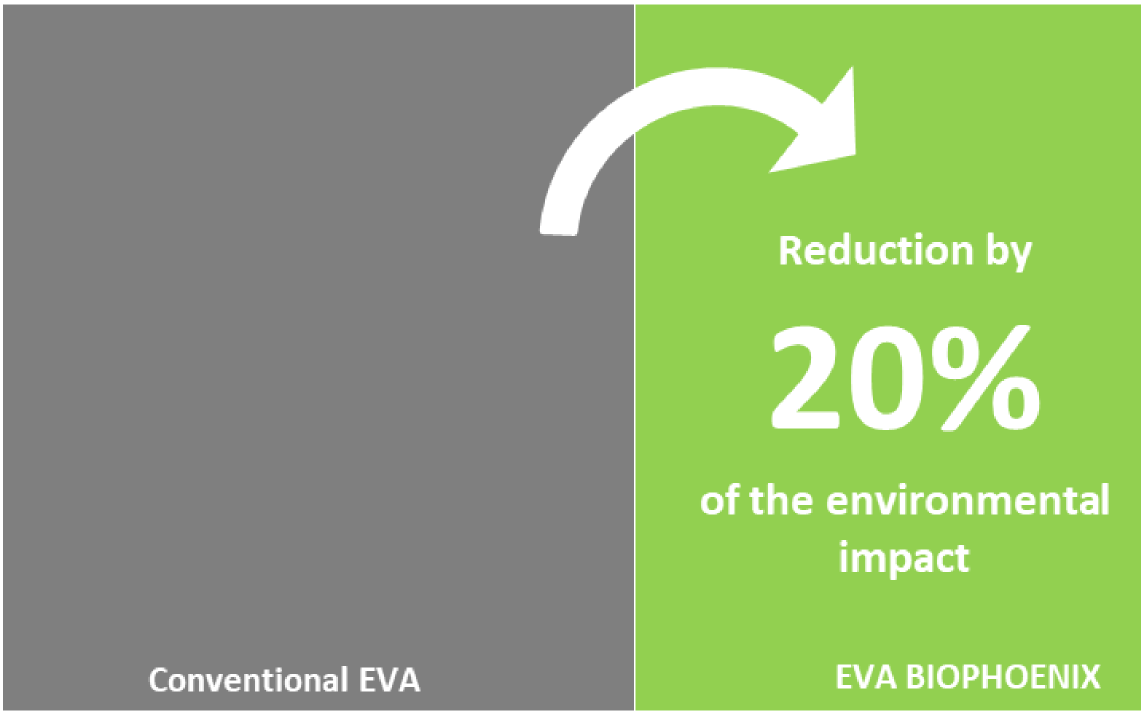
Figure 3: CO2eq emissions in the life cycle stages under study



A remarkable reduction in the environmental impact of the raw materials can be observed due to the renewable origin of the bioethanol and the recycled materials incorporated that serve as the basis for EVA BIO PHOENIX pellets, the impact of these materials being due solely to the cultivation of sugar cane, processing of both types of materials and transport, thus avoiding the extraction of virgin raw materials and their derived impacts. Processing has been considered unchanged. In the case of waste, those generated from renewable and recycled sources have less impact. The distribution and sale of both products is the same.

As can be seen, the overall improvement in the environmental impact of sustainable pellets is significant, reducing by 20% the environmental impact of the component.

Figure 4: Overall reduction of the environmental impact



The environmental impact in terms of climate change of the functional unit defined for this study (1 kg of EVA pellets) **ranges from 2.83 kg de CO_{2eq}** of the conventional product to **2.27 kg de CO_{2eq}** of the sustainable product. This means that a reduction by 20% of CO_{2eq} eq emissions is achieved.

ANNEX I. BIBLIOGRAPHIC REFERENCES

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ANNEX II – IMPACT CATEGORIES

This annex summarises the impact categories as follows:

Climate change: All inputs or outputs that result in greenhouse gas emissions. The consequences include increased average global temperatures and sudden regional climatic changes. Climate change is an impact affecting the environment on a global scale. The indicator "Climate Change, total" is constituted by three sub-indicators: Climate Change, fossil; Climate Change, biogenic; Climate Change, land use and land use change.

Ozone depletion: EF impact category that accounts for the degradation of stratospheric ozone due to emissions of ozone-depleting substances, for example long-lived chlorine and bromine containing gases (e.g., CFCs, HCFCs, Halons)

Ionising radiation, human health: EF impact category that accounts for adverse health effects on human beings caused by radioactive releases.

Photochemical ozone formation: EF impact category that accounts for the formation of ozone at the ground level of the troposphere caused by photochemical oxidation of volatile organic compounds (VOCs) and carbon monoxide (CO) in the presence of nitrogen oxides (NOx) and sunlight. High concentrations of ground-level tropospheric ozone damage vegetation, human respiratory tracts and manmade materials through reaction with organic materials.

Particulate matter: EF impact category that accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NOx, SOx, NH3)

Human toxicity - cancer - EF impact category that accounts for adverse health effects on human beings caused by the intake of toxic substances through inhalation of air, food/water ingestion, penetration through the skin insofar as they are related to cancer.

Human toxicity – non-cancer EF impact category that accounts for the adverse health effects on human beings caused by the intake of toxic substances through inhalation of air, food/water ingestion, penetration through the skin insofar as they are related to non-cancer effects that are not caused by particulate matter/respiratory inorganics or ionising radiation.

Acidification: EF impact category that addresses impacts due to acidifying substances in the environment. Emissions of NOx, NH3 and SOx lead to releases of hydrogen ions (H+) when the gases are mineralised. The protons contribute to the acidification of soils and water when they are released in areas where the buffering capacity is low, resulting in forest decline and lake acidification.

Eutrophication: Nutrients (mainly nitrogen and phosphorus) from sewage outfalls and fertilised farmland accelerate the growth of algae and other vegetation in water. The degradation of organic material consumes oxygen resulting in oxygen deficiency and, in some cases, fish death. Eutrophication translates the quantity of substances emitted into a common measure expressed as the oxygen required for the degradation of dead biomass. Three EF impact categories are used to assess the impacts due to eutrophication: Eutrophication, terrestrial; Eutrophication, freshwater; Eutrophication, marine.

Ecotoxicity, freshwater: Environmental footprint impact category that addresses the toxic impacts on an ecosystem, which damage individual species and change the structure and function of the ecosystem. Ecotoxicity is a result of a variety of different toxicological mechanisms caused by the release of substances with a direct effect on the health of the ecosystem.

Land use: EF impact category related to use (occupation) and conversion (transformation) of land area by activities such as agriculture, forestry, roads, housing, mining, etc. Land occupation considers the effects of the land use, the amount of area involved and the duration of its occupation (changes in quality multiplied by area and duration). Land transformation considers the extent of changes in land properties and the area affected (changes in quality multiplied by the area)

Water use: (Water depletion) It represents the relative available water remaining per area in a watershed, after the demand of humans and aquatic ecosystems has been met. It assesses the potential of water deprivation, to either humans or ecosystems, building on the assumption that the less water remaining available per area, the more likely another user will be deprived.

Resource use, fossil: EF impact category that addresses the use of non-renewable fossil natural resources (e.g., natural gas, coal, oil)

Resource use, minerals and metals: EF impact category that addresses the use of non-renewable abiotic natural resources (minerals and metals)