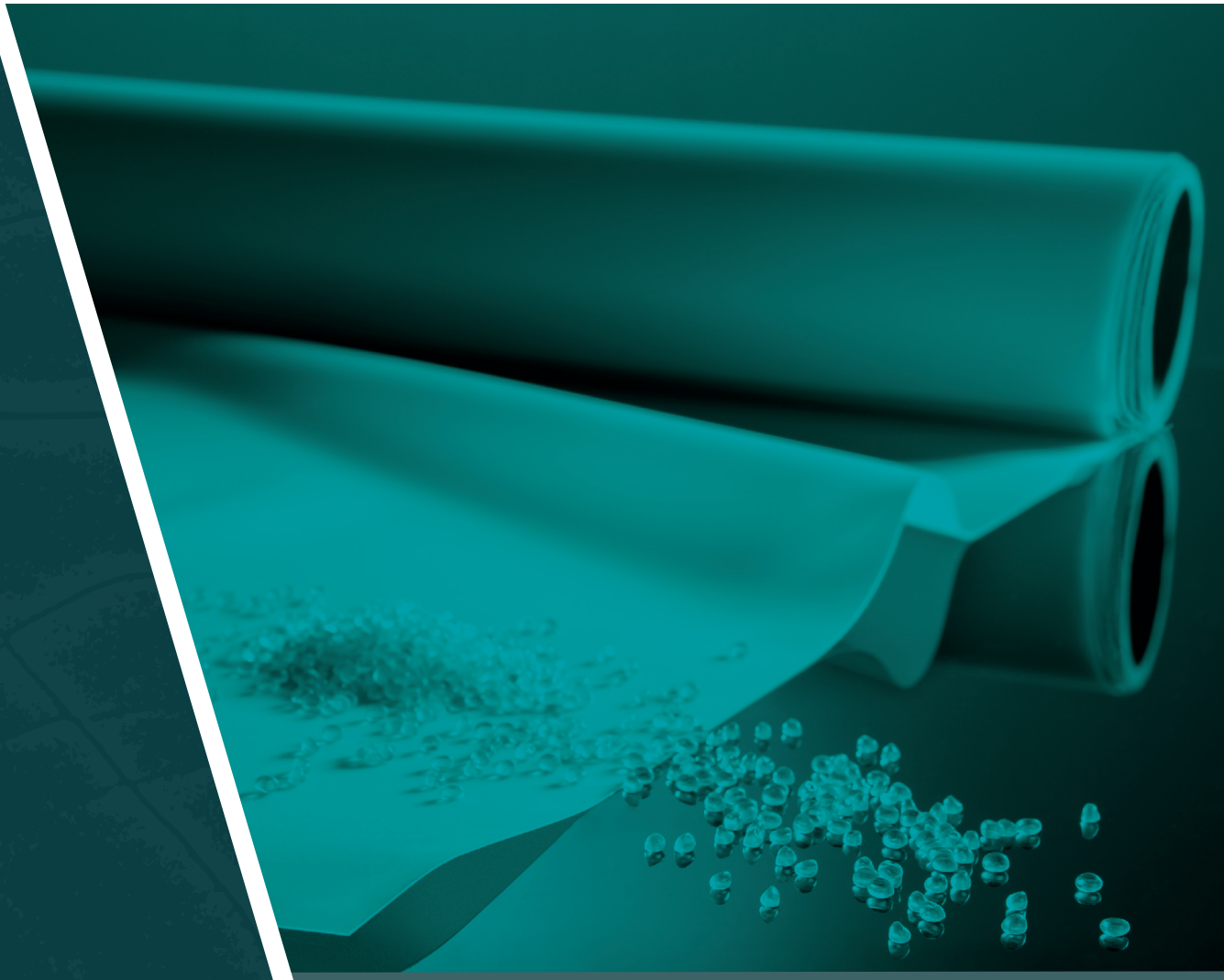
SATINAL

STRATO® EVA FILM



SATINAL S.P.A.

ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025:2006 and ISO 21930:2017

ASTM INTERNATIONAL

Satinal S.P.A. is pleased to present this Environmental Product Declaration (EPD) for their STRATO® EVA film. This EPD was developed in compliance with ISO 21930 and has been verified by Lindita Bushi, Ph.D., Athena Sustainable Materials Institute.

The LCA and the EPD were prepared by Vertima Inc. The EPD includes cradle-to-gate life cycle assessment (LCA) results.

For more information about Satinal S.P.A., visit Satinal.it/en/.

For any explanatory material regarding this EPD, please contact the program operator.

1. GENERAL INFORMATION

PCR GENERAL INFORMATION	
Reference PCR	ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
The PCR Part B review was conducted by:	*Technical Committee ISO/TC 59, Buildings and civil engineering works, Subcommittee SC 17, Sustainability in buildings and civil engineering works*

EPD GENERAL INFORMATION		
Program Operator	ASTM International 100 Barr Harbor Drive, West Conshohocken, PA 19428 www.astm.org	
Declared Product	**STRATO® EVA film**	
EPD Registration Number EPD 949	**EPD Date of Issue** March 14, 2025	**EPD Period of Validity** March 14, 2025 to March 13, 2030
EPD Recipient Organization	Satinal S.P.A. Via del Lavoro 1 Erba, Como 22036 Italy Satinal.it/en/	SATINAL

EPD Type/Scope and Declared Unit	**Year of Reported Manufacturer Primary Data**
Product-specific cradle-to-gate EPD with declared unit of 1 m^2.	2023

Geographical Scope	**LCA Software**	**LCI Databases**	**LCIA Methodology**
Global	OpenLCA v.2.0.3	Ecoinvent 3.9.1	EN 15804+A2, TRACI 2.1 and CED (LHV), v1.0

This LCA and EPD were prepared by:	Chantal Lavigne, M.A.Sc. Vertima Inc. www.vertima.ca
This EPD and LCA were independently verified in accordance with ISO 14025:2006, ISO 14040:2006 and ISO 14044:2006, as well as ISO 21930:2017. ☐ Internal ☒ External	Lindita Bushi Lindita Bushi, Ph.D. Athena Sustainable Materials Intitute

The owner of the declaration shall be liable for the underlying information and evidence; ASTM, or its affiliates, shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence.

LIMITATIONS

Environmental declarations within the same product category but from different programs may not be comparable. [1]

EPDs are comparable only if they comply with ISO 21930:2017, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.[2]

Furthermore, EPD comparability is only possible when all stages of the product life cycle have been considered. However, variations and deviations are possible. Example of variations: different LCA software and background LCI datasets may lead to differences in results upstream or downstream of the life cycle stages declared.

Theodosius Forest Village - Slovenia [Photo courtesy of Satinal S.P.A.]

2. PRODUCT SYSTEM DESCRIPTION

Satinal S.P.A. is an Italian company that features a multi-brand architecture encompassing a range of products and machinery for the glass industry worldwide:

- TK – Engineering and manufacturing machinery for glass processing (lamination, temper, chemical temper, heat soak test)
- STRATO® – Manufacturing polymeric interlayers for glass lamination/encapsulation
- SATINAL – Production of chemicals and machinery for glass frosting and acid-etching.

2.1. PRODUCT DESCRIPTION

STRATO® EVA crosslinking films are tough, resilient safety interlayers used in laminated architectural safety glass. These STRATO® EVA interlayers offer safety advantages by retaining dangerous shards in case of glass breakage. They are commonly used as safety glass interlayers available worldwide. Its cross-linking chemical composition allows the internal molecules to generate tridimensional links, thus guaranteeing an additional degree of protection for all architectural elements exposed to exceptional conditions – such as high temperatures, high humidity and extreme weather conditions. STRATO® also offers full protection against UV radiation (over 99%), preventing interior furnishings from fading. STRATO® EVA film needs to be laminated between two pieces of glass. This sandwich arrangement is called laminated safety glass according to EN 14449. STRATO® EVA Film is available in different colours, finishings and the following thicknesses: 0.38 mm, 0.76 mm and 1.52 mm.

Figure 1 provides illustrations of the STRATO® EVA Film.

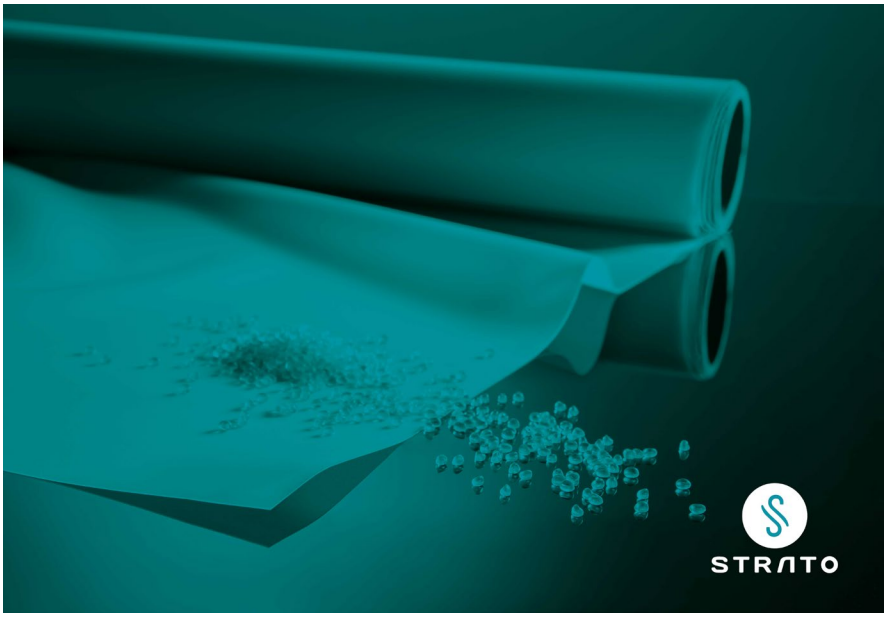


Figure 1: STRATO® EVA Film [Picture courtesy of Satinal S.P.A.].

STRATO® EVA Films are available in different colours and finishings, which are found under the following brand names:

STRATO® CLEAR
- STRATO® PLUS
- STRATO® EXTRA CHIARO
- STRATO® NATURAL UV

STRATO® FROST
- STRATO® LATTE
- STRATO® SATINATO
- STRATO® LEGGERO

STRATO® COLOUR
- STRATO® BIANCO
- STRATO® NERO
- STRATO® AZZURRO MEDITERRANEO
- STRATO® VERDE TOSCANA
- STRATO® BRONZO SICILIA
- STRATO® GRIGIO DOLOMITI
- STRATO® FOG (TRANSPARENT BLACK)
- STRATO® ROSE (TRANSPARENT ROSE)
- STRATO® STORM (TRANSPARENT PURPLE)
- STRATO® SAND (TRANSPARENT YELLOW)
- STRATO® LAVA (TRANSPARENT RED)

STRATO® BIRD FRIENDLY
- STRATO® BIRD FRIENDLY

STRATO® SOLAR CONTROL
- STRATO® FRESCO

STRATO® EVA SOLAR PV ENCAPSULANTS
- STRATO® EVA SOLAR PV
- STRATO® EVA SOLAR PV HLT
- STRATO® EVA SOLAR PV WHITE
- STRATO® EVA SOLAR PV BLACK

STRATO® EVA SOLAR PV COLORQUANT™
- STRATO® EVA SOLAR PV COLORQUANT™ TERRACOTTA
- STRATO® EVA SOLAR PV COLORQUANT™ GREY
- STRATO® EVA SOLAR PV COLORQUANT™ GREEN

More information can be found online at www.satinal.it/en/strato-glass-interlayers-range-of-products/.

2.2. PRODUCT APPLICATION

STRATO® EVA Film is an innovative, ductile and versatile EVA film which can be used in architectural and interior design applications. The insertion of coloured films or other materials (such as textiles, wire meshes, marble, etc.) in the assembly of the film interlayer and the glass plates creates chromatic and decorative effects with surprising aesthetic results, always in line with the trends of the moment.

2.3. TECHNICAL DATA

STRATO® EVA Film is certified according to European (UNI EN ISO) and American (SGGC – ANSI – Miami Dade) standards.

Examples of European Standards for which the STRATO® EVA Film has been tested:

- Glass in building - Laminated glass and laminated safety glass - Determination of interlayer viscoelastic properties (EN 16613)
- Resistance to high temperature and high humidity (UNI EN ISO 12543)

- Mechanical & impact properties (UNI EN ISO 12600 and 356)
- UV radiation (UNI EN 12543)

In North America, the sample of laminated glass (33.1) with a STRATO® EVA interlayer successfully passed the following tests:

- ASTM G155-13 | Xenon weathering
- ASTM D638-14 | Tensile strength
- ASTM D1929-10 | Self ignition temperature
- ASTM D2843-10 | Average smoke density
- ASTM D635-10 | Average liner burning rate – Average extent of burning – Average smoke density

2.4. PLACING ON THE MARKET

Test results of the STRATO® EVA Film are presented in the table below.

Name	Value	Unit
Light transmission level acc. to DIN EN 410	91%	%
Airborn sound reduction acc. to DIN EN20140-3 (optional)	37	dB
Constructional data for product/product system interlayers:		
Refractive index acc. to DIN EN ISO 489	1.45	-
Tensile strength acc. to ISO 527-3	20	Mpa
Elongation at break acc. to ISO 527-3	>400%	%
Tg acc. DMA, 3K/min, 1Hz	-45	°C

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.5. PROPERTIES OF DECLARED PRODUCT AS DELIVERED

Satinal S.P.A. offers EVA film rolls measuring between 300 mm (12″ inches) and 2600 mm (102″ inches).

2.6. PRODUCT COMPOSITION

The raw materials input for STRATO® EVA Films are detailed in Table 2. For details on material content, please refer to the health product declaration (HPD) available at http://www.hpd-collaborative.org/hpd-public-repository/

Materials	CAS No	wt.%
Ethylenevinaylacetate Copolymer	24937-78-8	> 98%
tert-Butyl peroxy-2-ethylhexylcarbonate	34443-12-4	< 1%
Other additives	Undisclosed	< 1%
TOTAL		**100%**

1) This product contains substances listed in the candidate list (date: 20.11.2024) exceeding 0.1 percentage by mass: No

2) This product contains other Carcinogenic, Mutagenic, Reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass: No

3) Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012)*: No

2.7. MANUFACTURING

The STRATO® EVA Film interlayer is prepared by mixing the raw materials in an extruder. The molten EVA is then forced through a flat die to produce a sheet of EVA film. The extruded EVA is then cooled to solidify before being wounded into rolls.

2.8. ENVIRONMENT AND HEALTH DURING MANUFACTURING

Measures relating to health protection during the manufacturing process comply with the national guidelines in Italy.

All of the STRATO® EVA Film production waste is recycled internally. Furthermore, Satinal S.P.A. uses energy produced from renewable sources: on-site solar panels and hydropower from the peaks of Trentino. The company's philosophy, based on quality and innovation, has driven Satinal S.P.A. towards the search for an economically and environmentally sustainable energy solution. Raising awareness of environmental issues and striving to respect and protect nature are topics considered as a moral and social obligation.

2.9. PRODUCT PROCESSING / INSTALLATION

Products are used by the glass industry to produce laminated glass. STRATO® EVA Film glass interlayers provide their best performances and stability when the lamination process is carried out correctly. Paying close attention to temperatures, time, heating homogeneity and quality of the laminating equipment is mandatory.

2.10. PACKAGING

STRATO® EVA Films are rolled on a cardboard tube, inserted into a vacuum polyethylene bag before being stacked on a wood pallet. It should be noted that pallets are all reused pallets.

Table 1: Amount of packaging materials per m^2 of STRATO® EVA Film

Packaging	kg/m^2
Cardboard tube	1.79E-02
Polyethylene bags	3.53E-04
Wood pallets	1.66E-02

2.11. CONDITION OF USE

Users should refer to the condition of use of laminated glass.

2.12. ENVIRONMENT AND HEALTH DURING USE

The product is not considered to be harmful to the environment or health during its use in laminated glass.

2.13. REFERENCE SERVICE LIFE

The reference service life of the product is dependent on the reference service life of glass.

2.14. EXTRAORDINARY EFFECTS

STRATO® EVA Film was tested in accordance with to ASTM D635-10 (Rate and extent of burn), ASTM D1929-10 (Self-Ignition Temperature Test) and ASTM D2483-10 (Smoke Density Test) with no deviations.[6]–[8]

2.15. RE-USE PHASE

The product is not expected to be reused.

2.16. DISPOSAL

Since the product is bonded to glass, the disposal of the product depends on the disposal pathway of laminated glass. Please refer to local regulations for laminated glass disposal.

2.17. FURTHER INFORMATION

Further information about STRATO® products, please visit www.satinal.it/en/.

DiamondMall Belo Horizonte – Brazil [Photo courtesy of Satinal S.P.A.]

3. LCA CALCULATION RULES

3.1. DECLARED UNIT

The selected declared unit (DU) for this study is **1 m^2 of STRATO® EVA Film**. The table below presents the reference flows of the studied product.

Table 2: Declared unit of studied products and associated reference flows.

Name	Value	Unit
Declared unit	1	m^2
Grammage	0.35	kg/m^2
Layer thickness	0.38	mm
Density	0.92	g/cm^3

3.2. PRODUCTION AVERAGE

STRATO® EVA Film is available in different colours and finishings; however, this does not lead to variation in their environmental impact indicators by more than ±10 %. Therefore, environmental impact indicators results are equivalent for all STRATO® EVA Films.

3.3. SYSTEM BOUNDARIES

The system boundaries are **cradle-to-gate**, i.e., only cover the production life cycle stage as illustrated in **Table 1**. Within this life cycle stage, three (3) modules are considered, namely A-1) Extraction and Upstream Production, A-2) Transport to Factory and A-3) Manufacturing. Construction (A-4; A-5), Use (B-1 to B-7) and End-of-life (C-1 to C-4) stages are not included in this study. Figure 2 presents the process flow diagram. No biogas or CO_2 certificates are used in this EPD project. Satinal S.P.A. does purchase renewable energy certificates (RECs); hence, results are shown with and without RECs.

Table 3: Description of the system boundary life cycle stages and related information modules

PRODUCTION STAGE			CONSTRUC-TION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Extraction and Upstream Production	Transport to Factory	Manufacturing	Transport to Site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport to Waste Processing or Disposal	Waste Processing	Disposal of Waste
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Key: X = included; MND = module not declared (excluded)

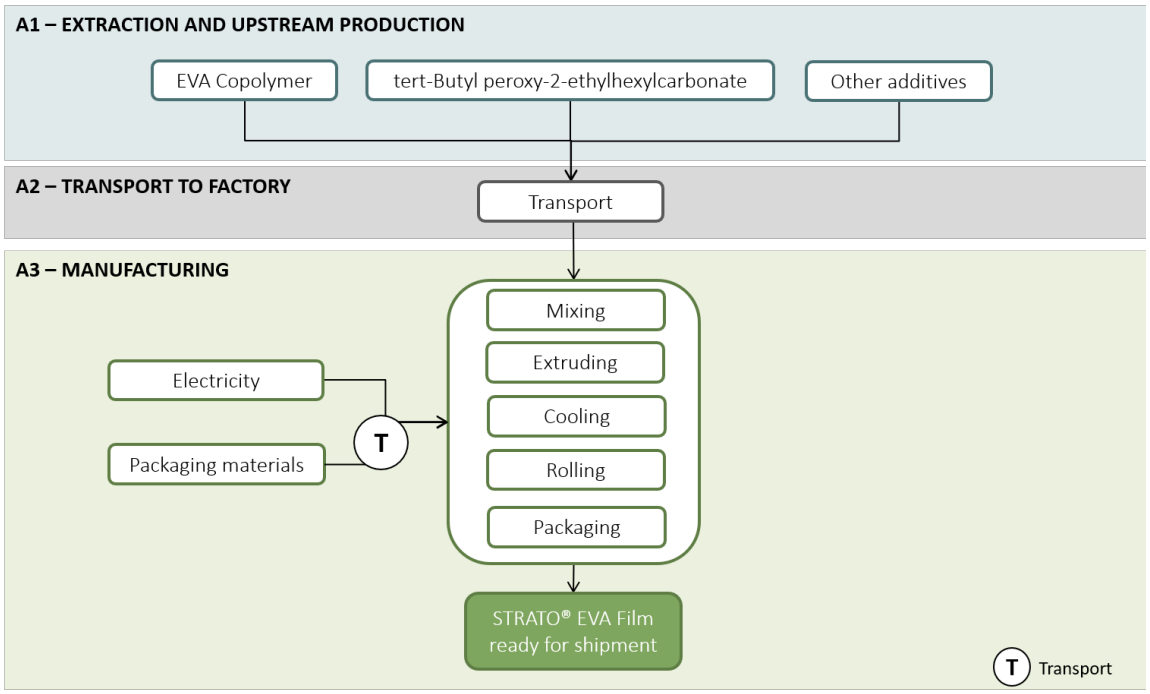


Figure 2: System boundaries of cradle-to-gate STRATO® EVA Film LCA.

Raw materials acquisition (A1): This module includes the extraction and transformation of raw materials needed to produce the EVA film.

Raw materials transportation (A2): This module includes the transportation of raw materials from the suppliers to Satinal's manufacturing facility located in Erba, Italy.

Manufacturing (A3): This stage includes energy (electricity) consumption for the manufacturing process, packaging materials to make products ready for shipment and their transport to Satinal's manufacturing plant.

3.4. CUT-OFF CRITERIA

The criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA shall not be applied in order to hide data.

In this study, no cut-off was used.

It should be noted that no data on the construction, maintenance or dismantling of the capital assets, daily transport of the employees, office work, business trips and other activity from Satinal's employees was included in the system boundaries. The model only takes into account the processes associated with infrastructures that are already included in the *ecoinvent* unit processes.

3.5. ALLOCATION

Allocation shall be avoided to the extent possible. If allocation cannot be avoided, the inputs and outputs of the system under study should be partitioned between its different products or functions in a way which reflects the underlying physical relationships between them.[2]

No allocation was used in this study.

Data relative to energy consumption (electricity) was provided for the product under study.

Waste processing of the material flows undergoing recycling processes are included up to the system boundary of the end-of-waste state. [5] In other words, a cut-off approach was used as further processing of the recycled material is part of raw material preparation of another product system (open-loop recycling). Also, no burdens are allocated across the system boundary with secondary material, secondary fuel or recovered energy flows arising from waste.

3.6. DATA SOURCES AND QUALITY REQUIREMENTS

Data Quality Parameter	Data Quality Discussion
Source of manufacturing data	Manufacturing data was collected from one manufacturing plant located in Erba, Italy, for the 2023 production year. This data included: total annual mass of products produced at the manufacturing plant; specific product composition; raw materials entering the product production process; transport distance of materials; electricity consumption; packaging materials and their transport to the facility.
Source of secondary data	Background data was taken from ecoinvent 3.9.1 "cut-off" datasets representative of Europe.
Geographical representativeness	Satinal S.P.A.'s manufacturing facility is based in Italy; hence electricity consumption from the grid is based on the Italian grid mix. Geographical correlation of the material supply and the selected datasets are largely representative of the same area.
Temporal representativeness	Primary data was collected so as to be representative of the full 2023 year. Datasets selected were not always published within the last ten years Nevertheless, ecoinvent remains a reference LCI database.
Technological representativeness	Primary data, obtained from the manufacturer, is representative of the current technologies and materials used by this company.
Completeness	All relevant process steps were considered and modeled to satisfy the goal and scope. No known flows were cut off.

4. LIFE CYCLE ASSESSMENT RESULTS

4.1. RESULTS TABLES

It should be noted that Life Cycle Impact Assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The tables below present the LCIA results for 1 m^2 of STRATO® EVA Film using En 15804+A2 impact indicators, TRACI methodologies, as well as indicators fro primary energy consumption, consumption of renewable and non-renewable materials, water consumption, and waste generation.

DiamondMall Belo Horizonte – Brazil [Photo courtesy of Satinal S.P.A.]

Environmental indicator	Unit	STRATO® EVA Film (without RECs)			
		A1	A2	A3	A1-A3
		(per m^2)	(per m^2)	(per m^2)	(per m^2)
EN 15804+A2 Core environmental impact indicators					
GWP_{total}[1]	kg CO_2 eq.	7.94E-01	3.08E-02	1.28E-01	9.53E-01
$GWP_{biogenic}$	kg CO_2 eq.	1.64E-03	2.69E-05	4.36E-03	6.02E-03
GWP_{fossil}	kg CO_2 eq.	7.92E-01	3.08E-02	1.23E-01	9.46E-01
GWP_{luluc}	kg CO_2 eq.	4.10E-04	1.46E-05	3.30E-04	7.50E-04
ODP	kg CFC-11 eq.	6.81E-09	6.80E-10	3.27E-09	1.08E-08
AP	mol H+ eq.	2.82E-03	7.42E-05	4.90E-04	3.38E-03
$EP_{freshwater}$	kg PO_4^{3-} eq.	1.20E-04	2.21E-06	3.00E-05	1.50E-04
EP_{marine}	kg N eq.	5.50E-04	2.02E-05	1.20E-04	6.90E-04
$EP_{terrestrial}$	mol N eq.	5.74E-03	2.10E-04	1.02E-03	6.97E-03
POCP	kg NMVOC eq.	2.66E-03	1.20E-04	4.00E-04	3.17E-03
ADP_{fossil}[2]	MJ, LHV	2.49E+01	4.55E-01	1.84E+00	2.71E+01
$ADP_{minerals\&metals}$[2]	kg Sb eq.	4.17E-06	8.38E-08	8.10E-07	5.06E-06
WDP[2]	m^3 depriv	5.81E-01	2.57E-03	8.63E-02	6.70E-01
EN 15804+A2 Additional environmental impact indicators					
PM	Disease incidence	2.41E-08	2.25E-09	3.15E-09	2.95E-08
IRP[3]	kgBq U235 eq.	4.67E-02	5.70E-04	1.48E-02	6.21E-02
ETP_{fw}[2]	CTUe	7.66E+00	4.26E-01	1.80E+00	9.88E+00
HTP_c[2]	CTUh	2.45E-10	1.40E-11	5.12E-11	3.10E-10
HTP_{nc}[2]	CTUh	6.89E-09	4.10E-10	1.42E-09	8.72E-09
SQP[2]	dimensionless	2.31E+00	4.19E-01	1.20E+00	3.92E+00
TRACI 2.1					
GWP_{100}-AR5[4]	kg CO_2 eq.	7.60E-01	3.00E-02	1.22E-01	9.13E-01
GWP_{100}-AR4[5]	kg CO_2 eq.	7.37E-01	2.95E-02	1.20E-01	8.87E-01
ODP	kg CFC-11 eq.	7.70E-09	7.35E-10	3.47E-09	1.19E-08
AP	kg SO_2 eq.	2.38E-03	6.40E-05	4.00E-04	2.84E-03
EP	kg N eq.	1.42E-03	2.27E-05	2.90E-04	1.73E-03
SFP	kg O_3 eq.	3.26E-02	1.18E-03	5.15E-03	3.89E-02
FFD	MJ Surplus	3.27E+00	6.09E-02	1.95E-01	3.52E+00

EN 15804+A2, core indicators: GWP_{total}: Climate change-total; **$GWP_{biogenic}$**: Climate change - Biogenic; **GWP_{fossil}**: Climate change - Fossil; **GWP_{luluc}**: Climate change - Land use and Land use change; **ODP**: Ozone depletion potential; **AP**: Acidification; **$EP_{freshwater}$**: Eutrophication potential, freshwater; **EP_{marine}**: Eutrophication potential, marine; **$EP_{terrestrial}$:** Eutrophication, terrestrial; **POCP**: Photochemical ozone formation potential; **ADP_{fossil}**: Resource use, fossils; **$ADP_{minerals\&metals}$**: Resource use, minerals and metals; **WDP**: Water use potential.

EN 15804+A2, add.indicators: PM: Particulate matter; **IRP**: Ionizing radiation potential; **ETP_{fw}**: Ecotoxicity potential, freshwater; **HTP_c**: Human toxicity potential, cancer; **HTP_{nc}**: Human toxicity potential, non-cancer; **SQP:** Potential soil quality index.

TRACI 2.1 indicators: GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.

(1) GWP_{total} is the sum of GWP_{fossil}, $GWP_{biogenic}$ and GWP_{luluc}.

(2) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(3) This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials, is also not measured by this indicator.

(4): GWP_{100}, excludes biogenic CO_2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

(5): GWP_{100}, excludes biogenic CO_2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

Environmental indicator	Unit	STRATO® EVA Film (without RECs)			
		A1	A2	A3	A1-A3
		(per m^2)	(per m^2)	(per m^2)	(per m^2)
Resource use					
RPR_E[1]	MJ, LHV	5.37E-01	6.65E-03	9.77E-01	1.52E+00
RPR_M[2]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T	MJ, LHV	5.37E-01	6.65E-03	9.77E-01	1.52E+00
$NRPR_E$[3]	MJ, LHV	6.25E-01	4.16E-01	7.62E-01	1.80E+00
$NRPR_M$[4]	MJ, LHV	1.59E+01	0.00E+00	0.00E+00	1.59E+01
$NRPR_T$	MJ, LHV	1.65E+01	4.16E-01	7.62E-01	1.77E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW[5]	m^3	1.37E-02	6.31E-05	2.17E-03	1.60E-02
Output flows and waste categories					
HWD[6]	kg	6.40E-01	1.14E-02	1.29E-01	7.81E-01
NHWD[7]	kg	2.76E-02	3.96E-02	9.39E-03	7.66E-02
RWD	kg	1.93E-07	2.36E-09	5.68E-08	2.52E-07
HLRW[8]	m^3	5.30E-10	6.50E-12	1.56E-10	6.93E-10
ILLRW[9]	m^3	3.59E-09	4.14E-11	1.21E-09	4.83E-09
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR[10]	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Resource use: PER_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **PER_M**: Renewable Primary Resources with Energy Content Used as Material; **PER_T**: Renewable Primary Resources Total; **$PENR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$PENR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$PENR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **FW**: Use of Net Fresh Water Resources.

Output flows and waste categories: HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **EE**: Exported Energy.

(1): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).

(2): Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.

(3): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).

(4): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.

(5): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption using ReCiPe Midpoint (E) 2016.

(6): Calculated from life cycle inventory results, based on datasets marked as "treatment and disposal of hazardous waste."

(7): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive."

(8): Calculated from life cycle inventory results, based on datasets "high-level radioactive waste for final repository. "

(9): Calculated from life cycle inventory results, based on datasets "low-level radioactive waste for final repository."

(10): Calculated based on the amounts leaving the system boundary when they have reached the end-of-waste state.

Environmental indicator	Unit	STRATO® EVA Film (with RECs)			
		A1	A2	A3	A1-A3
		(per m^2)	(per m^2)	(per m^2)	(per m^2)
EN 15804+A2 Core environmental impact indicators					
GWP_{total}(1)	kg CO_2 eq.	7.94E-01	3.08E-02	3.06E-02	8.56E-01
$GWP_{biogenic}$	kg CO_2 eq.	1.64E-03	2.69E-05	-3.96E-03	-2.29E-03
GWP_{fossil}	kg CO_2 eq.	7.92E-01	3.08E-02	3.42E-02	8.57E-01
GWP_{luluc}	kg CO_2 eq.	4.10E-04	1.46E-05	3.20E-04	7.40E-04
ODP	kg CFC-11 eq.	6.81E-09	6.80E-10	1.38E-09	8.87E-09
AP	mol H+ eq.	2.82E-03	7.42E-05	1.80E-04	3.08E-03
$EP_{freshwater}$	kg PO_4^{3-} eq.	1.20E-04	2.21E-06	1.69E-05	1.40E-04
EP_{marine}	kg N eq.	5.50E-04	2.02E-05	6.55E-05	6.40E-04
$EP_{terrestrial}$	mol N eq.	5.74E-03	2.10E-04	4.30E-04	6.37E-03
POCP	kg NMVOC eq.	2.66E-03	1.20E-04	1.40E-04	2.92E-03
ADP_{fossil}(2)	MJ, LHV	2.49E+01	4.55E-01	4.58E-01	2.58E+01
$ADP_{minerals\&metals}$(2)	kg Sb eq.	4.17E-06	8.38E-08	7.61E-07	5.02E-06
WDP(2)	m^3 depriv	5.81E-01	2.57E-03	1.98E-01	7.82E-01
EN 15804+A2 Additional environmental impact indicators					
PM	Disease incidence	2.41E-08	2.25E-09	1.87E-09	2.82E-08
IRP(3)	kgBq U235 eq.	4.67E-02	5.70E-04	3.37E-03	5.07E-02
ETP_{fw}(2)	CTUe	7.66E+00	4.26E-01	9.82E-01	9.06E+00
HTP_c(2)	CTUh	2.45E-10	1.40E-11	3.38E-11	2.92E-10
HTP_{nc}(2)	CTUh	6.89E-09	4.10E-10	9.94E-10	8.30E-09
SQP(2)	dimensionless	2.31E+00	4.19E-01	9.94E-01	3.72E+00
TRACI 2.1					
GWP_{100}-AR5(4)	kg CO_2 eq.	7.60E-01	3.00E-02	3.51E-02	8.25E-01
GWP_{100}-AR4(5)	kg CO_2 eq.	7.37E-01	2.95E-02	3.45E-02	8.01E-01
ODP	kg CFC-11 eq.	7.70E-09	7.35E-10	1.48E-09	9.92E-09
AP	kg SO_2 eq.	2.38E-03	6.40E-05	1.50E-04	2.59E-03
EP	kg N eq.	1.42E-03	2.27E-05	1.80E-04	1.62E-03
SFP	kg O_3 eq.	3.26E-02	1.18E-03	2.07E-03	3.58E-02
FFD	MJ Surplus	3.27E+00	6.09E-02	4.56E-02	3.37E+00

EN 15804+A2, core indicators: GWP_{total}: Climate change-total; **$GWP_{biogenic}$**: Climate change - Biogenic; **GWP_{fossil}**: Climate change - Fossil; **GWP_{luluc}**: Climate change - Land use and Land use change; **ODP**: Ozone depletion potential; **AP**: Acidification; **$EP_{freshwater}$**: Eutrophication potential, freshwater; **EP_{marine}**: Eutrophication potential, marine; **$EP_{terrestrial}$:** Eutrophication, terrestrial; **POCP**: Photochemical ozone formation potential; **ADP_{fossil}**: Resource use, fossils; **$ADP_{minerals\&metals}$**: Resource use, minerals and metals; **WDP**: Water use potential.

EN 15804+A2, add.indicators: PM: Particulate matter; **IRP**: Ionizing radiation potential; **ETP_{fw}**: Ecotoxicity potential, freshwater; **HTP_c**: Human toxicity potential, cancer; **HTP_{nc}**: Human toxicity potential, non-cancer; **SQP:** Potential soil quality index.

TRACI 2.1 indicators: GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.

(1) GWP_{total} is the sum of GWP_{fossil}, $GWP_{biogenic}$ and GWP_{luluc}.

(2) The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(3) This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

(4): GWP_{100}, excludes biogenic CO_2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

(5): GWP_{100}, excludes biogenic CO_2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

Environmental indicator	Unit	STRATO® EVA Film (with RECs)			
		A1	A2	A3	A1-A3
		(per m^2)	(per m^2)	(per m^2)	(per m^2)
Resource use					
RPR_E[1]	MJ, LHV	5.37E-01	6.65E-03	1.52E+00	2.06E+00
RPR_M[2]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T	MJ, LHV	5.37E-01	6.65E-03	1.52E+00	2.06E+00
$NRPR_E$[3]	MJ, LHV	6.25E-01	4.16E-01	2.59E-01	1.30E+00
$NRPR_M$[4]	MJ, LHV	1.59E+01	0.00E+00	0.00E+00	1.59E+01
$NRPR_T$	MJ, LHV	1.65E+01	4.16E-01	2.59E-01	1.72E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW[5]	m^3	1.37E-02	6.31E-05	5.11E-03	1.89E-02
Output flows and waste categories					
HWD[6]	kg	6.40E-01	1.14E-02	6.39E-02	7.16E-01
NHWD[7]	kg	2.76E-02	3.96E-02	9.43E-03	7.66E-02
RWD	kg	1.93E-07	2.36E-09	1.37E-08	2.09E-07
HLRW[8]	m^3	5.30E-10	6.50E-12	3.77E-11	5.75E-10
ILLRW[9]	m^3	3.59E-09	4.14E-11	2.62E-10	3.89E-09
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR[10]	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

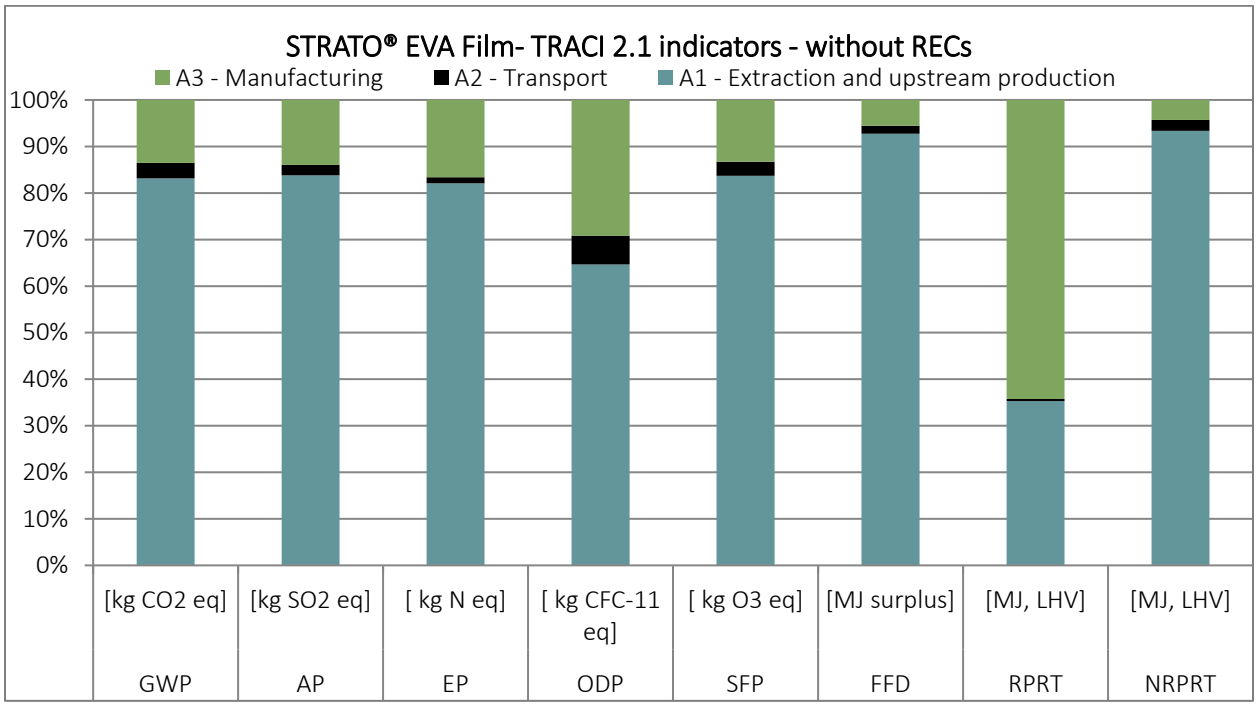
Resource use: PER_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **PER_M**: Renewable Primary Resources with Energy Content Used as Material; **PER_T**: Renewable Primary Resources Total; **$PENR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$PENR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$PENR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **FW**: Use of Net Fresh Water Resources.

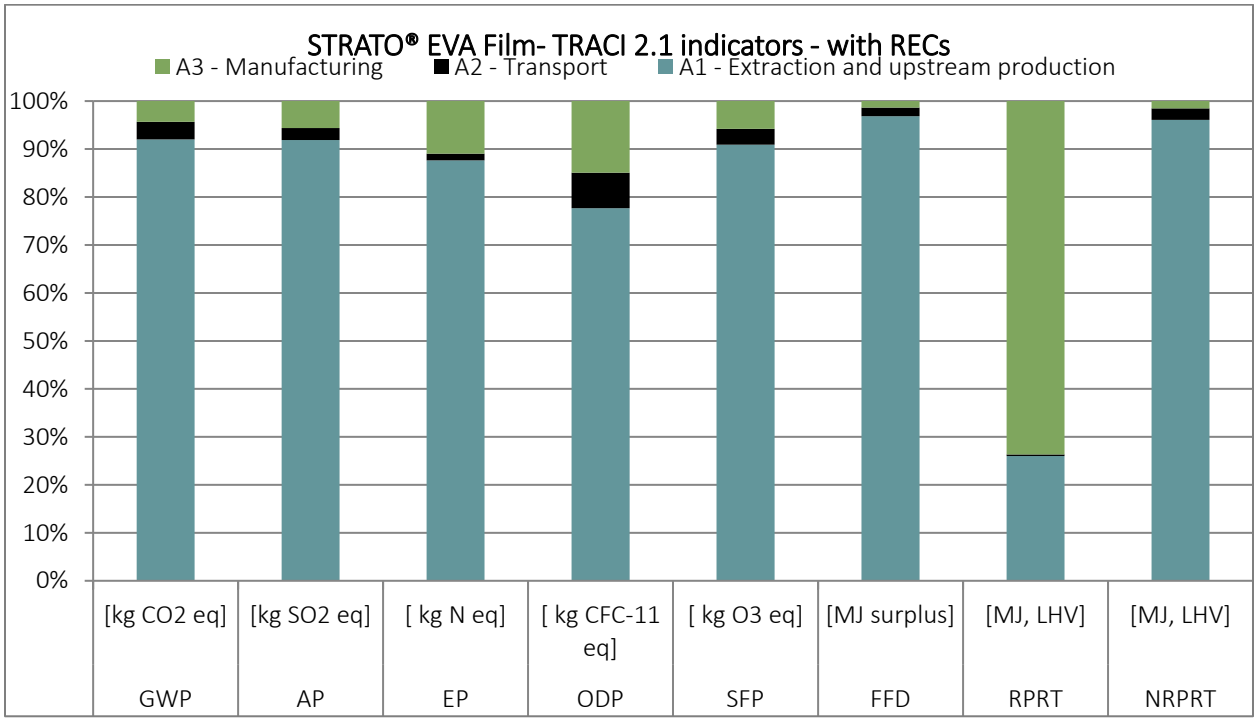
Output flows and waste categories: HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **EE**: Exported Energy.

(1): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).
(2): Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.
(3): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).
(4): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.
(5): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption using ReCiPe Midpoint (E) 2016.
(6): Calculated from life cycle inventory results, based on datasets marked as "treatment and disposal of hazardous waste."
(7): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive."
(8): Calculated from life cycle inventory results, based on datasets "high-level radioactive waste for final repository."
(9): Calculated from life cycle inventory results, based on datasets "low-level radioactive waste for final repository."
(10): Calculated based on the amounts leaving the system boundary when they have reached the end-of-waste state.

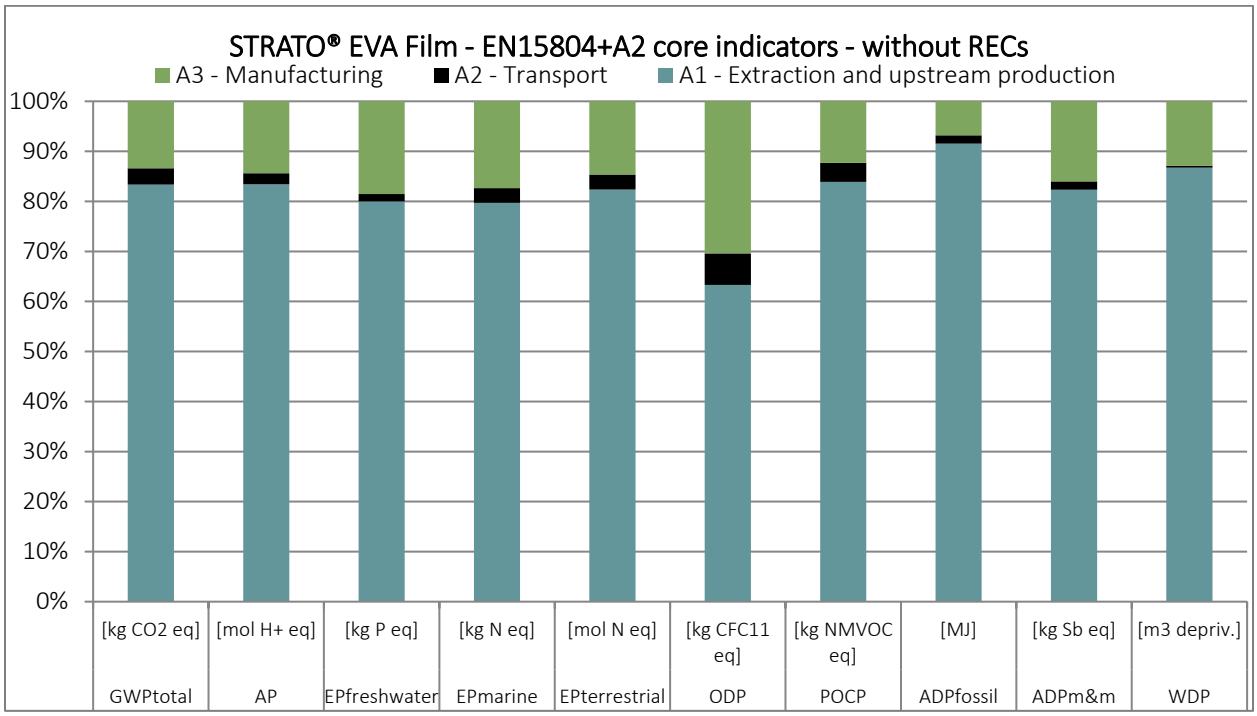
4.2. CONTRIBUTION ANALYSIS

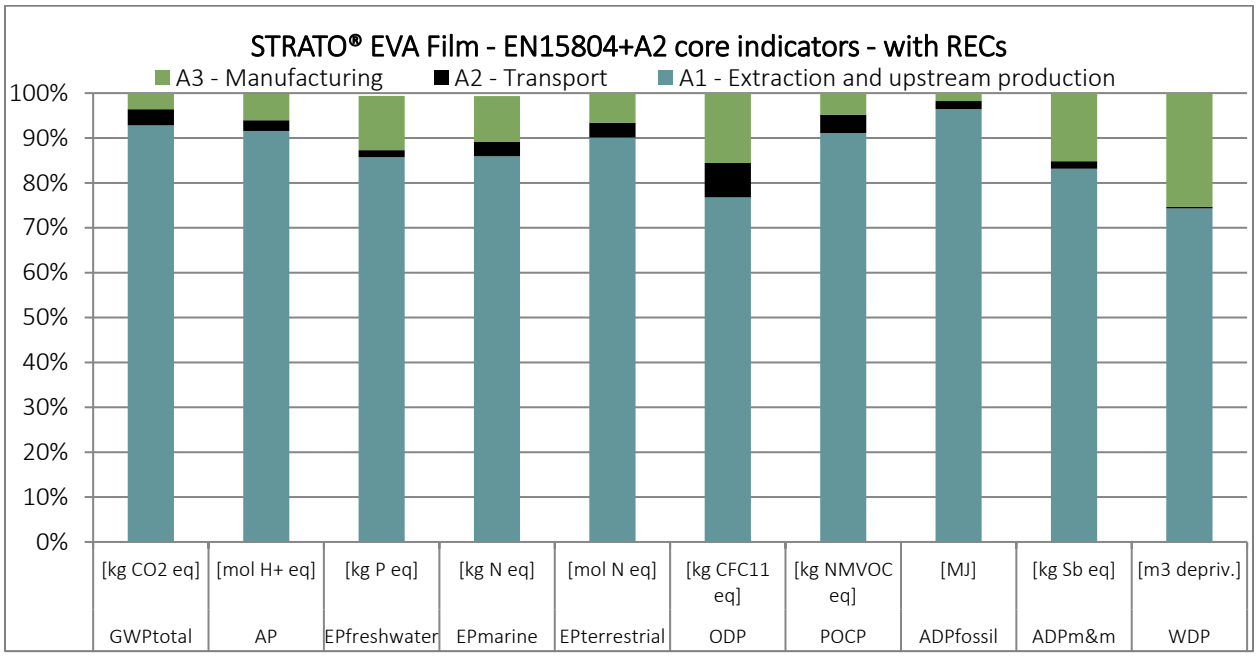
This section details the contribution to the potential environmental impacts and resource use of the different production life cycle stage modules. As can be seen from the figures below, extraction and upstream production (A1) is the main contributor to all potential impact categories, as well as non-renewable resource consumption. Manufacturing is the main contributor to renewable resource consumption.





GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential; **RPRT**: Renewable Primary Resources – Total; **NRPRT**: Non-Renewable Primary Resources – Total.





GWP_{total}: Climate change-total; **$GWP_{biogenic}$**: Climate change - Biogenic; **GWP_{fossil}**: Climate change - Fossil; **GWP_{luluc}**: Climate change - Land use and Land use change; **ODP**: Ozone depletion potential; **AP**: Acidification; **$EP_{freshwater}$**: Eutrophication potential, freshwater; **EP_{marine}**: Eutrophication potential, marine; **$EP_{terrestrial}$**: Eutrophication, terrestrial; **POCP**: Photochemical ozone formation potential; **ADP_{fossil}**: Resource use, fossils; **$ADP_{minerals\&metals}$**: Resource use, minerals and metals; **WDP**: Water use potential.

5. ADDITIONAL ENVIRONMENTAL INFORMATION

5.1. BIOGENIC CARBON

The product does not contain biogenic carbon. There is, however, biogenic carbon in the packaging as presented in the table below. Pallets have not been considered as they are reused pallets.

Table 4: Biogenic carbon in packaging materials per m^2 of STRATO® EVA Film

Packaging	kg/m^2	%C	kg biogenic C/m^2
Cardboard tube	1.79E-02	50%	8.970E-3

5.2. CONTENT OF REGULATED HAZARDOUS SUBSTANCES

The product is not a hazardous substance or preparation according to EU-directives 67/548/EEC or 1999/45/EC; regulation (EC) 1272/2008. Furthermore, the main substances composing the product, ethylenevinylacetate copolymer and tert-butyl peroxy-2-ethylhexylcarbonate, are not classified by OSHA HCS 2012.

5.3. RELEASE OF DANGEROUS SUBSTANCES FROM CONSTRUCTION PRODUCTS

According to the manufacturer's knowledge, this product is not regarded as dangerous material. For thermal decomposition or in case of fire, gases and vapors potentially hazardous for health can arise.

5.4. FURTHER INFORMATION

Satinal S.P.A. is ISO 9001: 2015 certified: the internal production processes of all Satinal S.P.A. product lines comply with the regulations and are verified through internal audits to guarantee certification.

Satinal S.P.A. has also published a Health Product Declaration® for the STRATO® EVA Film. More details are available on the HPDC public repository: https://www.hpd-collaborative.org/hpd-public-repository/.

Satinal S.P.A. rendering [Photo courtesy of Satinal S.P.A.]

6. REFERENCES

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[3] International Organization for Standardization (ISO), "ISO 14040:2006/AMD 1:2020 Environmental management - Life cycle assessment - Principles and framework," 2020.

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[7] ASTM International, "ASTM D1929-10 Standard Test Method for Determining Ignition Temperature of Plastics," 2011 [Online]. Available: https://www.astm.org/d1929-10.html.

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[9] ASTM International, "ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20," 2020 [Online]. Available: www.astm.org.

[10] Vertima, "Life Cycle Assessment of Satinal's STRATO EVA Film," 2025.

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EPD

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