



**WELSPUN**  
FLOORING

**Declaration Owner**

Welspun Flooring, LLC

SURVEY NO - 190, VILLAGE - CHANDANVELLY, MANDAL - SHABAD,  
CHANDANVELLY, Ranga Reddy, Telangana, 501503

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**Product:**

Artificial Grass

EPD represents delivery of product to customers globally.

**Functional Unit**

The functional unit is one square meter of flooring over a 75-year period

**EPD Number and Period of Validity**

SCS-EPD-06453

EPD Valid October 14, 2020 through October 13, 2025

**Product Category Rule**

PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018

PCR Guidance for Building-Related Products and Services Part B: Flooring EPD Requirements. Version 2. UL Environment. May 2018.



**Program Operator**

SCS Global Services

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Declaration Owner:	Welspun Flooring, Inc.																
Address:	Survey No-190,Chandanvelly,next to Hytabad,Shabad Mandal, Dist Rangareddy, Telangana, 501503, India																
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Declaration URL Link:	<a href="https://www.scsglobalservices.com/certified-green-products-guide">https://www.scsglobalservices.com/certified-green-products-guide</a>																
LCA Practitioner:	Tess Garvey, Ph.D., SCS Global Services																
LCA Software and LCI database:	OpenLCA 1.10 software and the Ecoinvent v3.5 database																
Product RSL:	6 years																
Markets of Applicability:	Global																
EPD Type:	Product-Specific																
EPD Scope:	Cradle-to-Grave																
LCIA Method and Version:	CML-IA and TRACI 2.1																
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external																
LCA Reviewer:	 Thomas Gloria, Ph.D., Industrial Ecology Consultants																
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018																
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig																
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<p><b>Disclaimers:</b> This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.</p> <p><b>Scope of Results Reported:</b> The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.</p> <p><b>Accuracy of Results:</b> Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.</p> <p><b>Comparability:</b> The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.</p> <p>In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, 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.</p>																	

## 1. Welspun

Welspun Flooring is Welspun Group's newest brainchild with a state of the art manufacturing facility spread over 300 acres, we are set to disrupt the world of flooring. Crafted passionately by our dedicated team of experts, Welspun Flooring is a breakthrough in terms of engineering and design. With form meeting function in each style, you'll see flooring in a new light! The idea is to offer holistic flooring solutions for architects, designers, retailers and consumers.

## 2. Products

### 2.1 PRODUCT DESCRIPTIONS

Artificial turf or grass is surface of synthetic fiber made to look like natural grass. It is most often used in arenas for sport that were originally or are played on natural grass. However, it is now being used on residential lawns and commercial applications as well. The main reason is maintenance—artificial turf stands up to heavy use, such as in sports, and requires no irrigation or trimming. Domed, covered, and partially covered stadiums may require artificial turf because of the difficulty of getting grass enough sunlight to stay healthy. Artificial turf does have its downside, however: limited life, periodic cleaning requirements, petroleum use, toxic chemicals from infill, and heightened health and safety concerns.

### 2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.



### 2.3 APPLICATION

The Welspun Flooring Artificial Grass products are very close to natural grass, and ideal for sports arenas, commercial applications, residential, terrace, gardens, and even home balconies.

### 2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the product system boundary are shown below.

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

**Table 1.** Life cycle phases included in the Welspun Flooring product system boundary.

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

X = Module Included | MND = Module Not Declared

## 2.5 TECHNICAL DATA

Technical specifications for the Artificial Grass product is summarized in Table 2.

**Table 2.** Product specifications for the Welspun Flooring Artificial Grass flooring products.

Characteristic	Value	Unit
Yarn type	PP-PE yarn	--
Primary backing type	PP Woven	--
Secondary backing type	--	--
Total thickness	27-30	mm
Product weight	1.90	kg/m <sup>2</sup> (oz/ft <sup>2</sup> )
Surface pile thickness	25	mm
Surface pile weight	900-1200	grams

## 2.6 MARKET PLACEMENT/APPLICATION RULES

Technical specifications and product performance results for the flooring products can be found on the manufacturer's website: [www.welspunflooring.com](http://www.welspunflooring.com)

## 2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The products are delivered for installation in the form of rolls.

## 2.8 MATERIAL COMPOSITION

The primary materials include polymer yarn, backings, coatings and other fillers.

The products are packaged for shipment using primarily cardboard and plastic wrap.

**Table 3.** Material content for the Artificial Grass in kilograms per square meter and percent of total mass.

Component	kg/m <sup>2</sup>	Percent
<b>Product</b>		
Yarn (PP-PE)	0.950	50%
Primary Backing (PP Woven)	0.250	13%
Coating (VAE or latex)	0.700	37%
Other fillers	--	--
<b>Total Product</b>	<b>1.90</b>	<b>100%</b>
<b>Packaging</b>		
Stickers	1.02x10 <sup>-4</sup>	0.0622%
Ribbons	8.50x10 <sup>-6</sup>	0.00518%
Cardboard	0.146	89.0%
LDPE Plastic film	0.0180	11.0%
<b>Total Packaging</b>	<b>0.164</b>	<b>100%</b>

No substances required to be reported as hazardous are associated with the production of this product.

## 2.9 MANUFACTURING

Welspun Flooring Artificial Grass is produced at their manufacturing facility in India. The Artificial Grass is made primarily from polypropylene/polyethylene yarn, polypropylene woven backing, and black latex coating, with various fillers.

## 2.10 PRODUCT INSTALLATION

Installation of the product is accomplished using hand tools with negligible impacts and waste. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

## 2.11 USE CONDITIONS

No special conditions of use are noted.

## 2.12 PRODUCT REFERENCE SERVICE LIFE AND BUILDING ESTIMATED SERVICE LIFE

The Reference Service Life (RSL) of the flooring product is based on the manufacturer's warranted lifetime and is summarized in Table 6 below. The building Estimated Service Life (ESL) is 75 years, consistent with the PCR.

## 2.13 RE-USE PHASE

The flooring products are not reused at end-of-life.

## 2.14 DISPOSAL

At end-of-life, the products may be disposed of in a landfill or via incineration. Although in some instances, vinyl flooring can be recycled into other products, the practice is not typical, nor widely available as a disposal route for the products in the consumer markets considered. It is assumed that no components of the product are recycled at end-of-life.

## 2.15 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website at [www.welspunflooring.com](http://www.welspunflooring.com)

### 3. LCA: Calculation Rules

#### 3.1 FUNCTIONAL UNIT

The functional unit used in the study is defined as 1 m<sup>2</sup> of floor covering installed for use over a 75-year period. The corresponding reference flow for each product system is presented in Table 4. For the present assessment, a reference service lifetime (RSL) corresponding to the manufacturer's warranted lifetime is assumed. The total number of required product lifecycles during the 75-year period over which the product system is modeled is also summarized for the product in Table 4.

**Table 4.** Reference flows and RSL for the Artificial Grass product

Reference Flow (kg/m <sup>2</sup> )	Reference Service Life – RSL (years)	Replacement Cycle (ESL/RSL-1)
1.90	6 years	11.5

#### 3.2 SYSTEM BOUNDARY

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the EPD scope are described in Table 5 and illustrated in Figure 1.

**Table 5.** The modules and unit processes included in the scope for the Welspun Flooring Artificial Grass product.

Module	Module Description	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Extraction and processing of raw materials for the product components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facilities
A3	Manufacturing, including ancillary material production	Manufacturing of Artificial Grass flooring products and packaging (incl. upstream unit processes)
A4	Transport (to the building site)	Transport of product (including packaging) to the building site
A5	Construction-installation process	Impacts from the installation of product are assumed negligible. Only impacts from packaging disposal are included in this phase
B1	Product use	Use of the product in a commercial building setting. There are no associated emissions or impacts from the use of the product.
B2	Product maintenance	Maintenance of products over the 75-year ESL, including periodic cleaning.
B3	Product repair	The product is not expected to require repair over its lifetime
B4	Product replacement	The materials and energy required for replacement of the product over the 75-year ESL of the assessment are included in this phase
B5	Product refurbishment	The product is not expected to require refurbishment over its lifetime
B6	Operational energy use by technical building systems	There is no operational energy use associated with the use of the product
B7	Operational water uses by technical building systems	There is no operational water use associated with the use of the product
C1	Deconstruction, demolition	Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts
C2	Transport (to waste processing)	Transport of the product to waste treatment at end-of-life
C3	Waste processing for reuse, recovery and/or recycling	The products are disposed of by recycling, landfilling or incineration which require no waste processing
C4	Disposal	Disposal of the product
D	Reuse-recovery-recycling potential	Module Not Declared

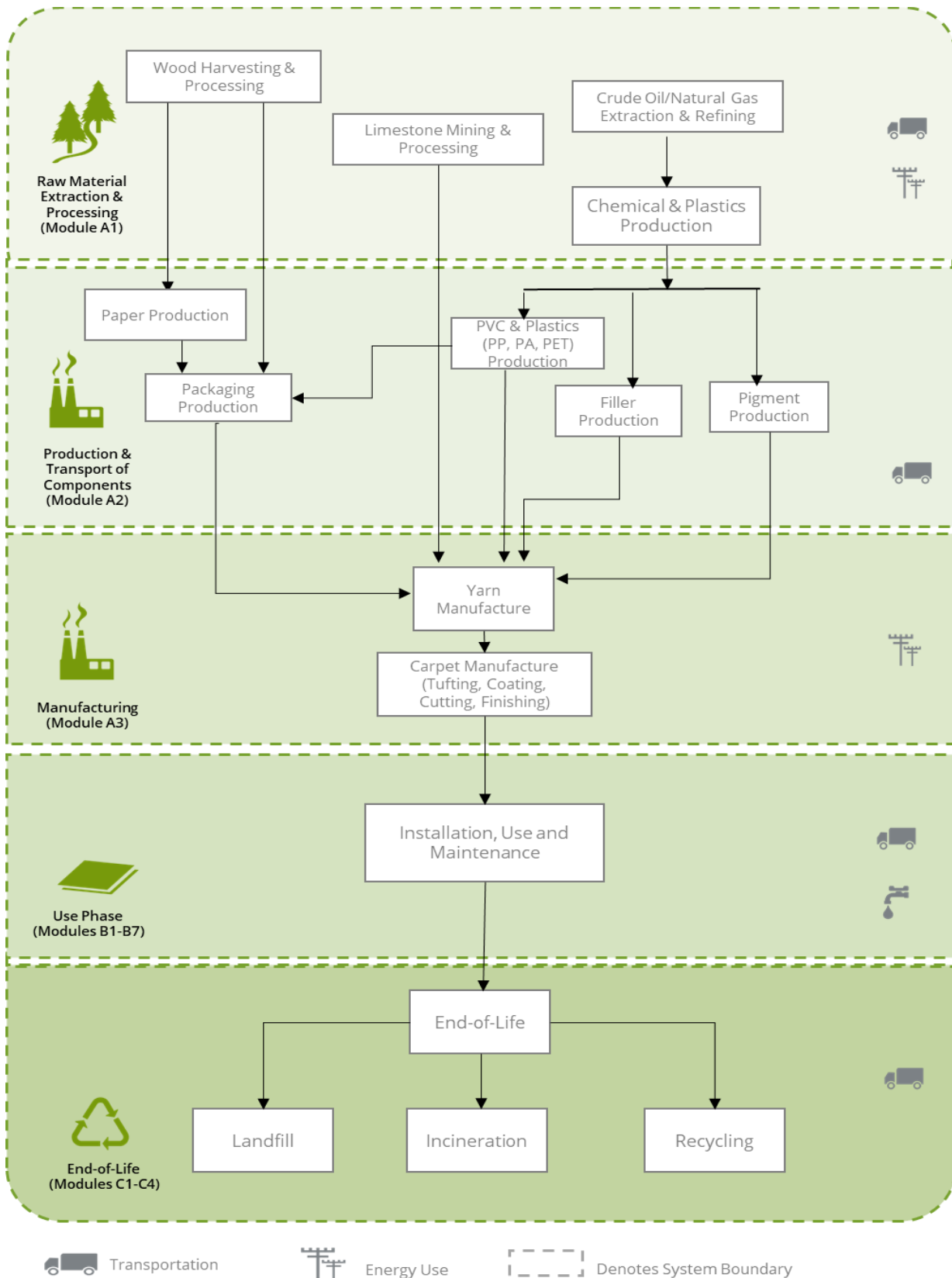


Figure 1. Flow Diagram for the life cycle of the Welspun Flooring Artificial Grass product system.



### 3.3 PRODUCT SPECIFIC CALCULATION FOR USE PHASE

The recommended cleaning regime is highly dependent on the use of the premises where the floor covering is installed. In high traffic areas more frequent cleaning will be needed compared to areas where there is low traffic. The manufacturer does not provide guidance for product maintenance.

### 3.4 UNITS

All data and results are presented using SI units.

### 3.5 ESTIMATES AND ASSUMPTIONS

- Electricity and resource use for yarn production, tufting and coating at the Welspun Flooring manufacturing facility was allocated to the products based on the mass as a fraction of the total production undergoing those processes separately.
- The Welspun Flooring facility is located in India. An Ecoinvent inventory dataset for the Indian energy grid mix was used to model resource use and emissions from electricity use at the manufacturing facility.
- The Reference Service Life (RSL) of the products was modeled based on information provided by the manufacturer assuming their products are installed and maintained as recommended and used for the specific application noted.
- The distance for distribution was modeled based on average distribution distances provided by the manufacturer.
- In the absence of primary data, other downstream transport, transport to waste processing and installation and deconstruction was modeled based on assumptions in the PCR.
- The maintenance phase of the product life cycle was modeled based on information provided by the manufacturer including recommended installation and cleaning methods.
- For the product end-of-life, disposal of product and product packaging is modeled based on the PCR guidance regarding recycling rates of product and packaging materials.
- For final disposal of the packaging material and flooring products at end-of-life, all materials are assumed to be transported 20 miles by diesel truck to either a landfill or material reclamation facility (for recycling). Datasets representing disposal in a landfill and waste incineration are from Ecoinvent.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

### 3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

### 3.7 DATA SOURCES

Primary data were provided by Welspun Flooring for their manufacturing facility. The source of secondary LCI data is the Ecoinvent database.



**Table 6.** Data sources for the Welspun Artificial Grass product system.

Component	Dataset	Data Source	Publication data
<b>PRODUCT</b>			
Yarns	polypropylene production, granulate   polypropylene, granulate   Cutoff, U - RoW	EI v3.5	2018
	market for polyethylene, low density, granulate   polyethylene, low density, granulate   Cutoff, U - GLO	EI v3.5	2018
<b>Backings</b>			
PP fleece woven	polypropylene production, granulate   polypropylene, granulate   Cutoff, U - RoW	EI v3.5	2018
<b>Coatings</b>			
SBR Latex	market for styrene   styrene   Cutoff, U - GLO market for butadiene   butadiene   Cutoff, U - GLO	EI v3.5	2018
<b>PACKAGING</b>			
Wrapping Film	market for packaging film, low density polyethylene   packaging film, low density polyethylene   Cutoff, U - GLO	EI v3.5	2018
<b>TRANSPORT</b>			
Road transport	market for transport, freight, lorry 16-32 metric ton, EURO4   transport, freight, lorry 16-32 metric ton, EURO4   Cutoff, U/RoW	EI v3.5	2018
Ship transport	transport, freight, sea, transoceanic ship   transport, freight, sea, transoceanic ship   Cutoff, U - GLO	EI v3.5	2018
Rail Transport	market group for transport, freight train   transport, freight train   Cutoff, U - GLO	EI v3.5	2018
<b>RESOURCES</b>			
Grid electricity	market for electricity, medium voltage   electricity, medium voltage   Cutoff, U - IN-Southern grid	EI v3.5	2018
Heat – natural gas	market for heat, district or industrial, natural gas   heat, district or industrial, natural gas   Cutoff, U - RoW	EI v3.5	2018
Coal	hard coal, import from RNA   hard coal   Cutoff, U - IN	EI v3.5	2018
Diesel	market for diesel, burned in diesel-electric generating set, 18.5kW   diesel, burned in diesel-electric generating set, 18.5kW   Cutoff, U - GLO	EI v3.5	2018
Water	market for tap water   tap water   Cutoff, U - RoW	EI v3.5	2018

### 3.8 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

**Table 7.** Data quality assessment for the Welspun Flooring Artificial Grass product system.

Data Quality Parameter	Data Quality Discussion
<p><b>Time-Related Coverage:</b> Age of data and the minimum length of time over which data is collected</p>	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 5 years old (typically 2018). All of the data used represented an average of all available data, specifically six months of data from September 2019-February 2020.
<p><b>Geographical Coverage:</b> Geographical area from which data for unit processes is collected to satisfy the goal of the study</p>	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for India. Surrogate data used in the assessment are representative of global operations in most cases. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on regional statistics.
<p><b>Technology Coverage:</b> Specific technology or technology mix</p>	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
<p><b>Precision:</b> Measure of the variability of the data values for each data expressed</p>	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
<p><b>Completeness:</b> Percentage of flow that is measured or estimated</p>	The LCA model included all known mass and energy flows for production of the flooring products which it was possible to model. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
<p><b>Representativeness:</b> Qualitative assessment of the degree to which the data set reflects the true population of interest</p>	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
<p><b>Consistency:</b> Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis</p>	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.5 data where available. Different portions of the product life cycle are equally considered.
<p><b>Reproducibility:</b> Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study</p>	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
<p><b>Sources of the Data:</b> Description of all primary and secondary data sources</p>	Data representing energy use at Welspun's manufacturing facility represents a six month average and are considered of moderate quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.5 LCI data are used.
<p><b>Uncertainty of the Information:</b> Uncertainty related to data, models, and assumptions</p>	Uncertainty related to materials in the products and packaging is moderate. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

### 3.9 PERIOD UNDER REVIEW

The period of review is September 2019-February 2020.

### 3.10 ALLOCATION

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

### 3.11 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

## 4. LCA: Scenarios and Additional Technical Information

### *Delivery and Installation stage (A4 - A5)*

Distribution of the flooring products to the point of installation is included in the assessment. Transportation parameters for modeling product distribution are summarized in Table 8. Transport distances for international product distribution were calculated as a production-weighted average of typical shipping distances. Transport of the products to the point of installation (800 km by diesel truck) is also included based on PCR guidance.

**Table 8.** Product distribution parameters, per 1 m<sup>2</sup> (A4).

Transport Mode	Value
Diesel truck – Fuel utilization (L/100 km)	42
Diesel truck – Capacity utilization (%)	76%
Diesel truck – Distance (km)	600
Ocean freighter – Fuel utilization (g/tkm)	2.5
Ocean freighter – Capacity utilization (%)	65%
Ocean freighter – Distance (km)	4,000
Rail – Fuel utilization (L/100 km)	market- n/a
Rail – Capacity utilization (%)	market- n/a
Rail – Distance (km)	220
Gross mass of products transported (kg)	2.06

The impacts associated with the product installation are assumed negligible. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

**Table 9.** Installation parameters for the flooring products, per 1 m<sup>2</sup> (A5).

Parameter	Value	
Ancillary materials (kg)	negligible	
Net freshwater consumption (m <sup>3</sup> )	-	
Electricity consumption (kWh)	-	
Product loss per functional unit (kg)	negligible	
Waste materials generated by product installation (kg)	negligible	
Output materials resulting from on-site waste processing (kg)	n/a	
Mass of packaging waste (kg)	Cardboard	0.0365
	Plastic LDPE	0.00450
	Other	1.11x10 <sup>-4</sup>

**Use stage (B1)**

No impacts are associated with the use of the product over the Reference Service Lifetime.

**Maintenance stage (B2)**

No maintenance is recommended for the artificial grass.

**Repair/Refurbishment stage (B3; B5)**

Product repair and refurbishment are not relevant during the lifetime of the products.

**Replacement stage (B4)**

The materials and energy required for replacement of the products over the 75-year RSL of the assessment are included in this stage.

**Building operation stage (B6 – B7)**

There is no operational energy or water use associated with the use of the products.

**Disposal stage (C1 - C4)**

The disposal stage includes removal of the products (C1); transport of the flooring products to waste treatment facilities (C2); waste processing (C3); and associated emissions as the product degrades in a landfill or is burned in an incinerator (C4). For the flooring products, no emissions are generated during demolition (C1) while no waste processing (C3) is required for incineration or landfill disposal.

Transportation of waste materials at end-of-life (C2) assumes a 20 mile (~32 km) average distance to disposal, consistent with assumptions used in the US EPA WARM model. At end-of-life, the product is assumed to be disposed in a landfill per PCR requirements. Assumed recycling rates for packaging component materials are based on the PCR. For the packaging materials, 15% of the plastic and 75% of paper and pulp materials are recycled. Of the material not recycled, 20% is incinerated and 80% is assumed landfilled. No recycling of the product materials is assumed at end-of-life. The relevant disposal statistics used for the packaging are summarized in Table 10.

**Table 10.** End-of-life disposal scenario parameters for Artificial Grass

Parameter		Value
Assumptions for scenario development		100% landfill
Collection process	Collected with mixed construction waste (kg)	1.9
Recovery	n/a	0.0
Disposal	Landfill (kg)	1.9
Removals of biogenic carbon <sup>1</sup> (kg CO <sub>2</sub> eq)	n/a	-

## 5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following environmental impact category indicators are reported using characterization factors based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1 and CML-IA.

CML-IA Impact Category	Unit	TRACI 2.1 Impact Category	Unit
Global Warming Potential ( <b>GWP</b> )	kg CO <sub>2</sub> eq	Global Warming Potential ( <b>GWP</b> )	kg CO <sub>2</sub> eq
Depletion potential of the stratospheric ozone layer ( <b>ODP</b> )	kg CFC 11 eq	Ozone Depletion Potential ( <b>ODP</b> )	kg CFC 11 eq
Acidification Potential of soil and water ( <b>AP</b> )	kg SO <sub>2</sub> eq	Acidification Potential ( <b>AP</b> )	kg SO <sub>2</sub> eq
Eutrophication Potential ( <b>EP</b> )	kg PO <sub>4</sub> <sup>3-</sup> eq	Eutrophication Potential ( <b>EP</b> )	kg N eq
Photochemical Oxidant Creation Potential ( <b>POCP</b> )	kg C <sub>2</sub> H <sub>4</sub> eq	Smog Formation Potential ( <b>SFP</b> )	kg O <sub>3</sub> eq
Abiotic depletion potential ( <b>ADP-elements</b> ) for non-fossil resources	kg Sb eq	Fossil Fuel Depletion Potential ( <b>FFD</b> )	MJ Surplus, LHV
Abiotic depletion potential ( <b>ADP-fossil fuels</b> ) for fossil resources	MJ, LHV	-	-

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

The following inventory parameters, specified by the PCR, are also reported.

Resources	Unit	Waste and Outflows	Unit
<b>RPR<sub>E</sub></b> : Renewable primary resources used as energy carrier (fuel)	MJ, LHV	<b>HWD</b> : Hazardous waste disposed	kg
<b>RPR<sub>M</sub></b> : Renewable primary resources with energy content used as material	MJ, LHV	<b>NHWD</b> : Non-hazardous waste disposed	kg
<b>NRPR<sub>E</sub></b> : Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	<b>HLRW</b> : High-level radioactive waste, conditioned, to final repository	kg
<b>NRPR<sub>M</sub></b> : Non-renewable primary resources with energy content used as material	MJ, LHV	<b>ILLRW</b> : Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
<b>SM</b> : Secondary materials	MJ, LHV	<b>CRU</b> : Components for re-use	kg
<b>RSF</b> : Renewable secondary fuels	MJ, LHV	<b>MR</b> : Materials for recycling	kg
<b>NRSF</b> : Non-renewable secondary fuels	MJ, LHV	<b>MER</b> : Materials for energy recovery	kg
<b>RE</b> : Recovered energy	MJ, LHV	<b>EE</b> : Recovered energy exported from the product system	MJ, LHV
<b>FW</b> : Use of net freshwater resources	m <sup>3</sup>	-	-

Modules B1, B3, B5, B6, and B7 are not associated with any impact and are therefore declared as zero. In addition, module C1 is likewise not associated with any impact as the products are expected to be manually deconstructed. Additionally, as the vinyl products do not typically contain bio-based materials, biogenic carbon emissions and removals are not declared. Module D is not declared. In the interest of space and table readability, these modules are not included in the results presented below

**Table 11.** Life Cycle Impact Assessment (LCIA) results for Welspun *Artificial Grass* products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Impact Category	A1	A2	A3	A4	A5	B2	B4	C2	C4
<b>CML-IA</b>									
GWP (kg CO <sub>2</sub> eq)	3.43	0.0694	11.0	0.348	0.0495	0.00	171	0.00993	0.0104
	1.84%	0.0373%	5.89%	0.187%	0.02660%	0.00%	92.0%	0.00534%	0.00560%
AP (kg SO <sub>2</sub> eq)	0.0112	5.50X10 <sup>-4</sup>	0.0448	0.00286	1.48X10 <sup>-5</sup>	0.00	0.684	3.88X10 <sup>-5</sup>	7.20X10 <sup>-5</sup>
	1.51%	0.0739%	6.02%	0.384%	0.001988%	0.00%	92.0%	0.00521%	0.00968%
EP (kg (PO <sub>4</sub> ) <sup>3-</sup> eq)	0.00168	8.51X10 <sup>-5</sup>	0.0247	4.50X10 <sup>-4</sup>	1.00X10 <sup>-4</sup>	0.00	0.311	9.15X10 <sup>-6</sup>	1.88X10 <sup>-5</sup>
	0.498%	0.0252%	7.31%	0.133%	0.0296%	0.00%	92.0%	0.00271%	0.00557%
POCP (kg C <sub>2</sub> H <sub>4</sub> eq)	0.00319	1.99X10 <sup>-5</sup>	0.00171	1.00X10 <sup>-4</sup>	1.01X10 <sup>-5</sup>	0.00	0.0580	1.63X10 <sup>-6</sup>	2.75X10 <sup>-6</sup>
	5.06%	0.0315%	2.71%	0.159%	0.0161%	0.00%	92.0%	0.00259%	0.00436%
ODP (kg CFC-11 eq)	2.69X10 <sup>-8</sup>	1.25X10 <sup>-8</sup>	1.94X10 <sup>-7</sup>	5.93X10 <sup>-8</sup>	3.63X10 <sup>-10</sup>	0.00	3.42X10 <sup>-6</sup>	1.85X10 <sup>-9</sup>	1.57X10 <sup>-9</sup>
	0.726%	0.336%	5.24%	1.60%	0.00979%	0.00%	92.0%	0.0497%	0.0423%
ADPE (kg Sb eq)	9.83X10 <sup>-7</sup>	1.64X10 <sup>-7</sup>	2.73X10 <sup>-6</sup>	1.02X10 <sup>-6</sup>	3.78X10 <sup>-9</sup>	0.00	5.67X10 <sup>-5</sup>	3.00X10 <sup>-8</sup>	3.30X10 <sup>-9</sup>
	1.59%	0.265%	4.43%	1.65%	0.00613%	0.00%	92.0%	0.0487%	0.00535%
ADPF (MJ eq)	118	1.03	134	5.03	0.00320	0.00	2970	0.151	0.141
	3.67%	0.0320%	4.14%	0.156%	0.000989%	0.00%	92.0%	0.00469%	0.00438%
<b>TRACI 2.1</b>									
GWP (kg CO <sub>2</sub> eq)	3.33	0.0691	10.9	0.347	0.0404	0.00	169	0.00990	0.0104
	1.81%	0.0376%	5.93%	0.189%	0.0219%	0.00%	92.0%	0.00538%	0.00564%
AP (kg SO <sub>2</sub> eq)	0.0112	5.50X10 <sup>-4</sup>	0.0448	0.00286	1.48X10 <sup>-5</sup>	0.00	0.684	3.88X10 <sup>-5</sup>	7.20X10 <sup>-5</sup>
	1.51%	0.0739%	6.02%	0.384%	0.00199%	0.00%	92.0%	0.00521%	0.00968%
EP (kg N eq)	0.00251	9.12X10 <sup>-5</sup>	0.0515	5.10X10 <sup>-4</sup>	2.70X10 <sup>-4</sup>	0.00	0.631	1.14X10 <sup>-5</sup>	1.89X10 <sup>-5</sup>
	0.366%	0.0133%	7.50%	0.0743%	0.0393%	0.00%	92.0%	0.00165%	0.00275%
SFP (kg O <sub>3</sub> eq)	0.145	0.0110	0.637	0.0563	3.60X10 <sup>-4</sup>	0.00	9.82	0.00109	0.00249
	1.36%	0.103%	5.97%	0.527%	0.00337%	0.00%	92.0%	0.0%	0.0233%
ODP (kg CFC-11 eq)	3.09X10 <sup>-8</sup>	1.66X10 <sup>-8</sup>	3.00X10 <sup>-7</sup>	7.88X10 <sup>-8</sup>	4.76X10 <sup>-10</sup>	0.00	4.96X10 <sup>-6</sup>	2.45X10 <sup>-9</sup>	2.08X10 <sup>-9</sup>
	0.572%	0.307%	5.57%	1.46%	0.008818%	0.00%	92.0%	0.0455%	0.0387%
FFD (MJ eq)	17.8	0.148	3.56	0.710	4.35X10 <sup>-3</sup>	0.00	256	0.0220	0.0189
	6.39%	0.0534%	1.28%	0.256%	0.00157%	0.00%	92.0%	0.00792%	0.00681%

**Table 12.** Resource use and waste flows for the Welspun *Artificial Grass* products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Parameter	A1	A2	A3	A4	A5	B2	B4	C2	C4
<b>Resources</b>									
RPR <sub>E</sub> (MJ)	1.02	0.0141	7.38	0.0823	0.00123	0.0	97.7	0.00161	0.00345
	0.96%	0.0133%	6.95%	0.0775%	0.00116%	0.00%	92.0%	0.00152%	0.00325%
RPR <sub>M</sub> (MJ)	0.0	0.0	1.96	0.0	0.0	0.0	22.5	0.0	0.0
	0.00%	0.00%	8.00%	0.00%	0.00%	0.00%	92.0%	0.00%	0.00%
NRPR <sub>E</sub> (MJ)	125	1.06	140	5.16	0.0343	0	3130	0.154	0.147
NRPR <sub>M</sub> (MJ)	51.7	0.00	0.783	0.00	0.00	0.00	603	0.00	0.00
SM (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
	0%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m <sup>3</sup> )	21	0.53	300	3.0	0.0029	0.00	3800	0.50	0.34
	0.51%	0.013%	7.3%	0.072%	7.1x10 <sup>-5</sup> %	0.00%	92%	0.012%	0.0083%
<b>Wastes</b>									
HWD (kg)	4.00x10 <sup>-6</sup>	6.57x10 <sup>-7</sup>	2.54x10 <sup>-5</sup>	3.72x10 <sup>-6</sup>	3.12x10 <sup>-8</sup>	0.00	3.90x10 <sup>-4</sup>	9.71x10 <sup>-8</sup>	8.98x10 <sup>-8</sup>
	0.943%	0.155%	5.98%	0.878%	0.00735%	0.00%	92.0%	0.0229%	0.0212%
NHWD (kg)	0.0547	0.0390	0.927	0.149	0.00620	0.00	34.6	0.00724	1.90
	0.145%	0.103%	2.46%	0.395%	0.0164%	0.00%	91.8%	0.0192%	5.04%
HLRW (kg)	1.21x10 <sup>-6</sup>	8.76x10 <sup>-8</sup>	1.87x10 <sup>-5</sup>	4.86x10 <sup>-7</sup>	2.19x10 <sup>-10</sup>	0.00	2.30x10 <sup>-4</sup>	8.83x10 <sup>-9</sup>	2.30x10 <sup>-8</sup>
	0.482%	0.0350%	7.46%	0.194%	8.75x10 <sup>-5</sup> %	0.00%	91.8%	0.00352%	0.00916%
ILLRW (kg)	6.72x10 <sup>-6</sup>	7.01x10 <sup>-6</sup>	1.00x10 <sup>-4</sup>	3.36x10 <sup>-5</sup>	1.49x10 <sup>-8</sup>	0.00	0.00158	1.03x10 <sup>-6</sup>	8.90x10 <sup>-7</sup>
	0.389%	0.405%	5.78%	1.94%	8.64x10 <sup>-5</sup> %	0.00%	91.4%	0.0597%	0.0515%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	0.112	0.00	1.29	0.00	0.00
	0.00%	0.00%	0.00%	0.00%	8.00%	0.00%	92.0%	0.00%	0.00%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

Neg. = Negligible



## 6. LCA: Interpretation

The contributions to total impact indicator results are dominated by the product replacement phase (B4) of the assessment. Of the remaining life cycle phases, the product manufacturing phase (A3) is generally the largest contributor followed by the raw material extraction and processing phase (A1), product distribution (A4), and disposal (C4). Other life cycle phase contributions are minimal.

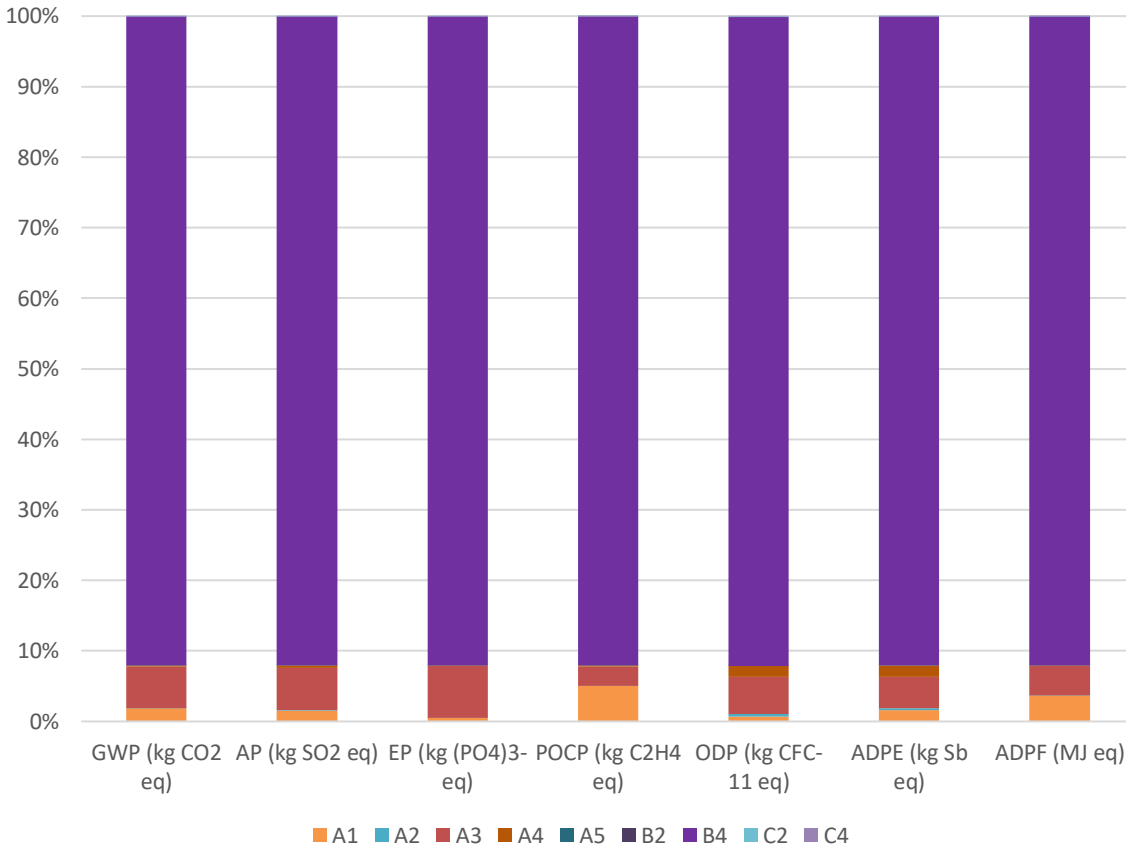


Figure 2. Contribution analysis for Artificial Grass – CML-IA. (with product replacements)

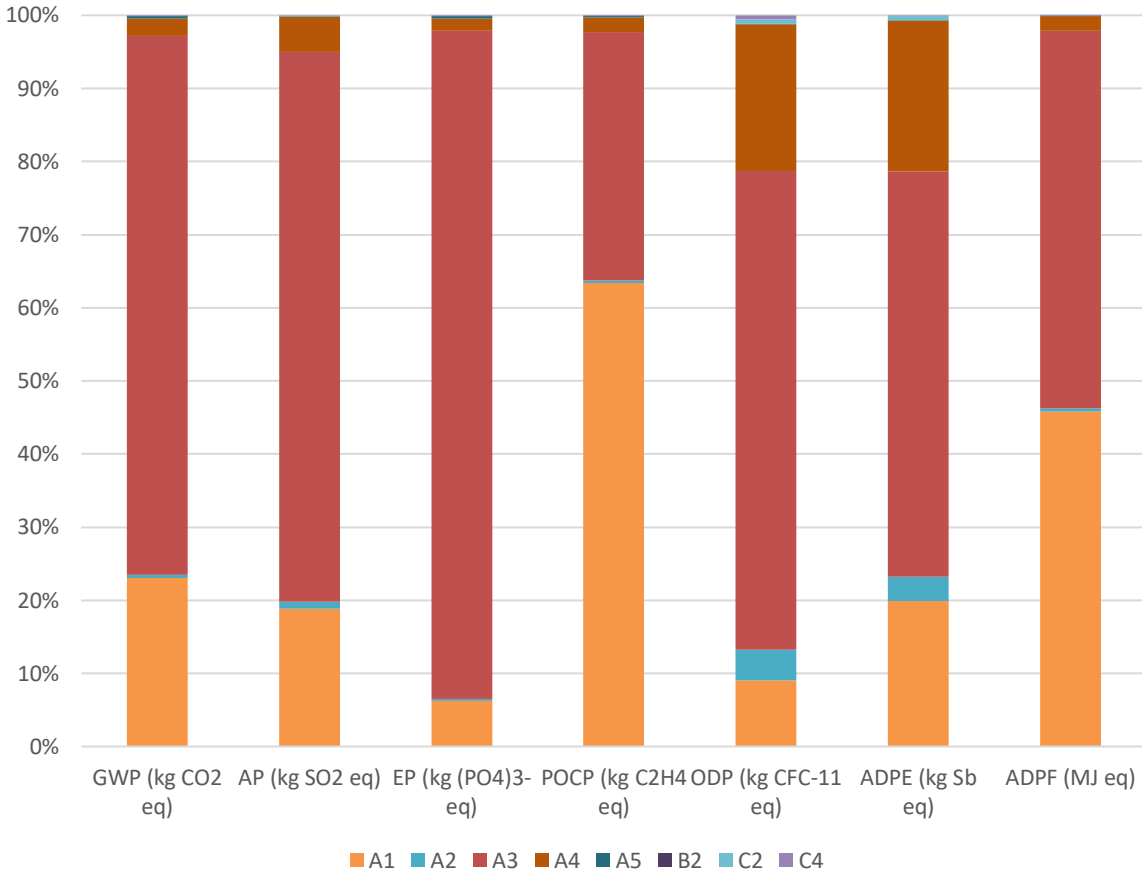


Figure 3. Contribution analysis for the Artificial grass – CML-IA. (without product replacements)

## 7. Additional Environmental Information

For more information on Welspun's certifications and environmental initiatives please view the website at <https://www.welspunindia.com/environment-management.php>

## 8. References

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