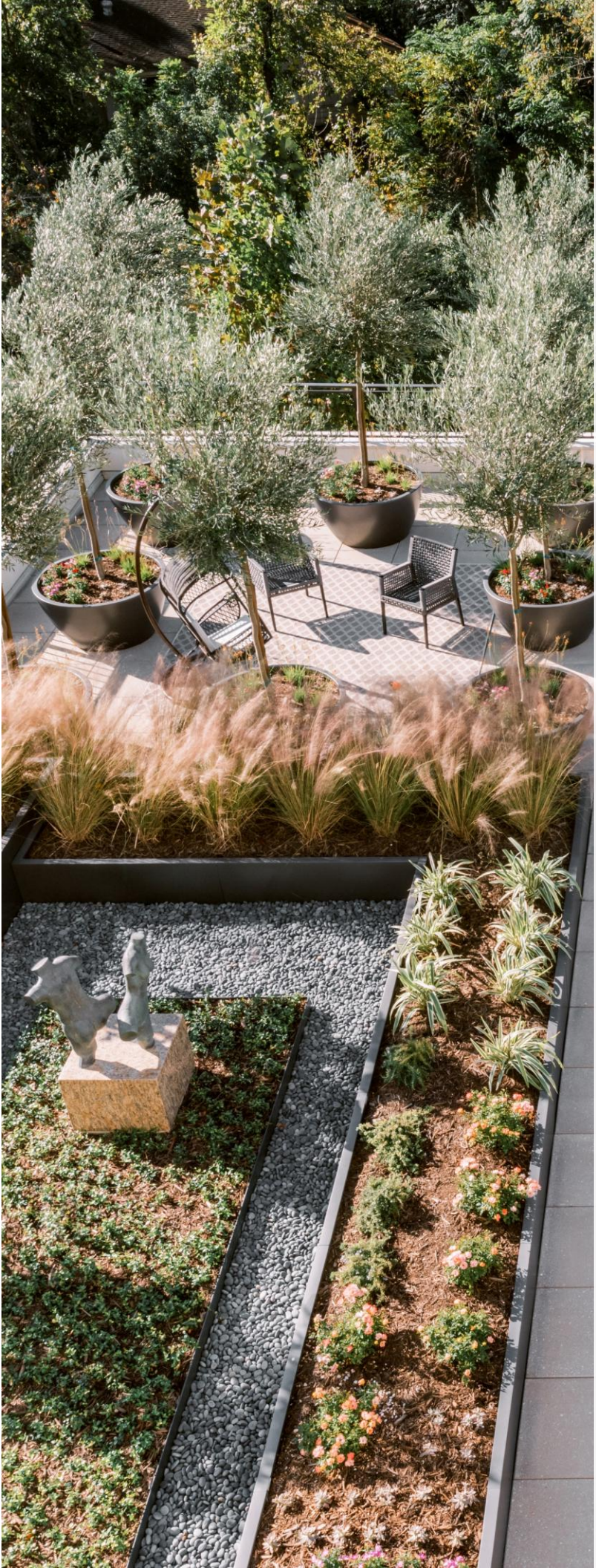

Tournesol

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner
Tournesol
2930 Faber St
Union City, CA, 94587
cmortale@tournesol.com | (510) 240-6849
https://tournesol.com

Product:

Planter products

- Fiberglass (FRP)
- Concrete (GFRC)
- Steel
- Aluminum
- Wood

Functional Unit

One metric ton of installed planter product

EPD Number and Period of Validity

SCS-EPD-10320
EPD Valid January 23, 2025 through January 22, 2030

Product Category Rule

ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

Declaration owner:	Tournesol
Address:	2930 Faber St, Union City, CA, 94587
Declaration Number:	SCS-EPD-10320
Date of Issue:	January 23, 2025
Declaration Validity Period:	EPD Valid January 23, 2025 through January 22, 2030
Program Operator:	SCS Global Services, 2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
General Program Instructions:	SCS Type III Environmental Declaration Program: Program Operator Manual. V12.0
Product(s):	Planter products
Declared Unit or Functional Unit:	One metric ton of installed planter product.
Product's Intended Application and Use:	landscaping and growing plants
Product RSL (if applicable):	N/A
Markets of Applicability:	North America
EPD Type:	Product specific
EPD Scope:	Cradle-to-installation
Year(s) of Reported Manufacturer Primary Data:	November 2022 through October 2023
LCA Software & Version Number:	OpenLCA v2.1.1
LCI Database(s) & Version Number:	Ecoinvent v3.10
LCIA Methodology & Version Number:	TRACI 2.1 and CML-IA
Reference PCR:	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
PCR review:	ISO Technical Committee
LCA Practitioner:	Urvi Talaty
Independent critical review of the LCA and data, according to ISO 14044 and the PCR:	☐ internal ☒ external
LCA Reviewer:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Independent verification of the declaration and data, according to ISO 14025 and the PCR:	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *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.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

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.*

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.

The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

1. Tournesol

Tournesol, is a growing manufacturer specializing in commercial pots, planters, fountains and site furnishings. They recently underwent an expansion to include Greenscreen trellis products, through which they are setting new standards in quality green wall and facade solutions, steadfast in their mission to transform spaces. Developed and manufactured in North America, their product range combines beauty and enduring quality, enabling designers' creativity and the builders' efficiency in creating exceptional outdoor spaces that allow community and biodiversity to thrive. Tournesol planters are manufactured in three North American facilities, located in Port Orchard, WA, Union City, CA, and Juarez, Mexico.

2. Product

2.1 PRODUCT DESCRIPTION

Descriptions of the Tournesol Planter products included in the LCA scope are included in Table 1 with example images shown in Figure 1.

Table 1. *List of Tournesol Planter models and product descriptions included in the LCA scope.*

Product Line	Product Description
FRP Planters	Tournesol's commercial-grade FRP planters are highly durable, last longer than plastic, and will endure in most winter climates. Their labor-intensive process results in a uniform, consistent quality product. They are available in three textures; Smooth, Rough Stucco, and Orange Peel.
GFRC Planters	Tournesol's GFRC products are cast in their plant in Juarez, Mexico. GFRC is glass fiber reinforced concrete. It's made by combining a mixture of fine sand, cement, polymer, water, other admixtures, and alkali-resistant glass fibers. GFRC products are available in five textures and a palette of colors.
Steel Planters and Aluminum Planters	Tournesol's metal planters are made from aluminum, mild steel, stainless steel, and weathering steel. Whether starting with metal castings, pipe, sheet metal, or strap, our metal fabrication process requires many labor-intensive steps. Tournesol's wide range of metal fabrication capabilities, including laser cutting, bending, and shaping, use state-of-the art laser cutters and laser welders. Their quality control process includes dry-fitting all modular projects to ensure a clean fit for seams and connection points.
Wood Planters	Tournesol's thermally modified wood planters are manufactured from hardwoods harvested in the Northeast, typically Oak. The planter's interior has a fiberglass liner to keep moisture from soil, ground, and irrigation away from the wood cladding. The wood is thermally processed in a kiln, producing a deep, rich color. Color and grain vary. Like all natural wood products, thermally modified wood will turn silver/gray once exposed to UV sunlight. Planters are also manufactured using softwoods.

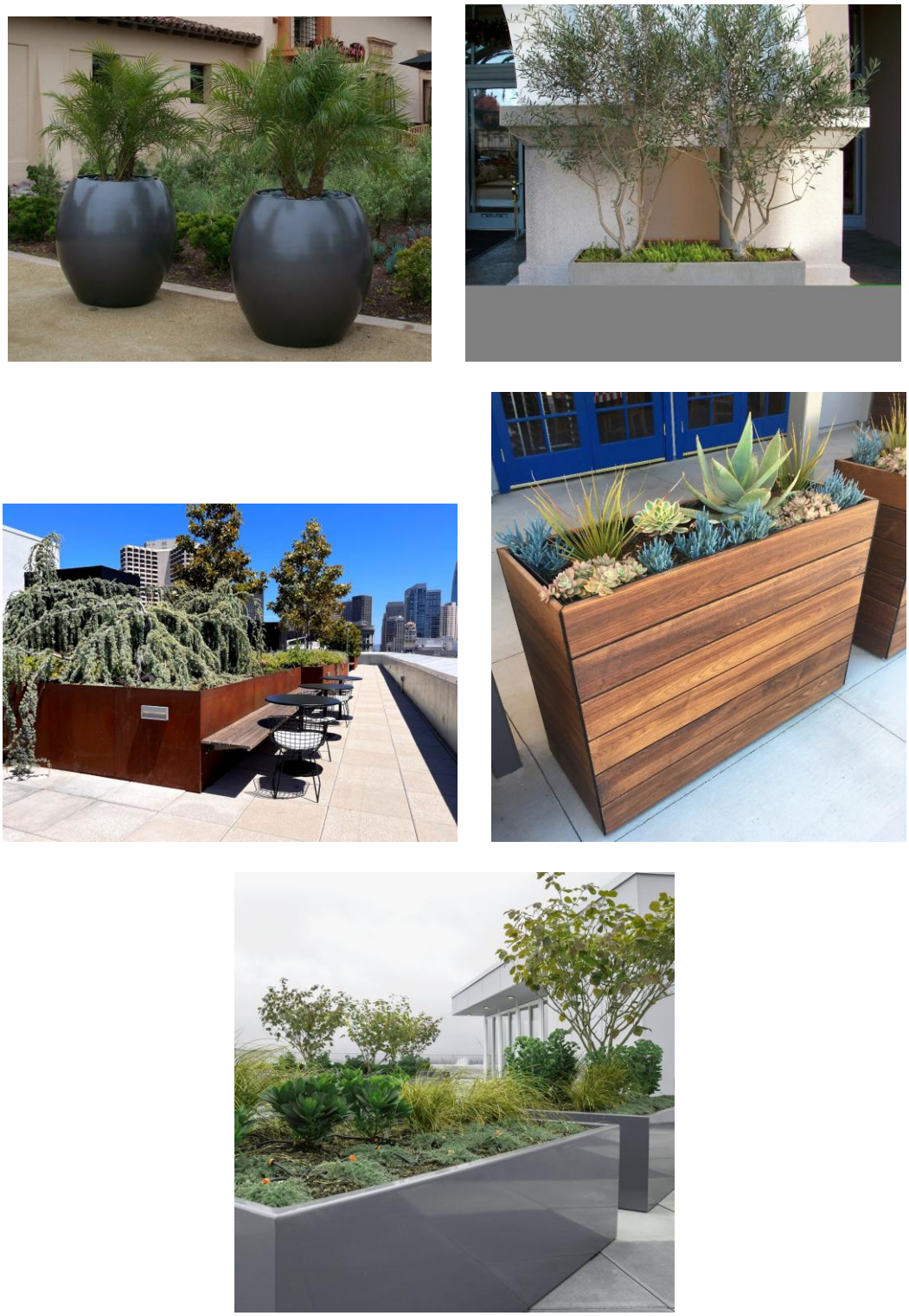

Figure 1. *Product images of Tournesol's planter products. Moving clockwise from the top left, the products are as follows: FRP, GFRC, Wood, Aluminum and Steel planter product groups.*

2.2 FLOW DIAGRAMS

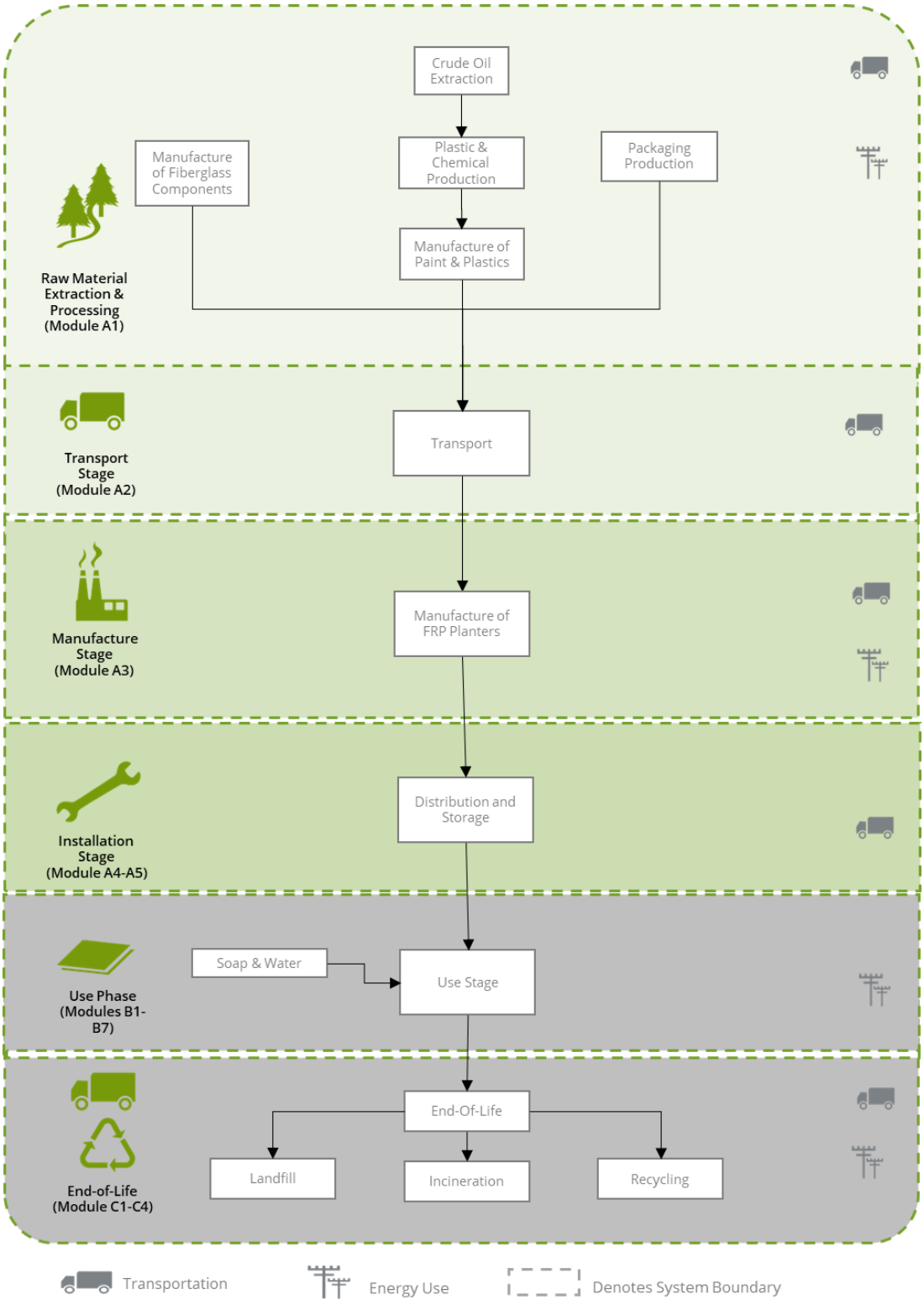

Figure 2. *Flow Diagram representing major unit operations in the life cycle of the Tournesol FRP planter product system.*

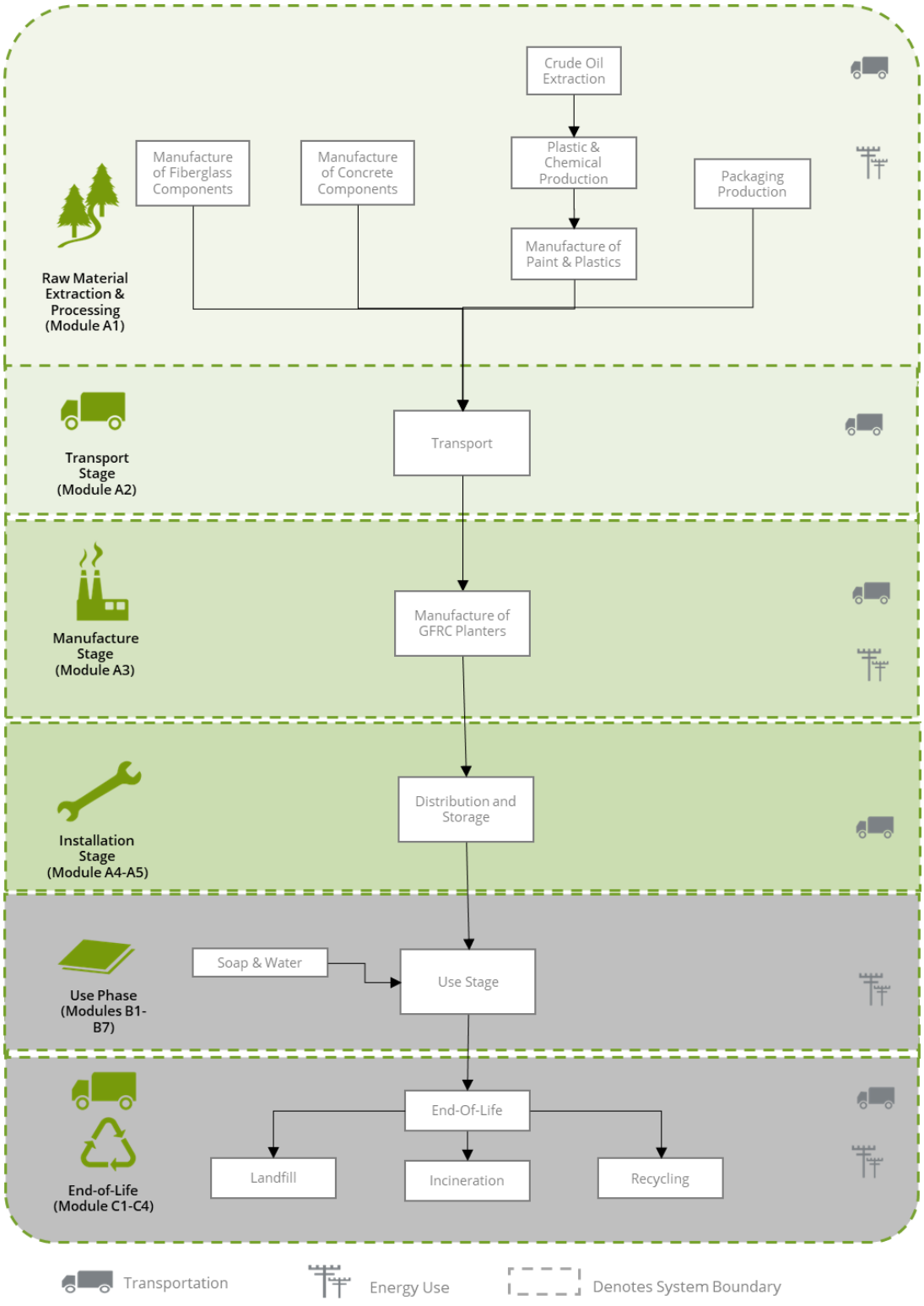

Figure 3. *Flow Diagram representing major unit operations in the life cycle of the Tournesol GFRC planter product system.*

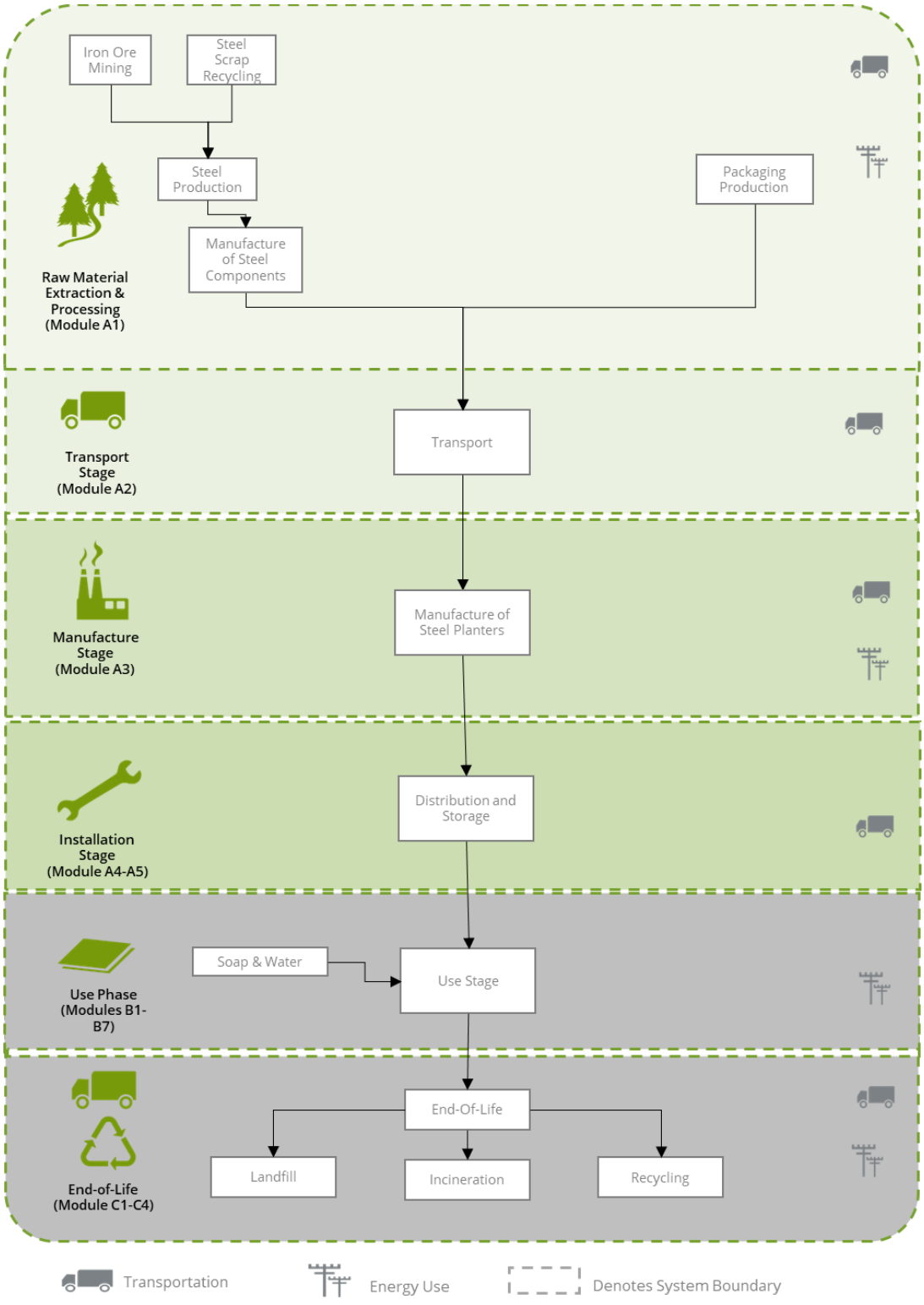

Figure 4. *Flow Diagram representing major unit operations in the life cycle of the Tournesol Steel planter product system.*

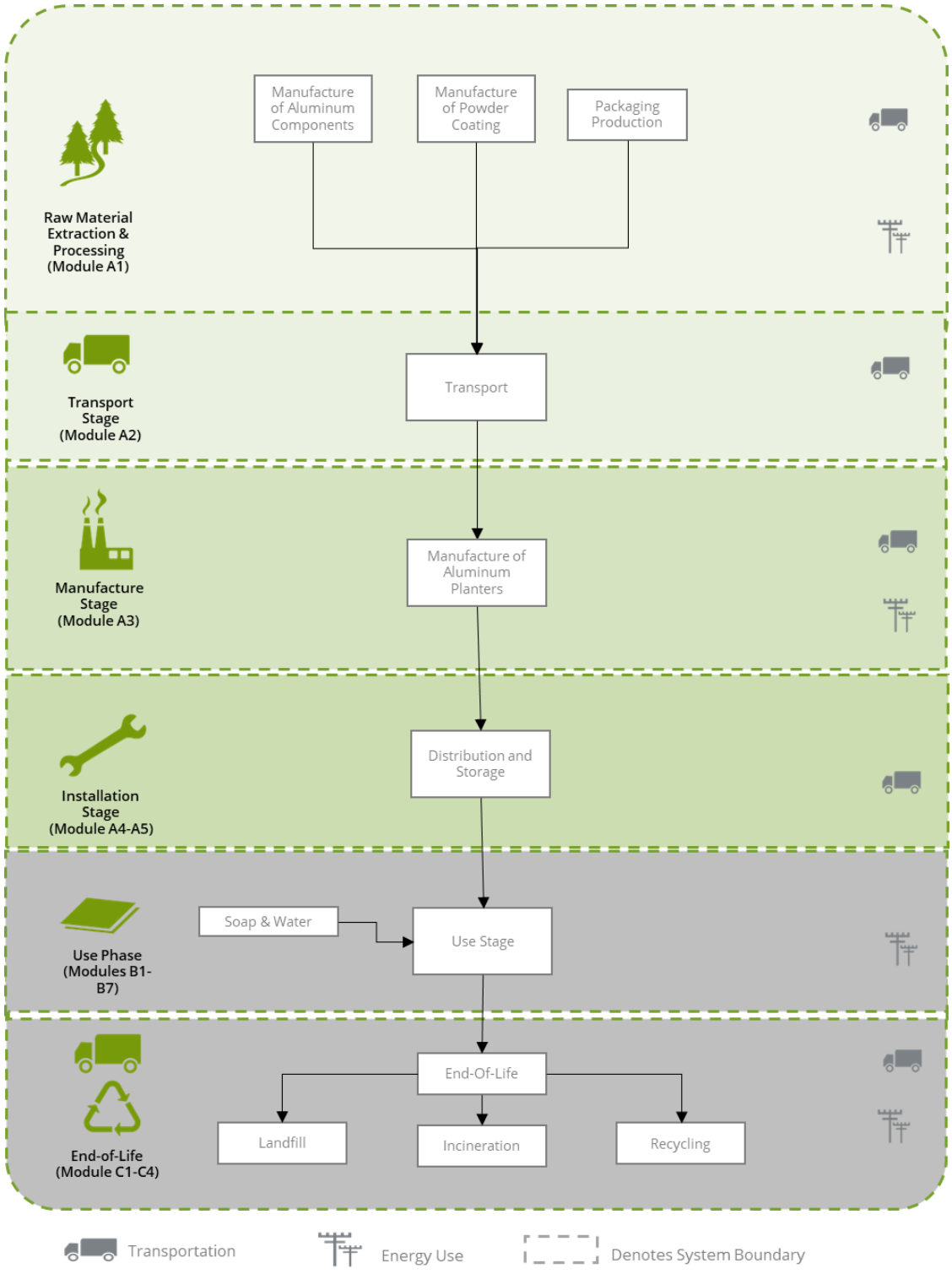

Figure 5. *Flow Diagram representing major unit operations in the life cycle of the Tournesol Aluminum planter product system.*

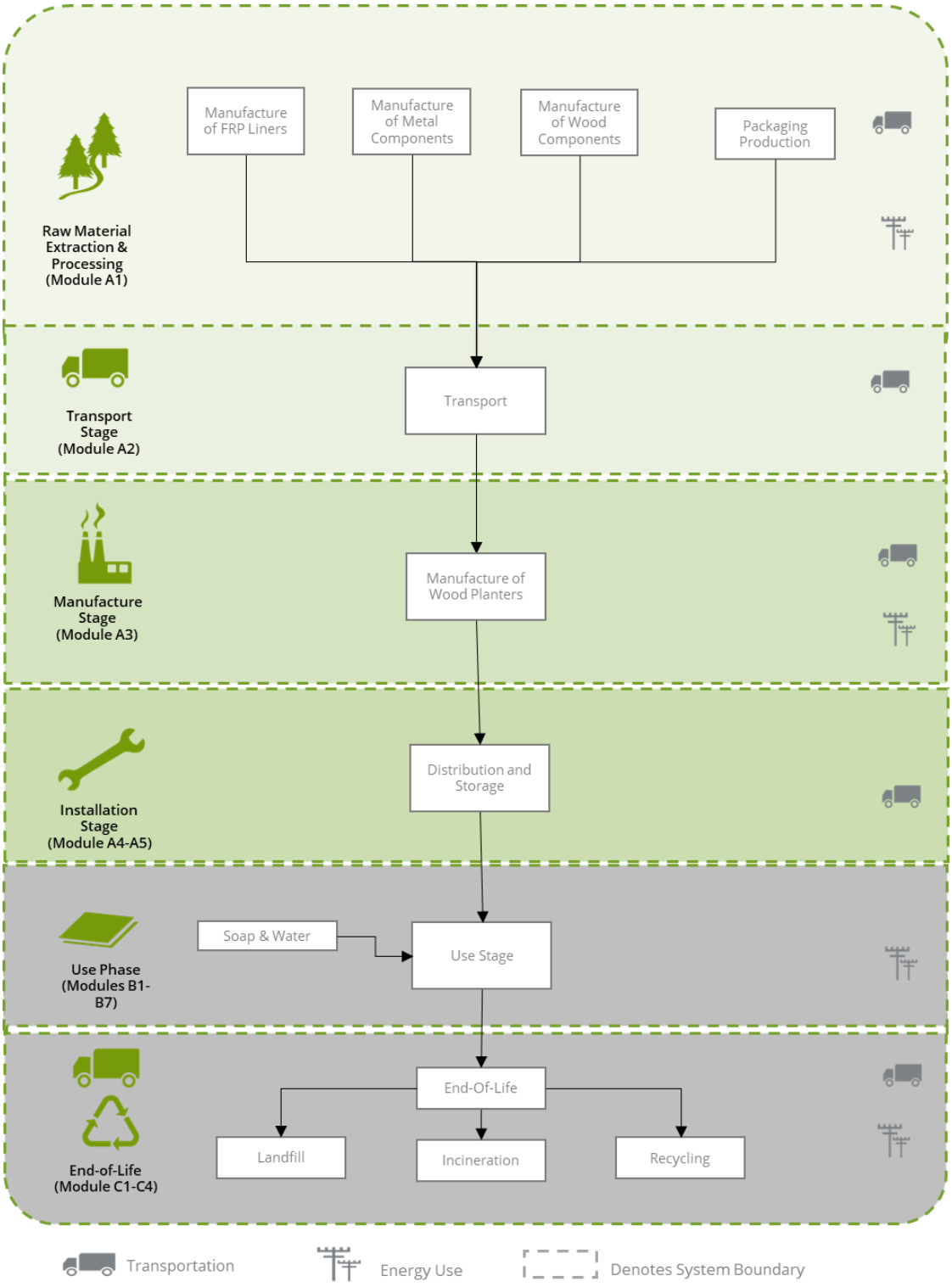

Figure 6. *Flow Diagram representing major unit operations in the life cycle of the Tournesol Wood planter product system.*

2.3 APPLICATION

The planters provide the primary function of landscaping and to support growing plants.

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-installation, including raw material extraction and processing; raw material transportation; product manufacture, distribution, and installation.

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.

Processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No known flows were deliberately excluded from this EPD.

2.6 MATERIAL COMPOSITION

Tournesol planter products are constructed from a variety of materials including fiberglass, concrete, steel, aluminum and wood and various coatings and adhesives. Table 2 – Table 6 summarizes the raw materials by mass for each planter type per metric ton of finished product.

Table 2. *Component material summary for the Tournesol FRP Planter products by mass (kg per metric ton product) and percent of final product.*

Product Input	Weight (kg)	Packaging Input	Weight (kg)
JUAREZ FACILITY			
Laminating resin	882	Wooden Pallets	106
Fiberglass Chopped Strand Mat	306	LDPE packaging film	11.3
Acetone	307	Foam	1.34
Black Sanding Gelcoat	91.4	Cardboard	11.4
Polypropylene honecomb component	41.3	Steel packaging	0.102
Fibertec	23.2		
Primer	23.1		
NOROX®	11.4		
Evercoat Z-Grip Export (Body filler)	22.4		
EvercoatEverglass (BODY FILLER)	9.91		
Various Paints	4.93		
Catalyst V66V47	2.74		
Methyl ethyl ketone	3.58		
Catalyst V66V280	0.763		
Emulfiber (Zahori)	41.1		
Evercoat Cream Hardener (Red, Blue, White)	0.734		
Pallets	1.55		
Phoenix colorant (White)	$2.65x10^{-2}$		
NOROX R-5 RED Concentrate	$4.24x10^{-2}$		
CAB-O-SIL M-5 Fumed Silica	3.51		
General Industrial Acelerator V6V768	$2.15x10^{-2}$		
Phoenix colorant (Black)	$2.65x10^{-2}$		
Partall Paste #2	25.2		
UNION CITY FACILITY			
Various Paints	34.5	HDPE packaging	58.8
Resin	20.8	Kraft paper	90.5
Primer	21.5	Wooden pallets	100
Catalyst for paint	5.00	LDPE packaging film	11.8
Hardener	14.9	Foam	7.82
Acetone	19.6	Cardboard	18.6
Reducer	9.94	Nonwoven textile	2.56
Black gelcoat	6.19	Steel packaging	1.54
Bondo	16.3	Glass	0.540
AIR20 Reducer	5.33		
Catalyst for primer	3.69		
Resin (Tooling)	5.93		
Wood Filler	4.49		
White Gelcoat	0.917		
Henry107	11.6		
Gelcoat (Tooling)	0.269		
Maximus	0.358		
Accelerator	$6.11x10^{-3}$		

Table 3. *Component material summary for the Tournesol GFRC Planter products by mass (kg per metric ton product) and percent of final product.*

Product Input	Weight (kg)	Packaging Input	Weight (kg)
Concrete Pigments (Various Colors)	16.7	Wooden pallets	104
Alkali Resistant Glass Fiber	82.5	LDPE packaging film	11.1
White Portland Cement	902	Foam	1.32
Forton® VF-774	29.5	Cardboard	11.2
Gray Portland Cement	464	Steel packaging	0.100
Metal rods	5.78		
Modified Waterborne Acrylate	1.27		
Concrete Stain (various colors)	5.75		
Exterior Acrylic Paints (various colors)	4.70		
Silica sand	264		
Woven Cord Strap	1.19		
Minifibers SHORT STUFF® Polyethylene	2.16		
XYPEX Concentrate	4.66		
EUCON 37	2.64		
Vermiculite	10.1		
Polystyrene foam slab	2.15		
3M Bondo® All-Purpose Putty	0.981		
HYDRO BARRIER™	5.04		
Stone Sealer	3.45		
Stucco Mesh	0.297		
HYDRO-DEFEND® Concrete Waterproofing Sealer	0.246		
Water	200		
Gravel	18.8		
SOLID-A-SORB	40.3		
Spec Strip (mold release agent)	2.59		
Citrus-Shield Neutral Paste Wax (mold release agent)	0.165		
Plaster (Yeso Maximo)	5.09		

Table 4. *Component material summary for the Tournesol Steel Planter products by mass (kg per metric ton product) and percent of final product.*

Product Input	Weight (kg)	Packaging Input	Weight (kg)
Hot rolled steel	1,000	LDPE packaging film	13.0
		Crating lumber	155
		Steel packaging	2.68
		Cardboard	12.6
		Oriented strand board	23.7

Table 5. *Component material summary for the Tournesol Aluminum Planter products by mass (kg per metric ton product) and percent of final product.*

Product Input	Weight (kg)	Packaging Input	Weight (kg)
Aluminum sheets	1,000	LDPE packaging film	13.0
Powder coating	45.5	Crating lumber	155
		Steel packaging	2.68
		Cardboard	12.6
		Oriented strand board	23.7

Table 6. *Component material summary for the Tournesol Wood Planter products by mass (kg per metric ton product) and percent of final product.*

Product Input	Weight (kg)	Packaging Input	Weight (kg)
UNION CITY FACILITY			
Hardwood lumber	399	LDPE packaging film	12.9
Softwood lumber	41.7	Crating lumber	154
FRP from Juarez	447	Steel packaging	2.66
Stainless steel fasteners	15.5	Cardboard	12.5
Steel	96.3	Oriented strand board	12.5
JUAREZ FACILITY			
		Wooden Pallets	46.3
		LDPE packaging film	4.95
		Foam	0.589
		Cardboard	4.98
		Steel packaging	4.48×10^{-2}

2.7 TRANSPORTATION

Transportation for the LCA model is based on data from the component manufacturer (1st tier supplier) to the manufacturing facility for fabrication and assembly. Transportation data for 2nd tier suppliers (material supplier to component manufacturer) are based on data embedded in the representative LCI datasets. For some materials, this distance was also available and incorporated into the model.

2.8 MANUFACTURE

The five planter products assessed are available with various finish options and are constructed of fiberglass, concrete, steel, aluminum, and wood, and miscellaneous coatings and adhesives. Production processes for the metal planters include laser cutting, powder coating and welding of metal. The production of wood planters includes saw cutting, polishing, coating and adhesion of the wood, and the attachment of metal fasteners and FRP liners. The production of GFRC and FRP planters includes mold creation, casting, demolding, reinforcement, and finishing. Model-specific framing and hardware are then added to each product.

2.9 PACKAGING

All planters are wrapped in plastic and paperboard packaging then boxed into wooden crates built to fit the planters' dimensions for shipping.

2.10 DISTRIBUTION

Distribution of the products to point of sale is included in the model, based on data from the manufacturer. Transportation of the finished product to the point of use was calculated as a weighted average based on the sales of the product by region.

Table 7. *Distribution transportation summary for the Tournesol Planter products*.

Name	Unit	FRP	GFRC	Steel	Aluminum	Wood
Fuel type	-		Diesel			
Liters of fuel	l/100km		18.7			
Vehicle type	-		Freight Truck			
Transport distance	km	2010	3390	2940	2940	2940
Capacity utilization (including empty runs, specify whether mass or volume based)	%		50			
Gross density of product transported	kg/m^3		n/a			
Weight of product transported (if gross density not reported)	kg		1000			
Volume of products transported (if gross density not reported)	m^3	n/a	n/a	n/a		n/a
Capacity utilization volume factor			50			

2.11 INSTALLATION

The products are installed using hand tools with no associated emissions or impacts. Table 8 summarizes the installation parameters for each planter product.

Table 8. *Installation summary for the Tournesol Planter products*.

Parameter	Value for FRP Planters	Value for GFRC Planters	Value for Metal Planters	Value for Aluminum Planters	Value for Wood Planters
Ancillary materials	-	-	-	-	-
Net freshwater consumption (m3)	-	-	-	-	-
Electricity consumption (kWh)	-	-	-	-	-
Product loss per functional unit (kg)	negligible	negligible	negligible	negligible	negligible
Waste materials generated by product installation (kg)	negligible	negligible	negligible	negligible	negligible
Output materials resulting from on-site waste processing (kg)	n/a	n/a	n/a	n/a	n/a
Direct emissions (kg)	-	-	-	-	-
Mass of packaging waste (kg)					
Plastics	79.0	13.3	13.0	13.0	13.0
Steel	1.54	0.100	2.68	2.68	2.68
Paper and paperboard	109	10.2	12.6	12.6	12.6
Wood	100	104	178	178	178
Other	2.56	-	-	-	-
Biogenic carbon in packaging (kg CO2)	385	215	349	349	327
VOC emissions	negligible	negligible	negligible	negligible	negligible

3. Methodological Framework

3.1 DECLARED/FUNCTIONAL UNIT

The declared unit in this study is one (1) metric ton of installed planter. Since the declared unit is on a mass basis, to calculate the actual impact of a particular planter, use the shipping weight of the planter as a multiplier.

3.2 SYSTEM BOUNDARY

Table 9. *Tournesol Planter system boundary.*

Product			Construction		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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = Module Included | MND = Module Not Declared

3.3 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.

3.4 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.

3.5 DATA SOURCES

Primary data were provided by Tournesol for their facility operations in addition to supplier locations and transport modes for the product component materials. The principal source of secondary LCI data is the Ecoinvent v3.10 database.

Table 10. *LCI datasets and used to model material production and processing for the Tournesol products.*

Component	Dataset	Data Source	Publication Date
PRODUCT - FRP Planters			
Laminating resin	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for styrene | styrene | Cutoff, U - GLO	EI v3.10	2023
Fiberglass Chopped Strand Mat	market for glass fibre reinforced plastic, polyester resin, hand lay-up | glass fibre reinforced plastic, polyester resin, hand lay-up | Cutoff, U - GLO	EI v3.10	2023
Acetone	market for acetone, liquid | acetone, liquid | Cutoff, U - RoW	EI v3.10	2023
Black Sanding Gelcoat	market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone)	EI v3.10	2023

Component	Dataset	Data Source	Publication Date
Polypropylene honeycomb component	injection moulding | injection moulding | Cutoff, U - RoW; market for polypropylene, granulate | polypropylene, granulate | Cutoff, U - GLO	EI v3.10	2023
Primer	market for butyl acetate | butyl acetate | Cutoff, U - RoW; market for calcium carbonate, precipitated | calcium carbonate, precipitated | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for hydrocarbons, aromatic, cyclic (C9+) | hydrocarbons, aromatic, cyclic (C9+) | Cutoff, U - GLO; market for methyl ethyl ketone | methyl ethyl ketone | Cutoff, U - RoW; silica sand production | silica sand | Cutoff, U - RoW; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for titanium dioxide | titanium dioxide | Cutoff, U - RoW; market for xylene, mixed | xylene, mixed | Cutoff, U - RoW	EI v3.10	2023
Fibertec	market for glass fibre | glass fibre | Cutoff, U - GLO; market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW	EI v3.10	2023
Evercoat Z-Grip Export (Body filler)	market for calcium carbonate, precipitated | calcium carbonate, precipitated | Cutoff, U - RoW; market for carbon black | carbon black | Cutoff, U - GLO; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for dolomite | dolomite | Cutoff, U - RoW; market for limestone, crushed, for mill | limestone, crushed, for mill | Cutoff, U - RoW; magnesite production; market for paraffin | paraffin | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO; market for styrene | styrene | Cutoff, U - GLO; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone)	EI v3.10	2023
NOROX® MEKP-9	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for hydrogen peroxide, without water, in 50% solution state | hydrogen peroxide, without water, in 50% solution state | Cutoff, U - RoW	EI v3.10	2023
Evercoat-Everglass (BODY FILLER)	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for glass fibre | glass fibre | Cutoff, U - GLO; market for glass tube, borosilicate | glass tube, borosilicate | Cutoff, U - GLO; magnesite production; market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone)	EI v3.10	2023
Various Paints	market for barium sulfide | barium sulfide | Cutoff, U - GLO; market for butyl acetate | butyl acetate | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for hydrocarbons, aromatic, cyclic (C9+) | hydrocarbons, aromatic, cyclic (C9+) | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
Catalyst V66V47	market for butyl acetate | butyl acetate | Cutoff, U - RoW; market for tap water | tap water | Cutoff, U - RoW; market for toluene diisocyanate | toluene diisocyanate | Cutoff, U - RoW	EI v3.10	2023
Methyl ethyl ketone	market for toluene diisocyanate | toluene diisocyanate | Cutoff, U - RoW	EI v3.10	2023
Catalyst V66V280	market for hexamethylene-1,6-diisoncyanate | hexamethylene-1,6-diisoncyanate | Cutoff, U - RoW; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Emulfiber (Zahori)	market for gravel, crushed | gravel, crushed | Cutoff, U - RoW; market for mastic asphalt | mastic asphalt | Cutoff, U - GLO	EI v3.10	2023
Evercoat Cream Hardener (Red, Blue, White)	market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Pallets	market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
phoenix colorant (White)	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
CAB-O-SIL M-5 Fumed Silica	market for silica sand | silica sand | Cutoff, U - GLO	EI v3.10	2023
NOROX R-5 RED Concentrate	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for ethyl benzene | ethyl benzene | Cutoff, U - RoW; market for xylene, mixed | xylene, mixed | Cutoff, U - RoW	EI v3.10	2023
General Industrial Accelerator V6V768	market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Phoenix colorant (Black)	market for carbon black | carbon black | Cutoff, U - GLO; market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Various Paints	market for barium sulfide | barium sulfide | Cutoff, U - GLO; market for butyl acetate | butyl acetate | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
Resin	market for styrene | styrene | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Primer	market for butyl acetate | butyl acetate | Cutoff, U - RoW; market for calcium carbonate, precipitated | calcium carbonate, precipitated | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for methyl ethyl ketone | methyl ethyl ketone | Cutoff, U - RoW; market for silica sand | silica sand | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for titanium dioxide | titanium dioxide | Cutoff, U - RoW; market for xylene, mixed | xylene, mixed | Cutoff, U - RoW	EI v3.10	2023
Catalyst for paint	market for hexamethylene-1,6-diisoncyanate | hexamethylene-1,6-diisoncyanate | Cutoff, U - RoW; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Hardener	market for calcium carbonate, precipitated | calcium carbonate, precipitated | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for plasticiser, for	EI v3.10	2023

Component	Dataset	Data Source	Publication Date
	concrete, based on sulfonated melamine formaldehyde | plasticiser, for concrete, based on sulfonated melamine formaldehyde | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW; market for toner, colour, powder | toner, colour, powder | Cutoff, U - GLO		
Acetone	market for acetone, liquid | acetone, liquid | Cutoff, U - RoW	EI v3.10	2023
Reducer	market for acetone, liquid | acetone, liquid | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Black gelcoat	market for carbon black | carbon black | Cutoff, U - GLO; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Bondo	market for calcium carbonate, precipitated | calcium carbonate, precipitated | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for ethylene glycol diethyl ether | ethylene glycol diethyl ether | Cutoff, U - GLO; market for flat glass, uncoated | flat glass, uncoated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; talc production; market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
Catalyst for primer	market for butyl acetate | butyl acetate | Cutoff, U - RoW; market for tap water | tap water | Cutoff, U - RoW; market for toluene diisocyanate | toluene diisocyanate | Cutoff, U - RoW	EI v3.10	2023
AIR20 Reducer	market for acetone, liquid | acetone, liquid | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Resin (Tooling)	market for styrene | styrene | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Wood Filler	market for calcium carbonate, precipitated | calcium carbonate, precipitated | Cutoff, U - RoW; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for ethylene glycol diethyl ether | ethylene glycol diethyl ether | Cutoff, U - GLO; market for flat glass, uncoated | flat glass, uncoated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
White Gelcoat	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for methyl methacrylate | methyl methacrylate | Cutoff, U - RoW; market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
Henry107	market for activated bentonite | activated bentonite | Cutoff, U - GLO; market for kaolin | kaolin | Cutoff, U - GLO; market for mastic asphalt | mastic asphalt | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Gelcoat (Tooling)	market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for methyl ethyl ketone | methyl ethyl ketone | Cutoff, U - RoW; market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Maximus	market for ammonia, anhydrous, liquid | ammonia, anhydrous, liquid | Cutoff, U - RNA; market for dipropylene glycol monomethyl ether | dipropylene glycol monomethyl ether | Cutoff, U - RoW; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Accelerator	chemical production, organic | chemical, organic | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
	PRODUCT - GFRC Planters		
Concrete Pigments (Various Colors)	market for iron ore concentrate | iron ore concentrate | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO	EI v3.10	2023
Alkali Resistant Glass Fiber	market for chemical, inorganic | chemical, inorganic | Cutoff, U - GLO; market for glass fibre | glass fibre | Cutoff, U - GLO	EI v3.10	2023
White Portland Cement	market for cement, Portland | cement, Portland | Cutoff, U - RoW	EI v3.10	2023
Forton® VF-774	market for acrylic dispersion, with water, in 58% solution state | acrylic dispersion, with water, in 58% solution state | Cutoff, U - RoW	EI v3.10	2023
Gray Portland Cement	market for cement, Portland | cement, Portland | Cutoff, U - RoW	EI v3.10	2023
Metal rods	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, U - RoW; steel production, electric, low-alloyed | steel, low-alloyed | Cutoff, U - RoW; hot rolling, steel | hot rolling, steel | Cutoff, U - RoW; metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, U - RoW	EI v3.10	2023
Modified Waterborne Acrylate	market for barium sulfide | barium sulfide | Cutoff, U - GLO; market for holmium oxide | holmium oxide | Cutoff, U - GLO; market for kaolin | kaolin | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW; market for zinc oxide | zinc oxide | Cutoff, U - GLO	EI v3.10	2023

Component	Dataset	Data Source	Publication Date
Concrete Stain (various colors)	market for ethylene glycol | ethylene glycol | Cutoff, U - RoW; market for paraffin | paraffin | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
Exterior Acrylic Paints (various colors)	market for paraffin | paraffin | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW; market for zinc oxide | zinc oxide | Cutoff, U - GLO	EI v3.10	2023
Silica sand	market for silica sand | silica sand | Cutoff, U - GLO	EI v3.10	2023
Woven Cord Strap	market for fibre, polyester | fibre, polyester | Cutoff, U - GLO; weaving of synthetic fibre, for industrial use | weaving, synthetic fibre | Cutoff, U - GLO	EI v3.10	2023
Minifibers SHORT STUFF® Polyethylene	fleece production, polyethylene | fleece, polyethylene | Cutoff, U - RoW; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
XYPEX Concentrate	market for cement, Portland | cement, Portland | Cutoff, U - RoW; market for chemical, inorganic | chemical, inorganic | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO	EI v3.10	2023
EUCON 37	market for chemical, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Vermiculite	market for expanded vermiculite | expanded vermiculite | Cutoff, U - GLO; market for silica sand | silica sand | Cutoff, U - GLO	EI v3.10	2023
Polystyrene foam slab	market for polystyrene foam slab | polystyrene foam slab | Cutoff, U - GLO	EI v3.10	2023
3M Bondo® All-Purpose Putty	market for activated silica | activated silica | Cutoff, U - GLO; market for chemical, inorganic | chemical, inorganic | Cutoff, U - GLO; market for inert filler | inert filler | Cutoff, U - GLO; market for limestone, crushed, for mill | limestone, crushed, for mill | Cutoff, U - RoW; market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW; silica sand production | silica sand | Cutoff, U - RoW; market for styrene | styrene | Cutoff, U - GLO; limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with talc instead of limestone); market for titanium dioxide | titanium dioxide | Cutoff, U - RoW	EI v3.10	2023
HYDRO BARRIER™	market for ethylene glycol | ethylene glycol | Cutoff, U - RoW; market for limestone, crushed, for mill | limestone, crushed, for mill | Cutoff, U - RoW; market for potassium hydroxide | potassium hydroxide | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW; market for titanium dioxide | titanium dioxide | Cutoff, U - RoW; market for zinc oxide | zinc oxide | Cutoff, U - GLO	EI v3.10	2023
Stone Sealer	market for chemical, inorganic | chemical, inorganic | Cutoff, U - GLO; market for chemical, organic | chemical, organic | Cutoff, U - GLO; market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Stucco Mesh	market for glass fibre | glass fibre | Cutoff, U - GLO	EI v3.10	2023
HYDRO-DEFEND® Concrete Waterproofing Sealer	market for acrylic binder, with water, in 54% solution state | acrylic binder, with water, in 54% solution state | Cutoff, U - RoW	EI v3.10	2023
Water	market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
Gravel	market for gravel, crushed | gravel, crushed | Cutoff, U - RoW	EI v3.10	2023
SOLID-A-SORB	limestone quarry operation | limestone, unprocessed | Cutoff, U - RoW (modified with diatomite instead of limestone)	EI v3.10	2023
	PRODUCT - Steel Planters		
Hot rolled steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, U - RoW; steel production, electric, low-alloyed | steel, low-alloyed | Cutoff, U - RoW; hot rolling, steel | hot rolling, steel | Cutoff, U - RoW	EI v3.10	2023
	PRODUCT - Aluminum Planters		
Aluminium sheet	market for aluminium, cast alloy | aluminium, cast alloy | Cutoff, U - GLO; sheet rolling, aluminium | sheet rolling, aluminium | Cutoff, U - RoW	EI v3.10	2023
Powder coat	market for coating powder | coating powder | Cutoff, U - RoW	EI v3.10	2023
	PRODUCT - Wood Planters		
Hardwood lumber - Thermally modified oak	market for sawnwood, board, hardwood, dried (u=20%), planed | sawnwood, board, hardwood, dried (u=20%), planed | Cutoff, U - RoW; thermal modification process modelled using LCI data from literature	EI v3.10	2023
Softwood lumber	market for sawnwood, board, softwood, dried (u=20%), planed | sawnwood, board, softwood, dried (u=20%), planed | Cutoff, U - RoW	EI v3.10	2023
Hardwood lumber - Ipe	market for sawnwood, azobe, dried (u=15%), planed | sawnwood, azobe, dried (u=15%), planed | Cutoff, U - RoW	EI v3.10	2023
Stainless steel	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, U - GLO	EI v3.10	2023
Hot rolled steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, U - RoW; steel production, electric, low-alloyed | steel, low-alloyed | Cutoff, U - RoW; hot rolling, steel | hot rolling, steel | Cutoff, U - RoW	EI v3.10	2023
	PACKAGING		
HDPE packaging	market for polyethylene, high density, granulate | polyethylene, high density, granulate | Cutoff, U - GLO; injection moulding | injection moulding | Cutoff, U - RoW	EI v3.10	2023
Kraft paper	market for kraft paper | kraft paper | Cutoff, U - RoW	EI v3.10	2023
Wooden pallets	market for EUR-flat pallet | EUR-flat pallet | Cutoff, U - RoW	EI v3.10	2023

Component	Dataset	Data Source	Publication Date
LDPE packaging film	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - GLO	EI v3.10	2023
Foam	market for polyethylene, low density, granulate | polyethylene, low density, granulate | Cutoff, U - GLO; market for polymer foaming | polymer foaming | Cutoff, U - GLO	EI v3.10	2023
Cardboard	market for corrugated board box | corrugated board box | Cutoff, U - US	EI v3.10	2023
Nonwoven textile	market for textile, nonwoven polyester | textile, nonwoven polyester | Cutoff, U - GLO	EI v3.10	2023
Steel packaging	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled | Cutoff, U - GLO; market for metal working, average for chromium steel product manufacturing | metal working, average for chromium steel product manufacturing | Cutoff, U - GLO	EI v3.10	2023
Glass	market for packaging glass, brown | packaging glass, brown | Cutoff, U - GLO	EI v3.10	2023
Crating lumber	market for sawnwood, beam, hardwood, dried (u=20%), planed | sawnwood, beam, hardwood, dried (u=20%), planed | Cutoff, U - RoW	EI v3.10	2023
Oriented strand board	market for oriented strand board | oriented strand board | Cutoff, U - RoW	EI v3.10	2023
	ANCILLARY MATERIALS		
Partall Paste #2	kerosene production, petroleum refinery operation | kerosene | Cutoff, U - RoW	EI v3.10	2023
Spec Strip (mold release agent)	chemical production, organic | chemical, organic | Cutoff, U - GLO	EI v3.10	2023
Citrus-Shield Neutral Paste Wax (mold release agent)	chemical production, organic | chemical, organic | Cutoff, U - GLO; kerosene production, petroleum refinery operation | kerosene | Cutoff, U - RoW; paraffin production | paraffin | Cutoff, U - RoW	EI v3.10	2023
Plaster (Yeso Maximo)	stucco production | stucco | Cutoff, U - RoW	EI v3.10	2023
	TRANSPORT		
Road transport	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RoW	EI v3.10	2023
Ship transport	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO	EI v3.10	2023
	RESOURCES		
Grid electricity - CAMX	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U - Custom CAMX 2022	EI v3.10	2023
Grid electricity - NWPP	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U - Custom NWPP 2022	EI v3.10	2023
Grid electricity - Mexico	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U - MX	EI v3.10	2023
Heat – natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, U - RoW	EI v3.10	2023
Fuel - Propane	heat production, propane, at industrial furnace >100kW | heat, district or industrial, other than natural gas | Cutoff, U - RoW	EI v3.10	2023
Water	market for tap water | tap water | Cutoff, U - RoW	EI v3.10	2023
	WASTE MANAGEMENT		
Hazardous waste treatment - Incineration	treatment of hazardous waste, hazardous waste incineration | hazardous waste, for incineration | Cutoff, U - RoW	EI v3.10	2023
Hazardous waste treatment - Incineration with energy recovery	treatment of hazardous waste, hazardous waste incineration, with energy recovery | hazardous waste, for incineration | Cutoff, U - RoW	EI v3.10	2023
Municipal solid waste - Landfill	treatment of municipal solid waste, sanitary landfill | municipal solid waste | Cutoff, U - RoW	EI v3.10	2023
Inert waste - Landfill	treatment of inert waste, sanitary landfill | inert waste | Cutoff, U - RoW	EI v3.10	2023
Steel - Landfill	treatment of scrap steel, inert material landfill | scrap steel | Cutoff, U - RoW	EI v3.10	2023
Steel - Incineration	treatment of scrap steel, municipal incineration | scrap steel | Cutoff, U - RoW	EI v3.10	2023
Paper and paperboard - Landfill	treatment of waste paperboard, sanitary landfill | waste paperboard | Cutoff, U - RoW	EI v3.10	2023
Paper and paperboard - Incineration	treatment of waste paperboard, municipal incineration | waste paperboard | Cutoff, U - GLO	EI v3.10	2023
Plastics - Incineration	treatment of waste plastic, mixture, municipal incineration | waste plastic, mixture | Cutoff, U - GLO	EI v3.10	2023
Plastics - Landfill	treatment of waste plastic, mixture, sanitary landfill | waste plastic, mixture | Cutoff, U - RoW	EI v3.10	2023
Wood - Landfill	treatment of waste wood, untreated, sanitary landfill | waste wood, untreated | Cutoff, U - RoW	EI v3.10	2023
Wood - Incineration	treatment of waste wood, untreated, municipal incineration | waste wood, untreated | Cutoff, U - GLO	EI v3.10	2023

3.6. 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 11. *Data quality assessment for Tournesol Planters.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. All of the secondary data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on production from November 2022 – October 2023.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	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 the CAMX and NWPP subregions in the US and for Mexico. Surrogate data used in the assessment are representative of North American or global operations. Data representative of global operations are US statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are considered representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative datasets are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Secondary data for operations are typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. 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. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	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.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.10 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on waste disposal statistics for the US.
Reproducibility: 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	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.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at Tournesol's facilities represent an annual average and are considered of medium to high quality due to the length of time over which these data are collected for the existing production processes. For secondary LCI datasets, Ecoinvent v3.10 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations was not available and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data 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.

3.7 PERIOD UNDER REVIEW

The period of review is 12-months, beginning in November 2022 and ending in October 2023.

3.8 COMPARABILITY AND BENCHMARKING

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.

3.9 ESTIMATES AND ASSUMPTIONS

- Representative inventory data for raw materials were modeled with unit process data taken from Ecoinvent.
- Electricity and resource use (natural gas, fuel oil) at the three Tournesol facilities were allocated to the product based on the product mass as a fraction of the total facility production volume.
- The Tournesol Union City, CA facility is located in the CAMX eGRID NERC subregion. An Ecoinvent inventory dataset was modified to reflect the eGRID energy mix for the CAMX region to estimate resource use and emissions from electricity use at the Union City manufacturing facility.
- The Tournesol Port Orchard, WA facility is located in the NWPP eGRID NERC subregion. An Ecoinvent inventory dataset was modified to reflect the eGRID energy mix for the NWPP region to estimate resource use and emissions from electricity use at the Port Orchard manufacturing facility.
- Steel datasets were developed using some representative secondary data sources for hot-rolled steel and cold formed steel from the AISI report, "Life Cycle Inventories of North American Steel Products.
- Technology of steelmaking for steel components produced in North America were based on the report "2022 World Steel in Figures.
- Data for the manufacturing processes to produce many of the steel, aluminum and plastic components of the products were not specifically known. Therefore, average metal working and plastic injection molding datasets for steel, aluminum and plastic component manufacturing are used.
- For thermally modified oak used to produce the wood planters, no primary data was available on the thermal modification process, and no proxy dataset was available in Ecoinvent. Secondary LCI data from literature was used to model the thermal modification process.
- Modeling of recycled material follows the recycled content method (also known as 100-0 method or cut-off method) whereby only the burdens of reprocessing the waste material are allocated to the system from the use of the recycled material.

4. 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 the TRACI 2.1 and CML-IA impact assessment method. Note also that neither characterization method includes biogenic carbon uptake or biomass CO2 emissions. Most of the wood in the wood planters is sourced from sustainably managed forests, including some of the Brazilian ipe, which is FSC certified when requested by a client. However, not all of the ipe is FSC certified and hence cannot be assumed to come from sustainably managed sources. In summary, there are no impacts associated with land-use changes as the wood for planters is either sourced from sustainably managed forests or there is a lack of data on land use change impacts from Brazilian ipe. Additionally, land use change impacts from the use of wood-based packaging is not relevant due to lack of data on the source of packaging materials and low contribution to total impact. Environmental impacts associated with carbonation are not relevant since the system boundary is cradle-to-installation and excludes the use and end-of-life phases, in which carbonation occurs. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Table 12. *Mandatory environmental impact assessment categories.*

Impact Category	LCIA Methodology	Unit
Global Warming Potential (GWP)	TRACI 2.1	kg CO_2 eq
Acidification Potential (AP)	TRACI 2.1	kg SO_2 eq
Eutrophication Potential (EP)	TRACI 2.1	kg PO_4 eq
Ozone Depletion Potential (ODP)	TRACI 2.1	kg CFC-11 eq
Photochemical Oxidant Creation Potential (POCP)	TRACI 2.1	kg O_3 eq
Abiotic Depletion Potential, fossil (ADPf)	CML-IA	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.

Table 13. *Additional transparency categories.*

Resource Use Indicator	Unit	Waste/Output indicator	Unit
Renewable primary resources used as energy carrier (RPR_E)	MJ, LHV	Non-hazardous waste disposed (NHWD)	kg
Renewable primary resources used as material (RPR_M)	MJ, LHV	Hazardous waste disposed (HWD)	kg
Non-renewable primary resources used as an energy carrier ($NRPR_E$)	MJ, LHV	High-level radioactive waste (HLRW)	kg
Non-renewable primary resources used as material ($NRPR_M$)	MJ, LHV	Intermediate- and low-level radioactive waste (ILLRW)	kg
Secondary materials (SM)	kg	Components for re-use (CRU)	kg
Renewable secondary fuels (RSF)	MJ, LHV	Materials for recycling (MR)	kg
Non-renewable secondary fuels (NRSF)	MJ, LHV	Materials for energy recovery (MER)	kg
Use of net freshwater resources (FW)	m^3	Recovered energy exported from the product system (EE)	MJ
Recovered energy (RE)	MJ, LHV		

Biogenic carbon emissions and removals are reported in accordance with ISO 21930 §7.2.7. and §7.2.12. The biogenic carbon emissions across the declared modules (A1-A3) are zero (carbon neutral). Based on ISO 21930 accounting rules for cradle-to-installation life cycle assessment, all carbon removed from the atmosphere (characterized in the LCIA as -1 kg CO_2e/kg CO_2) in module A1 is assumed emitted to the atmosphere in other modules (characterized in the LCIA as +1 kg CO_2e/kg CO_2). Total GWP_{BIO} includes biogenic carbon emissions and removals from the information modules A1-A5 and also reports values for modules C3/C4 to account for the biogenic carbon that is not emitted in the declared modules to ensure a net neutral biogenic carbon balance. The following inventory parameters related to biogenic carbon removals and emissions are reported:

Table 14. *Indicators describing biogenic carbon emissions and removals.*

Parameter	Parameter	Unit
Biogenic Carbon Removal from Product	BCRP	kg CO_2
Biogenic Carbon Emission from Product	BCEP	kg CO_2
Biogenic Carbon Removal from Packaging	BCRK	kg CO_2
Biogenic Carbon Emission from Packaging	BCEK	kg CO_2
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production	BCEW	kg CO_2

Biogenic carbon removals and emissions were calculated by multiplying the biogenic carbon content of each material against the mass of that material included in the product system; the carbon content is then converted to CO2 by a factor of 3.67, which is based on the ratio of CO2 to C. The biogenic carbon content for wood is based on published literature and was determined to be 50% carbon by weight, which is 0.5 kg C per kg of wood and 1.835 kg CO2 per kg of wood.

All biogenic carbon contained with packaging is released at its end-of-life, which occurs during product installation (A5). The hard and soft lumber used in the wood planter product is Forest Stewardship Council (FSC) certified wood, or derived from a country of origin with stable or increasing forest carbon stocks. However, for the Brazilian ipe used in the wood planters, FSC-certified ipe is only used when specifically requested by a client, and hence not all wood planters will contain ipe derived from sustainably managed forests. ISO 21930 requires a demonstration of forest sustainability to characterize carbon removals with a factor of -1 kg CO2e/kg CO2. For the wood planters, biogenic carbon flows for both scenarios are reported – FSC certified ipe and non-FSC certified ipe (see below).

ISO 21930 Section 7.2.11 Note 2 states the following regarding demonstrating forest sustainability: "Other evidences such as national reporting under the United Nations Framework Convention on Climate Change (UNFCCC) can be used to identify forests with stable or increasing forest carbon stocks." The thermally-modified oak used by Tournesol is FSC certified (See Appendix A), and this is considered as wood from a sustainably grown forest. The UNFCCC annual report of the US provides annual net GHG Flux Estimates for different land use categories. This reporting indicates national increasing and/or neutral forest carbon stocks in recent years. Thus, North American forests meet the conditions for characterization of removals with a factor of -1 kg CO2e/kg CO2. Tournesol's Douglas fir and cedar woods are sourced from North America.

All LCA results are stated to three significant figures in agreement with the PCR for this product and therefore the sum of the total values may not exactly equal 100%.

Table 15. *Key Life Cycle Impact Assessment results by life cycle phase for **FRP** Planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
TRACI						
GWP	kg CO_2 eq	5,970	646	3,000	384	82.4
	%	59%	6%	30%	4%	1%
AP	kg SO2 eq	24.5	4.01	7.02	1.46	$4.18x10^{-2}$
	%	66%	11%	19%	4%	0%
EP	kg PO4 eq	54.7	0.729	24.4	0.428	6.06
	%	63%	1%	28%	0%	7%
ODP	kg CFC-11 eq	$1.80x10^{-4}$	$1.02x10^{-5}$	$8.94x10^{-5}$	$6.12x10^{-6}$	$1.20x10^{-7}$
	%	63%	4%	31%	2%	0%
POCP	kg O3 eq	315	89.6	104	37.3	1.01
	%	58%	16%	19%	7%	0%
CML-IA						
ADPf	MJ	121,000	8,930	33,400	5,390	93.0
	%	72%	5%	20%	3%	0%

Table 16. Key Life Cycle Impact Assessment results by life cycle phase for **GFRC** Planters. Results are shown for one metric ton of installed planter product.

Impact Category	Unit	A1	A2	A3	A4	A5
TRACI						
GWP	kg CO_2 eq	1,720	602	1,700	649	12.3
	%	37%	13%	36%	14%	0%
AP	kg SO_2 eq	5.80	2.29	3.67	2.47	$1.20x10^{-2}$
	%	41%	16%	26%	17%	0%
EP	kg PO_4 eq	4.64	0.670	10.7	0.722	2.11
	%	25%	4%	57%	4%	11%
ODP	kg CFC-11 eq	$2.80x10^{-5}$	$9.58x10^{-6}$	$2.91x10^{-5}$	$1.03x10^{-5}$	$3.94x10^{-8}$
	%	36%	12%	38%	13%	0%
POCP	kg O_3 eq	101	58.4	50.5	62.9	0.318
	%	37%	21%	19%	23%	0%
CML-IA						
ADPf	MJ	11,300	8,450	14,100	9,100	31.6
	%	26%	20%	33%	21%	0%

Table 17. *Key Life Cycle Impact Assessment results by life cycle phase for **Steel** Planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
TRACI						
GWP	kg CO_2 eq	2,000	364	757	562	16.2
	%	54%	10%	20%	15%	0%
AP	kg SO_2 eq	7.22	1.38	2.41	2.14	$1.98x10^{-2}$
	%	55%	11%	18%	16%	0%
EP	kg PO_4 eq	9.40	0.405	3.93	0.626	3.45
	%	53%	2%	22%	4%	19%
ODP	kg CFC-11 eq	$1.17x10^{-5}$	$5.79x10^{-6}$	$1.01x10^{-5}$	$8.95x10^{-6}$	$6.65x10^{-8}$
	%	32%	16%	27%	24%	0%
POCP	kg O_3 eq	104	35.3	35.5	54.5	0.528
	%	45%	15%	15%	24%	0%
CML-IA						
ADPf	MJ	20,200	5,100	9,950	7,890	53.8
	%	47%	12%	23%	18%	0%

Table 18. *Key Life Cycle Impact Assessment results by life cycle phase for **Aluminum** Planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
TRACI						
GWP	kg CO_2 eq	6,680	62.8	757	562	16.1
	%	83%	1%	9%	7%	0%
AP	kg SO_2 eq	36.4	0.239	2.41	2.14	$1.94x10^{-2}$
	%	88%	1%	6%	5%	0%
EP	kg PO_4 eq	26.3	$6.99x10^{-2}$	3.93	0.626	3.45
	%	77%	0%	11%	2%	10%
ODP	kg CFC-11 eq	$5.10x10^{-5}$	$9.99x10^{-7}$	$1.01x10^{-5}$	$8.95x10^{-6}$	$6.47x10^{-8}$
	%	72%	1%	14%	13%	0%
POCP	kg O_3 eq	431	6.09	35.5	54.5	0.517
	%	82%	1%	7%	10%	0%
CML-IA						
ADPf	MJ	65,600	881	9,950	7,890	52.2
	%	78%	1%	12%	9%	0%

Table 19. *Key Life Cycle Impact Assessment results by life cycle phase for **Wood** Planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
TRACI						
GWP	kg CO_2 eq	2,860	733	1,510	562	14.7
	%	50%	13%	27%	10%	0%
AP	kg SO_2 eq	11.8	2.79	4.03	2.14	$1.80x10^{-2}$
	%	57%	13%	19%	10%	0%
EP	kg PO_4 eq	23.7	0.816	8.67	0.626	3.12
	%	64%	2%	23%	2%	8%
ODP	kg CFC-11 eq	$7.72x10^{-5}$	$1.17x10^{-5}$	$2.29x10^{-5}$	$8.95x10^{-6}$	$6.04x10^{-8}$
	%	64%	10%	19%	7%	0%
POCP	kg O_3 eq	162	71.1	57.7	54.5	0.479
	%	47%	21%	17%	16%	0%
CML-IA						
ADPf	MJ	54,000	10,300	16,100	7,890	48.9
	%	61%	12%	18%	9%	0%

Table 20. Resource use and waste flows for **FRP** planters. Results are shown for one metric ton of installed planter product.

Impact Category	Unit	A1	A2	A3	A4	A5
Resources						
RPRE	MJ	4,910	115	16,400	72.3	1.87
	%	23%	1%	76%	0%	0%
RPRM	MJ	27.9	N/A	5,430	N/A	0.00
	%	1%	0%	99%	0%	0%
NRPRE	MJ	125,000	9,040	36,000	5,460	95.0
	%	71%	5%	20%	3%	0%
NRPRM	MJ	42,500	N/A	3,860	N/A	0.00
	%	92%	0%	8%	0%	0%
SM	kg	0.00	N/A	5.09	N/A	0.00
	%	0%	0%	100%	0%	0%
RSF	MJ	N/A	N/A	N/A	N/A	N/A
NRSF	MJ	N/A	N/A	N/A	N/A	N/A
FW	m3	44.8	1.18	8.87	0.749	-0.604
	%	81%	2%	16%	1%	-1%
RE	MJ	N/A	N/A	N/A	N/A	N/A
Wastes						
HWD	kg	0.00	N/A	342	N/A	0.00
	%	0%	0%	100%	0%	0%
NHWD	kg	0.00	N/A	707	N/A	225
	%	0%	0%	76%	0%	24%
HLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
ILLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
CRU	kg	N/A	N/A	N/A	N/A	N/A
MR	kg	0.00	N/A	72.3	N/A	67.0
	%	0%	0%	52%	0%	48%
MER	kg	N/A	N/A	N/A	N/A	N/A
EE	MJ	N/A	N/A	N/A	N/A	N/A

Table 21. *Resource use and waste flows for **GFRC** planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
Resources						
RPRE	MJ	740	113	5,580	122	0.528
	%	11%	2%	85%	2%	0%
RPRM	MJ	0.00	N/A	2,060	N/A	0.00
	%	0%	0%	100%	0%	0%
NRPRE	MJ	12,000	8,560	14,800	9,220	32.1
	%	27%	19%	33%	21%	0%
NRPRM	MJ	194	N/A	558	N/A	0.00
	%	26%	0%	74%	0%	0%
SM	kg	0.00	N/A	1.57	N/A	0.00
	%	0%	0%	100%	0%	0%
RSF	MJ	N/A	N/A	N/A	N/A	N/A
NRSF	MJ	N/A	N/A	N/A	N/A	N/A
FW	m3	6.50	1.17	3.12	1.26	-0.254
	%	55%	10%	26%	11%	-2%
RE	MJ	N/A	N/A	N/A	N/A	N/A
Wastes						
HWD	kg	0.00	N/A	340	N/A	0.00
	%	0%	0%	100%	0%	0%
NHWD	kg	0.00	N/A	324	N/A	89.2
	%	0%	0%	78%	0%	22%
HLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
ILLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
CRU	kg	N/A	N/A	N/A	N/A	N/A
MR	kg	0.00	N/A	0.00	N/A	38.1
	%	0%	0%	0%	0%	100%
MER	kg	N/A	N/A	N/A	N/A	N/A
EE	MJ	N/A	N/A	N/A	N/A	N/A

Table 22. *Resource use and waste flows for **Steel** planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
Resources						
RPRE	MJ	1,620	68.4	12,600	106	0.871
	%	11%	0%	87%	1%	0%
RPRM	MJ	0.00	N/A	3,430	N/A	0.00
	%	0%	0%	100%	0%	0%
NRPRE	MJ	21,400	5,170	10,600	7,990	54.7
	%	47%	11%	24%	18%	0%
NRPRM	MJ	0.00	N/A	585	N/A	0.00
	%	0%	0%	100%	0%	0%
SM	kg	637	N/A	3.41	N/A	0.00
	%	99%	0%	1%	0%	0%
RSF	MJ	N/A	N/A	N/A	N/A	N/A
NRSF	MJ	N/A	N/A	N/A	N/A	N/A
FW	m3	25.1	0.709	6.86	1.10	-0.433
	%	75%	2%	21%	3%	-1%
RE	MJ	N/A	N/A	N/A	N/A	N/A
Wastes						
HWD	kg	0.00	N/A	1.27	N/A	0.00
	%	0%	0%	100%	0%	0%
NHWD	kg	0.00	N/A	0.00	N/A	151
	%	0%	0%	0%	0%	33%
HLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
ILLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
CRU	kg	N/A	N/A	N/A	N/A	N/A
MR	kg	0.00	N/A	1.69	N/A	55.4
	%	0%	0%	3%	0%	97%
MER	kg	N/A	N/A	N/A	N/A	N/A
EE	MJ	N/A	N/A	N/A	N/A	N/A

Table 23. *Resource use and waste flows for **Aluminum** planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
Resources						
RPRE	MJ	7,120	11.8	12,600	106	0.849
	%	36%	0%	63%	1%	0%
RPRM	MJ	0.00	N/A	3,430	N/A	0.00
	%	0%	0%	100%	0%	0%
NRPRE	MJ	68,800	892	10,600	7,990	53.1
	%	78%	1%	12%	9%	0%
NRPRM	MJ	0.00	N/A	585	N/A	0.00
	%	0%	0%	100%	0%	0%
SM	kg	738	N/A	3.41	N/A	0.00
	%	100%	0%	0%	0%	0%
RSF	MJ	N/A	N/A	N/A	N/A	N/A
NRSF	MJ	N/A	N/A	N/A	N/A	N/A
FW	m3	54.1	0.122	6.86	1.10	-0.433
	%	88%	0%	11%	2%	-1%
RE	MJ	N/A	N/A	N/A	N/A	N/A
Wastes						
HWD	kg	0.00	N/A	1.27	N/A	0.00
	%	0%	0%	100%	0%	0%
NHWD	kg	0.00	N/A	0.00	N/A	151
	%	0%	0%	0%	0%	100%
HLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
ILLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
CRU	kg	N/A	N/A	N/A	N/A	N/A
MR	kg	0.00	N/A	1.69	N/A	55.4
	%	0%	0%	3%	0%	97%
MER	kg	N/A	N/A	N/A	N/A	N/A
EE	MJ	N/A	N/A	N/A	N/A	N/A

Table 24. *Resource use and waste flows for **Wood** planters. Results are shown for one metric ton of installed planter product.*

Impact Category	Unit	A1	A2	A3	A4	A5
Resources						
RPRE	MJ	23,800	138	15,100	106	0.791
	%	61%	0%	38%	0%	0%
RPRM	MJ	7,940	N/A	4,350	N/A	0.00
	%	65%	0%	35%	0%	0%
NRPRE	MJ	56,000	10,400	17,200	7,990	49.7
	%	61%	11%	19%	9%	0%
NRPRM	MJ	0.00	N/A	834	N/A	0.00
	%	0%	0%	100%	0%	0%
SM	kg	61.3	N/A	4.11	N/A	0.00
	%	94%	0%	6%	0%	0%
RSF	MJ	N/A	N/A	N/A	N/A	N/A
NRSF	MJ	N/A	N/A	N/A	N/A	N/A
FW	m3	21.2	1.43	8.21	1.10	-0.391
	%	67%	5%	26%	3%	-1%
RE	MJ	N/A	N/A	N/A	N/A	N/A
Wastes						
HWD	kg	0.00	N/A	342	N/A	0.00
	%	0%	0%	100%	0%	0%
NHWD	kg	0.00	N/A	324	N/A	137
	%	0%	0%	70%	0%	30%
HLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
ILLRW	kg	N/A	N/A	N/A	N/A	N/A
	%	0%	0%	0%	0%	0%
CRU	kg	N/A	N/A	N/A	N/A	N/A
MR	kg	0.00	N/A	1.69	N/A	69.9
	%	0%	0%	2%	0%	98%
MER	kg	N/A	N/A	N/A	N/A	N/A
EE	MJ	N/A	N/A	N/A	N/A	N/A

Table 25. *Biogenic carbon emissions and removals - FRP planter product*

Parameter	Unit	TOTAL	A1	A2	A3	A4	A5	C4
BCRP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCRK	kg CO_2	-384	0.00	0.00	-384	0.00	0.00	0.00
BCEK	kg CO_2	384	0.00	0.00	0.00	0.00	384	0.00
BCEW	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 26. *Biogenic carbon emissions and removals - GFRC planter product*

Parameter	Unit	TOTAL	A1	A2	A3	A4	A5	C4
BCRP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCRK	kg CO_2	-211	0.00	0.00	-211	0.00	0.00	0.00
BCEK	kg CO_2	211	0.00	0.00	0.00	0.00	211	0.00
BCEW	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 27. *Biogenic carbon emissions and removals - steel planter product*

Parameter	Unit	TOTAL	A1	A2	A3	A4	A5	C4
BCRP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCRK	kg CO_2	-349	0.00	0.00	-349	0.00	0.00	0.00
BCEK	kg CO_2	349	0.00	0.00	0.00	349	0.00	0.00
BCEW	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 28. *Biogenic carbon emissions and removals - aluminum planter product*

Parameter	Unit	TOTAL	A1	A2	A3	A4	A5	C4
BCRP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEP	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCRK	kg CO_2	-349	0.00	0.00	-349	0.00	0.00	0.00
BCEK	kg CO_2	349	0.00	0.00	0.00	349	0.00	0.00
BCEW	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 29. *Biogenic carbon emissions and removals - wood planter product with FSC-certified thermally modified oak, North American cedar and Douglas fir and FSC-certified ipe*

Parameter	Unit	TOTAL	A1	A2	A3	A4	A5	C4
BCRP	kg CO_2	-809	-809	0.00	0.00	0.00	0.00	0.00
BCEP	kg CO_2	809	0.00	0.00	0.00	0.00	0.00	809
BCRK	kg CO_2	-327	0.00	0.00	-327	0.00	0.00	0.00
BCEK	kg CO_2	327	0.00	0.00	0.00	327	0.00	0.00
BCEW	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 30. *Biogenic carbon emissions and removals - wood planter product with FSC-certified thermally modified oak, North American cedar and Douglas fir and non-FSC certified ipe*

Parameter	Unit	TOTAL	A1	A2	A3	A4	A5	C4
BCRP	kg CO_2	-568	-568	0.00	0.00	0.00	0.00	0.00
BCEP	kg CO_2	809	0.00	0.00	0.00	0.00	0.00	809
BCRK	kg CO_2	-327	0.00	0.00	-327	0.00	0.00	0.00
BCEK	kg CO_2	327	0.00	0.00	0.00	327	0.00	0.00
BCEW	kg CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5. LCA: Interpretation

Results were summarized by life cycle phase for a cradle-to-installation assessment of the five Tournesol planter product systems. The contributions to indicator results are dominated by the raw material extraction and processing stage followed by the manufacturing stage, and then product installation.

6. Additional Environmental Information

6.1 ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

Tournesol is monitoring their Scope I and Scope II emissions and developing a process to understand their Scope III impacts better. Progress has been made through their updated third-party verified and certified HPD (Health Product Declaration) and EPD (Environmental Product Declaration) documents for their Greenscreen trellises. Manufacturing products with superior quality and materials leads to longevity of use, and they are striving to be an industry leader! Tournesol's Impact Report: Planet, People & Prosperity is their first annual sustainability report available to view and download on their website. They will continue to document their progress with sustainability reports annually.

6.2 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website at https://tournesol.com.

7. References

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