GLOBAL GREENTAG INTERNATIONAL PTY LTD

EPD™
Environmental Product Declaration

Environmental Product Declaration
Global GreenTag^{CertTM} EPD Program

Compliant to EN 15804:2012+A1 2013

SHAW
Performance Fabrics

Shaw Performance Fabric

Enviro Vision

GLOBAL GREENTAG® INTERNATIONAL

1. General information

Table1. General information of EPD program

Owner of the declaration	SHAW PERFORMANCE FABRIC 90 – 100 Lee Holm Road, St Marys NSW 2760 Australia https://shawblindfabrics.com/envirovision	
EPD Program holder	GlobalGreen Tag International Pty Ltd	
Product Category Rules (PCR)	- PCR 2020:03 Man-made fibres for textile sector - Global GreenTag// Sub Product Category Rules (PCR) based on Life Cycle Analysis Interior Textiles PCR 2022-2025 Sub-PCR 2022 TEX V1	
Generic PCR review conducted by	Technical committee of the International EPD System	
Independent Verification	X internal	☐ external
Approved and verified by	Dr. Nana Bortsie-Aryee	
EPD prepared by	ERKE Sustainable Building Design and Consultancy	
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LCA Software and LCI database:	OpenLCA software v1.11.0 Ecoinvent v3.8 database	
Registration Numbers:	SOA:PF01:2022:EP	
Issue date:	21/11/2022	
Valid to:	21/11/2027	
Markets of Applicability:	Global	
EPD Type:	Product Specific	
EPD Scope:	Cradle to gate with options, modules C1-C4 and module D	
Time representativeness:	2021	
LCIA Method and Version:	CML-IA, IPCC 2013, ILCD 2011 Midpoint+, USEtox 2 (recommended + interim), EF Method (adapted), Cumulative Energy Demand (LHV), ReCiPe 2016 Midpoint (H), EDIP 2003	

Established in 1948, SHAW is a supplier of performance fabrics to the commercial and residential market, with a distribution network across the Eastern seaboard, Western Australia and New Zealand. SHAW fabrics are developed to provide consistent performance and technical attributes, with consideration for consumer wellbeing and the environment.

1.1 Content of the Background Report

This Background Report represent the life cycle analysis of the Enviro Vision.
Enviro Vision LCA model under five major components;

- Goal and Scope Definition;
- Product Description;
- Life Cycle Inventory (LCI) – data collection and calculation of an inventory of materials, energy and emissions related to the system boundary being studied;
- Life Cycle Impact Assessment (LCIA) – analysis of data to evaluate contributions to various environmental impact categories;
- Interpretation – where the results were analyzed in relative contributions

1.2 Goal of the study

The overall goal of this study is to provide a comprehensive environmental profile view of Enviro Vision by Shaw. The limitations of the study are reduced to minimum by following the "Product Category Rule (PCR) "PCR 2020:03 Man-made fibres for textile sector and Global GreenTag// Sub Product Category Rules (PCR) based on Life Cycle Analysis Interior Textiles PCR 2022-2025 Sub-PCR 2022 TEX V1". The reason to conduct this study is to publish Type III Environmental Product Declaration, based on ISO 14040 and ISO 14044 standards.

The aim of publish an EPD is to make the environmental related information publicly available and provide an external communication of the EPD toward interested audiences such as; architects, engineers, building occupants and consumers. The intended use of the EPD will be also providing transparency in the business especially in business-to-business and business-to-consumer communication.

Critical review will be conducted by Global GreenTag^{CertTM} in conformance with ISO 14044. LCA & EPD program operator 'Global GreenTag^{CertTM} and third-party verifier Nana Bortsie-Aryee and public accessibility in customer portal. This LCA study was not written to support comparative assertions. LCA reports and 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 results due to and not limited to the practitioner's assumptions, the source of the data used in the study and the software tool used to conduct the study.

2. Product Information

2.1 Product Description

Enviro Vision is a non-PVC screen fabric with 100% polyester composition, which is manufactured according to Management Quality System ISO 9001 and Environmental Management System ISO 14001. Enviro Vision is Greenguard and Greenguard Gold certified. It is tested to AS1530 Part II & III, and passes flame retardancy test NFPA 701 (small scale). Enviro Vision is printable and easy to clean. The product is also formaldehyde and lead free.

Since Enviro Vision is 100% polyester composition, it is recyclable.

2.2 Product Specification

Enviro Vision is a non-PVC screen fabric for internal Roller Blinds. Its composition is 100% polyester and it is a recyclable product. Other important features of Enviro Vision are as follow;

- Formaldehyde free
- Lead free
- Easy clean

Table 2. Fabric Product Specification

DESIGN	
COMPOSITION	100% POLYESTER
WIDTH (cm)	165/300
THICKNESS (mm) (EN ISO 5084)	0,57
WEIGHT (g/m2) (ISO 3801)	255
TENSILE STRENGTH (WRAP/WEFT) (N) (EN ISO 13934-1)	WARP: 1997
	WEFT: 1850
TEAR STRENGTH (WARP/WEFT) (N) (EN ISO 13937-3)	WARP: 139
	WEFT: 113
LIGHT FASTNESS (ISO 105 B02)	MIN. 6

2.3 Material Composition

The primary materials include polyester and antistatic finishing agent.

Table 3. Material content for the fabric products, 1 m^2

Component	Percent
Polyester	97-99 %
Antistatic finishing agent	1-3 %

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

2.4 Packaging

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

Table 4. Material content for the fabric product packaging, per square meter.

Component	Percent
Carton Roll	0.54
Cardboard Box	0.01
Tube	0.45

2.5 Reference service life(RSL)

Not applicable for this product category.

3. LCA Calculation rules

3.1 Declared Unit

The functional unit is 1 m^2 of fabric product with an average weight of 0.262 kg/m^2 from cradle to Gate with options, modules A4-A5, C1-C4 and module D.

3.2 System boundary

It is a cradle to grave with options EPD. The system boundary is based on the EN 15804 description. Thetable below shows the system boundaries according to EN 15804.

Table 5. System boundary

	Production			Installation		Use stage							End-of-Life				Next product system
	Raw material supply (extraction,processing,	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse,recovery or	Disposal	Reuse, recovery or recyclingpotential
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Specific data used	>99%					-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-

Declared Modules of the study (MND = module not declared)

Table 6. The modules and unit processes included in the scope for Enviro Vision

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 fabric
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facilities
A3	Manufacturing, including ancillary material production	Manufacturing of fabric product and packaging
A4	Transport to the site	Transport of the final product to the sales depot
A5	Construction – installation process	This product does not require installation
B1	Product use	Module Not Declared
B2	Product maintenance	Module Not Declared
B3	Product repair	Module Not Declared
B4	Product replacement	Module Not Declared
B5	Product refurbishment	Module Not Declared
B6	Operational energy use by technical building systems	Module Not Declared
B7	Operational water uses by technical building systems	Module Not Declared
C1	Deconstruction, demolition	This product does not require deconstruction, demolition
C2	Transport to the waste processing	Transport of end of life products to the landfill area
C3	Waste processing for reuse, recovery and/or recycling	The product is disposed of by landfilling which require no waste processing
C4	Disposal	Disposal of end of life product
D	Reuse-recovery-recycling potential	Potential loads and benefits of end of life product

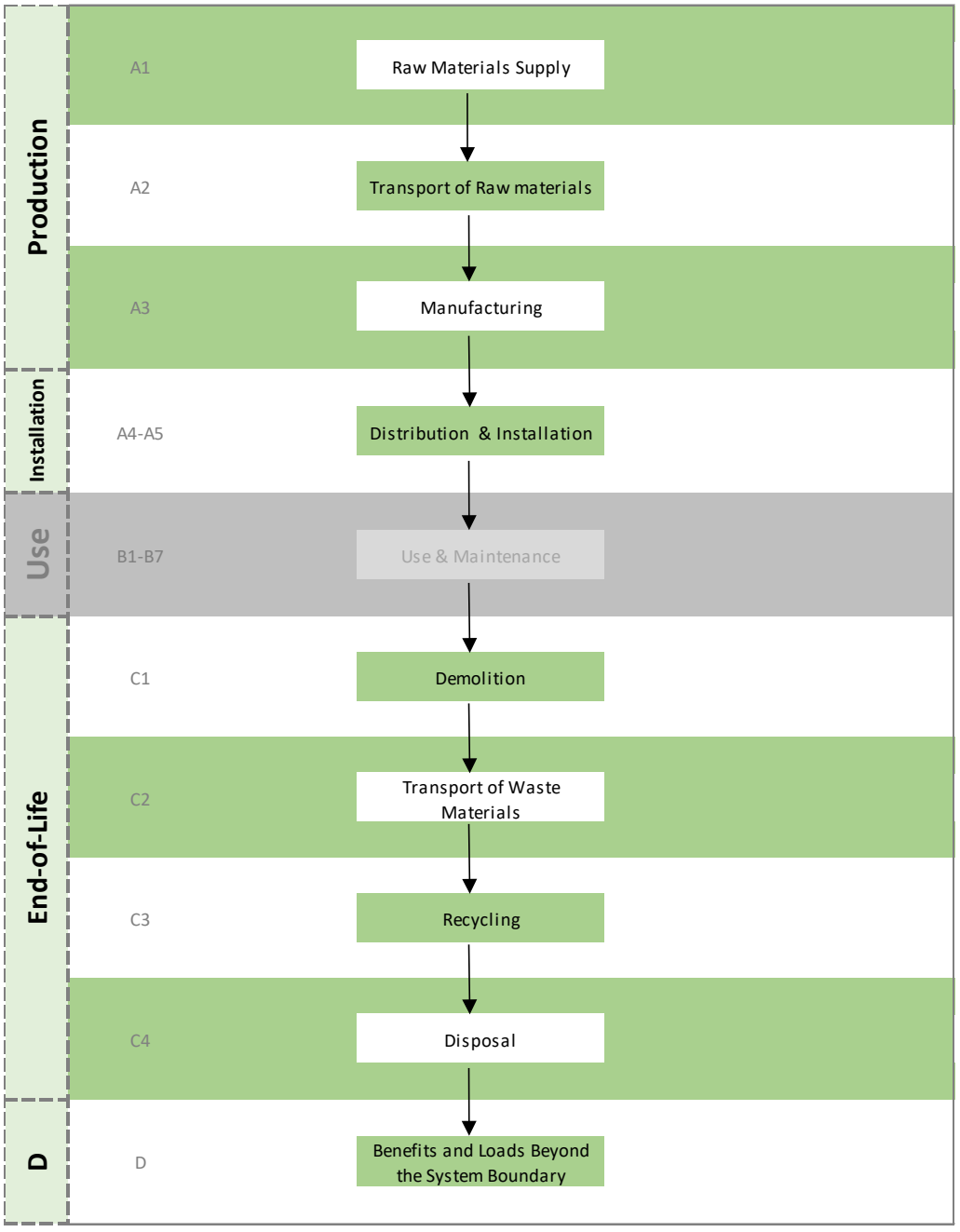


Figure 1. System diagram for the life cycle of the Enviro Vision

3.3 Time period

Manufacturer-supplied data (primary data) are based on annualized production for 2021.

3.4 Estimates and assumptions

End of life stages, end-of-life product is assumed to be disposed by 100%. Since there is no follow up procedure, transportation distance to the closest disposal area is estimated as 50 km and common transportation type and fuel are used in the calculation. The worst case scenario is assumed for waste disposal.

3.5 Cut-off criteria

All inputs and outputs to a (unit) process are included in the calculation, for which data were available. The applied cut off criteria is 1% off renewable and nonrenewable primary energy usage and 1% of the total mass input of that unit process in case of in sufficient input data or data gaps for a unit process.
The total of neglected input flows is a maximum of 1% of energy usage and mass.

Product stage (A1-A3) includes the provision of raw materials, transportation and manufacturing. End of life stage includes recycling of final waste during production and module D includes benefits of reuse, recovery, recycling. However, infrastructure, carrying of product to the storage in manufacturing site, production of manufacturing equipment, and personnel-related activities which are accepted as cut-off criteria are not included in this LCA study.

3.6 Allocation

The physical allocation was performed in which the product output fixed to 1 m^2 and the corresponding amount of product was used in calculations.
Average values for 1m^2 of product which is used within this study is calculated by considering product total weight per year production According to this, the total energy, water, and raw materials used to produce the product were divided by the total annual production.

3.7 Background data

For life cycle modelling of the considered products, the online software OpenLCA has been used to model the product systems considered in this study. All relevant background datasets are taken from the Ecoinvent v3.8 database. The datasets from Ecoinvent date from 2021 and are documented.

Table 7. Data sources for the Haixiang product system

Component	Data Source	Date
Polyester	Ecoinvent 3.8	2021
Antistatic finishing agent	Ecoinvent 3.8	2021
Packaging	**Data Source**	**Date**
Carton Roll	Ecoinvent 3.8	2021
Plastic Bag	Ecoinvent 3.8	2021
Tube	Ecoinvent 3.8	2021
Transportation	**Data Source**	**Date**
Road Transport	Ecoinvent 3.8	2021
Vessel Transport	Ecoinvent 3.8	2021
Energy	**Data Source**	**Date**
Electricity	Ecoinvent 3.8	2021
Natural Gas	Ecoinvent 3.8	2021

3.8 Data quality Assessment

For consistency and completeness of data, openLCA v1.11 and ecoinvent databases v3.8 is used. It provides the life cycle inventory database in all branches to assess the potential environmental burdens of a product from cradle to grave. All input and output flows, type of materials used, energy consumption, transportation and wastes were primary data taken from manufacturer. The manufacturer issues a declaration for the compatibility of their data with reality.

All processes were calculated using representative data on the products declared by the manufacturer. The manufacturer issues a declaration for the compatibility of technical data with physical reality.

All input data like material, energy, transportation and waste were primary data taken from manufacturer. The specific data quality coverages are;

- Geographical coverage: The study generally applies to the actual situation. Global data of raw materials, haulage vehicles, diesel usedfor transportation and waste has been used.
- Time period covered: Goal of the study is to determine the actual environmental loads for 12 consecutive months, so data for the time period between 01.01.2021 and 31.12.2021 is used.
- Technology coverage: The objective of the study is to use data that apply to average technology which represents actual situation.

Table 8. Data quality assessment for the Enviro Vision

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 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 annual production for 2020 so data for the time period between 01.01.2021 and 31.12.2021 is used.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The study generally applies to the actual situation. Global data of raw materials, haulage vehicles, diesel used for transportation and waste has been used.
Technology Coverage: Specific technology or technology mix	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.
Precision: Measure of the variability of the data values for eachdata expressed	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.
Completeness: Percentage of flow that ismeasured 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.
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 throughoutthe 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. For consistency of data, openLCA v1.11 ecoinvent v3.8 databases is used. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices for Global.

Data Quality Parameter	Data Quality Discussion
Reproducibility: Qualitative assessment ofthe 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 Shaw's facility represent anannual average and are considered of high quality due to the length oftime over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI datasets, Ecoinvent v3.8 LCI data are used, with a bias towards Ecoinvent v3.8 data.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the fabric products is very low. Actual supplier data for upstream operations was not available for allsuppliers and the study relied upon the use of existing representativedatasets. 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 andreceiving environments or tipping points.

3.4 EoL Allocation method

End of life stages, end-of-life product is assumed to be disposed by 100%. Since there is no follow up procedure, transportation distance to the closest disposal area is estimated as 50 km and common transportation type and fuel are used in the calculation. The worst case scenario is assumed for waste disposal.

The material and energy inputs and waste outputs were allocated depend on total mass annual production and calculated for 1 m^2 product. Likewise, packaging waste was calculated in accordance with the production ratio.

3.5 Comparability

Different LCA software and background LCI datasets may lead to different results for the life cycle stages. Therefore, without understanding the specific variability, the user is nor encouraged to compare the LCA results. Even for similar products data quality may produce incomparable results. Moreover, LCIA results are relative statements and do not anticipate category endpoints, exceeding thresholds, safety margins, or effects on risks.

4. LCA Scenarios and Additional TechnicalInformation

4.1 Transport to the building site (A4)

Distribution of the fabric products to the point of installation is included in the assessment. Transportation parameters for modeling transport to product distribution centers are summarized in Table 9.

Table 9. Transport parameters (A4)

Vehicle type used Average Distance transport to Distrubition	Transport to product distribution centers
Vessels	24,212 km

4.2 Installation (A5)

Installation of product is accomplished using hand tools with no associated emissions and negligible impacts.

4.3 EoL stage (C1 - C4, D)

The end of life stage consist of 5 main parameters that:

C1: Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts
C2: Transport of fabric product to waste treatment and recycle at end-of-life
C3: The product is disposed of by landfilling which require no waste processing
C4: Disposal of flooring product in municipal landfill
D: Potential benefits from reuse, recovery or recycling.
For the Enviro Vision, no emissions are generated during deconstruction and demolition stage (C1). Since C2 is transportation stage, emission occurs. The wastes directly go to disposal so there is no waste processing (C3) or potential benefits from reuse, recovery or recycling (D).

5. LCA Results

The environmental impact category indicators are also reported based on the CML-IA characterization factors according to EN15804.

Table 10. LCA impact indicators

Parameter	Unit	Calculation Method
Global Warming Potential (GWP)	[kg CO2-Eq.]	IPCC 2013
	[kg CO2-Eq.]	
	[kg CO2-Eq.]	
	[kg CO2-Eq.]	
Ozone Layer Depletion (ODP)	[kg CFC11-Eq.]	CML_IA
Acidification potential (AP)	[kg SO2-Eq.]	CML_IA
Acidification potential (AP)	[mol H+ Eq.]	ILCD 2011 Midpoint+
Eutrophication aquatic freshwater	[kg P]	ILCD 2011 Midpoint+
Eutrophication aquatic marine	[kg N-Eq.]	ILCD 2011 Midpoint+
Eutrophication terrestrial	[molc N-Eq.]	ILCD 2011 Midpoint+
Formation potential of tropospheric ozone (POCP)	[kg ethene-Eq.]	CML_IA
Photochemical ozone formation (POCP)	[kg NMVOC Eq.]	ILCD 2011 Midpoint+
Abiotic depletion potential - Elements (ADPE)	[kg Sb-Eq.]	CML_IA
Abiotic depletion potential -Fossil Fuels (ADPF)	[MJ]	CML_IA
Carbon uptake	[CO2 eq.]	IPCC 2013
Freshwater ecotoxicity (FE)	[PAF.m3.day]	USEtox 2 (recommended + interim)
Human toxicity, cancer (HTC)	[cases]	
Human toxicity, non-cancer (HTNC)	[cases]	
Land use - Potential soil quality index (LU-SQP)	[Pt]	EF Method (adapted)
Particulate matter (PM)	[disease inc]	
Ionizing radiation, human	[kBq U235 eq.]	

Parameter	Unit	Calculation Method
Primary energy resources – Renewable (PERE)	[MJ]	Cumulative Energy Demand (LHV)
Primary energy resources – Non-renewable (PENRE)	[MJ]	Cumulative Energy Demand (LHV)
Net use of fresh water	[m³]	ReCiPe 2016 Midpoint

Parameter	Unit	Calculation Method
Hazardous waste disposed (HWD)	[kg]	EDIP 2003
Non-hazardous waste disposed (NHWD)	[kg]	EDIP 2003
Radioactive waste disposed (RWD)	[kg]	EDIP 2003

Table 11. Potential impacts of Enviro Vision

1 m2 Shaw Enviro Vision_Potential environmental impacts													
Parameter		Unit	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		END OF LIFE STAGE					TOTAL
			A1	A2	A3	A4	A5	C1	C2	C3	C4	D	
			Raw Material Supply	Transport to Manufacturer	Manufacturing	Transport to Building Site	Construction - Installation	Deconstruction Demolition	Transport	Waste Processing	Disposal	Reuse, recovery or recycling potential	
Global Warming Potential (GWP)	Fossil	[kg CO2-Eq.]	5.39E-01	2.57E-03	1.14E+00	5.94E-05	1.46E-06	0.00E+00	6.60E-03	0.00E+00	1.40E-02	0.00E+00	1.71E+00
	Biogenic	[kg CO2-Eq.]	8.53E-03	2.87E-05	1.04E-02	1.54E-07	2.86E-03	0.00E+00	7.38E-05	0.00E+00	2.01E-01	0.00E+00	2.23E-01
	Land use and land transformation	[kg CO2-Eq.]	5.20E-04	1.54E-06	1.24E-04	4.32E-08	0.00E+00	0.00E+00	3.97E-06	0.00E+00	6.64E-06	0.00E+00	6.56E-04
	Total	[kg CO2-Eq.]	5.49E-01	2.60E-03	1.15E+00	5.98E-05	2.87E-03	0.00E+00	6.68E-03	0.00E+00	2.15E-01	0.00E+00	1.93E+00
Ozone Layer Depletion (ODP)		[kg CFC11-Eq.]	6.31E-08	1.61E-08	4.60E-08	9.40E-12	0.00E+00	0.00E+00	1.15E-09	0.00E+00	7.24E-10	0.00E+00	1.27E-07
Acidification potential (AP)		[kg SO2-Eq.]	2.02E-03	7.95E-06	4.44E-03	1.55E-06	1.04E-07	0.00E+00	2.04E-05	0.00E+00	3.67E-05	0.00E+00	6.53E-03
Acidification potential (AP)		[mol H+ Eq.]	2.43E-03	1.01E-05	5.30E-03	1.94E-06	1.14E-07	0.00E+00	2.59E-05	0.00E+00	4.61E-05	0.00E+00	7.82E-03
Eutrophication aquatic freshwater		[kg P]	1.49E-04	2.42E-07	1.75E-03	1.98E-09	0.00E+00	0.00E+00	6.23E-07	0.00E+00	4.16E-06	0.00E+00	1.91E-03
Eutrophication aquatic marine		[kg N-Eq.]	4.63E-04	2.77E-06	1.20E-03	4.78E-07	9.67E-07	0.00E+00	7.12E-06	0.00E+00	4.72E-04	0.00E+00	2.15E-03
Eutrophication terrestrial		[mol c N-Eq.]	4.83E-03	3.02E-05	9.50E-03	5.31E-06	5.63E-09	0.00E+00	7.76E-05	0.00E+00	1.26E-04	0.00E+00	1.46E-02
Formation potential of tropospheric ozone (POCP)		[kg ethene-Eq.]	1.37E-04	3.57E-07	1.82E-04	3.99E-08	4.99E-07	0.00E+00	9.17E-07	0.00E+00	3.53E-05	0.00E+00	3.56E-04
Photochemical ozone formation (POCP)		[kg NMVOC Eq.]	1.76E-03	9.19E-06	2.63E-03	1.37E-06	8.42E-07	0.00E+00	2.36E-05	0.00E+00	9.08E-05	0.00E+00	4.52E-03
Abiotic depletion potential -Elements (ADPE)		[kg Sb-Eq.]	6.13E-06	1.61E-08	1.13E-06	8.19E-11	0.00E+00	0.00E+00	4.14E-08	0.00E+00	1.83E-08	0.00E+00	7.34E-06
Abiotic depletion potential -Fossil Fuels (ADPF)		[MJ]	1.24E+01	3.73E-02	1.68E+01	7.60E-04	0.00E+00	0.00E+00	9.58E-02	0.00E+00	8.29E-02	0.00E+00	2.94E+01
Carbon uptake (CU)		[CO2 eq.]	-7.69E-03	-1.89E-05	-7.71E-03	-1.44E-07	0.00E+00	0.00E+00	-4.87E-05	0.00E+00	-6.36E-05	0.00E+00	-1.55E-02
Freshwater ecotoxicity (FE)		[PAF.m3.day]	7.73E+03	1.35E+01	1.43E+04	9.67E-02	4.96E-01	0.00E+00	3.48E+01	0.00E+00	1.67E+04	0.00E+00	3.87E+04
Human toxicity, cancer (HTC)		[cases]	3.49E-08	2.17E-10	1.44E-07	3.33E-12	3.28E-12	0.00E+00	5.59E-10	0.00E+00	8.09E-09	0.00E+00	1.88E-07
Human toxicity, non-cancer (HTNC)		[cases]	8.27E-08	3.76E-10	3.02E-07	2.54E-12	8.76E-11	0.00E+00	9.66E-10	0.00E+00	1.13E-07	0.00E+00	5.00E-07
Land use - Potential soil quality index (LU-SQP)		[Pt]	1.31E+00	2.53E-02	1.38E+00	4.65E-05	-6.56E-04	0.00E+00	6.50E-02	0.00E+00	1.16E-01	0.00E+00	2.89E+00
Particulate matter (PM)		[disease inc]	1.91E-08	1.35E-10	8.62E-09	1.81E-12	8.58E-14	0.00E+00	3.48E-10	0.00E+00	5.46E-10	0.00E+00	2.88E-08
Ionizing radiation, human		[kBq U235 eq.]	3.21E-02	2.15E-04	4.78E-03	3.45E-06	0.00E+00	0.00E+00	5.52E-04	0.00E+00	5.53E-04	0.00E+00	3.82E-02

Table 12. Use of primary and secondary resources of Enviro Vision

1 m2 Integra Steel Suspended Ceiling_Use of primary and secondary resources													
Parameter		Unit	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		END OF LIFE STAGE					TOTAL
			A1	A2	A3	A4	A5	C1	C2	C3	C4	D	
			Raw Material Supply	Transport to Manufacturer	Manufacturing	Transport to Building Site	Construction - Installation	Deconstruction Demolition	Transport	Waste Processing	Disposal	Reuse, recovery or recycling potential	
Primary energy resources – Renewable	Use as energy carrier	[MJ]	1.02E-01	2.15E-04	8.52E-02	1.75E-06	0.00E+00	0.00E+00	5.52E-04	0.00E+00	7.06E-04	0.00E+00	1.89E-01
	Used as raw materials	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	[MJ]	1.02E-01	2.15E-04	8.52E-02	1.75E-06	0.00E+00	0.00E+00	5.52E-04	0.00E+00	8.29E-02	0.00E+00	2.71E-01
Primary energy resources – Non-renewable	Use as energy carrier	[MJ]	1.24E+01	3.73E-02	1.68E+01	7.60E-04	0.00E+00	0.00E+00	9.59E-02	0.00E+00	0.00E+00	0.00E+00	2.93E+01
	Used as raw materials	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.36E-02	0.00E+00	8.36E-02
	TOTAL	[MJ]	1.24E+01	3.73E-02	1.68E+01	7.60E-04	0.00E+00	0.00E+00	9.59E-02	0.00E+00	0.00E+00	0.00E+00	2.93E+01
Secondary material		[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels		[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels		[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water		[m³]	7.12E-03	5.83E-06	2.21E-03	4.45E-08	0.00E+00	0.00E+00	1.50E-05	0.00E+00	8.19E-05	0.00E+00	9.43E-03

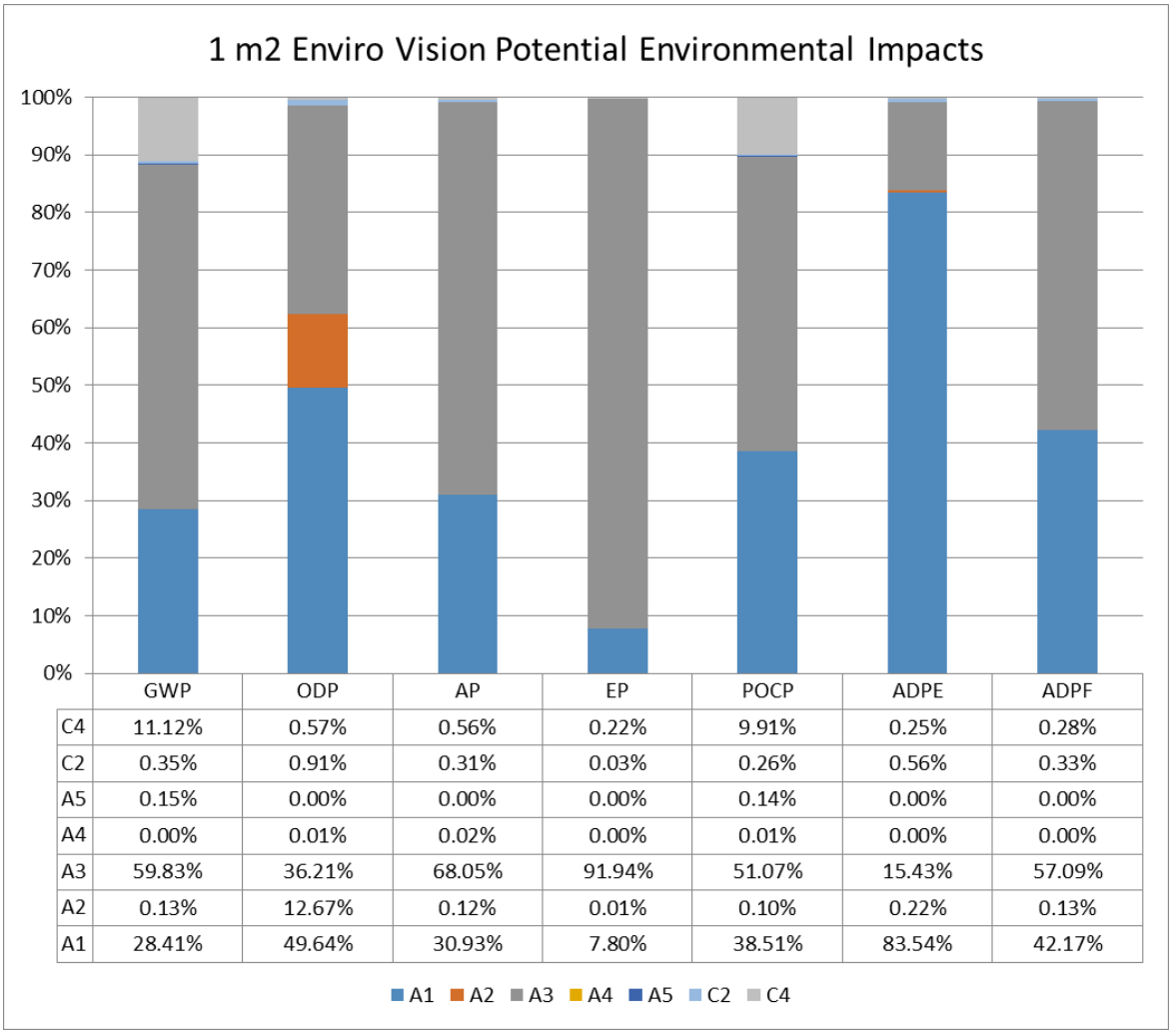
Table 13. Output flows and waste production for Enviro Vision

1 m2 Integra Steel Suspended Ceiling_Waste production													
Parameter		Unit	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		END OF LIFE STAGE					TOTAL
			A1	A2	A3	A4	A5	C1	C2	C3	C4	D	
			Raw Material Supply	Transport to Manufacturer	Manufacturing	Transport to Building Site	Construction - Installation	Deconstruction Demolition	Transport	Waste Processing	Disposal	Reuse, recovery or recycling potential	
Hazardous waste disposed		[kg]	2.97E-05	1.06E-07	8.17E-06	7.14E-10	0.00E+00	0.00E+00	2.74E-07	0.00E+00	2.96E-07	0.00E+00	3.86E-05
Non-hazardous waste disposed		[kg]	4.50E-02	1.26E-03	4.48E-02	1.88E-06	0.00E+00	0.00E+00	3.24E-03	0.00E+00	2.62E-01	0.00E+00	3.56E-01
Radioactive waste disposed		[kg]	1.04E-05	2.54E-07	3.11E-06	5.31E-09	0.00E+00	0.00E+00	6.53E-07	0.00E+00	4.56E-07	0.00E+00	1.49E-05

Parameter		Unit	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		END OF LIFE STAGE					TOTAL
			A1	A2	A3	A4	A5	C1	C2	C3	C4	D	
			Raw Material Supply	Transport to Manufacturer	Manufacturing	Transport to Building Site	Construction - Installation	Deconstruction Demolition	Transport	Waste Processing	Disposal	Reuse, recovery or recycling potential	
Components for reuse		[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling		[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery		[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity		[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal		[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6. Interpretation

According to calculated results, there are less raw materials that are used for production which are polyester and antistatic finishing agent and they have small amounts. That's why environmental effect of raw material supply is less than manufacturing, but has the second effect value. Environmental effect of manufacturing stage is mainly caused by electricity usage. That's why, using more sustainable and renewable energy resources may decrease environmental impact. According to information that is taken from the manufacturer, 8% of the energy will be provided from solar energy by 2022. Sensitivity analysis is made of this situation.



	GWP	ODP	AP	EP	POCP	ADPE	ADPF
C4	11.12%	0.57%	0.56%	0.22%	9.91%	0.25%	0.28%
C2	0.35%	0.91%	0.31%	0.03%	0.26%	0.56%	0.33%
A5	0.15%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%
A4	0.00%	0.01%	0.02%	0.00%	0.01%	0.00%	0.00%
A3	59.83%	36.21%	68.05%	91.94%	51.07%	15.43%	57.09%
A2	0.13%	12.67%	0.12%	0.01%	0.10%	0.22%	0.13%
A1	28.41%	49.64%	30.93%	7.80%	38.51%	83.54%	42.17%

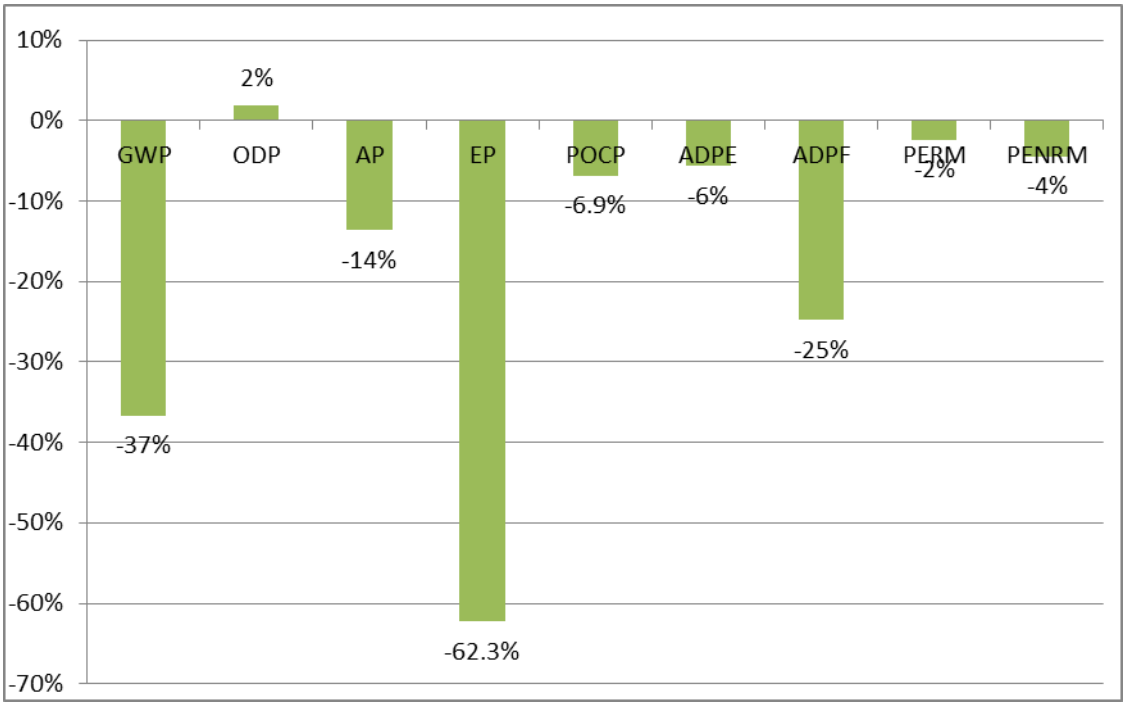
7. Sensitivity Analysis

From calculation results, it is seen that most of the environmental impact is caused by Module A3 (manufacturing), and electricity usage increases effects of module A3 according to software. That's why, using more renewable energy resources may be decrease these environmental impacts. Also, the manufacturer aims to use solar energy for 8% of the energy that is used for the manufacturing of the product.

Sensitivity analysis is made to understand the effect of using solar energy instead of 8% of the electricity. In Table 27, results of Module A3 is seen with and without using solar energy. All results decrease when the 8% of energy is solar energy. According to graph with using these results, percentages of decreases are shown. Eutrophication is effected the most with 8% ratio. Other parameters GWP, AP, POCP,s ADPF, PENRM, ODP, ADPE, PERM decreases with 7%, 6%, 4%, 2% ratios.

Table 27. Sensitivity Analysis for Enviro Vision

Parameter	Unit	A3 Results without renewable energy	A3 Results with renewable energy	Percentage of change
Global Warming Potential (GWP)	[kg CO2-Eq.]	1.15E+00	7.31E-01	-37%
Ozone Layer Depletion (ODP)	[kg CFC11-Eq.]	4.60E-08	4.69E-08	2%
Acidification potential (AP)	[kg SO2-Eq.]	4.44E-03	3.84E-03	-14%
Eutrophication aquatic freshwater (EP)	[kg P]	1.75E-03	6.61E-04	-62.3%
Formation potential of tropospheric ozone	[kg ethene-Eq.]	1.82E-04	1.69E-04	-6.9%
Abiotic depletion potential - Elements (ADPE)	[kg Sb-Eq.]	1.13E-06	1.07E-06	-6%
Abiotic depletion potential - Fossil Fuels (ADPF)	[MJ]	1.68E+01	1.26E+01	-25%
Primary energy resources – Renewable (PERM)	[MJ]	8.27E-02	8.08E-02	-2%
Primary energy resources – Non-renewable (PENRM)	[MJ]	1.32E+01	1.26E+01	-4%



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