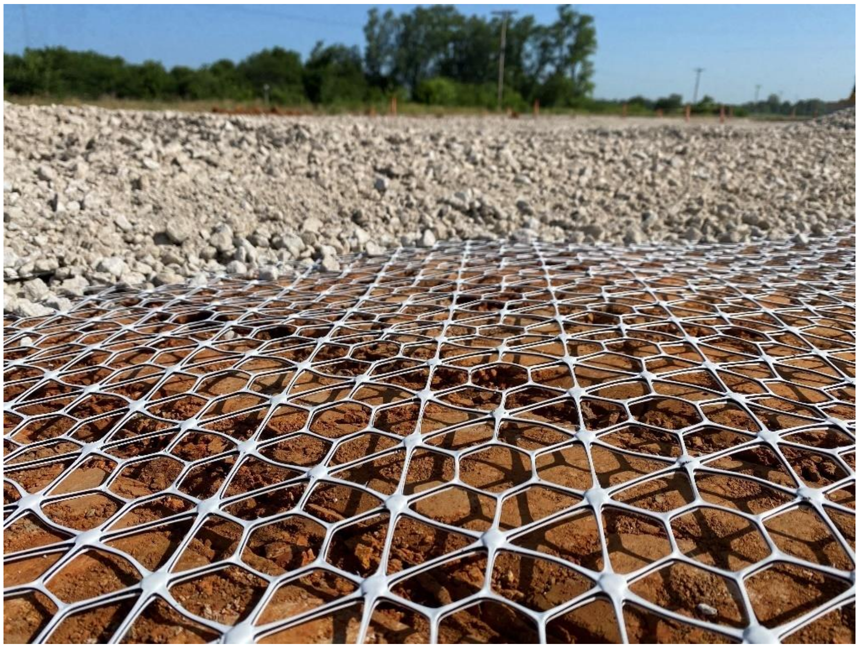
Environmental Product Declaration

Tensar InterAx™ Geogrids

Tensar InterAx™ NX650, NX750, and NX850 Geogrids

Tensar®



Tensar is committed to investing in research, industry collaboration, and product development that supports sustainable and resilient infrastructure. Our corporate mission is to advance and improve sustainable and resilient infrastructure by optimizing the construction and performance of roadways, building foundations and other structures while significantly reducing the environmental footprint associated with these activities. Our solutions allow customers and stakeholders to use natural resources sustainably and address climate change with urgency. Tensar recognizes the threats that global climate change has on our business and the communities in which we operate. This is the catalyst that drives our constant innovation, improvement, and the development of new products and operating technologies to significantly reduce our energy, resource consumption and waste.

Headquartered in Alpharetta, Georgia our workforce services stakeholders across the globe and are supported by operations from our production facilities in the US, Europe and Asia. We believe our sustainable foundation is a key differentiator that sets us apart from our competitors.

Highest performing geogrid for soil stabilization that combines advanced material science and optimized geometry to solve civil and site construction challenges.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025, ISO 14040, ISO 14044, and EN 15804+A2:2019. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN RD, NORTHBROOK, IL 60062 www.ul.com www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Tensar International Corporation 2500 Northwinds Pkwy, Suite 500, Alpharetta, GA 30009 USA
DECLARATION NUMBER	4790444122.101.2
DECLARED PRODUCT & FUNCTIONAL UNIT	Tensar InterAx™ Geogrids - NX650, NX750, NX850 Functional Unit = 1 m² (10.76 ft²) over 75 year lifetime
REFERENCE PCR AND VERSION NUMBER	EN 15804+A2:2019 was used as the Core PCR
DESCRIPTION OF PRODUCT APPLICATION/USE	Tensar International Corporation products are primarily used in commercial settings.
PRODUCT RSL DESCRIPTION	75 Years
MARKETS OF APPLICABILITY	Global
DATE OF ISSUE	November 1, 2022
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product Specific
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-Grave
YEAR(S) OF REPORTED PRIMARY DATA	January 2021 - December 2021 (NX650 added via June 2022 - June 2023 data)
LCA SOFTWARE & VERSION NUMBER	LCA for Experts v10.6.2.9
LCI DATABASE(S) & VERSION NUMBER	Sphera Managed LCA Content Database, Service Pack 35
LCIA METHODOLOGY & VERSION NUMBER	TRACI and methods as specified by EN15804+A2+AC2021
The sub-category PCR review was conducted by:	EN 15804+A2 2019, CEN/TC 350 & CEN/TC 350/WG 3
This declaration was independently verified in accordance with ISO 14025: 2006. EN 15804:2019+A2, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017). ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sustainable Solutions Corporation
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

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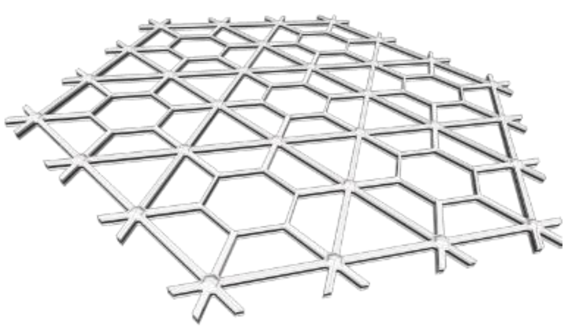
General Information

Description of Company/Organization

Tensar, a division of CMC, provides industry-leading technology that solves the toughest soil stabilization, earth reinforcement, and site development challenges. Our technology-based solutions create a greater total value through upfront construction savings and lifecycle cost savings, as well as time savings and increased sustainability. We help engineers, contractors and owners apply Tensar technologies to develop more cost-effective, higher-performing, sustainable, and resilient infrastructure and civil construction practices.

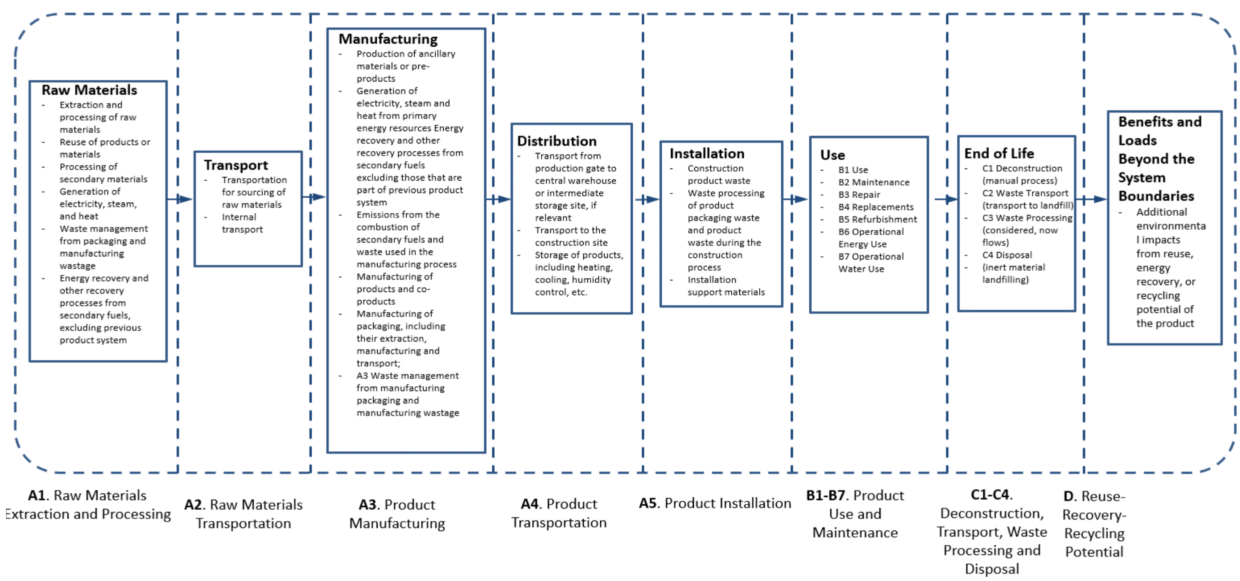
Production Description



Product Name: Tensar InterAx™ NX650, NX750, and NX850 Geogrid
Applying advanced material science, coextrusion technology and optimized geometry, Tensar InterAx™ geogrids provide efficient, high-performance stabilized layers that retain stiffness over time in applications such as soft soil mitigation, pavement enhancement, crane pads, working platforms, and foundation improvement under structures. Better performance means less aggregate is required to meet project requirements, saving cost, time and carbon emissions.

- Coextrusion manufacturing process creates a multi-layer product, giving InterAx™ the ability to accommodate aggregate nesting. The outer layers conform to the shape of the aggregate and hold in place.
- The open, floating hexagon allows for greater compliance and improved aggregate confinement under compaction and repetitive loading.
- Increased number of bearing surfaces provides improved performance of the geogrid-aggregate layer, by resisting radial displacement of the aggregate under load.

Flow Diagram



Manufacturer Specific EPD

This product-specific EPD was developed based on the cradle-to-grave (modules A1-D) Life Cycle Assessment. The EPD accounts for raw material extraction and processing, transport, product manufacturing, distribution, installation, use, maintenance, disposal, and benefits and loads beyond the system boundary. Manufacturing data were gathered directly from company personnel. For any product group EPDs, an impact assessment was completed for each product and the highest impacts were reported as conservative representations of the product group. Product grouping was considered appropriate if the individual product impacts differed by no more than ±10% in any impact category.

Application

Tensar InterAx™ NX650, NX750, and NX850 geogrids are ideal for a wide range of applications, including but not limited to: roads, pavement, surfaces, rail track, etc.

Material Composition

The composition of the Tensar InterAx™ Geogrids is as follows:

Component	NX650 / NX750 / NX850 Mass Composition (%)
Polypropylene	83.00%
Additive	17.00%
Total	100.00%

Technical Data

For the declared product, the following technical data in the delivery status must be provided with reference to the test standard:

Name	Value (NX650)	Value (NX750)	Value (NX850)	Unit
Aperture Shape	Hexagonal, Trapezoidal, & Triangular			
Structure	Coextruded & Integrally formed			
Rib Shape	Rectangular	Rectangular	Rectangular	
Rib Aspect Ratio	> 1.0	> 1.0	> 1.0	-
Node Thickness	0.14	0.14	0.18	in.
Continuous Parallel Rib Pitch	3.2	3.2	3.2	in.
Specific dimension of the finished rolls (width x length)	12.5 x 197	12.5 x 197	12.5 x 197	ft.

Market Placement / Application Rules

The standards that can be applied for NX650, NX750, and NX850 are:
- ASTM D4759-02

Properties of Declared Product as Delivered

Characteristics				
Product	NX650	NX750	NX850	Unit
Node Thickness	3.25	3.50	4.50	mm
Density of polymer	0.989	0.989	0.989	g/ml

Methodological Framework

Functional Unit

The declaration refers to the functional unit of one layer of 1 m² of Tensar InterAx™ Geogrids.

Name	NX650	NX750	NX850	Unit
Functional Unit	1.00	1.00	1.00	m^2
Weight per Functional Unit	0.226	0.306	0.362	kg/m^2
Multiplying Factor to functional Unit to Convert to 1 kg	4.42	3.26	2.76	-

System Boundary

This is a cradle-to-grave Environmental Product Declaration. The following life cycle phases were considered:

Product Stage			Construction Process Stage		Use Stage							End-of-Life Stage*				Benefits and Loads Beyond the System Boundaries
Raw material supply	Transport	Manufacturing	Transport from gate to the site	Construction/ installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction /demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Description of the System Boundary Stages Corresponding to the PCR

(X = Included; MND = Module Not Declared)

*This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of-life waste state or disposal of final residues.

Reference Service Life and Road Estimated Service Life

The Reference Service Life is determined by the guidance from the Product Category Rules and varies by product type. The road Estimated Service Life (ESL) for this EPD is 75 years. The manufacturer has tested the product service lifetime of the InterAx™ series to be 120 years.

Allocation

The LCI data was collected from the Morrow, GA manufacturing facility from January 2021 to December 2021 for NX750 and NX850. For NX650, June 2022 to May 2023 data was used from the same facility. The manufacturing for all products made at this facility have similar energy, waste, and water input requirements. Allocation was done on a mass basis.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances - as defined by the U.S. Occupational Health and Safety Act the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

Data Sources

For life cycle modeling, the LCA for Experts v10.6.2.9 Software System for Life Cycle Engineering, a recognized LCA modeling software program, was used. All background data sets relevant for production and disposal were taken from this software, including the Sphera Managed LCA Content database and the USLCI database.

Data Quality

For the data used in this LCA, the data quality is considered to be good to high quality. The data and data sets cover all relevant process steps and technologies over the supply chain of the represented geogrid products. The majority of secondary data sets are from the GaBi v10.6.2.9 database and wherever secondary data are used, the study adopts critically reviewed data wherever possible for consistency, precision, and reducibility to limit uncertainty. The data used are complete and representative of North America in terms of the geographic and technological coverage and is of a recent vintage, i.e. less than ten years old.

Period Under Review

The data used for the base Life Cycle Assement refer to the production processes from January 2021 to December 2021 (NX750 and NX850). For NX650, production data from June 2022 to June 2023 was used. The quantities of raw materials, energies, auxilary materials, and supplies used have been ascertained as average annual values.

Comparability

A comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to EN 15804+A2 and the construction context, respectively the product-specific characteristics of performance, are taken into account. Environmental declarations from different programs may not be comparable. Full conformance with EN 15804+A2 allows EPD comparability only when all stages of a product's life cycle have been considered. However, variations and deviations are possible.

Estimates and Assumptions

A significant majority of sales of the products in this LCA occur within North America, specifically within the continental USA.

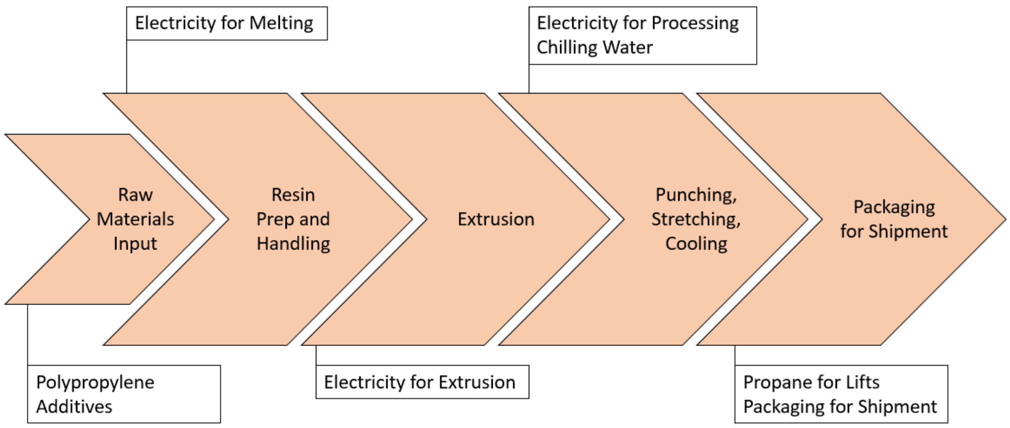
Maximum product transport from point of manufacture to installation site	Mode: Diesel-powered truck/trailer (75%), rail (25%) Distance: 1870 km (NX750 and NX850) Distance: 1763.03 km (NX650)
Product transport from installed site to waste processing	Mode: Diesel-powered truck/trailer Distance: 80 km
Installation procedures	Manual (no operational energy use)
Deconstruction procedures	Use of industrial vehicles to dismantle paved application

Technical Information and Scenarios

Manufacturing

The Geogrid products are manufactured by extruding pellets of polypropylene with additives into sheets, which are punched by a press. These sheets are then stretched, relaxed, and cooled with chilling water. The punched-out pieces of plastic go back into a regrind for internal recycling. The approximate rate at which regrind and virgin plastic is extruded is 40% to 60%, respectively.

Manufacturing Location: Morrow, GA



Packaging

These products are packaged with PVC tape and labels. They are then loaded onto a flatbed trailer.

Component	Mass Composition of Geogrid Packaging (%)
Polypropylene	3.29%
Polyvinyl Chloride	94.40%
Polystyrene	2.32%
Paper	0.00%
Total	100.00%

Biogenic Carbon Content

Name	Value	Unit per functional unit
Biogenic Carbon Content in product	0.00	kg C
Biogenic Carbon Content in accompanying packaging	0.00	kg C

Transportation

Transport to Construction Site (A4)				
Name	**NX650**	**NX750**	**NX850**	**Unit**
Fuel Type	Diesel	Diesel	Diesel	-
Liters of fuel	38	38	38	l/100km
Vehicle Type	75% by Truck 25% by Rail	75% by Truck 25% by Rail	75% by Truck 25% by Rail	-
Transport Distance	1763.03	1870	1870	km
Capacity Utilization (including empty runs, volume based)	90	90	90	%
Gross Density of Products Transported	1000	1000	1000	kg/m^3
Capacity Utilization Volume Factor	1	1	1	-

Product Installation

Installation is accomplished by manual labor and typically does not require any additional materials. If necessary, cutting the geogrid product is done by hand using handheld cutting tools. Any scrap generated from this cutting is disposed of in a landfill. There are no apparent risks involved with the installation of geogrids since no additional materials are required. The installer should wear appropriate PPE while installing the geogrids.

Installation into the Road (A5)				
Name	**NX650**	**NX750**	**NX850**	**Unit**
Auxiliary materials	-	-	-	kg
Water consumption	-	-	-	m^3
Other resources	-	-	-	kg
Electricity consumption	-	-	-	kWh
Other energy carriers	-	-	-	MJ
Product loss per functional unit	1.13E-03	1.53E-03	1.81E-03	kg
Waste materials at construction site	1.32E-03	1.78E-03	2.06E-03	kg
Packaging substance (landfill)	1.85E-04	2.51E-04	2.51E-04	kg
Packaging substance (incineration)	0.00E+00	0.00E+00	0.00E+00	kg
Packaging substance (recycling)	0.00E+00	0.00E+00	0.00E+00	kg
Biogenic carbon contained in packaging	0.00E+00	0.00E+00	0.00E+00	kg CO_2
Direct emissions to ambient air*, soil, and water	0.00E+00	0.00E+00	0.00E+00	kg CO_2
VOC emissions	-	-	-	$\mu g/m^3$

** CO_2 emissions to air from disposal of packaging*

Use

The Estimated Service Life (ESL) of a road is assumed to 75 years. With a Reference Service Life (RSL) of 75 years no product replacements are required, according to the PCR.

Cleaning and Maintenance:
Once installed, geogrids require no cleaning or maintenance.

Use-Phase Impacts:
Geogrids have no use-phase inputs or outputs and therefore have no impacts.

Disposal

The standard end-of-life scenario for these products is to remain-in-place once installed. Depending on the construction project, the geogrid may be removed and disposed of in a landfill or reclaimed as aggregate.

End-of-Life (C1 - C4)					
Name		**NX650**	**NX750**	**NX850**	**Unit**
Assumptions for scenario development	Final product disposal is modeled as 20% to landfill, 10% reclaimed as aggregate, 70% remain-in-place. This was determined by expert personnel at Tensar.	-	-	-	
Collection process (specified by type)	Collected separately	-	-	-	kg
	Collected as mixed construction waste	6.77E-02	9.19E-02	1.09E-01	kg
Recovery (specified by type)	Reuse	2.26E-02	3.06E-02	3.62E-02	kg
	Recycling	-	-	-	kg
	Incineration	-	-	-	kg
	Incineration with energy recovery	-	-	-	kg
Disposal (specified by type)	Landfilling	4.51E-02	6.13E-02	7.24E-02	kg
Removals of biogenic carbon (excluding packaging)		-	-	-	kg CO_2

Re-use Phase

10% of the geogrid is collected as mixed construction waste and is used as aggregate for road construction. This offsets gravel use on a per-volume basis.

Re-Use, recovery, And/Or Recycling Potential (D)					
Name		**NX650**	**NX750**	**NX850**	**Unit**
Material offsets	Geogrid collected as aggregate	2.26E-02	3.06E-02	3.62E-02	kg
	Gravel aggregate offset	-6.64E-02	-9.02E-02	-1.07E-01	kg

LCA Results - NX650

Results shown below were calculated using TRACI 2.1 Methodology for the NX650 product.

TRACI 2.1 Impact Assessment										
Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO_2-Eq.	7.19E-01	2.99E-02	2.95E-05	4.91E-03	9.43E-04	0.00E+00	9.44E-04	-1.71E-04
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.08E-12	1.13E-12	1.45E-18	1.28E-17	0.00E+00	0.00E+00	4.65E-17	-6.85E-18
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	9.95E-04	2.06E-04	1.57E-07	4.37E-05	4.86E-06	0.00E+00	5.01E-06	-6.05E-07
EP	Eutrophication potential	kg N-Eq.	7.77E-05	1.16E-05	2.51E-07	3.33E-06	2.94E-07	0.00E+00	8.03E-06	-4.73E-08
SP	Smog formation potential	kg O_3-Eq.	2.63E-02	5.87E-03	2.86E-06	1.53E-03	1.66E-04	0.00E+00	9.14E-05	-1.30E-05
FFD	Fossil fuel depletion	MJ-surplus	2.54E+00	5.29E-02	5.95E-05	9.24E-03	0.00E+00	0.00E+00	1.90E-03	-2.92E-04

**All use phase stages have been considered, however, all have impacts of zero*

Results shown below were calculated using methodologies prescribed in EN 15804+A2 for the NX650 product.

EN 15804+A2 Impact Categories										
Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	Climate Change - total	kg CO_2-Eq.	7.34E-01	3.01E-02	2.99E-05	4.95E-03	9.42E-04	0.00E+00	9.56E-04	-1.73E-04
ODP	Ozone depletion	kg CFC-11 eq.	2.02E-12	7.79E-13	6.90E-17	6.08E-16	0.00E+00	0.00E+00	2.21E-15	-3.24E-16
IRP	Ionising radiation, human health	kBq U-235 eq.	4.16E-02	6.77E-21	5.05E-07	1.69E-05	0.00E+00	0.00E+00	1.62E-05	-7.73E-06
POCP	Photochemical ozone formation, human health	kg NMVOC eq.	1.30E-03	2.65E-04	1.39E-07	6.48E-05	6.83E-06	0.00E+00	4.43E-06	-6.00E-07
PM	Particulate matter	Disease incidences	8.09E-09	8.45E-10	2.05E-12	3.80E-10	1.23E-11	0.00E+00	6.56E-11	-3.31E-11
HTP-nc	Human toxicity, non-cancer	CTU_h	5.03E-09	5.52E-10	3.39E-12	2.04E-11	2.51E-14	0.00E+00	1.08E-10	-3.61E-12
HTP-c	Human toxicity, cancer	CTU_h	1.45E-10	8.10E-12	3.15E-14	1.00E-12	0.00E+00	0.00E+00	1.01E-12	-5.34E-14
AP	Acidification	Mole of H^+ eq.	1.07E-03	2.27E-04	1.82E-07	4.63E-05	5.18E-06	0.00E+00	5.83E-06	-6.56E-07
EP-freshwater	Eutrophication, freshwater	kg P eq.	5.21E-07	8.56E-09	3.68E-08	2.44E-08	0.00E+00	0.00E+00	1.18E-06	-5.53E-10
EP-marine	Eutrophication, marine	kg N eq.	4.13E-04	9.10E-05	4.57E-08	2.40E-05	2.58E-06	0.00E+00	1.46E-06	-2.67E-07
EP-terrestrial	Eutrophication, terrestrial	Mole of N eq.	4.50E-03	9.94E-04	5.00E-07	2.62E-04	2.83E-05	0.00E+00	1.60E-05	-2.92E-06
ETP-fw	Ecotoxicity, freshwater	CTU_e	5.51E+00	5.58E-01	2.05E-03	5.45E-02	9.18E-07	0.00E+00	6.57E-02	-1.50E-03
LU	Land Use	Pt	1.41E+00	0.00E+00	3.96E-05	1.23E-02	0.00E+00	0.00E+00	1.27E-03	-3.89E-04
WDP	Water use	m^3 world equiv.	1.24E-01	0.00E+00	1.58E-06	2.89E-04	0.00E+00	0.00E+00	5.05E-05	-1.84E-05
ADPF	Resource use, fossils	MJ	1.97E+01	3.85E-01	4.64E-04	6.51E-02	0.00E+00	0.00E+00	1.48E-02	-2.57E-03
ADPE	Resource use, mineral and metals	kg Sb eq.	1.01E-07	0.00E+00	1.71E-12	3.26E-10	0.00E+00	0.00E+00	5.48E-11	-1.13E-11
GWP- Fossil	Climate Change, fossil	kg CO_2-Eq.	7.33E-01	3.01E-02	2.99E-05	4.95E-03	9.42E-04	0.00E+00	9.57E-04	-1.72E-04
GWP- Biogenic	Climate Change, biogenic	kg CO_2-Eq.	6.28E-04	0.00E+00	-5.56E-08	-1.30E-05	0.00E+00	0.00E+00	-1.78E-06	-8.69E-07
GWP-luluc	Climate Change, land use and land use change	kg CO_2-Eq.	4.96E-05	0.00E+00	1.12E-08	5.64E-06	0.00E+00	0.00E+00	3.58E-07	-1.22E-07

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain the resource use throughout the life cycle of the NX650 product.

Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	MJ, lower calorific value	8.51E-01	0.00E+00	5.54E-05	2.78E-03	0.00E+00	0.00E+00	1.77E-03	-3.11E-04
PERM	Renewable primary energy resources as material utilization	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	Total renewable primary energy use	MJ, lower calorific value	8.51E-01	0.00E+00	5.54E-05	2.78E-03	0.00E+00	0.00E+00	1.77E-03	-3.11E-04
PENRE	Nonrenewable primary energy as energy carrier	MJ, lower calorific value	2.00E+01	3.85E-01	4.73E-04	6.98E-02	0.00E+00	0.00E+00	1.51E-02	-2.68E-03
PENRM	Nonrenewable primary energy as material utilization	MJ, lower calorific value	1.18E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	Total non-renewable primary energy use	MJ, lower calorific value	3.18E+01	3.85E-01	4.73E-04	6.98E-02	0.00E+00	0.00E+00	1.51E-02	-2.68E-03
SM	Use of secondary material	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	3.70E-03	0.00E+00	5.86E-08	9.54E-06	0.00E+00	0.00E+00	1.87E-06	-5.84E-07

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain the output flows and wastes throughout the life cycle of the NX650 product.

Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	kg	1.24E-09	0.00E+00	1.18E-14	2.01E-13	0.00E+00	0.00E+00	3.77E-13	-4.30E-15
NHWD	Non-hazardous waste disposed	kg	4.33E-03	0.00E+00	1.41E-03	6.08E-06	0.00E+00	0.00E+00	4.50E-02	-1.38E-03
RWD	Radioactive waste disposal	kg	5.02E-04	0.00E+00	5.24E-09	2.00E-07	0.00E+00	0.00E+00	1.67E-07	-9.26E-08
CRU	Components for re-use	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
MR	Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-02
MER	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
EEE	Exported energy, electrical	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
EET	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

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the NX650 product.

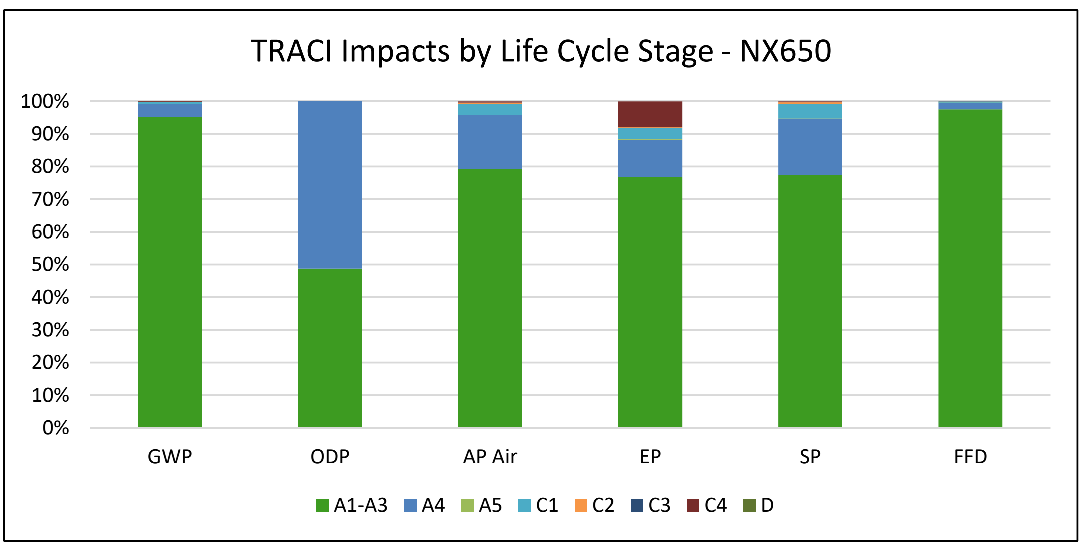
Greenhouse Gas Emissions and Removals

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**All use phase stages have been considered, however, all have impacts of zero*

Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories except ozone depletion. This is due to the upstream processing of plastic used in the product, along with electricity use in the manufacturing of the product. Product distribution drives ozone depletion potential due to the use of diesel in trucking. The disposal of the product (C4) contributes considerably to it's eutrophication potential due to the use of landfills in the end-of-life.



LCA Results - NX750

Results shown below were calculated using TRACI 2.1 Methodology for the NX750 product.

TRACI 2.1 Impact Assessment										
Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO_2-Eq.	8.83E-01	4.30E-02	7.50E-05	4.93E-03	1.28E-03	0.00E+00	2.58E-03	-2.62E-04
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	8.99E-14	1.63E-12	2.40E-18	9.38E-18	0.00E+00	0.00E+00	8.26E-17	-8.55E-18
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	1.17E-03	2.96E-04	3.26E-07	4.38E-05	6.59E-06	0.00E+00	1.12E-05	-8.06E-07
EP	Eutrophication potential	kg N-Eq.	9.11E-05	1.67E-05	4.73E-07	3.35E-06	3.99E-07	0.00E+00	1.63E-05	-6.69E-08
SP	Smog formation potential	kg O_3-Eq.	2.96E-02	8.44E-03	5.74E-06	1.53E-03	2.26E-04	0.00E+00	1.97E-04	-1.63E-05
FFD	Fossil fuel depletion	MJ-surplus	3.18E+00	7.61E-02	1.45E-04	9.24E-03	0.00E+00	0.00E+00	4.97E-03	-4.32E-04

**All use phase stages have been considered, however, all have impacts of zero*

Results shown below were calculated using methodologies prescribed in EN 15804+A2 for the NX750 product.

EN 15804+A2 Impact Categories										
Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	Climate Change - total	kg CO_2-Eq.	9.28E-01	4.40E-02	7.73E-05	5.04E-03	1.29E-03	0.00E+00	2.66E-03	-2.69E-04
ODP	Ozone depletion	kg CFC-11 eq.	9.87E-13	1.12E-12	1.19E-16	4.51E-16	0.00E+00	0.00E+00	4.09E-15	-4.19E-16
IRP	Ionising radiation, human health	kBq U-235 eq.	4.43E-02	9.74E-21	9.21E-07	1.64E-05	0.00E+00	0.00E+00	3.17E-05	-1.06E-05
POCP	Photochemical ozone formation, human health	kg NMVOC eq.	1.48E-03	3.81E-04	2.81E-07	6.50E-05	9.27E-06	0.00E+00	9.65E-06	-7.72E-07
PM	Particulate matter	Disease incidences	1.03E-08	1.22E-09	3.94E-12	3.81E-10	1.67E-11	0.00E+00	1.35E-10	-4.61E-11
HTP-nc	Human toxicity, non-cancer	CTU_h	7.10E-09	1.10E-09	6.71E-12	4.96E-11	1.99E-12	0.00E+00	2.30E-10	-7.69E-12
HTP-c	Human toxicity, cancer	CTU_h	1.74E-10	1.17E-11	6.15E-14	9.76E-13	0.00E+00	0.00E+00	2.11E-12	-9.03E-14
AP	Acidification	Mole of H^+ eq.	1.27E-03	3.26E-04	3.79E-07	4.65E-05	7.04E-06	0.00E+00	1.30E-05	-8.95E-07
EP-freshwater	Eutrophication, freshwater	kg P eq.	6.21E-07	1.23E-08	6.67E-08	2.52E-08	0.00E+00	0.00E+00	2.29E-06	-1.01E-09
EP-marine	Eutrophication, marine	kg N eq.	4.64E-04	1.31E-04	1.02E-07	2.40E-05	3.51E-06	0.00E+00	3.51E-06	-3.25E-07
EP-terrestrial	Eutrophication, terrestrial	Mole of N eq.	5.07E-03	1.43E-03	1.12E-06	2.63E-04	3.84E-05	0.00E+00	3.86E-05	-3.55E-06
ETP-fw	Ecotoxicity, freshwater	CTU_e	7.36E+00	2.34E+00	4.21E-03	5.26E-02	1.25E-06	0.00E+00	1.45E-01	-2.22E-03
LU	Land Use	Pt	1.38E+00	0.00E+00	1.30E-04	1.27E-02	0.00E+00	0.00E+00	4.49E-03	-6.29E-04
WDP	Water use	m^3 world equiv.	1.58E-01	0.00E+00	4.63E-06	2.95E-04	0.00E+00	0.00E+00	1.59E-04	-2.92E-05
ADPF	Resource use, fossils	MJ	2.45E+01	5.54E-01	1.11E-03	6.51E-02	0.00E+00	0.00E+00	3.81E-02	-3.82E-03
ADPE	Resource use, mineral and metals	kg Sb eq.	5.14E-07	0.00E+00	2.03E-11	1.59E-09	0.00E+00	0.00E+00	6.99E-10	-7.21E-11
GWP- Fossil	Climate Change, fossil	kg CO_2-Eq.	9.27E-01	4.40E-02	7.65E-05	5.05E-03	1.29E-03	0.00E+00	2.63E-03	-2.67E-04
GWP-Biogenic	Climate Change, biogenic	kg CO_2-Eq.	1.03E-03	0.00E+00	7.85E-07	-1.24E-05	0.00E+00	0.00E+00	2.70E-05	-1.66E-06
GWP-luluc	Climate Change, land use and land use change	kg CO_2-Eq.	5.78E-05	0.00E+00	2.72E-08	3.48E-06	0.00E+00	0.00E+00	9.35E-07	-1.11E-07

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain the resource use throughout the life cycle of the NX750 product.

Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	MJ, lower calorific value	8.00E-01	0.00E+00	1.07E-04	2.72E-03	0.00E+00	0.00E+00	3.68E-03	-4.29E-04
PERM	Renewable primary energy resources as material utilization	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	Total renewable primary energy use	MJ, lower calorific value	8.00E-01	0.00E+00	1.07E-04	2.72E-03	0.00E+00	0.00E+00	3.68E-03	-4.29E-04
PENRE	Nonrenewable primary energy as energy carrier	MJ, lower calorific value	2.49E+01	5.54E-01	1.14E-03	6.98E-02	0.00E+00	0.00E+00	3.93E-02	-3.97E-03
PENRM	Nonrenewable primary energy as material utilization	MJ, lower calorific value	1.18E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	Total non-renewable primary energy use	MJ, lower calorific value	3.67E+01	5.54E-01	1.14E-03	6.98E-02	0.00E+00	0.00E+00	3.93E-02	-3.97E-03
SM	Use of secondary material	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	4.75E-03	0.00E+00	1.64E-07	9.76E-06	0.00E+00	0.00E+00	5.64E-06	-9.26E-07

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain the output flows and wastes throughout the life cycle of the NX750 product.

Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	kg	1.49E-09	0.00E+00	4.14E-14	2.80E-13	0.00E+00	0.00E+00	1.42E-12	-9.35E-14
NHWD	Non-hazardous waste disposed	kg	5.25E-03	0.00E+00	1.72E-03	5.78E-06	0.00E+00	0.00E+00	5.87E-02	-1.81E-03
RWD	Radioactive waste disposal	kg	5.15E-04	0.00E+00	9.70E-09	1.87E-07	0.00E+00	0.00E+00	3.32E-07	-1.22E-07
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.06E-02	0.00E+00
MR	Materials 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
MER	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
EEE	Exported energy, electrical	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
EET	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

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the NX750 product.

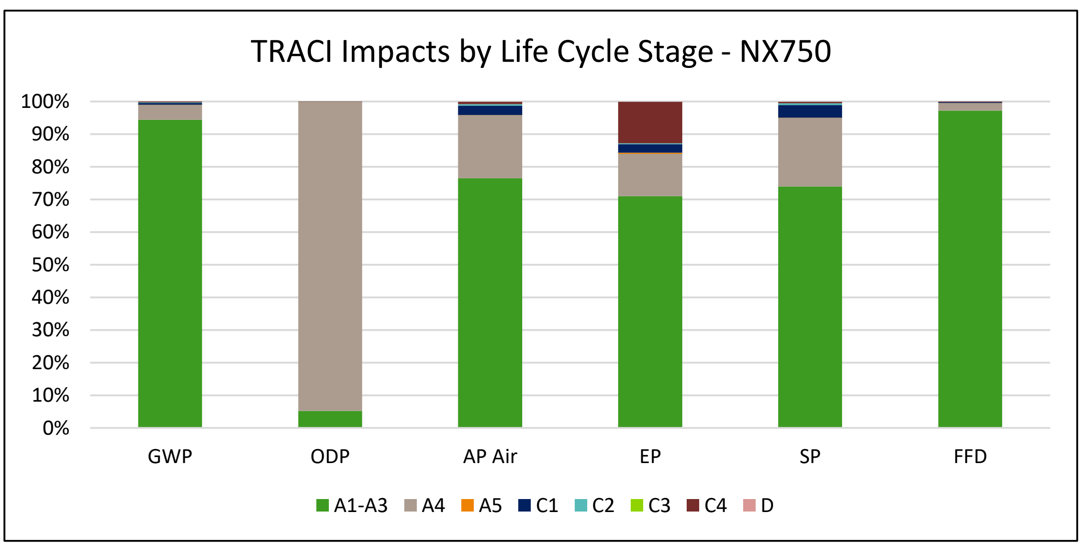
Greenhouse Gas Emissions and Removals

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**All use phase stages have been considered, however, all have impacts of zero*

Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories except ozone depletion. This is due to the upstream processing of plastic used in the product, along with electricity use in the manufacturing of the product. Product distribution drives ozone depletion potential due to the use of diesel in trucking. The disposal of the product (C4) contributes considerably to it's eutrophication potential due to the use of landfills in the end-of-life.



LCA Results - NX850

Results shown below were calculated using TRACI 2.1 Methodology for the NX850 product.

TRACI 2.1 Impact Assessment

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO_2-Eq.	1.04E+00	5.08E-02	8.67E-05	4.93E-03	1.51E-03	0.00E+00	3.05E-03	-3.10E-04
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	9.83E-14	1.92E-12	2.78E-18	9.38E-18	0.00E+00	0.00E+00	9.76E-17	-1.01E-17
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	1.38E-03	3.50E-04	3.78E-07	4.38E-05	7.79E-06	0.00E+00	1.33E-05	-9.52E-07
EP	Eutrophication potential	kg N-Eq.	1.08E-04	1.97E-05	5.47E-07	3.35E-06	4.72E-07	0.00E+00	1.92E-05	-7.90E-08
SP	Smog formation potential	kg O_3-Eq.	3.49E-02	9.98E-03	6.63E-06	1.53E-03	2.67E-04	0.00E+00	2.33E-04	-1.93E-05
FFD	Fossil fuel depletion	MJ-surplus	3.76E+00	8.99E-02	1.67E-04	9.24E-03	0.00E+00	0.00E+00	5.87E-03	-5.11E-04

**All use phase stages have been considered, however, all have impacts of zero*

Results shown below were calculated using methodologies prescribed in EN 15804+A2 for the NX850 product.

EN 15804+A2 Impact Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	Climate Change - total	kg CO_2-Eq.	1.10E+00	5.20E-02	8.94E-05	5.04E-03	1.52E-03	0.00E+00	3.14E-03	-3.18E-04
ODP	Ozone depletion	kg CFC-11 eq.	1.16E-12	1.32E-12	1.37E-16	4.51E-16	0.00E+00	0.00E+00	4.83E-15	-4.96E-16
IRP	Ionising radiation, human health	kBq U-235 eq.	5.24E-02	1.15E-20	1.06E-06	1.64E-05	0.00E+00	0.00E+00	3.74E-05	-1.25E-05
POCP	Photochemical ozone formation, human health	kg NMVOC eq.	1.75E-03	4.50E-04	3.25E-07	6.50E-05	1.10E-05	0.00E+00	1.14E-05	-9.13E-07
PM	Particulate matter	Disease incidences	1.22E-08	1.44E-09	4.56E-12	3.81E-10	1.97E-11	0.00E+00	1.60E-10	-5.45E-11
HTP-nc	Human toxicity, non-cancer	CTU_h	8.39E-09	1.30E-09	7.75E-12	4.96E-11	2.36E-12	0.00E+00	2.72E-10	-9.09E-12
HTP-c	Human toxicity, cancer	CTU_h	2.06E-10	1.38E-11	7.11E-14	9.76E-13	0.00E+00	0.00E+00	2.50E-12	-1.07E-13
AP	Acidification	Mole of H^+ eq.	1.50E-03	3.85E-04	4.38E-07	4.65E-05	8.31E-06	0.00E+00	1.54E-05	-1.06E-06
EP-freshwater	Eutrophication, freshwater	kg P eq.	7.34E-07	1.45E-08	7.71E-08	2.52E-08	0.00E+00	0.00E+00	2.71E-06	-1.19E-09
EP-marine	Eutrophication, marine	kg N eq.	5.48E-04	1.55E-04	1.18E-07	2.40E-05	4.14E-06	0.00E+00	4.15E-06	-3.84E-07
EP-terrestrial	Eutrophication, terrestrial	Mole of N eq.	5.99E-03	1.69E-03	1.30E-06	2.63E-04	4.54E-05	0.00E+00	4.56E-05	-4.20E-06
ETP-fw	Ecotoxicity, freshwater	CTU_e	8.69E+00	2.76E+00	4.87E-03	5.26E-02	1.47E-06	0.00E+00	1.71E-01	-2.62E-03
LU	Land Use	Pt	1.64E+00	0.00E+00	1.51E-04	1.27E-02	0.00E+00	0.00E+00	5.30E-03	-7.43E-04
WDP	Water use	m^3 world equiv.	1.87E-01	0.00E+00	5.35E-06	2.95E-04	0.00E+00	0.00E+00	1.88E-04	-3.45E-05
ADPF	Resource use, fossils	MJ	2.89E+01	6.55E-01	1.28E-03	6.51E-02	0.00E+00	0.00E+00	4.50E-02	-4.52E-03
ADPE	Resource use, mineral and metals	kg Sb eq.	6.08E-07	0.00E+00	2.35E-11	1.59E-09	0.00E+00	0.00E+00	8.26E-10	-8.52E-11
GWP- Fossil	Climate Change, fossil	kg CO_2-Eq.	1.09E+00	5.20E-02	8.84E-05	5.05E-03	1.52E-03	0.00E+00	3.11E-03	-3.15E-04
GWP-Biogenic	Climate Change, biogenic	kg CO_2-Eq.	1.21E-03	0.00E+00	9.08E-07	-1.24E-05	0.00E+00	0.00E+00	3.19E-05	-1.96E-06
GWP-luluc	Climate Change, land use and land use change	kg CO_2-Eq.	6.82E-05	0.00E+00	3.14E-08	3.48E-06	0.00E+00	0.00E+00	1.10E-06	-1.31E-07

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain the resource use throughout the life cycle of the NX850 product.

Resource Use											
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	Renewable primary energy as energy carrier	MJ, lower calorific value	9.35E-01	0.00E+00	1.23E-04	2.62E-03	0.00E+00	0.00E+00	4.30E-03	-5.02E-04
PERM	Renewable primary energy resources as material utilization	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	Total renewable primary energy use	MJ, lower calorific value	9.35E-01	0.00E+00	1.23E-04	2.62E-03	0.00E+00	0.00E+00	4.30E-03	-5.02E-04
PENRE	Nonrenewable primary energy as energy carrier	MJ, lower calorific value	2.91E+01	6.47E-01	1.31E-03	6.73E-02	0.00E+00	0.00E+00	4.59E-02	-4.64E-03
PENRM	Nonrenewable primary energy as material utilization	MJ, lower calorific value	1.18E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	Total non-renewable primary energy use	MJ, lower calorific value	4.09E+01	6.47E-01	1.31E-03	6.73E-02	0.00E+00	0.00E+00	4.59E-02	-4.64E-03
SM	Use of secondary material	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	5.55E-03	0.00E+00	1.88E-07	9.41E-06	0.00E+00	0.00E+00	6.59E-06	-1.08E-06

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain the output flows and wastes throughout the life cycle of the NX850 product.

Output Flows and Waste Categories										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	Hazardous waste disposed	kg	1.78E-09	0.00E+00	4.95E-14	2.90E-13	0.00E+00	0.00E+00	1.74E-12	-1.15E-13
NHWD	Non-hazardous waste disposed	kg	6.44E-03	0.00E+00	2.05E-03	6.00E-06	0.00E+00	0.00E+00	7.21E-02	-2.22E-03
RWD	Radioactive waste disposed	kg	6.32E-04	0.00E+00	1.16E-08	1.94E-07	0.00E+00	0.00E+00	4.07E-07	-1.50E-07
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.62E-02	0.00E+00
MR	Materials 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
MER	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
EEE	Exported energy, electrical	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
EET	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

**All use phase stages have been considered, however, all have impacts of zero*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the NX850 product.

Greenhouse Gas Emissions and Removals

Parameter	Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2-Eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

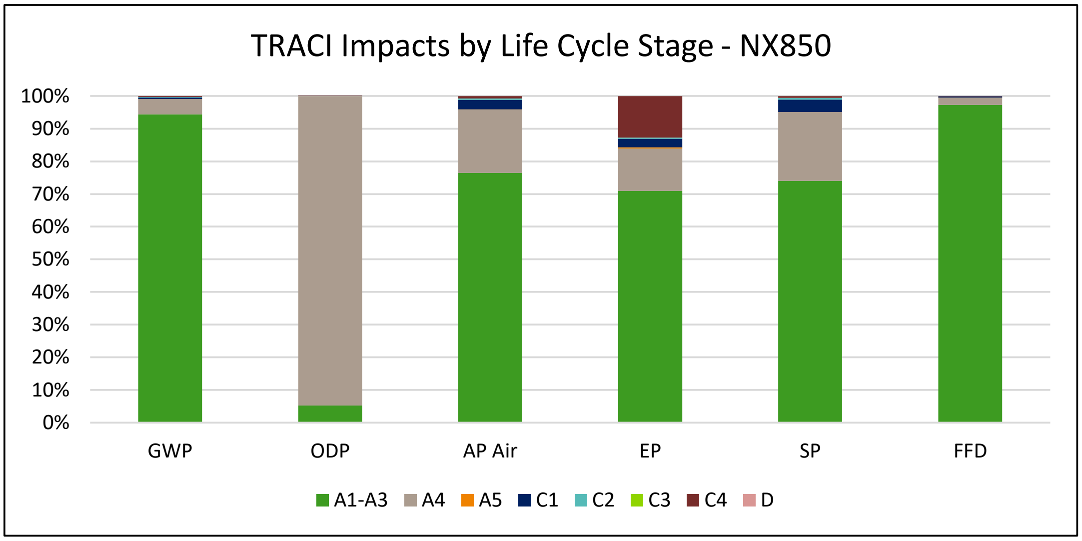
**All use phase stages have been considered, however, all have impacts of zero*

The following table contains disclaimers from EN 15804+A2 for the impact categories used above.

ILCD classification	Indicator	Disclaimer
ILCD Type 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD Type 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.		
Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.		

Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories except ozone depletion. This is due to the upstream processing of plastic used in the product, along with electricity use in the manufacturing of the product. Product distribution drives ozone depletion potential due to the use of diesel in trucking. The disposal of the product (C4) contributes considerably to it's eutrophication potential due to the use of landfills in the end-of-life.



Additional Environmental Information

Environment and Health During Manufacturing

Tensar is committed to safe, responsible, and sustainable manufacturing. Tensar strives to manufacture our products at a high efficiency. Tensar has a long-standing commitment to environmental stewardship, which aligns with our purpose as a company. We continue to reduce environmental impact from our operations, with a robust Environmental Management Systems (EMS) that manages risks from noise, dust, emissions, waste, and pollutants that may affect the environment in and around our facilities. We continue to focus on reducing energy use at our manufacturing and office facilities by implementing energy efficiency measures including monitoring equipment, combined heat and power, solar opportunities, intelligent LED lighting, and new energy-efficient compressors for our equipment. Tensar makes ongoing assessments on energy sourcing, moving to suppliers that provide our electricity needs from renewable sources with zero carbon emissions.

Environmental and Health During Installation

Following recomended installation guidelines, there are no harmful emissive potential and no damage to health or impairment during normal installation and intended use of Tensar products.

Environmental Cost Indicator

According to the UBA method (Version 3.0, 2019), the NX650, NX750, and NX850 geogrids have an environmental cost of 0.183, 0.216, and 0.255 EUR, respectively.

Extraordinary Effects

Fire
While interactions with fire are unlikely due to its location underground, burning can generate emissions that are harmful to human health and to the environment.

Water
There are no adverse environmental effects anticipated from the product interacting with water.

Mechanical Destruction
There are no adverse environmental effects anticipated from the mechanical destruction of the product.

Delayed Emissions

Delayed emissions are not considered in this LCA study.

Environmental Activities and Certifications

Tensar's commitment to ESG is central to our purpose and strategy. Tensar solutions advance and improve sustainable, resilient infrastructure by optimizing design and construction options, while significantly reducing the environmental footprint associated with construction and maintenance operations. As researchers, we are constantly investigating and testing new approaches to resiliency. As industry leaders, we helped co-found the Resilient Roads Roundtable and launched www.resilientroadways.com to bring together like-minded organizations - from business, academia, and government - joining forces to raise awareness and provide a forum for action. As manufacturers, our production facilities prioritize safety and continually work to improve energy efficiencies, minimize waste and utilize content in our manufacturing processes.

Further Information

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References

- EN 15804+A2 - Core PCR — European Standard EN 15804:2019+A2 - Sustainability of contruction works - Environmental product declarations - Core rules for the product category of construction products
- GaBi — Sphera LCA (GaBi) Software v10.6.2.9 2022
- ISO 14025 — ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14040 — ISO 14044 Amd 1:2017/amd 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines
- ISO 14044 — ISO 14044:2006-10, Environmental management — Life cycle assessment — Requirements and guidelines.
- Kiwa - source of guidance — Kiwa-Ecobility Experts - Requirements on the Environmental Product Declarations for geosynthetic products (draft)
- TRACI 2.1 — US EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI).
- CML 2001 — Center of Environmental Science of Leiden University impact categories and characterisation methods for impact assessment (CML).
- Life Cycle Assessment — Tensar Geogrids Life Cycle Assessment, Sustainable Solutions Corporation, November 2022. Appendix for NX650 added February 2023.

Contact Information

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