



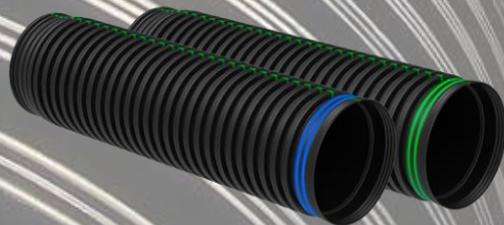
Environmental Product Declaration

for:

DrenPro® pipes

from

TUBOS TIGRE-ADS DO BRASIL LTDA



Programme: The International EPD® System, www.environdec.com
Programme operator: EPD International AB
EPD registration number: S-P-02265
Publication date: 2022-05-03
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This EPD has been developed in conformity with ISO 14025 and EN 15804:2012+A2:2019

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



THE INTERNATIONAL EPD® SYSTEM



THE INTERNATIONAL EPD® SYSTEM



General information

Programme information

Programme:	 The International EPD® System	 THE INTERNATIONAL EPD® SYSTEM
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden	Rua Camburiú, 255, Alto da Lapa 05058-020 São Paulo, SP Brasil
Website:	www.environdec.com	www.epdbrasil.com.br
E-mail:	info@environdec.com	epdbrasil@vanzolini.com.br

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR): *PCR 2019:14 Construction products version 1.11 (2021-02-05)*

PCR review was conducted by: *IVL Swedish Environmental Research Institute*
Moderator: Martin Erlandsson, martin.erlandsson@ivl.se

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification EPD verification

Third party verifier: *Claudia A. Peña*
Director of Sustainability at ADDERE Research & Technology Ltda.
email: cpena@addere.cl / claudia@epd-americalatina.com

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Tubos Tigre-ADS do Brasil Ltda.

Address: Av. Pennwalt, 270 - Distrito Industrial, Rio Claro - SP, 13505-650

Location of production site(s): Tigre-ADS Rio Claro: Av. Pennwalt, 270 - Distrito Industrial, Rio Claro - SP, 13505-650

Tigre-ADS Marechal Deodoro-AL: Rodovia Divaldo Suruagy km 424, Lote 202 a 205, Mal. Deodoro - AL, 57160-000

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About Tigre-ADS

Tigre-ADS is one of the leading manufacturers of corrugated pipes in High Density Polyethylene (HDPE) for application in rainwater drainage, irrigation, mining, sanitation, detention and retention. Present in South America since 2003, it has tested and proven technology in large projects carried out on all continents. Born from the union of two giants in the sector: Tigre – Brazilian multinational, leader in the manufacture of Pipes and Fittings - and ADS (Advanced Drainage Systems Inc.), an American multinational that introduced the first HDPE corrugated pipe in the United States, Tigre -ADS serves the civil construction and infrastructure market with excellent products, with greater durability, productivity, safety and respect for the environment.



WHERE ARE WE

Tigre-ADS has a strong presence in South America, with a factory in Chile, two in Brazil, one in Peru and its own distribution operations in Argentina and Colombia. It also distributes its products through Grupo Tigre in the following countries: Uruguay, Paraguay, Bolivia and Ecuador.



Tigre-ADS. A union of two giants.

Certifications:



Product information

Product name: DrenPro[®] pipes

Geographical scope: Brazil

Product identification/description:

DrenPro[®] pipes are exclusive for rainwater drainage, not applicable to effluent drainage. This application avoids the need to use materials for more specific protection, such as anticorrosive, for example. The pipe composition consists of high-density polyethylene - HDPE (95%), a black pigment composed of HDPE, antioxidants and carbon black, and a green pigment. DrenPro[®] pipes are manufactured by Tigre-ADS at Marechal Deodoro-AL and Rio Claro-SP facilities. In both plants the production processes are the same, i.e., the resin is sent to a pre-extrusion blender and finally to the extruder. After receiving the additives and being subjected to high pressures and temperatures, the resins are shaped into their tubular shape and cut into bars of 6 meters in length. The cutting process also has a finishing step to remove any burrs and especially for the application of ceramic tape and sealing ring (made of rubber), which will ensure the ease of installation of the point and pouch union system and also the excellent tightness of the drainage system.



DrenPro[®] pipe

DrenPro[®] Tigre-ADS HDPE corrugated pipes were developed with high technology and manufactured in light materials to facilitate installation and transport. They have an enlarged pouch and a conical tip that facilitates the installation, not requiring the use of soldering or electrofusion machines due to its point and pouch union system. One of the advantages of corrugated pipes in HDPE DrenPro[®] Tigre-ADS is the use of a double sealing ring, whose purpose is to ensure greater watertightness.

DrenPro[®] Tigre-ADS HDPE corrugated pipes have hydraulic conditions that ensure optimization of rainwater drainage networks, as well as several installation facilities in smaller ditches. Due to the high structural resistance of HDPE corrugated pipes, its installation allows for less coating, providing greater economy in soil movement (excavation, loading, transport to dump, backfill) and in the use of the machinery involved.

O-rings, in compliance with ASTM F477/EN 681, ensure better tightness and strength in the joint. The design meets or exceeds ASTM D3212/EN 1277 laboratory tests, ensuring that the pipe does not leak, and ASTM F1417 waterproof field testing requirements, playing an important role in complying with the most stringent environmental requirements in the handling of water-based fluids.

The DrenPro HDI range is a smooth interior, high-density polyethylene corrugated tubing for hermetic gravity conduction applications, with nominal diameters from 300mm to 1500mm. In compliance with the DNIT 094/2014 standard, HDPE corrugated pipes are manufactured with a completely circular section, smooth inner wall and outer annular corrugations. In addition, meeting ISO 12091 (ISO, 1995) and ISO 3127 (ISO, 1994) standards, they are heat and impact resistant.

Content information

Product characteristics	
Product names	DrenPro [®] Tigre-ADS HDPE corrugated pipes
UN CPC CODE	36320 - Tubes, pipes and hoses, and fittings therefor, of plastics pipes
Products covered	DN 375 mm DN 600 mm DN 1500 mm
Resin density	940 a 947 kg/m ³
Circumferential flexural modulus (2mm/min)	552 – 758 MPa
Coefficient of linear thermal expansion	2X10 ⁻⁴ - 80 / °C
Tensile yield stress (50mm/min)	21 - 24 MPa
Ring bending stiffness	2000 a 6000 N/m.m
Nominal diameter	375-1500 mm

Product composition			
Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
High-Density Polyethylene	92-99 kg	100	0
Carbon black	2-7 kg	0	0
Non-hazardous additives	<1 kg	0	0
TOTAL	102 kg		
Packaging materials	Weight, kg	Weight-% (versus the product)	
-	-	-	

Substances of very high concern (SVHC)

These products contain no substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency.

LCA information

Declared unit:

1 kg of DrenPro[®] pipe

Time representativeness:

Primary data covered a period of 12 months from June 2019 to May 2020

Database(s) and LCA software used:

openLCA[®] software developed by GreenDelta was used to create product systems models. The ecoinvent[®] database version 3.7.1 provided the life cycle background data for product system modelling

System boundaries:

Cradle-to-gate with options, modules C1–C4, module D and with optional modules (A1–A3+C+D and additional modules, i.e. A4 and A5).

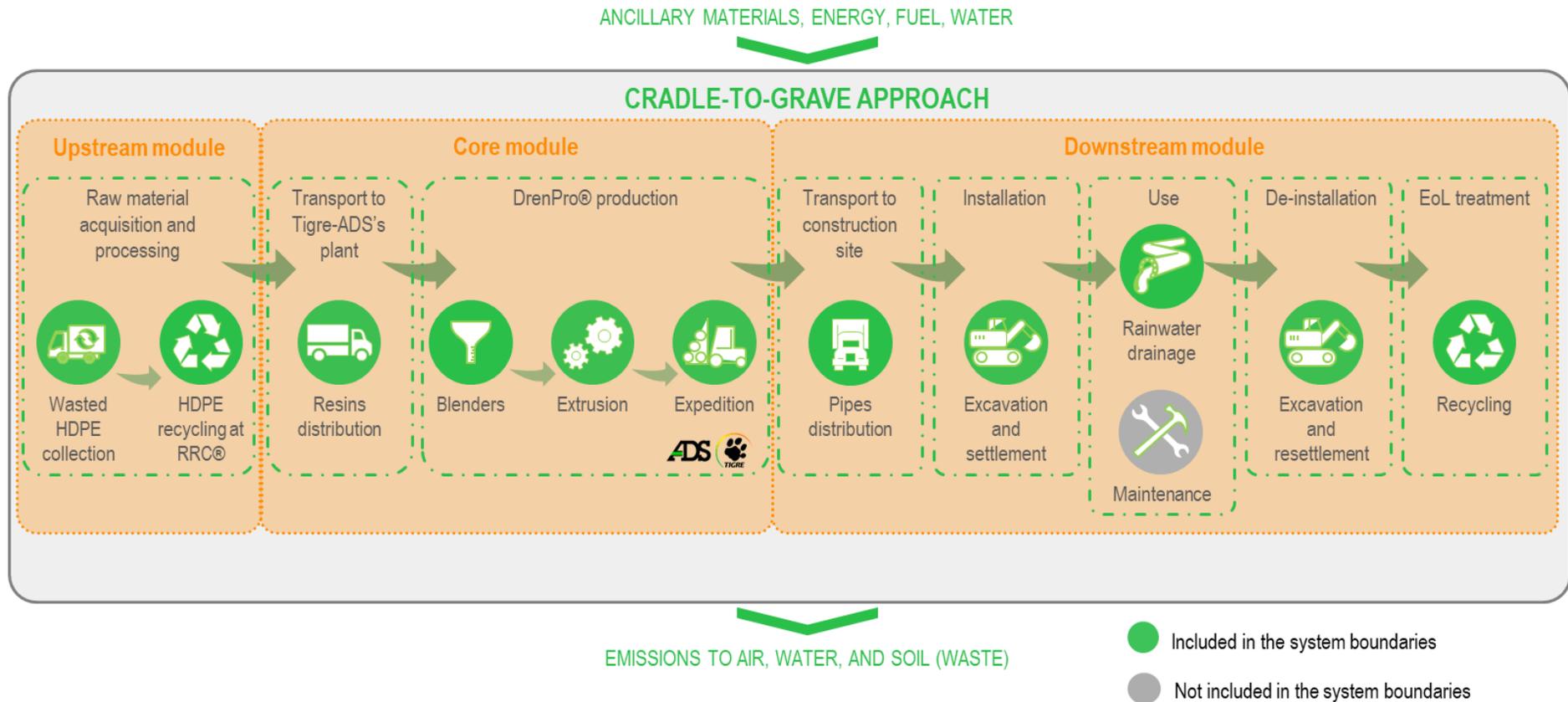
Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

	Product stage			Construction process stage		Use stage						End of life stage				Resource recovery stage			
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential		
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X		
Geography	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR		
Specific data used	>90%					-	-	-	-	-	-	-	-	-	-	-	-	-	
Variation – products	not relevant					-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	<10%					-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = module included in the EPD

ND = module not declared (does not indicate zero impact result)

Description of system boundaries:



Raw materials extraction and production:

HDPE is accepted at most recycling centres in the world, as it is one of the easiest plastic polymers to recycle. First, the plastic is sorted and cleaned, to remove any unwanted debris. The polyethylene recycled resin is obtained entirely from recycling companies that recover the resins post-consumption (PCR) present in shampoo bottles, detergent bottles, softener packages, and in post-industry elements (PIR) as drums, gallons, among others. A logistics network is established to capture recycled resins in São Paulo, Goiás, Minas Gerais, Mato Grosso, and Paraná states and even in some north-eastern region. The waste is received at the recycling plant and passes through several process, including sorting, washing, grinding and classification/quality check to meet Tigre-ADS material requirements. Final PCR and PIR are accommodated into big bags and sent to Tigre-ADS manufacturing plants.

Manufacturing:

After processing at the recycler unit, PCR/PIR are transported by truck to the factory in Rio Claro. Arriving at the Tigre-ADS facility in the form of flakes, it is sent to preparation processes before pelletizing and extrusion, including a blender for regulate granulometry and dryer to correct the granulate humidity. Air is heated and distributed throughout the drum by a fan or a blower. When the drying process is completed, the material goes to the granulator/pelletizer, which is essentially rotary grinders that are used to grind scrap parts and melt delivery systems (sprues and runners) into feedstock-sized granules for reprocessing. This allows the moulder to reduce waste and produce components more cost-effectively. Once the plastic is fed into the granulator, a series of cutting knives within the rotor is powered by an electric motor to break the plastic into smaller pieces. After leaving the granulator, the material is stored. The following step is a pre-extrusion blender. Going to the extrusion process, the resin is gravity fed from a top-mounted hopper into the barrel of the extruder. Additives, such as colorants and UV inhibitors, in either liquid or pellet form are often used and can be introduced into the resin below arriving at the hopper. As the material enters the feed throat near the rear of the barrel, it encounters the screw, forcing the plastic resin forward into the barrel, which is heated to the desired melt temperature. This step allows the plastic resin to melt gradually as it is pushed through the barrel and lowers the risk of overheating, which would cause degradation in the polymer. The resin leaves the screw and travels through a reinforced screen to remove any contaminants. After this part, the resin enters the die, giving the final product its profile or shape. The molten plastic flows from a cylindrical profile into the product's profile shape and is then cooled. Product quality is dependent upon the level of melt homogeneity achieved by the extruder screw. The extruders consume energy through the drive motor, barrel heaters, cooling fans, cooling water pumps, gear pumps, etc. Typically, the drive motor is the largest energy consuming device in an extruder while barrel/die heaters are responsible for the second largest energy demand. After being cooled, the product is sent to the final steps, such as cutting in the desired shape, finishing, dispatch to installation site. At Tigre-ADS any polyethylene scrap from the DrenPro[®] production line is reinserted into the processing through an additional grinder that will fed the blender altogether with the flakes from PCR/PIR supplier.

Use:

- ❖ **Installation:** This step includes the transport of pipes into the site and their installation. Logistic starts from either Rio Claro plant, serving the southeast region of Brazil, mainly the state of São Paulo, or from Marechal Deodoro plant, serving mainly the northeast region of Brazil. The logistic is done with road transportation by diesel-lorries. After arriving at the construction site, the pipes are unloaded by (generally) diesel machinery. Installation involves excavating a trench with depths and widths defined according to the need for tensile strength and the diameter of the pipe. The open trench should receive a layer of approximately 15 cm thick with coarse aggregates (gravel, for example) that serves as a bed to lay the pipes. Generally, the same machine that dug the trench is used to move and lay the pipes, but in the case of the DrenPro[®], depending on its diameter (and mass), laying can be done manually. After laying, the pipes need to be connected to ensure watertightness. The pipes have an enlarged bag and conical tip, it is not necessary to use welding or electrofusion machines due to their tip and bag union system, the connection being made simply by pressure between the pipes with the assistance of a lubricating paste. With the pipes in place, the last stage of the installation is filling the trench, which is usually carried out with the material removed during the excavation and disposing of the surplus material (named 'bota-fora'), with the aid of dump trucks to inert landfills;
- ❖ **Maintenance (repair):** Not accounted due to its variability, subjectivity, and minor environmental significance within pipe lifespan;
- ❖ **De-installation:** Although difficult to estimate accurately, DrenPro[®] pipes will deteriorate with time, needing to be replaced after 75 years. The de-installation stage includes a new excavation to remove the old pipes and the laying of new pipes. Once removed and due to its mono-material condition and aggregated value, the obsolete DrenPro[®] pipe would be recycled, with a cleaning/washing step and grinding to become recycled HDPE resin again (like the already established process for the DrenPro[®] manufacturing).

End-of-life (EoL):

The used DrenPro® pipe is transported from the installation site to the recycler, after being removed and replaced (for instance, obsolete pipes would be reinserted in the same recycling process as PCR/PIR). After arriving at the recycler, the used HDPE pipes are sorted and go through a cleaning process, consuming basically water and energy. HDPE is then shredded and melted down to further refine the polymer.

Cut-off criteria:

The cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows per module shall be a maximum of 5% of energy usage and mass. For this study, all input and output flows have been considered at 100%, including raw materials as per the product composition provided by the manufacturer. The only cut-off criterion was the environmental relevance of the production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities, although some irrelevant inputs may eventually not be considered.

Limitations and assumptions:

The main limitations and assumptions of this LCA/EPD were: long-term emissions were not considered due to the high uncertainty of modelling these aspects, we considered the same recycling processes for PCR/PIR resin, the installation and de-installation is based on the best professional judgment from Tigre-ADS's specialists since the installation depend on several factors (soil type and composition, type of construction, among others), and it was considered only carbon black as representative of the pigments used in the DrenPro® pipe. For the EoL, the DrenPro® recycling is an assumption of this LCA/EPD since this stage is not directly controlled by Tigre-ADS.

Allocation:

At the Tigre-ADS product system, it can be observed two situations where the EoL allocation may be applied. At the input side since the DrenPro® pipe main raw material is the recycled polyethylene (PE) from post consumption and post industry (PIR). And, at the output side since the obsolete DrenPro®, when uninstalled will be recycled. Regarding to the use of secondary materials (i.e., the recycled polyethylene), we considered the cut-off approach as recommended by EN 15804+A2:2019 and the PCR 2019:14 version 1.11 following the end-of-waste state principle. Therefore, for the secondary material consumed by Tigre-ADS, the end-of-waste state was set from the moment that the waste is collected and transported to the recycling processing plant. This means that all the impacts of the waste transportation by road, and the recycling plant operations were fully attributed to the DrenPro® pipe. For the potential recycling at the EoL of the DrenPro® pipes (module D), as recommended by the PCR 2019:14 and the EN 15804+A2:2019 the allocation was calculated according to the equation provided on Annex D of EN 15804+A2:2019.

Emission factor for the electricity production:

0.21965 kg CO₂eq./kWh

Environmental Information of the DrenPro[®] DN375

Potential environmental impact (DrenPro[®] DN375 produced at Rio Claro-SP plant) – mandatory indicators according to EN 15804

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-fossil	kg CO ₂ eq.	1.33E-01	4.57E-03	4.33E-01	5.70E-01	2.24E+00	6.82E-01	3.77E-01	6.45E-01	7.60E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq.	3.93E-02	8.23E-06	1.54E-01	1.94E-01	6.01E-03	9.11E-03	3.42E-04	1.70E-03	7.55E-02	-5.30E-03
GWP-luluc	kg CO ₂ eq.	2.30E-03	2.11E-06	2.44E-02	2.67E-02	1.24E-03	1.61E-03	3.79E-05	3.48E-04	1.13E-03	-7.52E-04
GWP-total	kg CO ₂ eq.	1.74E-01	4.58E-03	6.12E-01	7.91E-01	2.25E+00	6.93E-01	3.77E-01	6.47E-01	8.36E-01	-2.16E+00
ODP	kg CFC 11 eq.	1.97E-08	9.67E-10	1.03E-07	1.24E-07	4.53E-07	1.34E-07	7.94E-08	1.31E-07	4.74E-08	-5.47E-08
AP	mol H ⁺ eq.	8.06E-04	5.08E-05	3.16E-03	4.01E-03	1.39E-02	1.11E-02	3.38E-03	4.03E-03	3.67E-03	-8.50E-03
EP-freshwater	kg PO ₄ ³⁻ eq.	4.61E-04	6.76E-06	4.55E-04	9.23E-04	2.61E-03	1.81E-03	5.71E-04	7.52E-04	2.68E-03	-1.82E-03
EP-freshwater	kg P eq.	1.88E-05	3.48E-07	5.79E-05	7.71E-05	2.29E-04	4.60E-05	1.59E-05	6.50E-05	2.12E-04	-3.78E-04
EP-marine	kg N eq.	3.49E-04	1.58E-05	4.99E-04	8.63E-04	5.11E-03	4.01E-03	1.47E-03	1.48E-03	1.10E-03	-1.70E-03
EP-terrestrial	mol N eq.	2.63E-03	1.74E-04	5.31E-03	8.11E-03	5.58E-02	5.36E-02	1.61E-02	1.62E-02	8.82E-03	-1.80E-02
POCP	kg NMVOC eq.	7.45E-04	4.67E-05	1.46E-03	2.26E-03	1.54E-02	1.20E-02	4.43E-03	4.47E-03	2.56E-03	-7.53E-03
ADP-minerals&metals*	kg Sb eq.	2.93E-06	1.30E-07	1.37E-05	1.68E-05	1.06E-04	8.33E-06	7.86E-07	2.94E-05	1.35E-05	-3.53E-05
ADP-fossil*	MJ	2.00E+00	6.59E-02	9.33E+00	1.14E+01	3.23E+01	9.30E+00	5.15E+00	9.33E+00	9.22E+00	-6.66E+01
WDP	m ³	6.33E-02	3.00E-04	1.44E+00	1.50E+00	1.80E-01	1.33E-01	1.54E-02	5.16E-02	1.74E-01	-9.07E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact (DrenPro[®] DN375 produced at in Rio Claro-SP plant) – additional mandatory and voluntary indicators

		Results per declared unit									
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-GHG	kg CO ₂ eq.	1.52E-01	4.53E-03	4.91E-01	6.48E-01	2.22E+00	6.76E-01	3.73E-01	6.40E-01	7.95E-01	-2.09E+00
PM	disease inc.	2.70E-08	3.67E-10	5.40E-08	8.14E-08	1.70E-07	1.68E-07	8.44E-08	5.02E-08	7.67E-08	-7.41E-08
IRP**	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	2.97E+00	5.38E-02	9.64E+00	1.27E+01	3.06E+01	3.72E+02	3.01E+00	8.77E+00	1.56E+01	-2.26E+01
HTP-c	CTUh	2.52E-10	6.33E-12	4.12E-10	6.71E-10	3.94E-09	9.69E-10	5.85E-10	1.11E-09	1.23E-09	-8.68E-10
HTP-nc	CTUh	1.99E-09	5.69E-11	4.17E-09	6.21E-09	3.08E-08	6.80E-09	2.21E-09	8.91E-09	9.27E-09	-1.36E-08
SQP	Pt	1.13E+00	3.53E-02	2.08E+00	3.24E+00	1.43E+01	3.85E+00	6.46E-01	4.42E+00	4.61E+00	-2.39E+00
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

** The ionizing radiation (IRP), classified as additional impact category in EN 15804+A2, was not considered on LCA since this indicator is considered irrelevant for the product under analysis, and for the Brazilian context since the energy grid has a small share of energy from nuclear sources (exclusively consumed at Rio de Janeiro state).

Use of resources (DrenPro[®] DN375 produced at in Rio Claro-SP plant)

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
PERE	MJ	4.91E-01	7.78E-04	1.91E+00	2.40E+00	5.15E-01	3.51E-02	3.51E-02	1.46E-01	0.00E+00	0.00E+00
PERM	MJ	2.87E-02	0.00E+00	3.37E+00	3.40E+00	0.00E+00	3.91E-01	-2.71E-14	0.00E+00	7.68E-01	-9.08E-01
PERT	MJ	5.20E-01	7.78E-04	5.28E+00	5.80E+00	5.15E-01	4.26E-01	3.51E-02	1.46E-01	7.68E-01	-9.08E-01
PENRE	MJ	1.24E+00	6.58E-02	1.52E+00	2.82E+00	3.23E+01	5.15E+00	5.15E+00	9.32E+00	0.00E+00	0.00E+00
PENRM	MJ	7.59E-01	0.00E+00	7.82E+00	8.58E+00	0.00E+00	4.14E+00	-7.68E-14	0.00E+00	9.16E+00	-6.65E+01
PENRT	MJ	2.00E+00	6.58E-02	9.34E+00	1.14E+01	3.23E+01	9.29E+00	5.15E+00	9.32E+00	9.16E+00	-6.65E+01
SM	kg	1.14E+00	0.00E+00	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m ³	3.53E-03	7.27E-06	3.43E-02	3.78E-02	4.43E-03	3.20E-03	3.77E-04	1.27E-03	4.53E-03	-2.15E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										

Waste production and output flows (DrenPro[®] DN375 produced at in Rio Claro-SP plant)

Waste production

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00
Non-hazardous waste disposed	kg	0.93	0.00	0.04	0.97	0.00	1 791.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Output flows

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	5.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.77
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Information on biogenic carbon content (DrenPro[®] DN375 produced at in Rio Claro-SP plant)

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

Potential environmental impact (DrenPro[®] DN375 produced at Marechal Deodoro-AL plant) – mandatory indicators according to EN 15804

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-fossil	kg CO ₂ eq.	1.33E-01	2.42E-01	4.73E-01	8.48E-01	2.19E+00	6.65E-01	3.67E-01	6.30E-01	7.60E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq.	3.93E-02	4.42E-04	1.72E-01	2.12E-01	5.86E-03	8.89E-03	3.33E-04	1.65E-03	7.55E-02	-5.30E-03
GWP-luluc	kg CO ₂ eq.	2.30E-03	7.88E-05	2.73E-02	2.97E-02	1.21E-03	1.57E-03	3.70E-05	3.40E-04	1.13E-03	-7.52E-04
GWP-total	kg CO ₂ eq.	1.74E-01	2.42E-01	6.72E-01	1.09E+00	2.19E+00	6.75E-01	3.68E-01	6.32E-01	8.36E-01	-2.16E+00
ODP	kg CFC 11 eq.	1.97E-08	5.43E-08	1.08E-07	1.82E-07	4.42E-07	1.31E-07	7.74E-08	1.28E-07	4.74E-08	-5.47E-08
AP	mol H ⁺ eq.	8.06E-04	1.66E-03	3.45E-03	5.92E-03	1.36E-02	1.08E-02	3.30E-03	3.93E-03	3.67E-03	-8.50E-03
EP-freshwater	kg PO ₄ ³⁻ eq.	4.61E-04	2.92E-04	4.96E-04	1.25E-03	2.55E-03	1.76E-03	5.56E-04	7.35E-04	2.68E-03	-1.82E-03
EP-freshwater	kg P eq.	1.88E-05	1.87E-05	6.32E-05	1.01E-04	2.24E-04	4.49E-05	1.55E-05	6.35E-05	2.12E-04	-3.78E-04
EP-marine	kg N eq.	3.49E-04	6.40E-04	5.46E-04	1.53E-03	4.99E-03	3.91E-03	1.43E-03	1.45E-03	1.10E-03	-1.70E-03
EP-terrestrial	mol N eq.	2.63E-03	7.00E-03	5.82E-03	1.54E-02	5.44E-02	5.23E-02	1.57E-02	1.58E-02	8.82E-03	-1.80E-02
POCP	kg NMVOC eq.	7.45E-04	1.95E-03	1.57E-03	4.27E-03	1.50E-02	1.17E-02	4.32E-03	4.37E-03	2.56E-03	-7.53E-03
ADP-minerals&metals*	kg Sb eq.	2.93E-06	5.27E-06	1.38E-05	2.21E-05	1.03E-04	8.12E-06	7.66E-07	2.87E-05	1.35E-05	-3.53E-05
ADP-fossil*	MJ	2.00E+00	3.68E+00	1.01E+01	1.57E+01	3.15E+01	9.07E+00	5.02E+00	9.12E+00	9.22E+00	-6.66E+01
WDP	m ³	6.33E-02	1.83E-02	1.58E+00	1.67E+00	1.75E-01	1.30E-01	1.50E-02	5.04E-02	1.74E-01	-9.07E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact (DrenPro® DN375 produced at Marechal Deodoro-AL plant) – additional mandatory and voluntary indicators

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-GHG	kg CO ₂ eq.	1.52E-01	2.40E-01	5.38E-01	9.30E-01	2.17E+00	6.59E-01	3.64E-01	6.25E-01	7.95E-01	-2.09E+00
PM	disease inc.	2.70E-08	2.62E-08	5.81E-08	1.11E-07	1.65E-07	1.64E-07	8.22E-08	4.90E-08	7.67E-08	-7.41E-08
IRP**	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	2.97E+00	3.00E+00	1.05E+01	1.64E+01	2.99E+01	3.63E+02	2.94E+00	8.56E+00	1.56E+01	-2.26E+01
HTP-c	CTUh	2.52E-10	2.88E-10	4.31E-10	9.71E-10	3.85E-09	9.44E-10	5.71E-10	1.09E-09	1.23E-09	-8.68E-10
HTP-nc	CTUh	1.99E-09	3.58E-09	4.47E-09	1.00E-08	3.01E-08	6.63E-09	2.16E-09	8.71E-09	9.27E-09	-1.36E-08
SQP	Pt	1.13E+00	3.26E+00	2.25E+00	6.64E+00	1.40E+01	3.76E+00	6.30E-01	4.33E+00	4.61E+00	-2.39E+00
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

** The ionizing radiation (IRP), classified as additional impact category in EN 15804+A2, was not considered on LCA since this indicator is considered irrelevant for the product under analysis, and for the Brazilian context since the energy grid has a small share of energy from nuclear sources (exclusively consumed at Rio de Janeiro state).

Use of resources (DrenPro[®] DN375 produced at Marechal Deodoro-AL plant)

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
PERE	MJ	4.91E-01	4.14E-02	5.84E+00	6.37E+00	5.02E-01	3.42E-02	3.42E-02	1.42E-01	0.00E+00	0.00E+00
PERM	MJ	2.87E-02	4.82E-05	6.49E-02	9.37E-02	0.00E+00	3.81E-01	-2.32E-13	0.00E+00	7.68E-01	-9.08E-01
PERT	MJ	5.20E-01	4.15E-02	5.90E+00	6.46E+00	5.02E-01	4.15E-01	3.42E-02	1.42E-01	7.68E-01	-9.08E-01
PENRE	MJ	1.24E+00	3.67E+00	4.65E+00	9.56E+00	3.15E+01	5.02E+00	5.02E+00	9.10E+00	0.00E+00	0.00E+00
PENRM	MJ	7.59E-01	7.55E-03	5.43E+00	6.19E+00	0,00E+00	4.04E+00	-4.59E-13	0.00E+00	9.16E+00	-6.65E+01
PENRT	MJ	2.00E+00	3.68E+00	1.01E+01	1.57E+01	3.15E+01	9.06E+00	5.02E+00	9.10E+00	9.16E+00	-6.65E+01
SM	kg	1.14E+00	0.00E+00	0.00E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m ³	3.53E-03	4.47E-04	3.78E-02	4.18E-02	4.32E-03	3.12E-03	3.68E-04	1.24E-03	4.53E-03	-2.15E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										

Waste production and output flows (DrenPro[®] DN375 produced at Marechal Deodoro-AL plant)

Waste production

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00
Non-hazardous waste disposed	kg	0.95	0.00	0.02	0.97	0.00	1 791.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Output flows

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	6.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.74
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Information on biogenic carbon content (DrenPro[®] DN375 produced at Marechal Deodoro-AL plant)

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

Environmental Information of the DrenPro[®] DN600

Potential environmental impact (DrenPro[®] DN600 produced at in Rio Claro-SP plant) – mandatory indicators according to EN 15804

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-fossil	kg CO ₂ eq.	1.34E-01	5.81E-03	4.58E-01	5.98E-01	1.65E+00	3.97E-01	2.13E-01	7.07E-01	7.60E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq.	3.97E-02	9.06E-06	1.55E-01	1.94E-01	4.40E-03	5.50E-03	1.95E-04	1.86E-03	7.55E-02	-5.30E-03
GWP-luluc	kg CO ₂ eq.	2.32E-03	2.75E-06	2.45E-02	2.68E-02	9.09E-04	9.73E-04	2.17E-05	3.83E-04	1.13E-03	-7.52E-04
GWP-total	kg CO ₂ eq.	1.76E-01	5.82E-03	6.37E-01	8.19E-01	1.65E+00	4.04E-01	2.13E-01	7.10E-01	8.36E-01	-2.16E+00
ODP	kg CFC 11 eq.	1.99E-08	1.23E-09	1.08E-07	1.30E-07	3.34E-07	7.79E-08	4.48E-08	1.44E-07	4.74E-08	-5.47E-08
AP	mol H ⁺ eq.	8.14E-04	7.90E-05	3.29E-03	4.19E-03	1.02E-02	6.63E-03	1.97E-03	4.42E-03	3.67E-03	-8.50E-03
EP-freshwater	kg PO ₄ ³⁻ eq.	4.65E-04	9.55E-06	4.89E-04	9.63E-04	1.92E-03	1.08E-03	3.33E-04	8.25E-04	2.68E-03	-1.82E-03
EP-freshwater	kg P eq.	1.90E-05	4.04E-07	6.51E-05	8.45E-05	1.68E-04	2.74E-05	9.15E-06	7.15E-05	2.12E-04	-3.78E-04
EP-marine	kg N eq.	3.52E-04	2.32E-05	5.23E-04	8.98E-04	3.76E-03	2.40E-03	8.59E-04	1.63E-03	1.10E-03	-1.70E-03
EP-terrestrial	mol N eq.	2.66E-03	2.56E-04	5.56E-03	8.48E-03	4.11E-02	3.21E-02	9.40E-03	1.78E-02	8.82E-03	-1.80E-02
POCP	kg NMVOC eq.	7.52E-04	6.83E-05	1.54E-03	2.36E-03	1.13E-02	7.18E-03	2.59E-03	4.90E-03	2.56E-03	-7.53E-03
ADP-minerals&metals*	kg Sb eq.	2.96E-06	1.42E-07	2.32E-05	2.63E-05	7.72E-05	5.00E-06	4.47E-07	3.24E-05	1.35E-05	-3.53E-05
ADP-fossil*	MJ	2.02E+00	8.30E-02	9.98E+00	1.21E+01	2.38E+01	5.41E+00	2.91E+00	1.02E+01	9.22E+00	-6.66E+01
WDP	m ³	6.39E-02	3.55E-04	1.46E+00	1.52E+00	1.32E-01	8.02E-02	8.86E-03	5.67E-02	1.74E-01	-9.07E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact (DrenPro[®] DN600 produced at in Rio Claro-SP plant) – additional mandatory and voluntary indicators

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-GHG	kg CO ₂ eq.	1.54E-01	5.76E-03	5.16E-01	6.76E-01	1.63E+00	3.94E-01	2.11E-01	7.02E-01	7.95E-01	-2.09E+00
PM	disease inc.	2.72E-08	4.46E-10	5.60E-08	8.37E-08	1.25E-07	1.00E-07	4.99E-08	5.49E-08	7.67E-08	-7.41E-08
IRP**	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	3.00E+00	6.51E-02	1,01E+01	1.32E+01	2.25E+01	2,25E+02	1.71E+00	9,63E+00	1,56E+01	-2.26E+01
HTP-c	CTUh	2.55E-10	7.80E-12	4.33E-10	6.96E-10	2.89E-09	5.63E-10	3.32E-10	1.22E-09	1.23E-09	-8.68E-10
HTP-nc	CTUh	2.01E-09	6.76E-11	4.45E-09	6.53E-09	2.27E-08	4.03E-09	1.26E-09	9.77E-09	9.27E-09	-1.36E-08
SQP	Pt	1.14E+00	4.30E-02	2.20E+00	3.38E+00	1.06E+01	2.30E+00	3.65E-01	4.81E+00	4.61E+00	-2.39E+00
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

** The ionizing radiation (IRP), classified as additional impact category in EN 15804+A2, was not considered on LCA since this indicator is considered irrelevant for the product under analysis, and for the Brazilian context since the energy grid has a small share of energy from nuclear sources (exclusively consumed at Rio de Janeiro state).

Use of resources (DrenPro[®] DN600 produced at in Rio Claro-SP plant)

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
PERE	MJ	4.96E-01	9.07E-04	1.92E+00	2.42E+00	3.77E-01	2.02E-02	2.02E-02	1.60E-01	0.00E+00	0.00E+00
PERM	MJ	2.90E-02	0.00E+00	3.40E+00	3.43E+00	0.00E+00	2.36E-01	-6.51E-10	0.00E+00	7.68E-01	-9.08E-01
PERT	MJ	5.25E-01	9.07E-04	5.32E+00	5.85E+00	3.77E-01	2.57E-01	2.02E-02	1.60E-01	7.68E-01	-9.08E-01
PENRE	MJ	1.25E+00	8.29E-02	1.53E+00	2.86E+00	2.37E+01	2.91E+00	2.91E+00	1.02E+01	0.00E+00	0.00E+00
PENRM	MJ	7.66E-01	0.00E+00	8.46E+00	9.22E+00	0.00E+00	2.50E+00	-3.01E-09	0.00E+00	9.16E+00	-6.65E+01
PENRT	MJ	2.02E+00	8.29E-02	9.99E+00	1.21E+01	2.37E+01	5.41E+00	2.91E+00	1.02E+01	9.16E+00	-6.65E+01
SM	kg	1.15E+00	0.00E+00	0.00E+00	1.15E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m ³	3.57E-03	8.62E-06	3.48E-02	3.84E-02	3.25E-03	1.92E-03	2.17E-04	1.39E-03	4.53E-03	-2.15E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										

Waste production and output flows (DrenPro[®] DN600 produced at in Rio Claro-SP plant)

Waste production

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.68	0.00
Non-hazardous waste disposed	kg	2.18	0.00	0.10	2.28	0.00	3 471.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Output flows

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	13.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87.52
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Information on biogenic carbon content (DrenPro[®] DN600 produced at in Rio Claro-SP plant)

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

Potential environmental impact (DrenPro® DN600 produced at Marechal Deodoro-AL plant) – mandatory indicators according to EN 15804

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-fossil	kg CO ₂ eq.	1.34E-01	2.47E-01	4.90E-01	8.71E-01	1.64E+00	3.95E-01	2.12E-01	7.04E-01	7.60E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq.	3.97E-02	4.50E-04	1.68E-01	2.08E-01	4.38E-03	5.47E-03	1.94E-04	1.86E-03	7.55E-02	-5.30E-03
GWP-luluc	kg CO ₂ eq.	2.32E-03	8.08E-05	2.67E-02	2.91E-02	9.04E-04	9.68E-04	2.16E-05	3.81E-04	1.13E-03	-7.52E-04
GWP-total	kg CO ₂ eq.	1.76E-01	2.47E-01	6.84E-01	1.11E+00	1.64E+00	4.01E-01	2.12E-01	7.06E-01	8.36E-01	-2.16E+00
ODP	kg CFC 11 eq.	1.99E-08	5.54E-08	1.12E-07	1.87E-07	3.32E-07	7.75E-08	4.45E-08	1.43E-07	4.74E-08	-5.47E-08
AP	mol H ⁺ eq.	8.14E-04	1.72E-03	3.52E-03	6.05E-03	1.02E-02	6.59E-03	1.96E-03	4.39E-03	3.67E-03	-8.50E-03
EP-freshwater	kg PO ₄ ³⁻ eq.	4.65E-04	2.99E-04	5.21E-04	1.29E-03	1.91E-03	1.07E-03	3.31E-04	8.21E-04	2.68E-03	-1.82E-03
EP-freshwater	kg P eq.	1.90E-05	1.91E-05	6.96E-05	1.08E-04	1.67E-04	2.72E-05	9.10E-06	7.11E-05	2.12E-04	-3.78E-04
EP-marine	kg N eq.	3.52E-04	6.57E-04	5.60E-04	1.57E-03	3.74E-03	2.38E-03	8.54E-04	1.62E-03	1.10E-03	-1.70E-03
EP-terrestrial	mol N eq.	2.66E-03	7.19E-03	5.97E-03	1.58E-02	4.08E-02	3.19E-02	9.34E-03	1.77E-02	8.82E-03	-1.80E-02
POCP	kg NMVOC eq.	7.52E-04	2.00E-03	1.63E-03	4.38E-03	1.13E-02	7.14E-03	2.58E-03	4.87E-03	2.56E-03	-7.53E-03
ADP-minerals&metals*	kg Sb eq.	2.96E-06	5.39E-06	2.33E-05	3.17E-05	7.68E-05	4.97E-06	4.44E-07	3.22E-05	1.35E-05	-3.53E-05
ADP-fossil*	MJ	2.02E+00	3.75E+00	1.06E+01	1.64E+01	2.36E+01	5.38E+00	2.89E+00	1.02E+01	9.22E+00	-6.66E+01
WDP	m ³	6.39E-02	1.86E-02	1.57E+00	1.65E+00	1.31E-01	7.97E-02	8.81E-03	5.64E-02	1.74E-01	-9.07E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact (DrenPro[®] DN600 produced at Marechal Deodoro-AL plant) – additional mandatory and voluntary indicators

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-GHG	kg CO ₂ eq.	1.54E-01	2.45E-01	5.53E-01	9.52E-01	1.62E+00	3.92E-01	2.09E-01	6.98E-01	7.95E-01	-2.09E+00
PM	disease inc.	2.72E-08	2.67E-08	5.91E-08	1.13E-07	1.24E-07	9.97E-08	4.96E-08	5.46E-08	7.67E-08	-7.41E-08
IRP**	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	3.00E+00	3.05E+00	1.08E+01	1.68E+01	2.24E+01	2.24E+02	1.70E+00	9.58E+00	1.56E+01	-2.26E+01
HTP-c	CTUh	2.55E-10	2.95E-10	4.48E-10	9.97E-10	2.87E-09	5.60E-10	3.30E-10	1.22E-09	1.23E-09	-8.68E-10
HTP-nc	CTUh	2.01E-09	3.64E-09	4.69E-09	1.03E-08	2.25E-08	4.01E-09	1.25E-09	9.72E-09	9.27E-09	-1.36E-08
SQP	Pt	1.14E+00	3.30E+00	2.33E+00	6.77E+00	1.06E+01	2.29E+00	3.63E-01	4.79E+00	4.61E+00	-2.39E+00
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

** The ionizing radiation (IRP), classified as additional impact category in EN 15804+A2, was not considered on LCA since this indicator is considered irrelevant for the product under analysis, and for the Brazilian context since the energy grid has a small share of energy from nuclear sources (exclusively consumed at Rio de Janeiro state).

Use of resources (DrenPro[®] DN600 produced at Marechal Deodoro-AL plant)

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
PERE	MJ	4.96E-01	4.21E-02	5.71E+00	6.25E+00	3.75E-01	2.01E-02	2.01E-02	1.60E-01	0.00E+00	0.00E+00
PERM	MJ	2.90E-02	1.08E-04	8.86E-02	1.18E-01	0.00E+00	2.35E-01	-2.27E-10	0.00E+00	7.68E-01	-9.08E-01
PERT	MJ	5.25E-01	4.22E-02	5.80E+00	6.37E+00	3.75E-01	2.55E-01	2.01E-02	1.60E-01	7.68E-01	-9.08E-01
PENRE	MJ	1.25E+00	3.73E+00	4.54E+00	9.53E+00	2.36E+01	2.89E+00	2.89E+00	1.02E+01	0.00E+00	0.00E+00
PENRM	MJ	7.66E-01	1.69E-02	6.05E+00	6.84E+00	0.00E+00	2.49E+00	-1.43E-09	0.00E+00	9.6E+00	-6.65E+01
PENRT	MJ	2.02E+00	3.75E+00	1.06E+01	1.64E+01	2.36E+01	5.38E+00	2.89E+00	1.02E+01	9.16E+00	-6.65E+01
SM	kg	1.15E+00	0.00E+00	0.00E+00	1.15E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m ³	3.57E-03	4.55E-04	3.74E-02	4.14E-02	3.24E-03	1.91E-03	2.16E-04	1.39E-03	4.53E-03	-2.15E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										

Waste production and output flows (DrenPro[®] DN600 produced at Marechal Deodoro-AL plant)

Waste production

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.68	0.00
Non-hazardous waste disposed	kg	2.19	0.00	0.04	2.23	0.00	3 471.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Output flows

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.00
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Information on biogenic carbon content (DrenPro[®] DN600 produced at Marechal Deodoro-AL plant)

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

Potential environmental impact (DrenPro® DN1500 produced at in Rio Claro-SP plant) – mandatory indicators according to EN 15804

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-fossil	kg CO ₂ eq.	1.34E-01	3.54E-03	3.64E-01	5.02E-01	1.49E+00	3.21E-01	2.40E-01	9.57E-01	7.60E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq.	3.98E-02	4.46E-06	1.49E-01	1.88E-01	3.97E-03	2.56E-03	2.25E-04	2.54E-03	7.55E-02	-5.30E-03
GWP-luluc	kg CO ₂ eq.	2.33E-03	1.75E-06	2.35E-02	2.59E-02	8.18E-04	4.45E-04	2.55E-05	5.22E-04	1.13E-03	-7.52E-04
GWP-total	kg CO ₂ eq.	1.77E-01	3.54E-03	5.36E-01	7.16E-01	1.49E+00	3.24E-01	2.40E-01	9.60E-01	8.36E-01	-2.16E+00
ODP	kg CFC 11 eq.	1.99E-08	7.50E-10	5.65E-08	7.71E-08	3.01E-07	6.52E-08	5.03E-08	1.94E-07	4.4E-08	-5.47E-08
AP	mol H ⁺ eq.	8.16E-04	6.00E-05	2.68E-03	3.55E-03	9.23E-03	4.46E-03	2.40E-03	5.96E-03	3.67E-03	-8.50E-03
EP-freshwater	kg PO ₄ ³⁻ eq.	4.66E-04	6.61E-06	4.17E-04	8.90E-04	1.73E-03	7.36E-04	4.05E-04	1.12E-03	2.68E-03	-1.82E-03
EP-freshwater	kg P eq.	1.90E-05	2.18E-07	5.74E-05	7.66E-05	1.52E-04	1.90E-05	1.08E-05	9.72E-05	2.12E-04	-3.78E-04
EP-marine	kg N eq.	3.53E-04	1.67E-05	4.39E-04	8.08E-04	3.39E-03	1.73E-03	1.05E-03	2.19E-03	1.10E-03	-1.70E-03
EP-terrestrial	mol N eq.	2.67E-03	1.85E-04	4.65E-03	7.50E-03	3.70E-02	2.15E-02	1.15E-02	2.39E-02	8.82E-03	-1.80E-02
POCP	kg NMVOC eq.	7.54E-04	4.89E-05	1.22E-03	2.02E-03	1.02E-02	5.21E-03	3.18E-03	6.60E-03	2.56E-03	-7.53E-03
ADP-minerals&metals*	kg Sb eq.	2.97E-06	7.04E-08	2.05E-05	2.36E-05	6.95E-05	2.56E-06	5.12E-07	4.43E-05	1.35E-05	-3.53E-05
ADP-fossil*	MJ	2.02E+00	4.99E-02	6.58E+00	8.65E+00	2.14E+01	4.41E+00	3.28E+00	1.38E+01	9.22E+00	-6.66E+01
WDP	m ³	6.40E-02	1.96E-04	1.40E+00	1.46E+00	1.19E-01	4.21E-02	1.04E-02	7.67E-02	1.74E-01	-9.07E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact (DrenPro[®] DN1500 produced at in Rio Claro-SP plant) – additional mandatory and voluntary indicators

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-GHG	kg CO ₂ eq.	1.54E-01	3.52E-03	4.21E-01	5.79E-01	1.47E+00	3.18E-01	2.37E-01	9.49E-01	7.95E-01	-2.09E+00
PM	disease inc.	2.73E-08	2.53E-10	4.25E-08	7.01E-08	1.13E-07	8.49E-08	6.27E-08	7.35E-08	7.67E-08	-7.41E-08
IRP**	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	3.01E+00	3.71E-02	8.12E+00	1.12E+01	2.03E+01	1.00E+02	1.94E+00	1.30E+01	1.56E+01	-2.26E+01
HTP-c	CTUh	2.55E-10	4.56E-12	3.77E-10	6.36E-10	2.60E-09	4.79E-10	3.77E-10	1.66E-09	1.23E-09	-8.68E-10
HTP-nc	CTUh	2.01E-09	3.74E-11	3.69E-09	5.74E-09	2.04E-08	2.68E-09	1.45E-09	1.32E-08	9.27E-09	-1.36E-08
SQP	Pt	1.14E+00	2.46E-02	1.73E+00	2.89E+00	9.62E+00	1.27E+00	4.12E-01	6.35E+00	4.61E+00	-2.39E+00
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

** The ionizing radiation (IRP), classified as additional impact category in EN 15804+A2, was not considered on LCA since this indicator is considered irrelevant for the product under analysis, and for the Brazilian context since the energy grid has a small share of energy from nuclear sources (exclusively consumed at Rio de Janeiro state).

Use of resources (DrenPro® DN1500 produced at in Rio Claro-SP plant)

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
PERE	MJ	4.97E-01	4.94E-04	1.85E+00	2.35E+00	3.40E-01	2.37E-02	2.37E-02	2.18E-01	0.00E+00	0.00E+00
PERM	MJ	2.91E-02	0.00E+00	3.25E+00	3.28E+00	0.00E+00	1.05E-01	-1.42E-09	0.00E+00	7.68E-01	-9.08E-01
PERT	MJ	5.26E-01	4.94E-04	5.10E+00	5.63E+00	3.40E-01	1.28E-01	2.37E-02	2.18E-01	7.68E-01	-9.08E-01
PENRE	MJ	1.25E+00	4.99E-02	1.47E+00	2.78E+00	2.14E+01	3.28E+00	3.28E+00	1.38E+01	0.00E+00	0.00E+00
PENRM	MJ	7.68E-01	0.00E+00	5.11E+00	5.88E+00	0.00E+00	1.13E+00	-4.55E-09	0.00E+00	9.16E+00	-6.65E+01
PENRT	MJ	2.02E+00	4.99E-02	6.59E+00	8.66E+00	2.14E+01	4.40E+00	3.28E+00	1.38E+01	9.16E+00	-6.65E+01
SM	kg	1.16E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m ³	3.57E-03	4.81E-06	3.33E-02	3.69E-02	2.93E-03	1.01E-03	2.55E-04	1.89E-03	4.53E-03	-2.15E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										

Waste production and output flows (DrenPro[®] DN1500 produced at in Rio Claro-SP plant)

Waste production

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.86	0.00
Non-hazardous waste disposed	kg	9.89	0.00	0.43	10.33	0.00	15 950.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Output flows

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	63.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397.00
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Information on biogenic carbon content (DrenPro[®] DN1500 produced at in Rio Claro-SP plant)

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

Potential environmental impact (DrenPro® DN1500 produced at Marechal Deodoro-AL plant) – mandatory indicators according to EN 15804

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-fossil	kg CO ₂ eq.	1.34E-01	2.45E-01	4.87E-01	8.67E-01	1.48E+00	3.21E-01	2.39E-01	9.54E-01	7.60E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq.	3.98E-02	4.47E-04	1.70E-01	2.10E-01	3.96E-03	2.56E-03	2.24E-04	2.53E-03	7.55E-02	-5.30E-03
GWP-luluc	kg CO ₂ eq.	2.33E-03	8.01E-05	2,70E-02	2.94E-02	8.16E-04	4.44E-04	2.54E-05	5.21E-04	1.13E-03	-7.52E-04
GWP-total	kg CO ₂ eq.	1.77E-01	2.46E-01	6.84E-01	1.11E+00	1.49E+00	3.24E-01	2.39E-01	9.57E-01	8.36E-01	-2.16E+00
ODP	kg CFC 11 eq.	1.99E-08	5.50E-08	1.11E-07	1.86E-07	3.00E-07	6.51E-08	5.02E-08	1.94E-07	4.74E-08	-5.47E-08
AP	mol H ⁺ eq.	8.16E-04	1.70E-03	3.51E-03	6.03E-03	9.21E-03	4.44E-03	2.39E-03	5.94E-03	3.67E-03	-8.50E-03
EP-freshwater	kg PO ₄ ³⁻ eq.	4.66E-04	2,97E-04	5.17E-04	1.28E-03	1.73E-03	7.34E-04	4.04E-04	1.11E-03	2.68E-03	-1.82E-03
EP-freshwater	kg P eq.	1.90E-05	1.90E-05	6.84E-05	1.06E-04	1.51E-04	1.90E-05	1.08E-05	9.69E-05	2.12E-04	-3.78E-04
EP-marine	kg N eq.	3.53E-04	6.52E-04	5.57E-04	1.56E-03	3.38E-03	1.73E-03	1.05E-03	2.19E-03	1.10E-03	-1.70E-03
EP-terrestrial	mol N eq.	2.67E-03	7.13E-03	5.93E-03	1.57E-02	3.70E-02	2.15E-02	1.15E-02	2.39E-02	8.82E-03	-1.80E-02
POCP	kg NMVOC eq.	7.54E-04	1.99E-03	1.61E-03	4.35E-03	1.02E-02	5.20E-03	3.17E-03	6.58E-03	2.56E-03	-7.53E-03
ADP-minerals&metals*	kg Sb eq.	2.97E-06	5.34E-06	2.22E-05	3.06E-05	6.93E-05	2.56E-06	5.11E-07	4.42E-05	1.35E-05	-3.53E-05
ADP-fossil*	MJ	2.02E+00	3.73E+00	1.05E+01	1.62E+01	2.14E+01	4.40E+00	3.27E+00	1.38E+01	9.22E+00	-6.66E+01
WDP	m ³	6.40E-02	1.85E-02	1.58E+00	1.66E+00	1.19E-01	4.20E-02	1.04E-02	7.65E-02	1.74E-01	-9.07E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact (DrenPro[®] DN1500 produced at Marechal Deodoro-AL plant) – additional mandatory and voluntary indicators

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
GWP-GHG	kg CO ₂ eq.	1.54E-01	2.43E-01	5.51E-01	9.49E-01	1.47E+00	3.18E-01	2.36E-01	9.47E-01	7.95E-01	-2.09E+00
PM	disease inc.	2.73E-08	2.65E-08	5.89E-08	1.13E-07	1.13E-07	8.47E-08	6.25E-08	7.33E-08	7.67E-08	-7.41E-08
IRP**	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	3.01E+00	3.03E+00	1.07E+01	1.68E+01	2.02E+01	1.00E+02	1.94E+00	1.30E+01	1.56E+01	-2.26E+01
HTP-c	CTUh	2.55E-10	2.92E-10	4.39E-10	9.86E-10	2.60E-09	4.78E-10	3.76E-10	1.66E-09	1.23E-09	-8.68E-10
HTP-nc	CTUh	2.01E-09	3.62E-09	4.55E-09	1.02E-08	2.04E-08	2.67E-09	1.44E-09	1.32E-08	9.27E-09	-1.36E-08
SQP	Pt	1.14E+00	3.29E+00	2.33E+00	6.75E+00	9.60E+00	1.27E+00	4.11E-01	6.34E+00	4.61E+00	-2.39E+00
Acronyms	GWP-GHG = supplementary indicator for climate impact, with characterization factors (CFs) based on IPCC (2013); PM = Potential incidence of disease due to PM emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans; HTP-nc = Potential Comparative Toxic Unit for humans; SQP = Potential soil quality index										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

** The ionizing radiation (IRP), classified as additional impact category in EN 15804+A2, was not considered on LCA since this indicator is considered irrelevant for the product under analysis, and for the Brazilian context since the energy grid has a small share of energy from nuclear sources (exclusively consumed at Rio de Janeiro state).

Use of resources (DrenPro[®] DN1500 produced at Marechal Deodoro-AL plant)

Results per declared unit											
Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
PERE	MJ	4.97E-01	4.18E-02	5.78E+00	6.32E+00	3.39E-01	2.37E-02	2.37E-02	2.17E-01	0.00E+00	0.00E+00
PERM	MJ	2.91E-02	1.03E-04	8.22E-02	1.11E-01	0.00E+00	1.04E-01	1.10E-12	0.00E+00	7.68E-01	-9.08E-01
PERT	MJ	5.26E-01	4.19E-02	5.86E+00	6.43E+00	3.39E-01	1.28E-01	2.37E-02	2.17E-01	7.68E-01	-9.08E-01
PENRE	MJ	1.25E+00	3.71E+00	4.60E+00	9.56E+00	2.14E+01	3.27E+00	3.27E+00	1.38E+01	0.00E+00	0.00E+00
PENRM	MJ	7.68E-01	1.61E-02	5.89E+00	6.68E+00	0.00E+00	1.13E+00	1.79E-11	0.00E+00	9.16E+00	-6.65E+01
PENRT	MJ	2.02E+00	3.73E+00	1.05E+01	1.62E+01	2.14E+01	4.39E+00	3.27E+00	1.38E+01	9.16E+00	-6.65E+01
SM	kg	1.16E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m ³	3.57E-03	4.52E-04	3.77E-02	4.18E-02	2.93E-03	1.01E-03	2.54E-04	1.88E-03	4.53E-03	-2.15E-02
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.										

Waste production and output flows (DrenPro[®] DN1500 produced at Marechal Deodoro-AL plant)

Waste production

Indicator	Unit	Results per declared unit									
		A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.86	0.00
Non-hazardous waste disposed	kg	9.92	0.00	0.18	10.10	0.00	15 950.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Output flows

Indicator	Unit	Results per declared unit									
		A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	D
Components for re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	63.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	398.00
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, electricity	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy, thermal	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND: Not Declared

Information on biogenic carbon content (DrenPro[®] DN1500 produced at Marechal Deodoro-AL plant)

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂.

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