DAPHabitat System

www.daphabitat.pt

ENVIRONMENTAL PRODUCT DECLARATION

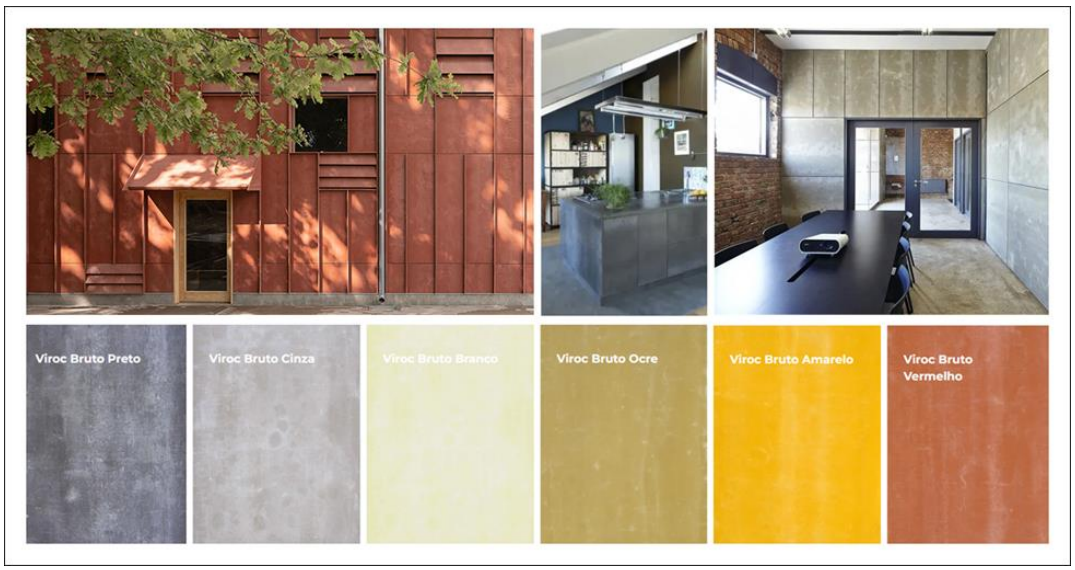
[according to ISO 14025, EN 15804:2012+A1:2013 and EN 15942]

Registration Number: DAP 011:2022

Viroc® Cement Bonded Particle Board

ISSUE DATE: 14/10/2022 **VALID UNTIL: 13/10/2027**

VIROC Portugal – Indústria de Madeira e Cimento, S.A.



VERSION 1.1. EDITION JULY 2015

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Program operator:	Sustainable Construction Platform www.centrohabitat.net centrohabitat@centrohabitat.net
Address:	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro
Email address:	deptecnico@centrohabitat.net
Telephone number:	(+351) 234 401 576
Website:	www.daphabitat.pt
Logo:	

1.2. EPD owner

Name of the owner:	Viroc Portugal – Indústria de Madeira e Cimento S.A.
Production site:	Estrada Nacional 10, Km 44.7, Vale da Rosa, PT- 2914-519 Setúbal – Portugal
Address (head office):	Av. Infante Dom Henrique N.º337, 3º Andar, 1800-210 Lisboa - Portugal
Telephone:	(+351) 213 190 140
E-mail:	info@investwood.pt
Website:	https://www.investwood.pt
Logo:	
Information concerning the applicable management Systems:	Chain of custody certification FSC® and PEFC™
Specific aspects regarding the production:	CAE Principal : 16211 – Wood Particleboard - Manufacturers

Organization's environmental policy:

Viroc S.A. seeks to constantly improve customer satisfaction by continuously enhancing its methods and processes.
It promotes the use of wood from forests managed–with sustainable methods and all legal requirements and regulations are complied.
The supply and use of wood produced near the plant is a priority to avoid long delivery routes, thus benefiting the environment.
Viroc S.A. has a system in place to guarantee compliance with the chain of custody requirements, in accordance with the FSC STD-40-004, FSC STD-40-005 and PEFC ST 2002:2013 standards.
Viroc Portugal undertakes not to acquire wood coming from:

– Forests where civil or traditional rights are violated;

– Forests with high conservation value, threatened by forest management activities;

– Genetically modified trees (GMOs);

– Illegally exploited forests;

– Forests resulting from the conversion of natural forests into plantations or non-forest uses.

VIROC, S.A. is committed not to purchase wood from:

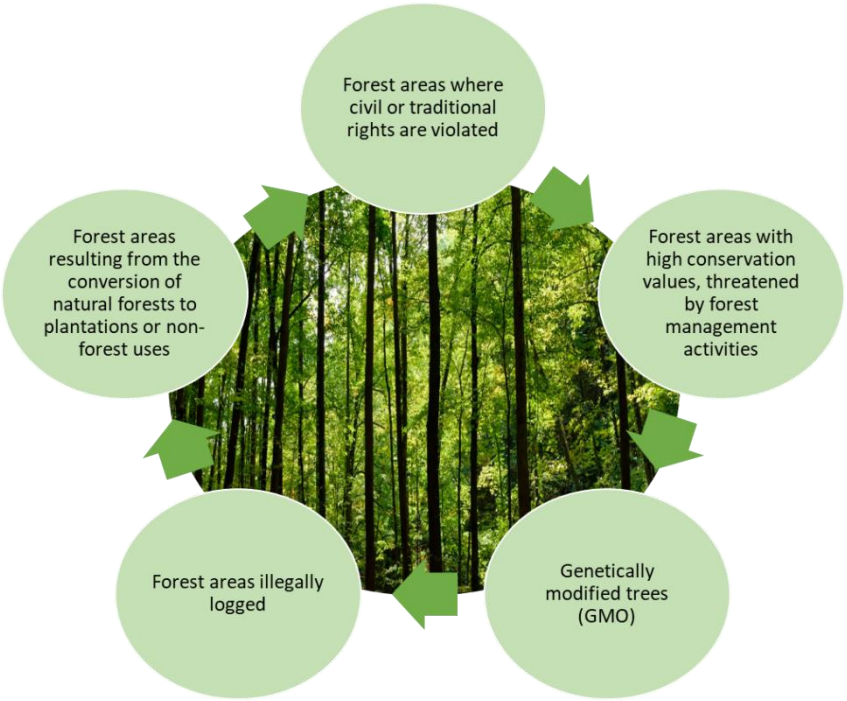

Figure 1 - Viroc's commitment scheme in relation to the acquisition of wood.

1.3. Information concerning the EPD

Authors:	1. Centro Tecnológico da Cerâmica e do Vidro 2. Viroc Portugal – Indústria de Madeira e Cimento S.A.
Contact of the authors:	1. CTCV materials: habitat | iParque – Parque Tecnológico de Coimbra - Lote 6 | 3040-540 Antanhol – Portugal (T) +351 239 499 200 Marisa Almeida: marisa@ctcv.pt 2. VIROC Portugal – Indústria de Madeira e Cimento S.A. Estrada Nacional 10, Km 44.7, Vale da Rosa, PT-2914-519 Setúbal – Portugal (T) +351 213 190 140 info@investwood.pt
Emission date:	2022-10-14
Registration date:	2022-10-28
Registration number:	DAP 011:2022
Valid until:	2027-10-13
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD of one (1) product class, produced in one (1) industrial plants belonging to one (1) sole producer (VIROC Portugal – Indústria de Madeira e Cimento S.A.).
Where to consult explanatory material:	https://www.investwood.pt
Type of EPD:	EPD from cradle to gate (A1-A3)

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2009 and EN 15804:2012+A1:2013	
Certification Body	**Verifier (s)**
(CERTIF – Associação para a Certificação)	(Helena Gervásio)

1.5. EPD Registration

Program Operator
(Plataforma para a Construção Sustentável)

1.6. PCR of reference

Name:	1. RCP: base model for construction products and services 2. EN 16485:2014 – Round and sawn timber – Environmental Product Declarations – Product category rules for wood and wood-based products for use in construction (CEN, 2014).
Emission Date:	1. November 2020 2. November 2014
Number of registration on the data base:	1. RCP-mb001
Version:	1. Versão 2.0
Identification and contact of the coordinator(s):	1. RCP: base model for construction products and services • Marisa Almeida | marisa@ctcv.pt • Luís Arroja | arroja@ua.pt • José Silvestre | jds@civil.ist.utl.pt 2. CEN
Identification and contact of authors:	1. RCP: base model for construction products and services •Marisa Almeida; Luis Arroja; José Silvestre; Fausto Freire; Cristina Rocha; Ana Paula Duarte; Ana Cláudia Dias; Helena Gervásio; Victor Ferreira; Ricardo Mateus e António Baio Dias • Marisa Almeida | marisa@ctcv.pt • Luis Arroja | arroja@ua.pt • José Silvestre | jds@civil.ist.utl.pt • Fausto Freire • Cristina Rocha • Ana Paula Duarte • Ana Cláudia Dias • Helena Gervásio • Victor Ferreira • Ricardo Mateus • António Baio Dias 2. CEN
Composition of the sectorial panel:	-
Período de consulta:	1. 18/11/2015 – 18/01/2016 2. (…)
Valid until:	1. December 2022 2. Without validity (same that EN15804+A1)

1.7. Information concerning the product/product class

Identification of the product:

Viroc® Cement Bonded Particle Board

Illustration of the product:

Brief description of the product:

Viroc® boards are composite panels made of a mixture of wood particles and cement known as Viroc® Cement Bonded Particle Board. These boards combine the flexibility of wood with the strength of cement, allowing a wide range of applications both indoors and outdoors.

Viroc® boards have a heterogeneous appearance with different randomly dispersed shades, resulting from the natural colors of the raw materials used and chemical reactions.

Table 1. Viroc® composition.

Raw materials	Grey Viroc® and White Viroc® (%)	Remaining colours (%)
Portland cement (CEM ii – L42,5R)	66%	62%
Wood (Pine)	21%	21%
Water	11%	11%
Other non-toxic compounds (sodium silicate and aluminium sulphate	2%	2%
Pigment	-	4%

Main technical characteristics of the product:

Table 2. Technical properties of Viroc®

Properties		Units	Viroc®									Standard
Thickness		mm	8	10	12	16	19	22*	25*	28*	32*	-
Density		Kg/m³	>1000 kg/m³									EN 323
Weight per sqm		Kg/m²	10,8	13,5	16,2	21,6	25,7	29,7	33,8	37,8	43,2	-
Panels weitgh	2600x1250	Kg	35,1	43,9	52,7	70,2	83,4	96,5	109,7	122,9	140,4	-
	3000x1250	Kg	40,5	50,6	60,8	81,0	96,2	111,4	126,6	141,8	162,0	-
Modulus of elasticity in bending		N/mm²	4000 to 4500 N/mm² (Class 2) ≧ 4500 N/mm² (Class 1)									EN 310
Bending strengh		N/mm²	≥ 9									EN 310
Internal bond		N/mm²	≥ 0,5									EN 319
Internal bond after cyclic test		N/mm²	≥ 0,3									EN 319 EN 321
Swelling in thickness 24 h		%	≤ 1,5%									EN 317

	Swelling in thickness after cyclic test	%	≤ 1,5%	EN 317 EN 321
	Humidity factory exit	%	6 - 12%	EN 322
	Surface alkalinity	PH	11 - 13	-
	Fire Reaction		B-s1,d0	EN13501

Description of the products' application:	Viroc® are manufactured and available in different colors, thicknesses and dimensions. Viroc® board is supplied raw, unfinished. The surfaces have some irregularities and imperfections, such as small incrustations, stains, scratches and salts from chemical reactions. When the panel is applied in sight, the surface that becomes visible must be cleaned/polished with a cleaning disc, in order to remove dust, scratches, dirt and salts. This cleaning/polishing does not change the natural appearance of the panel. The Viroc board can be supplied with both surfaces sanded. This process aims to calibrate the thickness of the panel, in particular when it is applied to a supporting floor and the coating is a thin layer such as a linoleum or vinyl canvas. The sanded surface of the panel has no decorative functions. Viroc panel is a versatile material that can be used in the following applications: facades; walls and wall coverings; floors; false ceilings; roofing support; lost formwork; interior design; urban furniture.
Reference service life:	Not specified (EPD from cradle-to-gate).
Placing on the market / Rules of application in the market / Technical rules of the product:	EN 13986 EN 634-2 EN 310 EN 317 EN 319 EN 321 EN 322 EN 323 EN 13501-1
Quality control:	VIROC pursues a medium/long term business strategy based on the concept of sustainable growth, promoting the use of wood from sustainably managed forests, and continuously improving its methodologies and processes, relying on innovation and research. VIROC is committed to guaranteeing a Quality Management System that responds to the requirements of Customers and other interested parties, to the development and continuous improvement of its services and products, complying with all legal, statutory and regulatory requirements. In addition, it assumes compliance with all the requirements of its QMS and the continuous improvement of its effectiveness.
Special delivery conditions:	Not applicable
Components and substances to declare:	Not applicable
History of the LCA studies:	No LCA studies have been identified for similar products.

2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT

2.1. Calculation rules of the LCA

Declared unit:	1 m^3 of Viroc®, ready for dispatch. The average density is 1350 kg/m^3, with moisture content between 6% and 12%. Following the recommendation of EN 16485 in point 6.3.2 and in accordance with EN 15804:2012 + A1, the following conversion factor (CF) is indicated to convert the declared unit of 1 m^3 of Viroc® panel to the mass unit (kg panel): CF (kg/m^3) = 1/panel density.
Functional unit:	Not applicable.
System boundaries:	In general, Viroc® panels follow the same production process, using some different raw materials (pigments) that give them different colors. The raw material base is the logs of pine produced in Portugal according to the best forest management practices, and according to PEFC™ and FSC® certification. All forest operations, from the preparation of the land, the conduction of forest stands, forest exploitation and establishment of the road and divisional network, were considered. Wood processing begins with the reception and unloading of green wood logs from pine trees produced in mainland Portugal. The logs are debarked and sent to a flaker that turns them into chips. These chips are calibrated and classified into fine and coarse (Obtaining the chips). Then, all the different raw material, the wood chips, the water, the additives and finally the cement, are mixed together forming a mass which is called a mixture (mixture preparation). The mixture is transported to the forming machine where it is distributed and deposited on steel sheets, which are previously sprayed with a release oil, forming a mattress of uniform thickness. On the surfaces of the mattress, in contact with the sheets, the finest elements of the mixture are deposited, leaving the cement in sight (Formation of the mattress). Subsequently, the sheets with the mattress are stacked in a certain number of floors depending on the thickness of the panels to be manufactured. This pile is then pressed, and the set of pressed panels is called a clamp. Each clamp is assigned a number that is associated with all the quality control tests that are carried out (Pressing). The clamp is introduced into a hardening tunnel that has the purpose of accelerating the curing process, where, under the effect of pressure, temperature, humidity and time, it acquires resistance to be manipulated. The clamp is released and the boards are separated from the sheets. The boards undergo a pre-cut operation and are re-stacked and placed in maturation. The sheets are cleaned and re-entered into the production circuit. During the maturation time, the chemical bonds of cement hydration are completed (Cure). Finally, the boards go through a drying tunnel in order to remove excess humidity (drying). Quality control tests are carried out on the finished product in order to verify the physical and mechanical characteristics of the panel produced, which are then cut, packaged and stored for later loading into trucks that will ship the Viroc® boards. The consumption of electricity, fuel oil, release oil and lubricant, as well as the diesel consumed in the internal movements of the machines, in the transport of the bark rejected from the debarking of the logs for the production of thermal energy, were considered. The transport and treatment of waste resulting from the manufacturing process of Viroc® panels, bark, chips, board waste (non-conforming and cuts), packaging waste, paper and cardboard, were considered. The waste boards and the dust resulting from finishing processes are sent to the raw material supplier for reintroduction into the cement manufacturing process, promoting the circular economy.
Criteria for the exclusion:	While carrying out the LCA, the production processes of logs, auxiliary materials and energy consumed in the manufacture of Viroc® boards were considered for which inventory data was available. It should be noted that the processes not considered are covered by the exclusion criterion defined in NP EN 15804: 2012 + A1: 2015 namely because their mass is less than 1% of the total mass of the entries. The following processes were excluded:

	▪ environmental loads associated with the construction and maintenance of infrastructure and equipment (capital goods) ▪ long-term emissions
Assumption and limitations:	The data collected and results of the environmental impacts and other indicators presented in this EPD refer to the year of 2019.
Quality and other characteristics about the information used in the LCA:	For the processes over which the producer has an influence, that is, the manufacture of Viroc® panels, real and specific data was used. For processes that Viroc, SA has no total influence or specific information, such as the production of dyes, chemicals, lubricating oils and packaging materials, production of fuels and electricity, treatment and recovery of waste (fly ash and boiler dust, solvents, paper and cardboard packaging, metals, absorbents, waste from cement-based composite materials) and transport, generic data obtained from the Ecoinvent database - version 3.7 was used. The generic data used comply with the data quality requirements (temporal scope, geographic scope, plausibility, completeness, consistency, source reliability and differences in data and sensitivity analysis).
Allocation rules:	The allocation rules adopted were based on the annual volumetric production of Viroc® panels. Since pine bark is sold for the production of thermal energy, all data up to the debarking process were allocated only to the production of the panel, using mass allocation factors (91% corresponds to the panel, 9% corresponds to the bark).
Comparability of EPD for construction products:	EPD's for construction products and services may not be comparable if they are not produced in accordance with EN15804, EN16485 and EN15942 and in accordance with the comparability conditions determined by ISO 14025.

2.1.1. Flow diagram of input and output of the processes

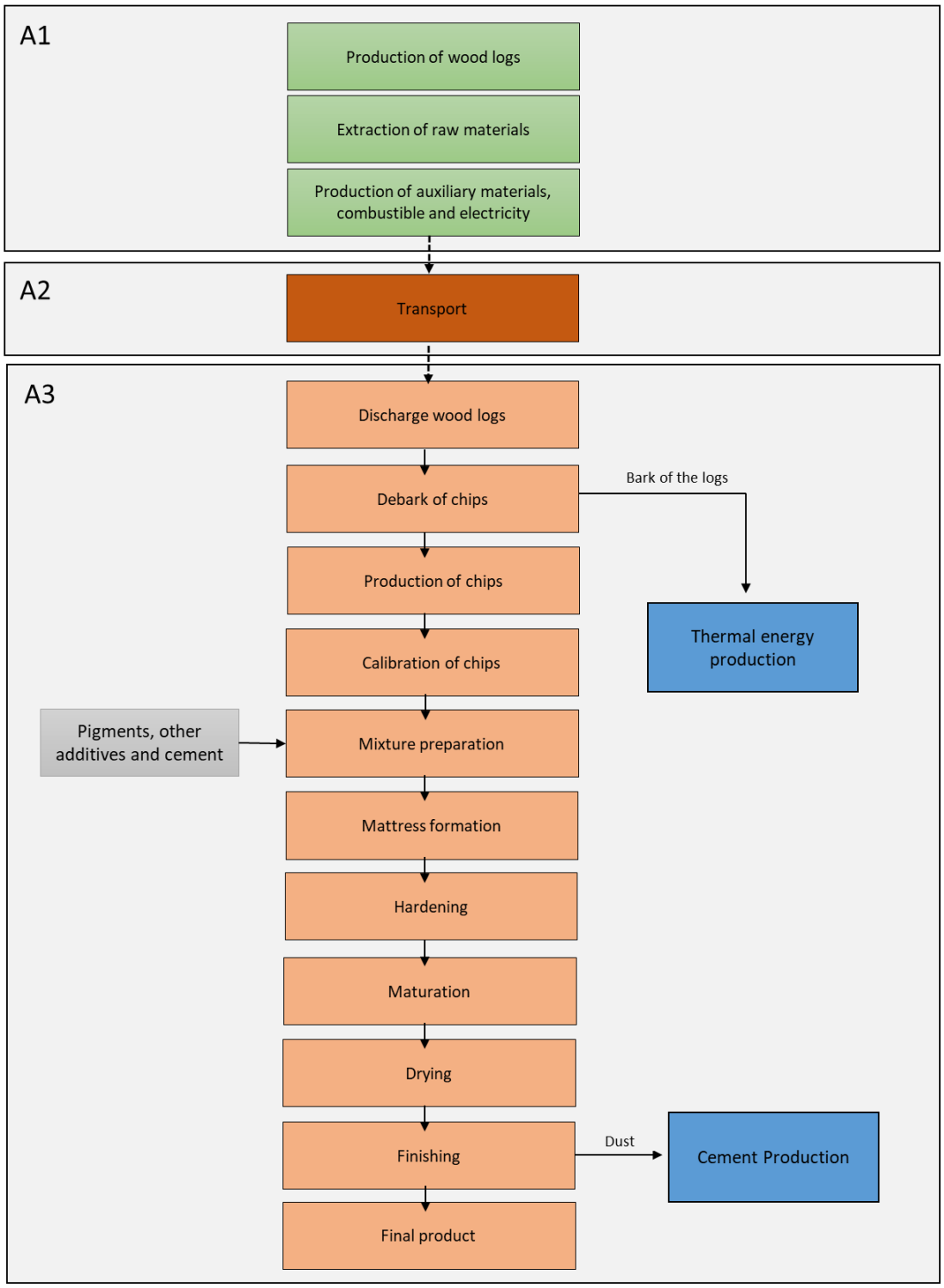

Figure 2 - Flowchart of the manufacturing process for Viroc®.

2.1.2. Description of the system boundaries

(✓= included; ✘ = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘

The extraction of wood, the main raw material, is carried out in suitable and certified locations. The data inventory of the forest management system, which includes preparing the land, installing the stand, conducting the stand, forestry exploration, and establishing the road and divisional network were considered.

The green logs with bark, made of pine, are received and unloaded at Viroc, SA. In this operation, diesel consumption occurs in the machinery that unloads the pine logs. The logs are debarked and sent to a flaker that turns them into chips. The chips are subjected to a magnetic separation in order to remove any metal that may be contaminating the wood, and then the chips pass through fine refiner that define their granulometry.

The bark resulting from the barking step is sold (by-product) for external valorisation (thermal energy).

Then, the chips go to the mixer where the remaining raw materials (e.g. cement, pigment) are added, until a homogeneous mixture is obtained – forming stage. This mixture goes to the forming heads of the forming machine. Here the mixture is distributed and deposited on steel sheets, which are previously sprayed with a release oil, forming a mattress of uniform thickness. All mattresses are weighed and if their weight is out of specification, this mattress is rejected and this mixture is reintroduced into the process.

After the formation of the mattress, follows the pressing and hardening of the clamp, which acquires resistance to be manipulated. Then, the Viroc panels are pre-squared and stacked one on top of the other, remaining maturing for a minimum of 7 days. After maturation, the panels enter a drying tunnel. Drying time depends on panel thickness. Finally, the panels are subjected to final finishing and packaged and stored for later loading onto trucks that will ship the Viroc® panels. The dust resulting from the final finishes of the product, non-conforming board and mixture residues resulting from discharges from the machine due to breakdown or change of products, are forwarded to the supply of cement to re-enter the cement production process.

Emissions to air resulting from the combustion of fuel in the boiler were estimated using data provided by Viroc such as thermal consumption, operating hours, power, and EMEP/EEA emission factors (2019).

Emissions into the atmosphere resulting from the forming dedusting, squaring, cutting, sanding and dust silo were obtained through campaigns to characterize emissions from 2017 to 2020.

Electricity consumption is associated with all the automatic operations described, the operation of the debarking device, flaker, metal separation, forklifts, and all the equipment used for panel preparation, mattress formating, drying, sanding and cutting. It should be noted that the electricity consumption for each type of panel considers the consumption of administrative activities.

The consumption of thermal fuel oil and oil associated with the production of heat in the hardening and drying tunnels, mold release oil associated with the panel production process, diesel associated with movements in the wood park and lubricating oils associated with equipment maintenance was also considered. The hardening tunnel and drying tunnel operate at temperatures in the order of 60-80ºC fed with thermal oil heated by the fuel oil boiler.

The waste produced during the manufacturing process of Viroc® boards is subject to recovery processes abroad (eg metals).

2.2. Parameters describing environmental impacts

		Global warming kg CO_2 equiv.	Ozone layer depletion kg CFC 11 equiv.	Acidification kg SO_2 equiv.	Eutrophication kg $(PO_4)^{3-}$ equiv.	Photochemical oxidation kg C_2H_4 equiv.	Abiotic depletion kg Sb equiv.	Abiotic depletion – fossil fuels MJ, P.C.I.
Raw material supply **Transport** **Manufacturing**	**A1 –A3**	8.80E+02	6.47E-05	2.28E+00	2.76E-01	1.09E-01	3.47E-05	7.19E+03

LEGEND:

Product stage

NOTE:
Values expressed by declared unit (1 m³ of Viroc® board).

2.3. Parameters describing resource use

		Primary energy						Secondary materials and fuels, and use of water			
		EPR MJ, P.C.I.	RR MJ, P.C.I.	TRR MJ, P.C.I.	EPNR MJ, P.C.I.	RNR MJ, P.C.I.	TRNR MJ, P.C.I.	MS kg	CSR MJ, P.C.I.	CSNR MJ, P.C.I.	Net use of fresh water m³
Raw material supply **Transport** **Manufacturing**	**A1 –A3**	1.01E+03	0	1.01E+03	8.21E+03	0	8.21E+03	0	0	0	5.84E+00

Values expressed by declared unit (1 m³ Viroc® panel)

LEGEND:

Product stage

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials;
RR = use of renewable primary energy resources used as raw materials;
TRR = total use of renewable primary energy resources (EPR + RR);
EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
RNR = use of non-renewable primary energy resources used as raw materials;
TRNR = total use of non-renewable primary energy resources (EPRN + RNR);
MS = use of secondary material;
CSR = use of renewable secondary fuels;
CSNR = use of non-renewable secondary fuels.

2.4. Other environmental information describing different waste categories

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed** kg
Raw material supply **Transport** **Manufacturing**	**A1 –A3**	9.79E-03	4.52E+00	3.50E-02

Values expressed by declared unit (1 m³ of Viroc® board)

LEGEND:

Product stage

2.5. Other environmental information describing output flows

Parameters	Units*	Viroc®
Components for re-use	kg	0
Materials for recycling	kg	**509**
Radioactive waste eliminated	kg	0
Materials for energy recovery	kg	**3,55**
Exported energy	MJ by energy carrier	**0**

* expressed by declared unit (1 m³ Viroc® panel)

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