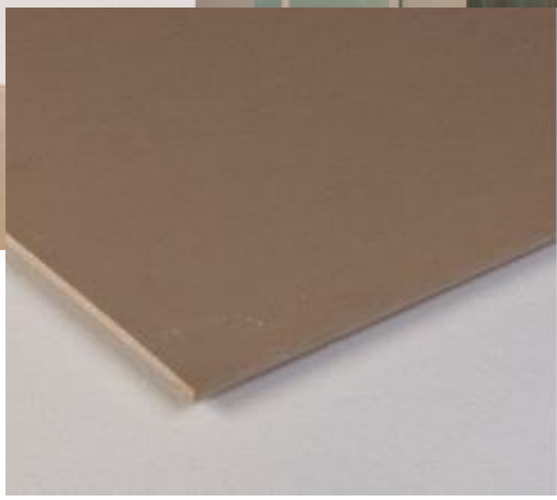
THE INTERNATIONAL EPD® SYSTEM

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

Standard board 9 mm

Date of issue:2019-07-10
Validity: 5 years
Valid until: 2024-07-05
Scope of the EPD®: VIETNAM



The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

Gyproc SAINT-GOBAIN

Registration number The International EPD® System:
S-P-01626

General information

Manufacturer: **Saint-Gobain Construction Product Vietnam (SGCPV)**

Programme used: International EPD System **http://www.environdec.com/**

EPD registration number/declaration number: S-P-01626

PCR identification: EN 15804 as the core PCR + The International EPD® System PCR 2012:01 version 2.2 for Construction Products and construction services with reference to the Saint Gobain Environmental Product Declaration Methodological Guide for Construction Products

Site of manufacture: **SGCPV Ho Chi Minh & Hai Phong**

Product / product family name and manufacturer represented: **Standard Board – SGCPV**

> **European Standard :** EN 520:2004+A1:2009 Gypsum Plasterboards, definitions, Requirements and test methods Type D, F,I,R
>
> **American Standard :** ASTM C1396-14a Standard Specification for Gypsum Board Section 5: Gypsum wallboard
>
> **Vietnam Standard** : TCVN 8256:2009 - về Tấm thạch cao - Yêu cầu kỹ thuật

Declaration issued: **2019-07-10**

Valid until: **2024-07-05**

Demonstration of verification: an independent verification of the declaration was made, according to ISO 14025:2010. This verification was external and conducted by the following third party: Dr Andrew NORTON, Renuables based on the PCR mentioned above.

EPD Prepared by: **Saint-Gobain LCA Central TEAM.** Contact: **Yves.coquelet@saint-gobain.com**

The Functional unit is 1 m2 of plasterboard with a weight of 5.4 kg /m² and a density of 600 kg/m3

Declaration of Hazardous substances: (Candidate list of Substances of Very High Concern): none

Geographical scope: The EPD covers VIETNAM

CEN standard EN 15804 serves as the core PCR[a]	
PCR:	PCR 2012:01 Construction products and Construction services, Version 2.2
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair:
Independent verification of the declaration, according to EN ISO 14025:2010 **Internal** ☐ **External** ☒	
Third party verifier:	**Andrew Norton , Renuables** **http://renuables.co.uk**
Accredited or approved by	The International EPD System

Product description

Product description and use: Standard board consists of gypsum encased in paper liners.

Designed for use in the residential sector, Standard board.

Description of the main product components and or materials:
Plasterboard is made up of a gypsum core (calcium sulfate hydrate) with additive and a paper liner.

Description of the main components and/or materials for 1 m2 of product for the calculation of the EPD®:

PARAMETER	VALUE
Quantity of plaster for 1 m^2 of product	5.80 Kg
Thickness	9.0 mm
Density	644 kg/m^3
Surfacing	Paper 340 g/m^2
Packaging for the transportation and distribution	Polyethylene: 1.15 g/m^2
Product used for the Installation	Paper tape, jointing compound, screws

During the life cycle of the product any hazardous substance listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization" has been used in a percentage higher than 0,1% of the weight of the product.

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product.

LCA calculation information

EPD TYPE DECLARED	Cradle to gate with options
FUNCTIONAL UNIT	1 m^2 of installed board.
SYSTEM BOUNDARIES	Cradle to gate with options: stages A1 – 3, A4, A5, B1 – 7, C1 – 4
REFERENCE SERVICE LIFE (RSL)	50 years by default, it corresponds to standard building design life
CUT-OFF RULES	Life Cycle Inventory data for a minimum of 99% of total inflows to the upstream and core module shall be included
ALLOCATIONS	Production data. Recycling, energy and waste data have been calculated on a mass basis.
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Scope includes: Vietnam Data included is collected from two production sites, SGPCV Ho Chi Minh Data Collected for the year 2018 and Hai Phong Data Collected for the first trimester 2019 As Hai Phong is a new plant and has been producing for only 6 months. At the end of 2019, a verification of ratio, impacts and production will be made by Saint-Gobain TEAM to verify that all assumptions made on the first trimester are right and correspond to a full year of production. Cradle to gate with options study. Background data: Ecoinvent (2015) and Gabi (2013 - 2016)
PRODUCT CPC CODE	37530 (Articles of plaster or of compositions based on plaster)

Life cycle stages

Flow diagram of the Life Cycle

Product stage, A1-A3

Description of the stage: the product stage of plasterboard products is subdivided into 3 modules A1, A2 and A3 respectively "Raw material supply", "transport to manufacturer" and "manufacturing".

A1, raw material supply

This includes the extraction and processing of all raw materials and energy which occur upstream from the manufacturing process.

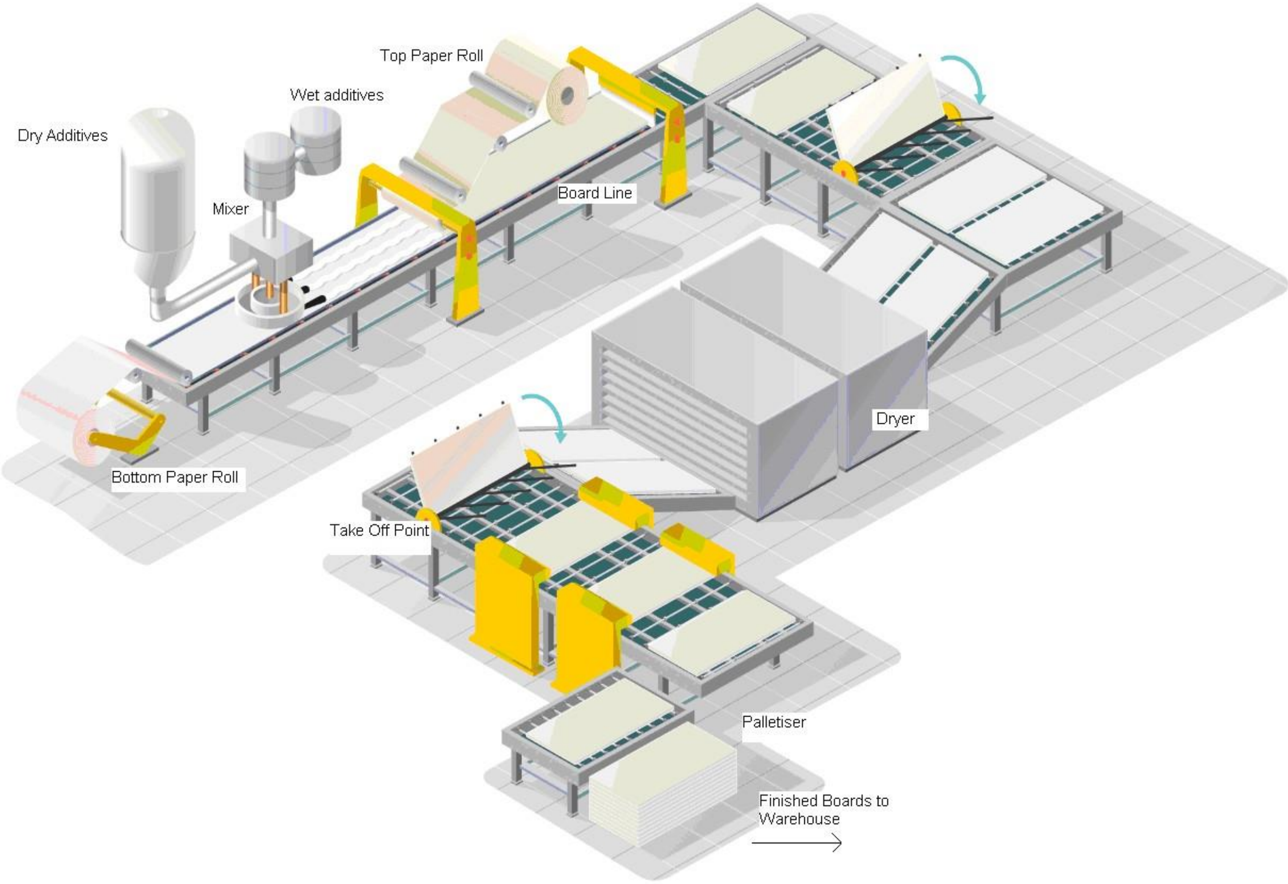
A2, transport to the manufacturer

The raw materials are transported to the manufacturing site. The modelling includes road, boat and/or train transportations of each raw material.

A3, manufacturing

This module includes the manufacture of products and the manufacture of packaging. The production of packaging material is taken into account at this stage. The processing of any waste arising from this stage is also included.

Manufacturing process flow diagram



Manufacturing in detail:
The initial materials are homogenously mixed to form a gypsum slurry that is spread via multiple hose outlets onto a paper liner on a moving conveyor belt. A second paper liner is fed onto the production line from above to form the plasterboard. The plasterboard continues along the production line where it is finished, dried, and cut to size.

Recycled Gypsum waste is reintegrated back into the manufacturing process wherever possible.

Construction process stage, A4-A5

Description of the stage: the construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building

A4, Transport to the building site: this module includes transport from the production gate to the building site. Transport is calculated on the basis of a scenario with the parameters described in the following table.

PARAMETER	VALUE (expressed per functional/Functional unit)
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Medium Truck (15t of load weight) 0.24 liters per km
Distance	367 (km)
Capacity utilisation (including empty returns)	66.7 %
Bulk density of transported products	772 kg/m³
Volume capacity utilisation factor	1

A5, installation into the building The accompanying table quantifies the parameters for installing the product at the building site. All installation materials and their waste processing are included.

PARAMETER	VALUE (expressed per functional/Functional unit)
Ancillary materials for installation (specified by materials)	Jointing compound 0.315 kg/m2 board, tape 1.23m /m2 board, screws 8 /m2 board
Water use	0.1575 liters/m2 board
Other resource use	None
Quantitative description of energy type (regional mix) and consumption during the installation process	None
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	Board: 0.493 kg Screws: 0 kg Jointing Compound: 0.027 kg Jointing Tape: 0.0013 kg
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	9 mm Standard Board: 0.0187 to recycling 0.474 kg to landfill Screws: 0 kg Jointing Compound: 0.027 kg to landfill Jointing Tape: 0.00013 kg to landfill
Direct emissions to ambient air, soil and water	None

Use stage (excluding potential savings), B1-B7

Description of the stage:

The use stage, related to the building fabric includes:
B1, use or application of the installed product;
B2, maintenance;
B3, repair;
B4, replacement;
B5, refurbishment,
B6, Operational energy use
B7, Operational water use

Description of scenarios and additional technical information:

The product has a reference service life of 50 years. This assumes that the product will last in situ with no requirements for maintenance, repair, replacement or refurbishment throughout this period. Therefore, it has no impact at this stage.

Maintenance:

PARAMETER	VALUE (expressed per functional/Functional unit) / DESCRIPTION
Maintenance process	None required during plasterboard lifetime
Maintenance cycle	None required during plasterboard lifetime
Ancillary materials for maintenance (e.g. cleaning agent, specify materials)	None required during plasterboard lifetime
Wastage material during maintenance (specify materials)	None required during plasterboard lifetime
Net fresh water consumption during maintenance	None required during plasterboard lifetime
Energy input during maintenance (e.g. vacuum cleaning), energy carrier type, (e.g. electricity) and amount, if applicable and relevant	None required during plasterboard lifetime

Repair:

PARAMETER	VALUE (expressed per functional/Functional unit) / DESCRIPTION
Repair process	None required during plasterboard lifetime
Inspection process	None required during plasterboard lifetime
Repair cycle	None required during plasterboard lifetime
Ancillary materials (e.g. lubricant, specify materials)	None required during plasterboard lifetime
Wastage material during repair (specify materials)	None required during plasterboard lifetime
Net fresh water consumption during repair	None required during plasterboard lifetime
Energy input during repair (e.g. crane activity), energy carrier type, (e.g. electricity) and amount if applicable and relevant	None required during plasterboard lifetime

Replacement:

PARAMETER	VALUE (expressed per functional/Functional unit) / DESCRIPTION
Replacement cycle	None required during plasterboard lifetime
Energy input during replacement (e.g. crane activity), energy carrier type, (e.g. electricity) and amount if applicable and relevant	None required during plasterboard lifetime
Exchange of worn parts during the product's life cycle (e.g. zinc galvanized steel sheet), specify materials	None required during plasterboard lifetime

Refurbishment:

PARAMETER	VALUE (expressed per functional/Functional unit) / DESCRIPTION
Refurbishment process	None required during plasterboard lifetime
Refurbishment cycle	None required during plasterboard lifetime
Material input for refurbishment (e.g. bricks), including ancillary materials for the refurbishment process (e.g. lubricant, specify materials)	None required during plasterboard lifetime
Wastage material during refurbishment (specify materials)	None required during plasterboard lifetime
Energy input during refurbishment (e.g. crane activity), energy carrier type, (e.g. electricity) and amount	None required during plasterboard lifetime
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	None required during plasterboard lifetime

Use of energy and water:

PARAMETER	VALUE (expressed per functional/Functional unit) / DESCRIPTION
Ancillary materials specified by material	None required during plasterboard lifetime
Net fresh water consumption	None required during plasterboard lifetime
Type of energy carrier (e.g. electricity, natural gas, district heating)	None required during plasterboard lifetime
Power output of equipment	None required during plasterboard lifetime
Characteristic performance (e.g. energy efficiency, emissions, variation of performance with capacity utilisation etc.)	None required during plasterboard lifetime
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	None required during plasterboard lifetime

End-of-life stage C1-C4

Description of the stage: The end-of-life stage includes:
C1, de-construction, demolition;
C2, transport to waste processing;
C3, waste processing for reuse, recovery and/or recycling:
the entire product is assumed here to be sent to landfill
C4, disposal, including provision and all transport, provision of all materials, products and related energy and water use.

End-of-life:

PARAMETER	VALUE (expressed per functional/Functional unit) / DESCRIPTION
Collection process specified by type	6.3 kg collected with mixed construction waste
Recovery system specified by type	0.243 kg for recycling
Disposal specified by type	6.06 kg to municipal landfill
Assumptions for scenario development (e.g. transportation)	On average, Gypsum waste is transported 25 km by road from construction / demolition sites to end of life treatment or disposal.

Reuse/recovery/recycling potential, D

Description of the stage:
Module D has not been taken into account

LCA results

Description of the system boundary (X = Included in LCA, MNA = Module Not Assessed)

CML 2001 has been used as the impact model. Specific data has been supplied by the plant, and generic data come from the GABI and Ecoinvent databases.
All emissions to air, water, and soil, and all materials and energy used have been included.

All figures refer to a functional unit of 1m² of plasterboard with a weight of 5.40 kg/m²

PRODUCT STAGE			CONSTRUCTION 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	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-recovery
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	MNA

ENVIRONMENTAL IMPACTS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Global Warming Potential (GWP 100) - *kg CO_2 equiv/FU*	1,58E+00	9,85E-02	2,14E-01	0	0	0	0	0	0	0	2,76E-02	1,45E-02	0	9,48E-02	MNA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	7,05E-09	1,51E-17	6,00E-10	0	0	0	0	0	0	0	3,77E-18	5,85E-14	0	5,29E-16	MNA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	5,81E-03	3,93E-04	7,17E-04	0	0	0	0	0	0	0	9,69E-05	5,89E-05	0	5,41E-04	MNA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1,26E-03	9,60E-05	1,35E-04	0	0	0	0	0	0	0	5,65E-06	1,49E-05	0	6,13E-05	MNA
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethylene equiv/FU*	2,87E-04	1,44E-05	6,14E-05	0	0	0	0	0	0	0	6,52E-06	2,41E-06	0	4,45E-05	MNA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	8,04E-07	1,31E-09	3,89E-06	0	0	0	0	0	0	0	6,86E-10	1,26E-09	0	3,22E-08	MNA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	2,38E+01	1,37E+00	2,80E+00	0	0	0	0	0	0	0	3,44E-01	1,96E-01	0	1,26E+00	MNA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Use of renewable primary energy excluding renewable primary energy resources used as raw materials *MJ/FU*	1,11E+01	3,15E-02	1,35E+00	0	0	0	0	0	0	0	1,12E-03	1,17E-02	0	1,66E-01	MNA
Use of renewable primary energy used as raw materials *MJ/FU*	5,27E+00	0	4,13E-01	0	0	0	0	0	0	0	0	0	0	0	MNA
Total use of renewable primary energy resources (primary energy	2,16E+01	3,15E-02	1,77E+00	0	0	0	0	0	0	0	1,12E-03	1,17E-02	0	1,66E-01	MNA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2,42E+01	1,38E+00	2,90E+00	0	0	0	0	0	0	0	3,45E-01	1,97E-01	0	1,31E+00	MNA
Use of non-renewable primary energy used as raw materials *MJ/FU*	2,98E-01	0	2,34E-02	0	0	0	0	0	0	0	0	0	0	0	MNA
Total use of non-renewable primary energy resources (primary energy	2,45E+01	1,38E+00	2,93E+00	0	0	0	0	0	0	0	3,45E-01	1,97E-01	0	1,31E+00	MNA
Use of secondary material *kg/FU*	3,38E-01	0	3,03E-02	0	0	0	0	0	0	0	0	0	0	0	MNA
Use of renewable secondary fuels- *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Use of non-renewable secondary fuels - *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Use of net fresh water - m^3/FU	7,35E-03	1,05E-05	9,49E-04	0	0	0	0	0	0	0	2,06E-06	1,97E-05	0	3,29E-04	MNA

WASTE CATEGORIES

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	7,59E-06	4,94E-09	6,51E-07	0	0	0	0	0	0	0	4,25E-11	1,09E-08	0,00E+00	2,23E-08	MNA
Non-hazardous (excluding inert) waste disposed *kg/FU*	9,68E-03	1,67E-05	5,16E-01	0	0	0	0	0	0	0	5,08E-05	1,66E-05	0,00E+00	6,07E+00	MNA
Radioactive waste disposed *kg/FU*	1,55E-04	1,61E-06	3,84E-05	0	0	0	0	0	0	0	4,26E-07	4,03E-07	0,00E+00	1,73E-05	MNA

OUTPUT FLOWS

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Materials for recycling *kg/FU*	4,43E-03	0	2,17E-02	0	0	0	0	0	0	0	0	0	2,37E-01	0	MNA
Materials for energy recovery *kg/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA
Exported energy, detailed by energy carrier *MJ/FU*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MNA

LCA results interpretation

[1] This indicator corresponds to the abiotic depletion potential of fossil resources.
[2] This indicator corresponds to the total use of primary energy.
[3] This indicator corresponds to the use of net fresh water.
[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

Global Warming Potential (Climate Change) (GWP)

When analyzing the above figure for GWP, it can clearly be seen that the majority of contribution to this environmental impact is from the production modules (A1 – A3). This is primarily because the sources of greenhouse gas emissions are predominant in this part of the life cycle. CO2 is generated upstream from the production of electricity and is also released on site by the combustion of natural gas. We can see that other sections of the life cycle also contribute to the GWP; however, the production modules contribute to over 80% of the contribution. Combustion of fuel in transport vehicles will generate the second highest percentage of greenhouse gas emissions.

Non-renewable resources consumptions

We can see that the consumption of non – renewable resources is once more found to have the highest value in the production modules. This is because a large quantity of natural gas is consumed within the factory, and non – renewable fuels such as natural gas and coal are used to generate the large amount of electricity we use. The contribution to this impact from the other modules is very small and primarily due to the non – renewable resources consumed during transportation.

Energy Consumptions
As we can see, modules A1 – A3 have the highest contribution to total energy consumption. Energy in the form of electricity and natural gas is consumed in a vast quantity during the manufacture of glass wool so we would expect the production modules to contribute the most to this impact category.

Water Consumption
We can see that water consumption is mainly during the production phase. For the production phase, water is used within the manufacturing facility and therefore we see the highest contribution here. However, we recycle a lot of the water on site so the contribution is still relatively low.

Waste Production
Waste production does not follow the same trend as the above environmental impacts. The largest contributor is the end of life module. This is because a big part of the product is sent to landfill once it reaches the end of life state. However, there is a still an impact associated with the production module since we do generate waste on site. The very small impact associated with installation is due to the loss rate of product during implementation.

References:

1. EPD International (2017) General Program Instructions for the International EPD® System. Version 3.0, dated 2017-12-11. www.environdec.com.
2. The International EPD System PCR 2012:01 Construction products and Construction services, Version 2.2
3. EN 15804:2012 + A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
4. ISO 21930:2007 Sustainability in building construction – Environmental declaration of building products
5. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures
6. ISO 14040:2006 Environmental management. Life cycle assessment. Principles and framework
7. ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines
8. http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp