

KNAUF

Gypsum Powder



Knauf Ltd. & Partner

ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025:2006 and ISO 21930:2017



Knauf Company is pleased to present this Environmental Product Declaration (EPD) for their Gypsum Powder. This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified by Lindita Bushi, Ph.D., from ATHENA Institute.

The LCA and the EPD were prepared by Vertima Inc. The EPD includes cradle-to-gate life cycle assessment (LCA) results.

For more information about Knauf Company, visit <https://knauf.com/ar-EG>

For any explanatory material regarding this EPD, please contact the program operator.

1. GENERAL INFORMATION

PCR GENERAL INFORMATION			
Reference PCR	International Standard ISO 21930: Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services. Second Edition July 2017.		
The PCR review was conducted by:	<i>International Organization for Standardization</i>		
EPD GENERAL INFORMATION			
Program Operator	ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs), General Program Instructions, Version: 8.0, Revised 04/29/20. 100 Barr Harbor Drive, West Conshohocken (PA) 19428-2959 USA www.astm.org		
Declared Product	Gypsum Powder (Almany and Fugagips)		
EPD Registration Number 1099	EPD Date of Issue March 2026	EPD Period of Validity March 2026 - March 2031	
EPD Recipient Organization	Knauf Company Cairo Festival City, Podium 1, PO6, 4th Floor, 4730006, New Cairo knauf.com/ar-EG		
EPD Type/Scope and Declared Unit Product-specific cradle-to-gate EPD with declared unit of 1 kg of manufactured and packaged of Gypsum Powder.			Year of Reported Manufacturer Primary Data 2021
Geographical Scope Global	LCA Software OpenLCA v.1.11.0	LCI Databases Ecoinvent 3.9.1	LCIA Methodology IPCC 2021 and CML v4.8 2016
This LCA and EPD were prepared by:		Vertima Inc. www.vertima.ca	
This EPD and LCA were independently verified in accordance with ISO 14025:2006, ISO 14040:2006 and ISO 14044:2006, as well as ISO 21930:2017. <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External		 Lindita Bushi, Ph.D. Athena Sustainable Materials Institute	

The owner of the declaration shall be liable for the information and evidence herein; ASTM, or its affiliates, shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence.





LIMITATIONS

Environmental declarations from different programs (ISO 14025) may not be comparable. EPDs are comparable only if they comply with ISO 21930, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.



2 PRODUCT DEFINITION AND INFORMATION

2.1 COMPANY DESCRIPTION

Founded in 1932, Knauf Egypt began as a family company and over the years has grown into a global enterprise spanning 90 countries, incorporating multiple brands, and delivering world-class construction materials and solutions via 40,000 employees worldwide. Knauf Egypt is one of the world's leading manufacturers of building products for interior design, insulation, and acoustic design ceilings. Knauf operates plants globally, producing state-of-the-art drywall systems, gypsum plasters, and insulating materials, as well as external thermal insulation composite systems. In addition, they offer a wide range of paints, flowing screeds and flooring systems.

In the context of the growing popularity of sustainable building and LEED V4.1 Rating Systems, developing Type III Environmental Product Declarations (EPDs) would allow Knauf to increase visibility for its products.

Knauf therefore retained the services of Vertima Inc. to carry out a life cycle assessment and develop an EPD for Gypsum Powder manufactured at the site located at Al Semad, Attaka, Suez Governorate 8132540, Egypt. The headquarter of Knauf Egypt is located at Cairo Festival City, Podium 1, PO6, 4th Floor, 4730006, New Cairo.

2.2 PRODUCT DESCRIPTION

Products analyzed include two plasters (Almany and Fugagips), high-quality white mortar with fast-curing properties which create a homogeneous mixture ready for immediate use and application without any other additives. Sold in 25-kg bags, the product color is white. Figure 1 shows Knauf product images. The primary United Nations Standard Products and Services Code (UNSPSC) code for gypsum powder products is 30111701 and the Construction Specifications Institute (CSI) code for gypsum powder products is 09 29 00.



Figure 1: Representation of Knauf Gypsum Powder (plaster).

2.2.1 Product Average

The weighted profile of each product is calculated based on 2021 annual production data (in kg). Based on ISO 21930 section 5.3 on average EPDs for groups of similar products, the EPDs developed in this analysis represent the average of similar Knauf Gypsum powders (plasters) from the same manufacturer. The plasters include Almany and Fugagips. They have the same composition but private labels.

2.2.1.1 Product-Specific EPD

In the context of the growing popularity of sustainable building and LEED v4 and v4.1 Rating Systems, developing Type III Environmental Product Declarations (EPDs) would allow Knauf to increase visibility for its Gypsum Powder



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products. The EPD for the Gypsum Powder products has been developed according to ISO 21930 – 2017 in accordance with ISO 14025, ISO 14040 and ISO 14044 [1, 2, 3, 4]. The LCA follows an attributional approach and EPDs comply with the ASTM Program Operator Rules, version 8.0 revised 04/29/20 [5].

2.3 APPLICATION

Knauf Gypsum Powder is used for ceiling applications.

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

This LCA is a cradle-to-gate study. For this analysis, the attributional approach was followed and impacts of infrastructure have been excluded.

The life cycle stage included in the analysis is the production stage. According to ISO 21930-2017 [1], this includes A1) Extraction and upstream production, A2) Raw materials transportation to the manufacturing site, and A3) Manufacturing.

According to the ISO 21930-2017 allocation procedure, mass should be used as the primary basis for co-product allocation. OpenLCA software v1.11 [6], an open-source software, was used to calculate the inventory and to assess potential environmental impacts associated with the inventoried emissions.

2.5 TECHNICAL DATA AND STANDARD TESTS

For specific properties and performance data for Knauf products, please consult the following link: <https://knauf.com/en> [7]. Table 1 presents the technical data and standard tests for the products under study. The Gypsum Powder is an anhydrous material.

Table 1: Technical Details

Product	Declared Units	Unit
Gypsum Powder (plaster)	1	kg
Bag weight	25	kg
Products	Standard Tests	Description
Gypsum Powder (Plaster)	EN 13279	Gypsum binders and Gypsum plasters
	EN 13501	Fire classification of construction products and building elements

2.6 PRODUCT COMPOSITION AND INPUT MATERIALS

The composition of Gypsum Powder products is presented in Table 2 below. Based on mass balance, manufacturing losses constitute 4% of the materials input.



Table 2: Material composition for Gypsum Powder product

Components	Amount (%)
Gypsum	99.04%
Compound	0.50%
Plast Retard PE	0.06%
Total	100.00%

2.7 MANUFACTURING

Gypsum Powder is manufactured using plaster of Paris as its main raw material. Plaster of Paris is prepared through the controlled heating of natural gypsum rocks. The plaster is then melted with different additives based on the desired properties. Figure 2 shows the flow diagram for the manufacturing stage.

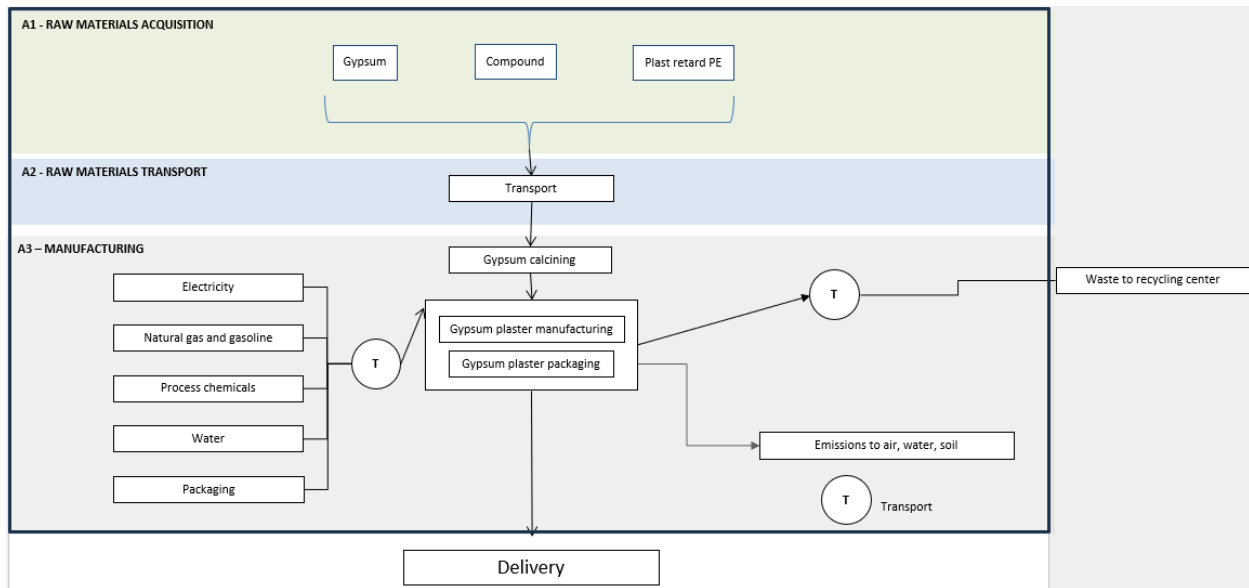


Figure 2: Flow diagram for Knauf Gypsum Powder manufacturing process.

2.8 PACKAGING

The plaster mixture is packaged in paper bags, loaded onto wood pallets and all wrapped with stretch film to prepare for delivery. The materials used are presented in Table 3.

Table 3: Packaging materials used per each DU of Gypsum Powder (Plaster) products.

Materials	Gypsum Powder (Plaster)	Units
Wood pallet	8.21E-02	kg
Paper bags	5.56E-03	kg
Stretch film	4.84E-02	kg



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2.9 USE CONDITIONS

Following the installation of Knauf Gypsum Powder products, the manufacturer does not provide specific recommendations concerning use conditions except those indicated on the TDS sheet.

2.10 REFERENCE SERVICE LIFE AND ESTIMATED BUILDING SERVICE LIFE

According to ISO 21930-2017, the reference service life (RSL) is not accounted for as the use stage is not included in the analysis [1].

2.11 REUSE, RECYCLING, AND ENERGY RECOVERY

There is no re-use or energy recovery in the Gypsum Powder (Plaster) manufacturing process.

2.12 DISPOSAL

This LCA study assumes that 100% of waste materials are recycled. Waste materials include metal, cardboard, plastic, steel, wood pallets and used oil. There are no hazardous wastes generated in the process. Waste transportation to the recycling center was accounted for in the inventory.

2.13 FURTHER INFORMATION

Further information about Gypsum Powder (Plasters) products is available at <https://knauf.com/ar-EG>



3 LIFE CYCLE ASSESSMENT CALCULATION RULES

3.1 DECLARED UNIT

The declared unit (DU) analyzed is 1 kg of manufactured and packaged Gypsum Powder (Plaster).

3.2 SYSTEM BOUNDARIES

According to ISO 21930-2017, the LCA is cradle-to-gate. The life cycle stage included in the analysis is the Production stage. Construction, Use and End-of-Life stages are not included in the system boundary. The production stage includes the following modules: A1) Extraction and upstream production, A2) Raw materials transportation to the manufacturing site, and A3) Manufacturing (Figure 3).

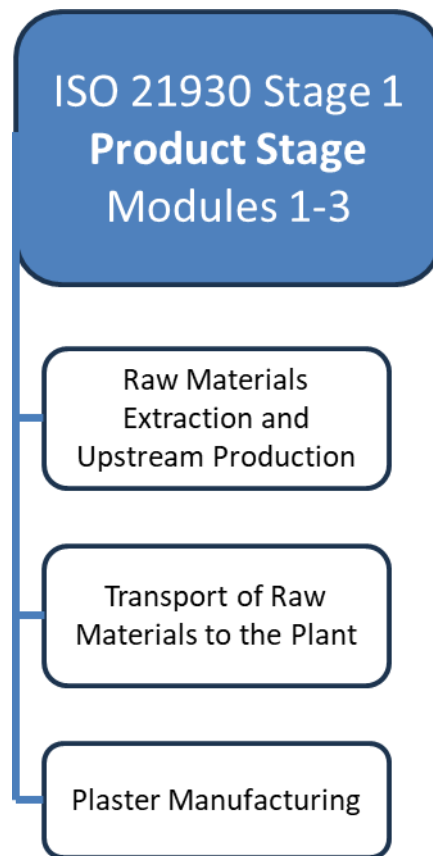


Figure 3: Presents the life cycle stages, and their modules, included in the system boundaries [1]

Extraction and upstream production (module A1): This stage includes the extraction and manufacturing of raw materials needed to produce Gypsum Powder (Plaster) products.

Raw materials transportation to manufacturing site (module A2): This stage includes the transportation of raw materials from suppliers to Knauf’s manufacturing site at Al Semad, Attaka, Suez Governorate 8132540, Egypt.

Manufacturing (module A3): This stage includes water and energy (electricity, gasoline and natural gas) consumption for the manufacturing processes. No renewable electricity is used in this EPD. Chemicals include are those used in the process as well as their transport to the site. Hazardous and non-hazardous waste treatment has been counted as well. Finally, packaging materials to make products ready for shipment are covered by this stage. This includes their extraction, manufacturing, and transportation to the factory.

3.3 CUT-OFF CRITERIA

According to section 6.3.3 of ISO 21930 [1], if a mass flow or energy flow represents less than 1% of the cumulative mass or energy flows of the system, it may be excluded from the system boundaries. However, these flows should not have a relevant environmental contribution. Also, at least 95% of the total energy and mass flows shall be included, and the cumulative mass or environmental impacts of the excluded flows shall not exceed 5% of the total mass and energy flows or potential environmental impacts.

In this study, no primary data (input material, energy consumption) was excluded from the system boundaries. Water consumption includes the water used for cleaning and water consumption by employees. No primary data on the construction, maintenance or dismantling of the company's capital assets was included in the model. In addition, primary data on daily transport of employees, office work, business trips and other employee activities were not included in the model.

As mentioned in ISO 21930-2017, clause 6.2.7.2, cut-off rules were not applied for hazardous waste. They were accounted for.

3.4 DATA SOURCES

Inventory data was collected from the manufacturing site located at Al Semad, Attaka, Suez Governorate 8132540, Egypt. using a life cycle inventory (LCI) questionnaire. Data was collected via the Technical Manager and the manufacturing team. The Technical Manager and Production Manager were responsible for filling out the questionnaire. Further telephone, email and meeting discussions allowed us to further detail aspects of the questionnaire, to collect additional information or to seek clarifications. See Table 4 below.

Table 4 Data Source of Gypsum Powder

Material / Process Category	Module	Material/Process Name	Inventory Dataset Name	Dataset Source	Dataset Geographic Region	Data Reference Year
Raw Material	A1	Gypsum	gypsum quarry operation gypsum, mineral Cutoff, U - RoW	Ecoinvent dataset 3.9.1	RoW	2022
		Compound	cellulose fibre production cellulose fibre Cutoff, U - RoW	Ecoinvent dataset 3.9.1	RoW	2022
		Plast Retard PE	polyethylene production, low density, granulate polyethylene, low density, granulate Cutoff, U - RoW	Ecoinvent dataset 3.9.1	RoW	2022
Transport	A2	Truck	transport, freight, lorry >32 metric ton, EURO6 transport, freight, lorry >32 metric ton, EURO6 Cutoff, U - RER	Ecoinvent dataset 3.9.1	RER	2022
		Boat	transport, freight, sea, container ship transport, freight, container ship Cutoff, U - GLO	Ecoinvent dataset 3.9.1	GLO	2022
Energy	A3	Electricity	market for electricity, medium voltage electricity, medium voltage Cutoff, U - EG	Ecoinvent dataset 3.9.1	EG	2022
		Natural gaz	natural gas, burned in micro gas turbine, 100kWe heat, central or small-scale, natural gas Cutoff, U - RoW	Ecoinvent dataset 3.9.1	RoW	2022
		Gasoline	Gasoline, combusted in equipment - RNA	USLCI	RNA	2002

When primary data was not available, datasets were selected either from the *ecoinvent* v3.9.1 - cut-off database, the most comprehensive LCI database currently available that is more representative globally.

3.5 DATA QUALITY

Data Quality Parameter	Data Quality Discussion
Source of manufacturing data: Description sources of data	Manufacturing data was collected from the Knauf manufacturing site located at Al Semad, Attaka, Suez Governorate 8132540, Egypt. Data included the total annual units in kg and total production mass of products under study; raw materials entering the production of the products under study; materials losses; transport modes and distance of materials; energy consumption; water consumption; emissions to the environment at the manufacturing plant; waste treatment; packaging materials; and Gypsum Powder product distribution.
Source of secondary data: Description sources of raw material, energy source, transport, waste and packaging data	When appropriate, the grid mix was changed for the grid mix of the province or country where the process takes place. Otherwise, ecoinvent datasets representative of the global market or “rest-of-the-world” were mainly selected as proxies.
Geographical representativeness	Manufacturing site is located at Al Semad, Attaka, Suez Governorate 8132540, Egypt; hence electricity consumption is based on the Egypt grid mix. Geographical correlation of the material supply and the selected datasets are representative of each specific area or a larger area.
Temporal representativeness	Primary data was collected to be representative of the 2021 production year, while this is not always the case for ecoinvent datasets. Nevertheless, ecoinvent

Data Quality Parameter	Data Quality Discussion
	v 3.9.1 remains the reference LCI database used in this study.
Technological representativeness	Primary data, obtained from the manufacturer, are representative of the current technologies and materials used by the company.
Completeness	All relevant process steps were considered and modelled to satisfy the goal and scope. Cut-off criteria were respected.

3.6 PERIOD UNDER REVIEW

The period under review is the 2021 production year.

3.7 ALLOCATION

According to ISO 21930-2017, the allocation approach used as the primary basis for co-product allocation is mass allocation. In this study, mass allocation was used for the manufacturing input and output flow and the yearly production mass of each product under study was used as a basis. Data relative to material and energy consumption were provided for all co-products by the manufacturer.

Materials undergoing recycling/reuse/incineration (with energy recovery for other product systems) processes are excluded from the system boundary. A cut-off approach was used because recycled/reused/incineration material is part of raw material preparation for another product system.

No burdens are allocated across the system boundary with secondary material, secondary fuel or recovered energy flows arising from waste.

4 LIFE CYCLE ASSESSMENT RESULTS

4.1 RESULTS TABLES

The life cycle assessment results are presented per DU. According to the standard requirements, results presented derive from the life cycle impact assessment (LCIA) and the life cycle inventory (LCI).

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

According to ISO 21930-2017, the life cycle impact assessment shall, at a minimum, report the set of impact categories. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, EPD users shall not use additional measures for comparative purposes.

The LCA results are presented in Table 5 for Knauf Gypsum Powder (Plaster) products.

Table 5: Gypsum Powder (Plaster) Life Cycle Impact Assessment Results per DU of 1 kg

Indicators	Units	Production stage			Total
		A1	A2	A3	
Global Warming Potential-Total (GWP-total), IPCC 2021 (AR6)	kg CO2 eq	5.90E-03	1.58E-02	5.64E-01	5.86E-01
Global Warming Potential-Biogenic (GWP-biogenic), IPCC 2021 (AR6)	kg CO2 eq	1.11E-04	4.78E-06	4.27E-03	4.39E-03
Global Warming Potential-Fossil (GWP-fossil), IPCC 2021 (AR6)	kg CO2 eq	5.79E-03	1.58E-02	5.58E-01	5.80E-01
Global Warming Potential-Land Use and Land Use Change (GWP-luluc), IPCC 2021 (AR6)	kg CO2 eq	4.92E-06	7.72E-06	1.52E-03	1.54E-03
Ozone depletion potential (ODP)	kg CFC-11-Eq	5.67E-11	2.93E-10	9.23E-09	9.58E-09
Eutrophication potential (EP)	kg PO4-Eq	1.63E-05	8.05E-06	7.02E-04	7.26E-04
Acidification potential (AP)	kg SO2-Eq	5.15E-05	3.24E-05	1.22E-03	1.30E-03
Photochemical oxidant creation potential (POCP)	kg ethylene-Eq	3.57E-06	3.15E-06	1.53E-04	1.60E-04
Abiotic depletion potential (ADP): elements	kg Sb-Eq	3.29E-07	4.41E-08	1.07E-06	1.44E-06
Abiotic depletion potential (ADP): fossil fuels	MJ	7.04E-02	2.15E-01	3.46E+00	3.74E+00

According to ISO 21930, the life cycle inventory (LCI) shall be presented for resources used and output flows, waste categories and carbon removals and emissions.[1] The environmental parameters used for inventory analysis describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy, and water.

The LCI results are presented in Table 6 for Knauf Gypsum Powder products.

Table 6: Gypsum Powder (Plaster) Life Cycle inventory Impact Results per DU of 1 kg.

Parameter	Unit	Production stage			Total
		A1	A2	A3	
RPRE ⁽¹⁾	MJ, LHV	3.77E-03	3.50E-03	2.17E+00	2.17E+00
RPRM ⁽²⁾	MJ, LHV	0.00E+00	0.00E+00	2.19E+00	2.19E+00
PERT ⁽³⁾	MJ, LHV	3.77E-03	3.50E-03	4.35E+00	4.36E+00
NRPRE ⁽⁴⁾	MJ, LHV	7.55E-02	2.19E-01	1.93E+00	2.22E+00
NRPRM ⁽⁵⁾	MJ, LHV	0.00E+00	0.00E+00	1.83E+00	1.83E+00
PENRT ⁽⁶⁾	MJ, LHV	7.55E-02	2.19E-01	3.76E+00	4.05E+00
SM ⁽⁷⁾	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF ⁽⁸⁾	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF ⁽⁹⁾	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW ⁽¹⁰⁾	m ³	0.00E+00	0.00E+00	2.57E-05	2.57E-05
RE ⁽¹¹⁾	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Output Flows and Waste					
HWD ⁽¹²⁾	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD ⁽¹³⁾	kg	0.00E+00	0.00E+00	2.25E-05	2.25E-05
HLRW ⁽¹⁴⁾	m ³	3.47E-12	3.41E-12	1.94E-10	2.01E-10
ILLRW ⁽¹⁵⁾	m ³	1.87E-11	2.17E-11	1.05E-09	1.09E-09
CRU ⁽¹⁶⁾	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR ⁽¹⁷⁾	kg	0.00E+00	0.00E+00	2.25E-05	2.25E-05
MER ⁽¹⁸⁾	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE ⁽¹⁹⁾	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*In the calculation of RPR_M and NRPR_M, packaging materials were included.

(1): RPR_E = RPRT - RPR_M, where RPRT⁽³⁾ is equal to the value for renewable energy obtained using the CED LHV methodology.

(2): RPR_M is calculated by multiplying the mass (kg) of the material input (or its components) by the net calorific value (lower heating value) (MJ/kg) of this input as per ACLCA ISO 21930 Guidance [8]. In the calculation of RPR_M, packaging materials were included.

(4): NRPR_E = NRPRT - NRPR_M, where NRPRT⁽⁶⁾ is equal to the value for non-renewable energy obtained using the CED LHV methodology (both non-renewable energy, fossil fuel and nuclear).

(5): NRPR_M is calculated by multiplying the mass (kg) of the material input (or its components) by the net calorific value (lower heating value) (MJ/kg) of this input as per ACLCA ISO 21930 Guidance [8]. In the calculation of NRPR_M, packaging materials were included.

(7): Calculated as per ACLCA ISO 21930 Guidance [8], 6.5 Secondary material, SM: There is no SM involved in the Knauf manufacturing process.

(8): Calculated as per ACLCA ISO 21930 Guidance [8], 6.6 Renewable secondary fuels, RSF: There is no RSF involved in the Knauf manufacturing process.

(9): Calculated as per ACLCA ISO 21930 Guidance [8], 6.7 Non-renewable secondary fuels, NRSF: There is no NRSF involved in the Knauf manufacturing process.

(10): Water used in the Knauf manufacturing process is for production and cleaning.

(11): In the Knauf process there is no recovered energy (RE) used.

(12): Calculated from life cycle inventory results, based on datasets marked as "hazardous."

(13): Calculated from life cycle inventory results, based on "non-hazardous" wastes.

(14): Calculated as per ACLCA ISO 21930 Guidance [8], 10.3 High-level radioactive waste, conditioned, to final repository. It should be noted that the Knauf manufacturing process does not generate any HLRW (high-level radioactive waste), e.g., when generated by electricity production, consists mostly of spent fuel from reactors. (ISO 21930:2017, clause 7.2.14).

(15): Calculated as per ACLCA ISO 21930 Guidance [8], 10.4 Intermediate- and low-level radioactive waste, conditioned, to final repository. It should be noted that the Knauf manufacturing process does not generate any ILLRW (low- and intermediate-level radioactive waste), e.g., when generated by electricity production, arise mainly from routine facility maintenance and operations (ISO 21930:2017, clause 7.2.14).

(16 to 19): Reused components (CRU), materials for energy recovery (MER), exported energy (EE) are nil and materials for recycling (MR) are accounted for in this analysis.

5 LCA: INTERPRETATION

The aim of this section is to present more details on the contribution to the impacts and resource use of the different life cycle modules of each Knauf product studied. See Figure 4 below.

The manufacturing module (A3) is the major contributor to the environmental impacts for all impact categories. The transportation module (A2) represents the second contributor. Extraction of raw materials (upstream production) module (A1) is the lowest contributor. The relative environmental impacts of gypsum powder products for the A3 module are between 74% and 97% for all impact categories. The extraction of raw materials and upstream production module (A1) presents environmental impacts less than 23% for all impact categories. In the transportation module (A2), a major environmental impact is for the ADP fossil fuel impact category (< 6%). See figures 4 below.

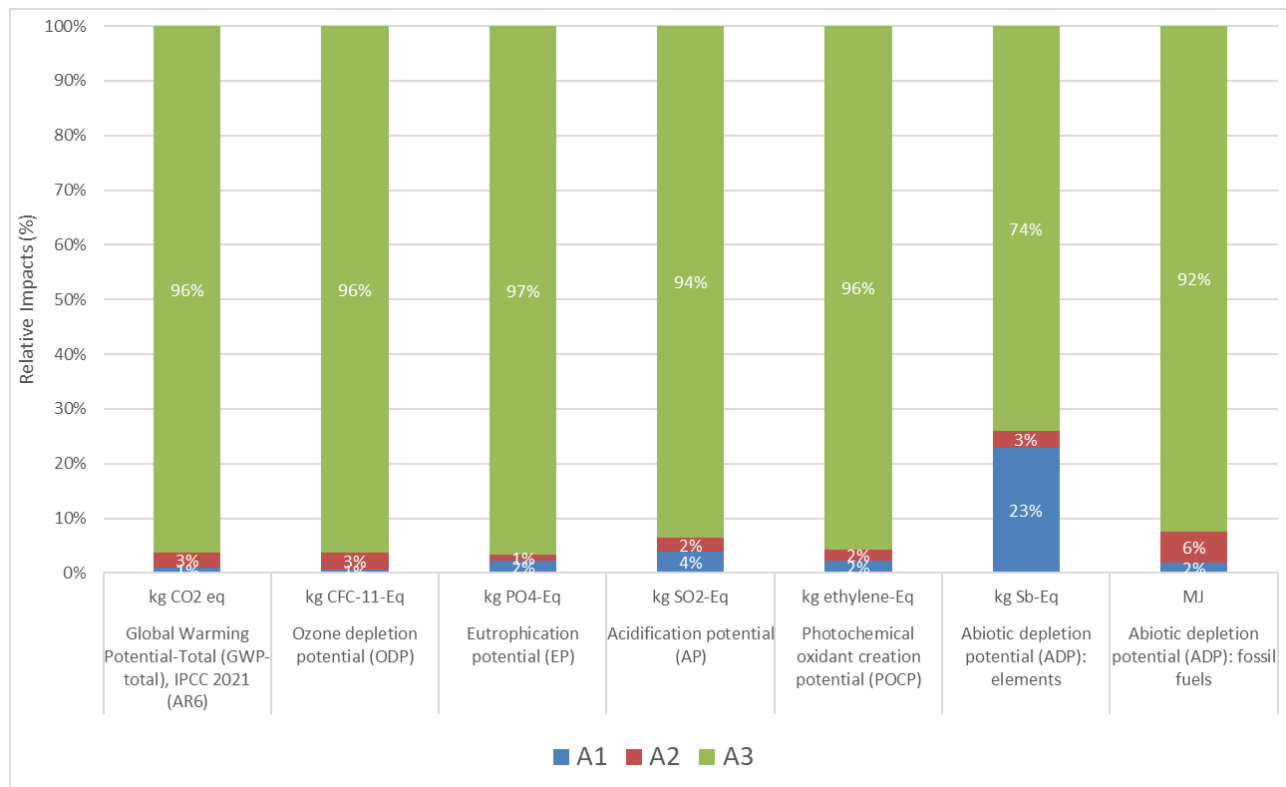


Figure 4: Contribution of each life cycle stage of Gypsum Powder (Plaster)

6 ADDITIONAL ENVIRONMENTAL INFORMATION

6.1 ENVIRONMENTAL ACTIVITIES AND CERTIFICATION

No more information about the Knauf Gypsum Powder (Plaster) products.

6.2 EXTRAORDINARY EFFECTS

There are no extraordinary effects for Knauf Gypsum Powder (Plaster) products.

7 REFERENCES

- [1] ISO 21930:2017 (E), "Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services," 2017.
- [2] ISO 14025, "Environmental labels and declarations – Type III environmental declarations – Principles and procedures. 25pp," 2006.
- [3] ISO 14040/Amd1 2020 "Environmental management - Life cycle assessment - Principles and framework. 20 pp," 2006.
- [4] ISO 14044/Amd1 2017/Amd2 2020 "Environmental management - Life cycle assessment - Requirements and guidelines. 46 pp," 2006.
- [5] ASTM, "ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20."
- [6] Openlca.org, "<https://www.openlca.org/?s=version+1.11>," [Accessed 08/14/2023].
- [7] Knauf, "<https://knauf.com/en>" 18 03 2024. [Accessed 08/03/2024].
- [8] American Center for Life Cycle Assessment (ACLCA), "ACLCA Guidance to Calculating Non-LCIA Inventory metrics in Accordance with ISO 21930;2017," American Center for Life Cycle Assessment, 2019.



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