

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for

CEM I 42.5 R Portland Cement

ARTOVA PLANT



ADOÇİM®

Programme:
The International EPD® System
www.environdec.com

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EPD International AB

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Programme Information

Programme

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Product Category Rules (PCR): 2019:14 Version 1.11, 2021-02-05, Construction
Products and CPC 54 Construction Services, EN 15804:2012 + A2:2019 Sustainability of
Construction Works

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

EPD process certification

EPD verification

Third party verifier: Prof. Vladimír Kočí

Approved by: The International EPD® System

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.

About The Company

ADOÇİM CEMENT, started cement production in 1995, is a group company of TITAN CEMENT since 2008. TITAN Cement Group's roots are backed in 1902 and operates in cement, ready-mix concrete and aggregate fields in more than 15 countries.

ADOÇİM has Integrated Cement Plant in Tokat/Artova, Ready-Mixed Concrete Facilities in Artova, Sivas, Tokat and Çorum in Turkey.

ADOÇİM has a production capacity of 1.300.000 tons/year of clinker and 1.782.000 tons/year of cement production in their integrated cement factory located in Tokat/Artova. The raw material needs of our facility is met by ADOÇİM's own quarries.

Since its foundation, ADOÇİM has maintained a professional approach on eco-friendliness, frugality, worker and occupational safety, quality control and sustainability, and continues to do so today at all its plants. ADOÇİM clinker and cement productions are absolutely guaranteed by continuous quality control activities.

Moreover, ADOÇİM controls its environmental impacts through continuous and observable systems. The company has been worked on Non-Hazardous Waste Recycling and Incineration and also has started to use alternative fuels from disposing of wastes of various industries. ADOÇİM operates according to Turkish Environmental Legislations and also European Union Environmental Policies and Legislation. In ADOÇİM, all key operations carry out within the ISO 14001 framework.

The Artova plant has Environmental Permit and License certificate and continues its activities in a sustainable life cycle to achieve its neutral-carbon target. In addition, with its ISO 9001, ISO 45001 and ISO 50001 management systems certificates, it has a perspective that prioritizes quality, environmentalism, energy efficiency and prioritizes the safety of its employees and all other stakeholders.



About the Product

Product Name and Identification: CEM I 42.5 R;
Compressive Strength of 28 days (MPa): ≥ 42.5

Product Description: Cement, one of the most important building materials, is a binding agent that sets and hardens to adhere to building units such as stones, bricks, tiles, etc. Setting and hardening result from hydration, which is a chemical combination of the cement compounds with water that yields submicroscopic crystals or a gel-like material with a high surface area. Cement hardens both in the air and under water, and remains in its hardened state once

reached. Portland cement is made up of clinker and gypsum. Due to its high clinker content, the strength gain is fast and the durability is high. It is intended for general use and suitable for both prefabricated applications and conditions where early stripping is required.

The declared product is CEM I 42.5 R which complies with the requirements of EN197-1. The product investigated in this EPD is a special cement type produced at the Artova plant, by ADOÇİM.



Areas of Applications

- Concrete and Reinforced Concrete Pipes
- Briquette and Tile Production
- Multi-Storey and High Reinforced Concrete Buildings
- Production of Prefabricated Building Elements
- Foundation Concrete
- Railway Sleepers
- All kinds of constructions for general use

Composition

Clinker : 95 - 100 %

Minor additive compound : 0 - 5 %

Technical features according to EN 197-1		CEM I 42.5 R
Mechanical properties	Compressive Strength 2 days (MPa)	$\geq 20,0$
	Compressive Strength 28 days (MPa)	$\geq 42,5 ; \leq 62,5$
Chemical properties	Chloride content (Cl, % w/w)	$\leq 0,1$
	Sulfate content (SO ₃ % w/w)	$\leq 4,0$
Physical properties	Initial setting time (min)	$\geq 60,0$
	Soundness (mm)	$\leq 10,0$

LCA Information

Declared Unit

1 tonne CEM I 42.5 R Portland Cement

Time Representativeness

2020

Database(s) and LCA Software Used

Ecoinvent 3.5, SimaPro 9.0

The inventory for the LCA study is based on the 2020 production figures for ADOÇİM CEM I 42.5 R Portland Cement produced in plant in Tokat, Turkey.

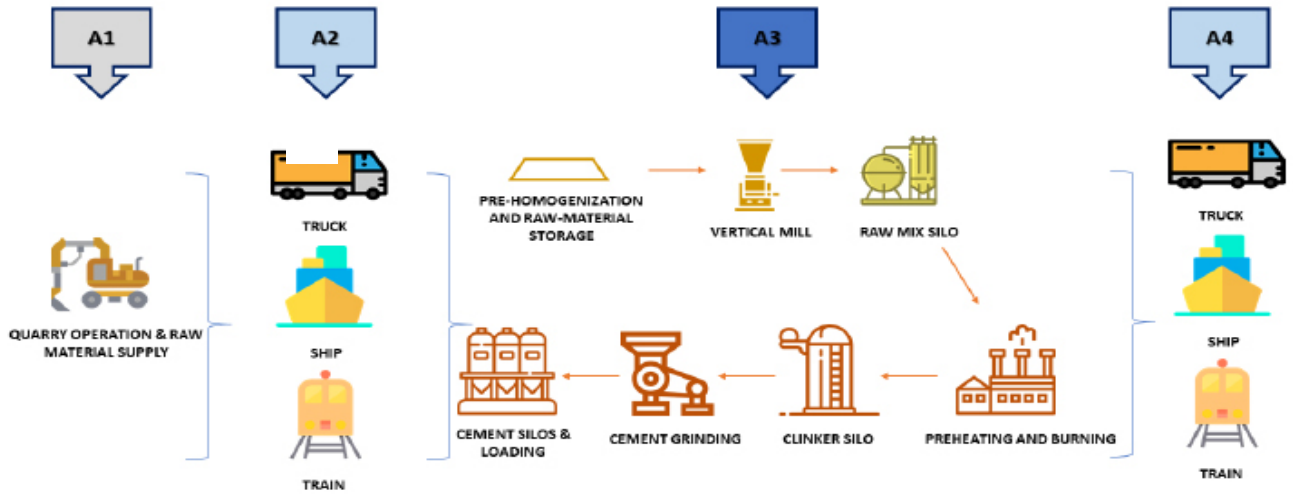
This EPD's system boundary is cradle to gate including to transport to site. The results of the LCA with the indicators as per EPD requirement are given in the following tables for product manufacture (A1, A2, A3), and construction process stage (A4). According to EN 15804+A2:2019 standard, if the product or material is physically integrated with other products during installation then they cannot be physically separated at the end of life stage. For this reason, modules C1-C4 and Module D are excluded.

The system boundaries in tabular form for all modules are shown in the table below.

Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads
Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction, demolition	Transport	Waste Processing	Disposal	Future reuse, recycling or energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

X = Included in LCA, ND = Not Declared

System Boundary



A1: Raw Material Supply

Production for each product starts with locally sourced but some transported materials from other parts of the world. 'Raw material supply' includes raw material extraction and pretreatment processes before production.

A2: Transport of Raw Materials

Transport is relevant for delivery of raw materials and other materials to the plant and the transport of materials within the plant. Transport of raw materials to production site is taken as the weight average values for transport from raw materials supplier in 2020.

A3: Manufacturing

Cement production starts with quarry operation. After the crushing and homogenization process, raw materials are sent to the mills. Production continue with burning and cooling. Finally, additional raw materials are added to the mixture, mixed and ready for use.

A4: Transport to Site

Transport routes for the final product to construction sites are provided by ADOÇİM. Based on the given information, the product shipment distances of the routes are calculated.



More Information

Allocations

Water consumption, energy consumption and raw material transportation were weighted according to 2020 production figures. In addition, hazardous and nonhazardous waste amounts were also allocated from the 2020 total waste generation.

Cut-Off Criteria

1% cut-off applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA Modelling, Calculation and Data Quality

The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while fresh water use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The SimaPro 9.0 LCA software and the Ecoinvent 3.5 LCA database were used to calculate the environmental impacts. The regional energy datasets were used for all energy calculations.

Geographical Scope

The geographical scope of this EPD is global.



LCA Results

Environmental Impacts for 1 tonne of CEM I 42.5 R Portland Cement			
Impact Category	Unit	A1-A3	A4
GWP - Fossil	kg CO ₂ eq	912	5.89
GWP - Biogenic	kg CO ₂ eq	14.3	0.003
GWP - Luluc	kg CO ₂ eq	0.619	0.002
GWP - Total	kg CO ₂ eq	927.1	5.90
ODP	kg CFC-11 eq	28.7E-6	1.33E-6
AP	mol H+ eq	2.41	0.071
*EP - Freshwater	kg P eq	0.134	366E-6
EP - Freshwater	kg (PO ₄) ⁻³ eq	0.409	0.001
EP - Marine	kg N eq	0.597	0.018
EP - Terrestrial	mol N eq	6.67	0.203
POCP	kg NMVOC	1.74	0.056
ADPE	kg Sb eq	1.32E-3	85.0E-6
ADPF	MJ	3868	87.2
WDP	m ³ depriv.	81.4	0.246
PM	disease inc.	14.9E-6	437E-9
IR	kBq U-235 eq	25.8	0.432
ETP - FW	CTUe	6202	66.3
HTTP - C	CTUh	244E-9	2.22E-9
HTTP - NC	CTUh	6.27E-6	71.1E-9
SQP	Pt	776	79.0
Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change - biogenic, GWP-luluc: Climate change - land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion - elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics - particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.		
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site.		
Disclaimer 1	This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.		
Disclaimer 2	The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.		
*Disclaimer 3	EP-freshwater: This indicator is calculated both in kg PO ₄ eq and kg P eq as required in the characterization model. (EUTREND model, Struijs et al, 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)		

Resource use for 1 tonne of CEM I 42.5 R Portland Cement

Impact Category	Unit	A1-A3	A4
PERE	MJ	295	0.977
PERM	MJ	0	0
PERT	MJ	295	0.977
PENRE	MJ	3864	87.2
PENRM	MJ	0	0
PENRT	MJ	3864	87.2
SM	kg	0	0
RSF	MJ	0	0
NRSF	MJ	0	0
FW	m ³	5.03	0.016
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water.		
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site.		

Waste & Output Flows for 1 tonne of CEM I 42.5 R Portland Cement

Impact Category	Unit	A1-A3	A4
HWD	kg	0.008	0
NHWD	kg	0.015	0
RWD	kg	0	0
CRU	kg	0	0
MFR	kg	0	0
MER	kg	0	0
EE (Electrical)	MJ	0	0
EE (Thermal)	MJ	0	0
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy, Thermal.		
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3, A4: Transport to Site.		

References

/GPI/ General Programme Instructions of the International EPD® System. Version 4.0.

/EN ISO 9001/ Quality Management Systems - Requirements

/EN ISO 14001/ Environmental Management Systems - Requirements

/EN ISO 50001/ Energy Management Systems - Requirements

/ISO 14020:2000/ Environmental Labels and Declarations — General principles

/EN 15804:2012+A2:2019/ Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

/ISO 14040/44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006) and Requirements and guidelines (ISO 14044:2006)






/PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2019:14 Version 1.11 DATE 2019-12-20

/The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. www.environdec.com

/Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

/SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

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