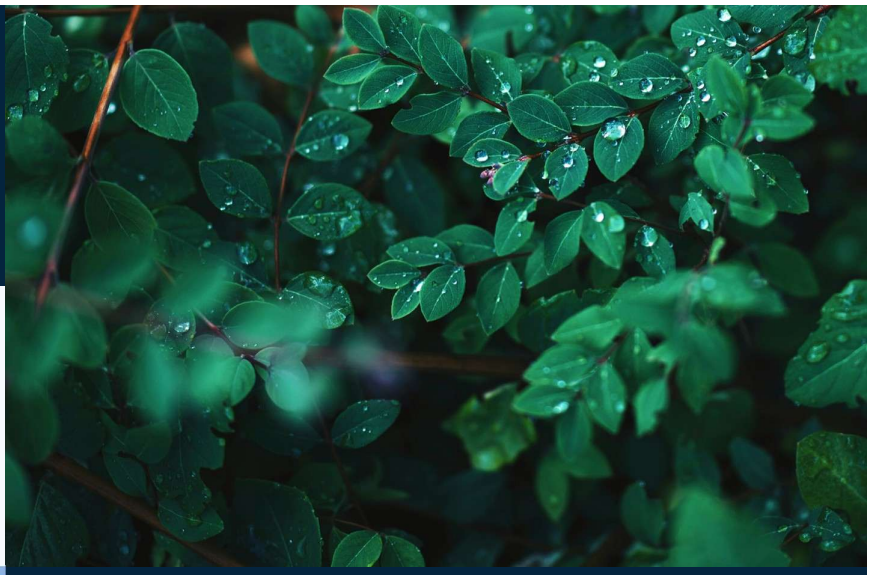
Warta cementownia

Łukasiewicz
Institute of Ceramics
and Building Materials



ENVIRONMENTAL PRODUCT DECLARATION no. 05-09/2024

PORTLAND CEMENT LOW-ALKALI CEM I 52,5 N-SR3/NA

Declaration owner:
Cementownia Warta S.A.

Program owner:
Łukasiewicz Research Network – Institute of Ceramic and Building Material
Environmental Engineering Center

Name of program:
Environmental Product Declaration - B2B

Date of issue:
16.09.2024

Declaration valid until:
16.09.2029

1. General Information

Declaration owner: **Cementownia Warta S.A.**	**Product of declaration:** Portland low-alkali cement **CEM I 52,5 N-SR3/NA**
Program owner: Łukasiewicz Research Network– Institute of Ceramics and Building Materials Environmental Engineering Center in Opole. **http://www.icimb.pl/opole/**	**Declaration owner:** Cementownia Warta S.A. 17 Przemysłowa St, Trębaczew 98-355 Działoszyn Telefon: +48 43 84 13 003 Adres e-mail: info@wartasa.com.pl **https://www.wartasa.com.pl/**
Date of issue: **16.09.2024**	**Declared unit:** **1 t** (1 ton) portland low-alkali cement **CEM I 52,5 N-SR3/NA**
Declaration valid until: **16.09.2029**	**Scope:** The declaration includes: Portland low-alkali cement **CEM I 52,5 N-SR3/NA** produced at Cementownia Warta S.A. in Trębaczew. The environmental declaration is based on average data provided by the manufacturer for one production plant and applies to the product manufactured by Cementownia Warta S.A., included in the declaration. The average values of the input and output streams were calculated based on data provided by the manufacturer from one production site. It contains information on the environmental impact of the declared products. All data on the production cycle were collected by Cementownia Warta S.A. in the period from 01/01/2023 to 31/12/2023 (12 months) and reflect the production technology used at that time. The life cycle assessment has been developed in accordance with the requirements of PN-EN ISO 15804+A2:2020, PN-EN ISO 14025 and PN-EN ISO 14040. The rules for product categorization have been adopted in accordance with the PN-EN 15804 standard. The declaration owner is responsible for the information and the base evidence. The Łukasiewicz Research Network - Institute of Ceramics and Building Materials Center for Environmental Engineering is not responsible for the manufacturer's information and data and evidence regarding the life cycle assessment. Claims resulting from different programs or executed contrary to the standard may not be comparable.

Product Categorization Rules (PCR)	In accordance with the standards: PN-EN 15804+A2:2020-03 Sustainability of construction works. Environmental Product Declarations. Basic principles of categorization of construction products.
Representatives:	Polish product, year 2023
Declared durability:	According to EN 16908, the reference service life of clinkers is not declared because it is an intermediate product to produce cement, which in turn is an intermediate product used in many fields, mainly in construction.
Reasons for performing in the LCA:	B2B
Life Cycle Analysis (LCA):	LCA analysis includes modules A1-A3 according to the standard PN-EN 15804+A2 (cradle-to-gate).

Łukasiewicz Research Network - Institute of Ceramics and Building Materials Center for Environmental Engineering provides access to Type III environmental declaration for portland low-alkali cement CEM I 52,5 N-SR3/NA manufactured by Cementownia Warta S.A. to interested parties.

Authors' team:

Katarzyna Kiprian, M.Sc.

Ewa Głodek-Bucyk, Ph.D.

Patryk Okoń, M.Sc.

Approved:

Joanna Poluszyńska, PhD.

Director of the Environmental Engineering Center

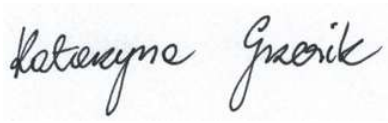
Ewa Głodek-Bucyk, Ph.D.

Leader of the Process Engineering Research Group

Review:

CEN standard PN-EN 15804+A2 serves as the main PCR document.
Independent verification of declarations and data according to EN ISO 14025:2010

- ☐ internal
- ☑ external



Katarzyna Grzesik, PhD, DSc

2. Information of Manufacturer and Products

Cementownia "Warta" S.A. is a major manufacturer of cement on the Polish market. The Cementownia Warta S.A. is located in Trębaczew, Działoszyn commune, in the Pajęczno district, in the south-western part of the Łódź Voivodeship, on the right bank of the Warta River. The production plant is shown in Figure 1. The owner of the cement plant is the German company Polen Zement Beteiligungsgeselschaft GmbH from Dortmund.

Figure 1. View on Cementownia Warta S.A. and Mining Plant „Działoszyn", A lump in the excavation of the deposit „Niwiska Górne – Grądy.

The activity of the Cementownia Warta S.A. includes processes related to limestone mining, Portland clinker production, cement production and comprehensive customer service in the field of:

- technological consulting,
- organization of transport to the customer,
- services of the Company Laboratory in the field of environmental tests and measurements, occupational health and fuel quality – accredited by PCA AB 1119.

Photo. Michał Braszczyński, Cementownia Warta S.A.

Cementownia Warta S.A. produces the following types of cements:

- Portland low-alkali cements,
- Portland slag cement,
- Portland fly-ash cement,
- Multicomponent Portland cements,
- Multicomponent cement,
- Special cements:
    - Portland cement PN-B-19707 - CEM I 42,5 N-NA Warta CEM I 42,5 N - NA "WARTA" low-alkali motorway cement
    - Portland cement PN-B-19707 - CEM I 42,5 N-LH/SR 5/NA Warta CEM I 42,5 N – LH/SR5/NA "WARTA" low-alkali road and bridge cement
    - Portland cement PN-B-19707 - CEM I 52,5 N-SR 3/NA Warta CEM I 52,5 N - HSR/NA "WARTA" low-alkali bridge-airport cement

The cement plant offers cements that meet the high requirements of Polish and European standards, approved for use in specialized sectors of civil, marine, mining and ecological construction. Over 70% of the cement produced is low-alkali cements.

"WARTA" low-alkali special cements are characterized by high strength parameters and very low alkali content, as well as stability of quality characteristics. Cementownia Warta S.A. is the main supplier of special cements on the domestic market.

Manufacturing products is carried out under the control of independent, national research institutes. The Department has certificates, technical recommendations and suitability assessments issued by: Łukasiewicz Research Network - Institute of Ceramics and Building Materials in Krakow, Road and Bridge Research Institute in Warsaw, Building Research Institute in Warsaw and Air Force Institute of Technology in Warsaw.

The core business of Warta Cementownia S.A. is the production of Portland clinker as an intermediate product and Portland and mixed cements. The production technology is based on two modern lines of Portland clinker production using the dry method with four-stage cyclone preheater. Fossil fuels and alternative fuels are co-combusted in the installation.

Clinker is an intermediate product used in the production of Portland cements, obtained by burning in rotary kilns a properly corrected powder, which consists mainly of calcium compounds (carbonates) and iron-bearing, clay-bearing and silicon-bearing additives. The main components of Portland clinker are calcium silicates, calcium aluminates and calcium aluminoferrates. Portland clinker is the basic raw material used for the production of common cements, i.e. hydraulic binders in the form of grey powders formed by joint grinding of the main components (Portland clinker, slag

fly ash, pozzolan, etc.) and calcium sulfate and additives (chromium Cr(VI) reducer, surfactants) for a suitably fine granulation.

The characteristics of the cement obtained depend on the properties of the clinker used and the amount and type of ingredients and additives used.

Cement, i.e. the end product of clinker milling with additives, is produced in ball mills. The basic ingredients for the production of CEM I 52,5 N-SR3/NA cement are: Portland clinker, gypsum (synthetic or natural). The final product produced in the milling process is transported to cement silos. It is collected in bulk – by cars and rail transport.

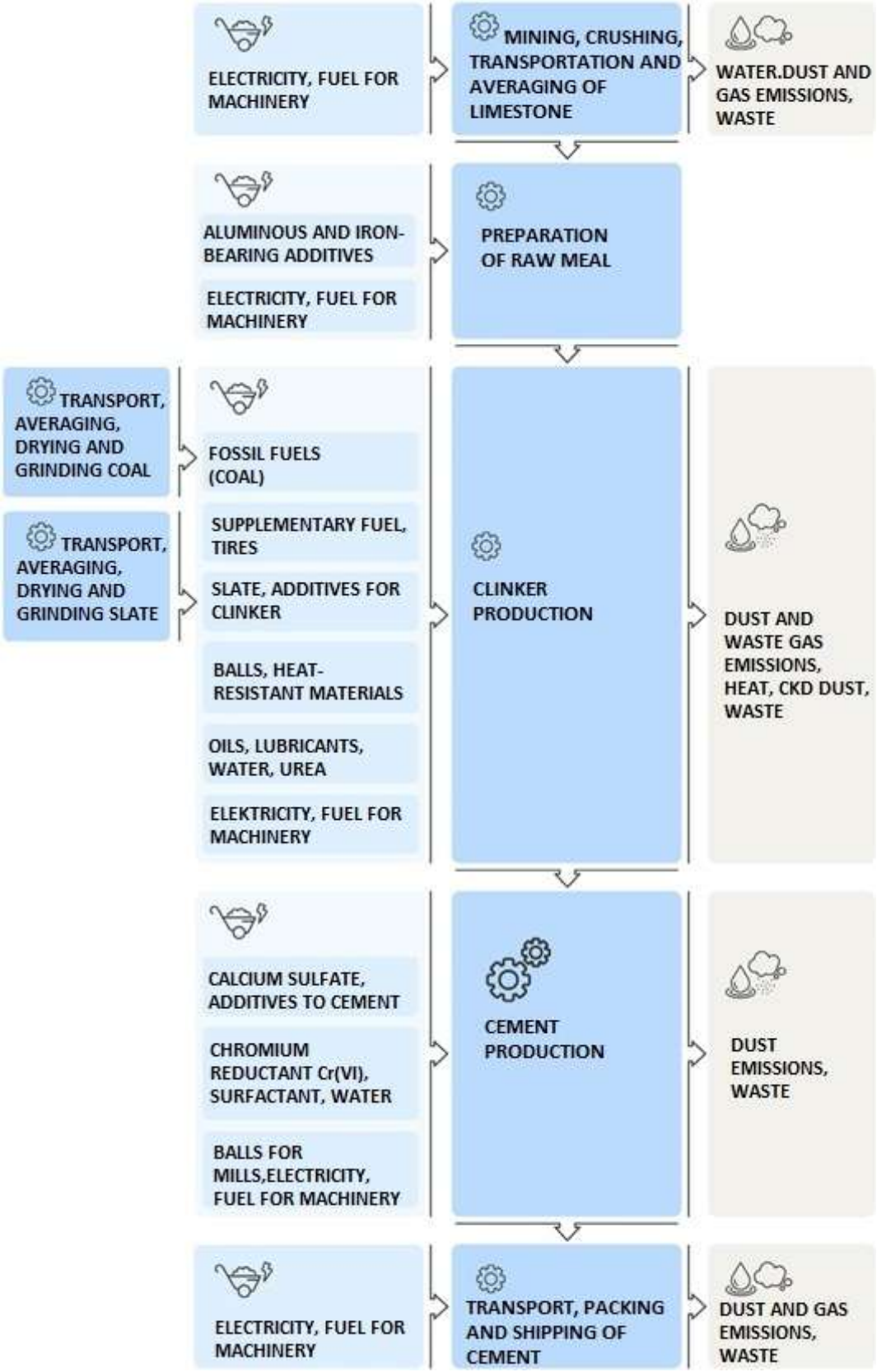
Low-alkali Portland cement CEM I 52.5 N-SR3/NA meets the requirements of PN-EN 197 – 1 standards. It consists of 95 – 100 % clinker and 0 – 5% secondary components. It is characterized by a rapid increase in early strength, high standard strength, very low alkali content, moderate hydration heat, high resistance to direct weather conditions and corrosive effects of the environment, and light color. CEM I 52.5 N-SR3/NA cement is mainly used in the construction of bridges, flyovers, tunnels, viaducts and in aviation, marine and port construction, hydrotechnical and hydropower engineering.

Cement production is carried out according to the scheme (Fig. 2).

Photo. Michał Braszczyński, „Działoszyn" Mining Plant, Niwiska Górne – Grądy deposit

Figure 2.

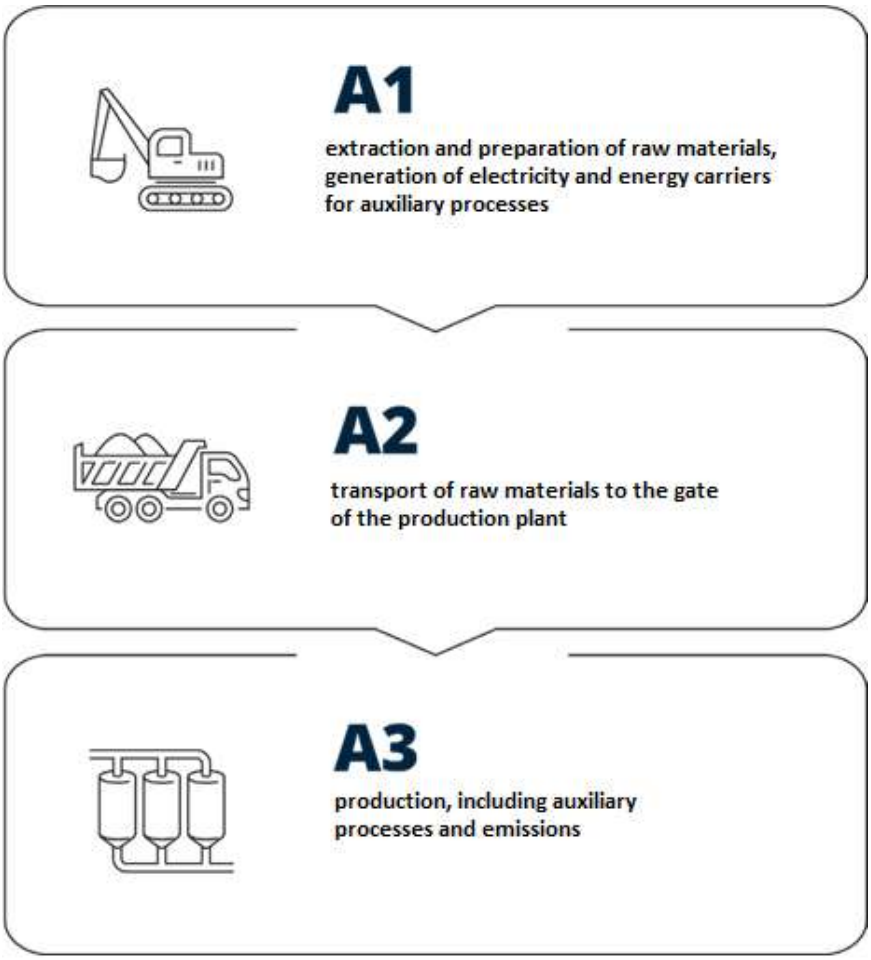
Scheme of the cement production process produced in Cementownia Warta S.A.



3. LCA: Calculation rules

System limitations

The life cycle analysis of the tested products includes modules A1-A3 (Cradle to Gate) in accordance with PN-EN 15804. The selected system boundaries are in accordance with the system boundaries given in EN 16908:2017.



Data collection period

Data on the production process were provided in 2024 for the period 01.01.2023 - 31.12.2023.

Jednostka deklarowana

1 t (1 ton) of portland low-alkali cement **CEM I 52,5 N-SR3/NA.**

Assumptions

A1 – extraction and consumption of raw materials refers to specific mass shares in the production process, per unit declared of the product. The values used in the calculation of module A1 have been prepared taking into account national data and data contained in the Ecoinvent v. 3.9.2 database.

A2 – the distance from the place of obtaining raw materials to the production plant was determined individually for each raw material, the means of transport used were differentiated due to the method of delivery of raw materials.

A3 – CO_2, NO_x, SO_2, CO_2, NH_3 emission values, sum of heavy metals (As, Cr, Cu, Ni, Pb, Zn), Cd+Tl, Hg, PCDD + PCDF, PCB, PAHS and dust from the production process obtained as a result of measurements carried out on the premises of the plant.

Cut-off criteria

99% of all mass streams involved in the participation in the production process. The modelling of the set of inputs and outputs takes into account all known and available reference flows, as well as the associated master data. All energy used in the process has been taken into account in the environmental declaration.

General data

The data for the calculations come from Ecoinvent v. 3.9.2, and from the KOBiZE report.
Emission factors for electricity were determined using actual data from the KOBiZE report. The Polish electricity emission factor (Ecoinvent supplemented with current national data from KOBiZE) is 0.685 kg CO_2/kWh. A detailed analysis of data quality was part of an external audit.

The calculations were based on the information contained in the PN-EN 16908:2017-02 Cement and construction lime standard. Environmental Product Declarations. Product category rules supplementing EN 15804.

Allocation

All data on components manufactured in Cementownia Warta S.A. were provided by the manufacturer and were referred to the declared unit of the product – **1 t** portland low-alkali cement **CEM I 52,5 N-SR3/NA.** The allocation rules used in this EPD are based on the general ICIMB-PCR A principles.

4. LCA: Results

The table below shows the LCA modules considered in the calculation of the environmental impact categories for the products covered by the declaration.

DESCRIPTION OF SYSTEM BOUNDARIES (X – INCLUDED IN LCA, MND – UNDECLARED MODULE)																
Production stage			**Construction stage**		**Usage stage**							**End of life stage**				**Benefits and flows beyond the boundaries of the system**
Mining and supply of raw materials	Transport	Production	Transport	Construction process	Usufruct	Maintenance	Repair	Exchange	Renovation	Energy consumption	Water consumption	Demolition	Transport	Waste treatment	Waste management	Reuse potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

The following tables present the results of the life cycle assessment (LCA) for 1 ton of portland low-alkali cement **CEM I 52,5 N-SR3/NA**. Explanations of the abbreviations used to describe the impact category are given below:

GWP-total	Global Warming Potential total
GWP-fossil	Global Warming Potential: fossil fuels
GWP-biogenic	Global Warming Potential: biogenic
GWP-luluc	Global Warming Potential: land use and land 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-terrestial	Eutrophication potential, Accumulated Exceedance
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals	Abiotic depletion potential for non-fossil resources
ADP-fossil	Abiotic depletion potential for fossil resources
WDP	Water (user) deprivation potential
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 (cancerogenic)
HTP-nc	Potential comparative Toxic Unit for humans (non-cancerogenic)
SQP	Potential soil quality index
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
PEN-RE	Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials
RE	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy resources
SM	Use of secondary material
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water

MAIN IMPACT INDICATORS: 1 ton portland cement CEM I 52,5 N-SR3/NA					
	Life cycle stage				
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
GWP-total	kg CO_2 eq.	4,12E+01	8,03E+00	8,62E+02	9,12E+02
GWP-fossil (fuel and process emission)	kg CO_2 eq.	4,10E+01	7,93E+00	8,56E+02	9,05E+02
GWP-fossil (fuel and process emission without biogenic fraction)	kg CO_2 eq.	0,00E+00	0,00E+00	8,66E+02	8,66E+02
GWP-fossil (energy from alternative fuel)	kg CO_2 eq.	0,00E+00	0,00E+00	3,90E+01	3,90E+01
GWP-biogenic (primary energy)	kg CO_2 eq.	1,43E-01	8,77E-02	5,66E+00	5,89E+00
GWP-luluc	kg CO_2 eq.	1,79E-02	5,85E-03	1,16E-01	1,40E-01
ODP	kg CFC11 eq.	6,43E-07	1,34E-07	2,59E-07	1,04E-06
AP	mol H+ eq.	1,13E-01	2,30E-02	1,21E+00	1,35E+00
EP-freshwater	kg PO_4 eq.	2,94E-02	2,73E-03	1,54E-01	1,86E-01
EP-marine	kg N eq.	2,29E-02	5,30E-03	4,94E-01	5,23E-01
EP-terrestrial	mol N eq.	2,36E-01	5,09E-02	3,38E+00	3,67E+00
POCP	kg NMVOC eq.	7,42E-02	2,48E-02	1,25E+00	1,35E+00
ADP-minerals & metals	kg Sb eq.	1,38E-04	2,23E-05	1,19E-04	2,79E-04
ADP-fossil	MJ	1,37E+03	1,07E+02	1,32E+03	2,79E+03
WDP	WDP (m^3) world ekw	2,69E+01	5,50E-01	-1,75E+02	-1,48E+02

ADDITIONAL IMPACT INDICATORS: 1 ton portland cement CEM I 52,5 N-SR3/NA					
	Life cycle stage				
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
PM	Disease incidency	6,87E-07	4,69E-07	8,00E-06	9,16E-06
IRP	kBq U235 eq.	9,80E-01	3,68E-01	1,09E+00	2,44E+00
ETP-fw	CTUe	2,94E-02	2,73E-03	1,54E-01	1,86E-01
HTP-c	CTUh	5,98E-09	1,85E-09	2,20E-07	2,28E-07
HTP-nc	CTUh	7,98E-08	2,59E-08	6,37E-06	6,47E-06
SQP	-	1,40E+02	5,89E+01	2,21E+02	4,20E+02

INDICATORS DESCRIBING RESOURCE CONSUMPTION: 1 ton portland cement CEM I 52,5 N-SR3/NA					
	Life cycle stage				
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
PERE	MJ	2,95E+01	4,53E+00	1,18E+02	1,52E+02
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	2,95E+01	4,53E+00	1,18E+02	1,52E+02
PEN-RE	MJ	1,81E+03	1,13E+02	1,76E+03	3,68E+03
RE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	1,81E+03	1,13E+02	1,76E+03	3,68E+03
SM	kg	0,00E+00	0,00E+00	1,63E-01	1,63E-01
RSF	MJ	0,00E+00	0,00E+00	6,15E+02	6,15E+02
NRSF	MJ	0,00E+00	0,00E+00	7,22E+02	7,22E+02
FW	m^3	3,87E-01	8,61E-02	2,48E+00	2,95E+00

INDICATORS DESCRIBING OUTPUT STREAMS AND WASTE: 1 ton portland cement CEM I 52,5 N-SR3/NA					
	Life cycle stage				
Indicator	**Unit** (referred to the DU)	**A1**	**A2**	**A3**	**A1-A3**
Amount of hazardous waste	kg	WN	WN	4,67E-02	4,67E-02
Amount of non-hazardous waste	kg	WN	WN	5,30E+00	5,30E+00
Amount of radioactive waste	kg	WN	WN	0,00E+00	0,00E+00
Reusable components	kg	WN	WN	0,00E+00	0,00E+00
Recycling materials	kg	WN	WN	5,30E+00	5,30E+00
Energy recovery materials	kg	WN	WN	4,52E-02	4,52E-02
Exported energy	MJ/energy carrier	WN	WN	0,00E+00	0,00E+00

BIOGENIC CARBON	
Biogenic carbon content of the product (kg C_{org})	**0,00E+00**
Biogenic carbon content in the package (kg C_{org})	**0,00E-00**

Note: 1 kg of biogenic carbon corresponds to emissions of approximately 3,67 kg CO_2.

5. Interpretation of results

Figure 3 shows a graph of the contributions of individual life cycle modules to the basic categories of influence of portland low-alkali cement **CEM I 52.5 N-SR3/NA.**

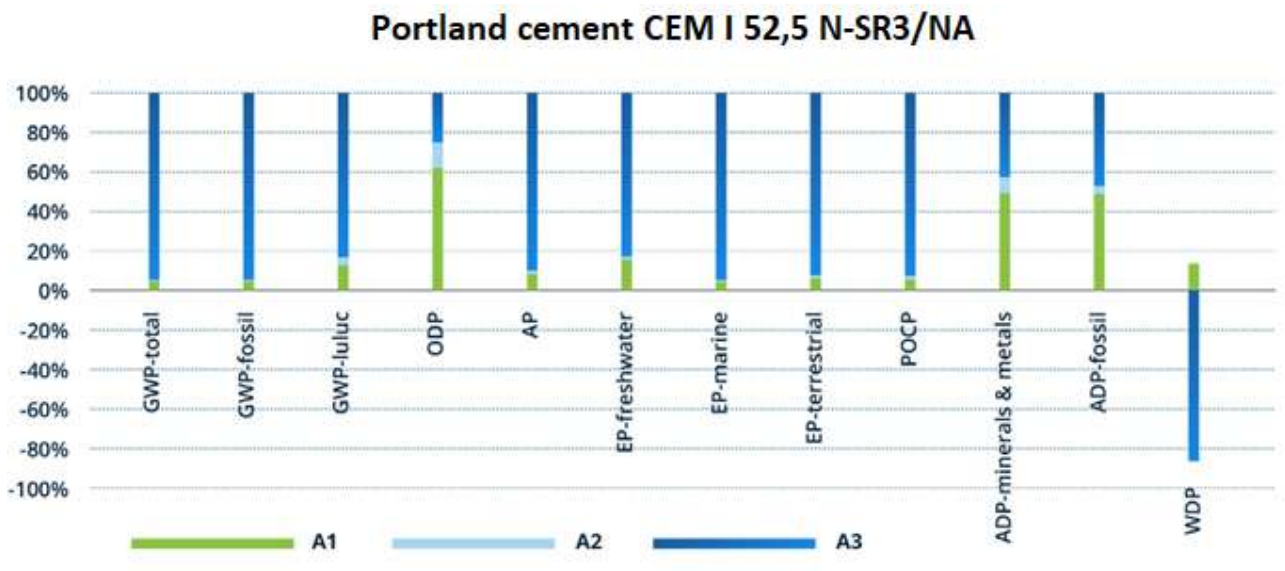


Figure 3.

Shares of life cycle modules on the main categories of influence - portland low-alkali cement **CEM I 52,5 N-SR3/NA.**

Literature

Photo. Michał Braszczyński, Cementownia Warta S.A.

- PN-EN ISO 14025:2014-04, Environmental labels and declarations -- Type III environmental declarations -- Rules and procedures.
- PN-EN 15804+A2:2020, Sustainability of building structures -- Environmental product declarations -Basic principles of categorization of construction products.
- PN-EN ISO 14040:2009 Environmental management. Life Cycle Assessment. Principles and structure.
- PN-EN ISO 14044:2009, Environmental management. Life Cycle Assessment. Requirements and guidelines.
- EN 15942:2012, Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- The Act of 14 December 2012 on Waste, Journal of Laws. 2013, item 21.
- Act of 27 April 2001. Environmental Protection Law Journal of Laws 2024.54, consolidated text.
- EN 197-1:2011: Cement – Part 1: Composition, specifications and conformity criteria for commonly used cements.
- KOBiZE CO2, SO2, NOx, CO and total particulate matter emission factors for electricity, 2022.
- PN-EN 16908:2017-02 Cement and construction lime. Environmental Product Declarations. Product category rules supplementing EN 158044.

Explanatory material can be obtained by contacting the representative directly Cementownia Warta S.A

Łukasiewicz Research Network – Institute of Ceramics and Building Materials
31-983 Kraków, Cementowa 8 Str., Poland

CENTER OF ENVIROMENTAL ENGINEERING

45-641 Opole, Oświęcimska 21 Str., Poland
Phone: +48 77 456 32 01
www.icimb.lukasiewicz.gov.pl
info.opole@icimb.lukasiewicz.gov.pl

Łukasiewicz
Institute
of Ceramics
and Building
Materials

PROCESS ENGINEERING RESEARCH GROUP

TYPE III ENVIRONMENTAL DECLARATION CERTIFICATE

no. 05-09/2024

Products:

Portland low-alkali cement

CEM I 52,5 N-SR3/NA

Owner:

Cementownia Warta S.A.

17 Przemysłowa st., Trębaczew

98-355 Działoszyn

The declaration was developed in accordance with the requirements of the standard:

PN-EN 15804+A2: 2020-03

Sustainability of construction works
Environmental product declarations
Core rules for the product category of construction products

The declaration was verified in accordance with the requirements of the standard:

PN-EN ISO 14025:2010

Environmental labels and declarations
Type III environmental declarations. Principles and procedures

The certificate was issued for the first time on **September 16, 2024** and is valid for 5 years or until the said EPD is amended.

Process Engineering Research Group Leader

Ewa Głodek-Bucyk, PhD Eng.

Director of Environmental Engineering Center

Joanna Poluszyńska, PhD

Opole, September 2024