DANISMADEN

DANIS MADENCİLİK HARFİYAT İNSAAT SAN. TİC. A.S.

Life Cycle Assessment Analysis Report

LCA Report for Products:

-Washed Aggregate Stone Powder

-Aggregate No:1

-Aggregate No:2

Owner of the Report
Danış Madencilik Harfiyat İnşaat San. Tic. A.Ş.

LCA Consultant
Furkan Yıldız, BSc.

Date
11.06.2024

metsims
Sustainability Consulting

CONTENTS

TABLES

FIGURES

List of Acronyms

Table 1. List of Acronyms for indicators

ADPE	Abiotic Depletion - elements
ADPF	Abiotic Depletion – fossil resources
AP	Acidification Terrestrial and Freshwater
CRU	Components for reuse
CTUe	Comparative Toxic Unit for Aquatic Ecotoxicity Impacts
CTUh	Comparative Toxic Unit for Human Toxicity Impacts
EE (Electrical):	Exported energy electrical
EE (Thermal):	Exported energy thermal
EF	Environmental Footprint
EPA	Environmental Protection Agency
EP-freshwater	Eutrophication freshwater
EP-terrestrial	Eutrophication terrestrial
EP-marine	Eutrophication marine
Eq.	Equivalent
ETP-FW	Ecotoxicity Freshwater
FW	Use of net fresh water
GWP	Global Warming Potential
GWP-total	Global Warming Potential – Total
GWP-fossil	Global Warming Potential – Fossil
GWP-biogenic	Global Warming Potential – Biogenic
GWP-LULUC	Global Warming Potential – Land Use and Transformation
HTP-NC	Non-cancer human health effects
HTP-C	Cancer human health effects
HWD	Hazardous waste disposed
IR	Ionising Radiation
IREC	International Renewable Energy Certificate
ISO	International Standard Organization
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
MER	Materials for energy recovery
MFR	Material for recycling
NHWD	Non-hazardous waste disposed
NRSF	Use of non-renewable secondary fuels
ODP	Ozone Layer Depletion
OEF	Organizational Environmental Footprint
PERE	Use of renewable primary energy excluding used as raw materials
PERM	Use of renewable primary energy resources used as raw materials
PERT	Total use of renewable primary energy resources
PENRE	Use of non-renewable primary energy excluding used as raw materials
PENRM	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy re-sources
PM	Particulate Matter
POCP	Photochemical Oxidation
RER	Region of Europe
ROW	Rest of the World
RSF	Use of renewable secondary fuels
RWD	Radioactive waste disposed
SM	Use of secondary material
SQP	Soil Quality
WDP	Water Scarcity

1. EXECUTIVE SUMMARY

Goal and Scope:

This Life Cycle Assessment (LCA) study evaluates the environmental impacts of 1 tonne of Washed Aggregate Stone Powder, Aggregate No:1 and Aggregate No:2 from cradle to gate before the delivery to end-users, manufactured by Danış Madencilik in Sarıyer/İstanbul. The results can be used for business-to-business communications.

Database:

SimaPro 9.5 and Ecoinvent 3.9.1 are used in the assessment.

Methodology Used:

- ISO14040/44 & EN 15804+A2

The results of the LCA study performed for Washed Aggregate Stone Powder showed that manufacturing stage is the dominant life cycle stage in all environmental impacts categories.

The results of the LCA study performed for Aggregate No:1 showed that raw material stage is the dominant life cycle stage in all environmental impacts categories.

The results of the LCA study performed for Aggregate No:2 showed that manufacturing stage is the dominant life cycle stage in all environmental impacts categories.

Carbon Footprint of 1 tonne of products manufactured in İstanbul:

- 13,2 kg of CO_2 equivalent for Washed Aggregate Stone Powder manufactured in İstanbul.
- 8,5 kg of CO_2 equivalent for Aggregate No:1 manufactured in İstanbul.
- 9,4 kg of CO_2 equivalent for Aggregate No:2 manufactured in İstanbul.

Most Significant Emission Sources:

Manufacturing Stage with about 65% of all environmental impacts for Washed Aggregate Stone Powder.

Raw Material Stage with about 54% of all environmental impacts for Aggregate No:1.

Manufacturing Stage with about 51% of all environmental impacts for Aggregate No:2.

2. SUMMARY

This study aims to evaluate the environmental impact of Washed Aggregate Stone Powder, Aggregate No:1 and Aggregate No:2 by Danış Madencilik. This report focuses on the application of Life Cycle Assessment (LCA) methodology to calculate the potential environmental impacts of Danış Madencilik products within the defined system boundary.

This LCA was conducted using data collated in 2023 from Danış Madencilik's production plant. The LCA model was developed and the results of the LCA were presented in this report.

LCA was performed in agreement with the requirements of the ISO 14040/44 standard. Environmental impacts are calculated with four different impact assessment methodology. The inventory for the LCA study is based on the 2023 production figures for Washed Aggregate Stone Powder, Aggregate No:1 and Aggregate No:2 manufactured by Danış Madencilik in their İstanbul Plant in Turkey. This LCA was modelled using SimaPro 9.5 LCA software package using the Ecoinvent 3.9.1 database for background data.

The LCA study includes the stages from the upstream supply chain for raw materials acquisition to transport to factory gate and manufacturing stages before the delivery to the client. The term 'raw materials' includes raw materials extraction. Transport is relevant for delivering raw materials to the plant as well as internal transport for handling of materials within the operation.

When the result of the LCA study was analysed, raw materials for Aggregate No:1, manufacturing for Washed Aggregate Stone Powder and Aggregate No:2 appeared to be the dominant life cycle stage for all environmental impact categories assessed.

The LCA part of this work is conducted Metsims Sustainability Consulting. Metsims is a specialised sustainability consultancy based in the UK and Turkey, focusing on life cycle assessment, product sustainability, carbon management and sustainable finance.

3. GENERAL ASPECTS

3.1. General Information About the Company and The Product

Danış Family, which started its commercial activities in 1980, established Danış Beton in Istanbul/Ataşehir in 1999 with the mobilization of the construction industry. While continuing to operate the concrete facility in 2012, it started to produce aggregate in partnership with USC Yapı Madencilik in line with the demand of the sector. Danış Family purchased the entire operating license in 2015, strengthened its infrastructure and took its place among the important companies of the sector. ,

Mission, Purpose & Strategy

Danış Madencilik's mission is to produce in a way that provides high added value for the country by closely following and applying technological developments. While doing all these, its top priority is to act in accordance with the law at every stage of its business process, to always be aware of responsibilities towards the environment and to care about people.

Danış Madencilik's aim is to do business at international standards in every field and to be a constantly growing organization that is recognized by international circles.

Danış Madencilik's strategy is to ensure operational excellence by combining the entire process from the first stage of production to the final product with state-of-the-art equipment, to obtain the highest possible value in the short, medium and long term by using its resources in the best way, to gain transportation and cost advantage by using its proximity to the city center and main transportation lines.

3.2. Statement That the Study Has Been Conducted According to The Requirements of This Standard

This study is conducted according to the guidelines of ISO 14040 and ISO 14044 and the requirements given in the Product Category Rules (PCR) document for Construction EN 15804:2012+ A2:2019/AC:2021 Sustainability of Construction Works.

The inventory for the LCA study is based on the 2023 production figures of Danış Madencilik in their İstanbul Plant in Türkiye. This LCA was modelled with SimaPro 9.5 LCA package using the the Ecoinvent 3.9.1 database for secondary data.

4. ABOUT THE LCA

Life Cycle Assessment (LCA) is a method of systematically mapping a product's environmental impact. LCA deals with environmental aspects, i.e. environmental impacts, and its potential impact on human health, ecosystems and natural resources during the product life cycle from raw materials extraction and production to use, recycling and final management. The use of energy and materials is mapped at all levels, as well as emissions to the environment and nature, and management of residual materials and possible energy recovery. Through increased understanding of the environmental impacts of the environmental aspects, measures can be taken where they make the most of their use. LCA according to standardized methods also facilitates comparisons with other products, which may be useful in market communications and for developing environmental strategies for developing products, processes and business models.

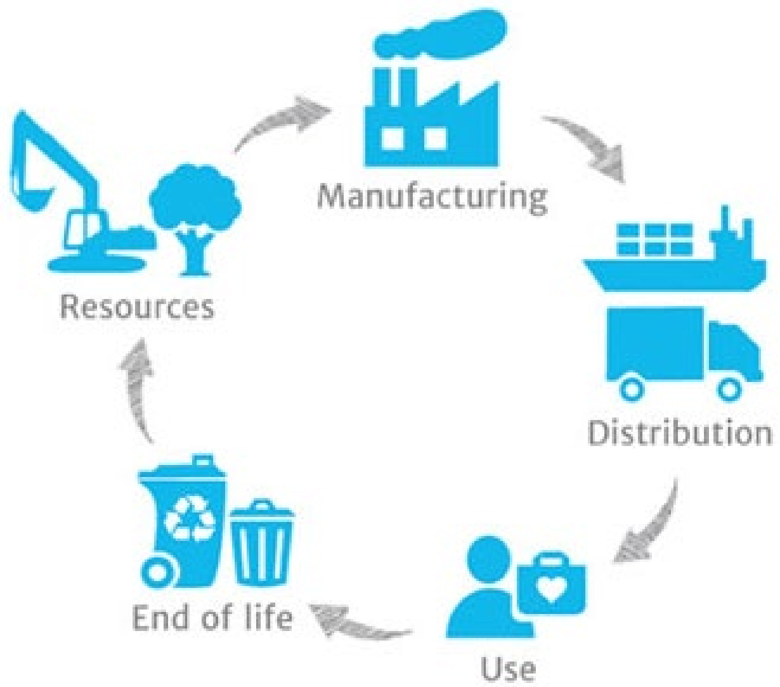

Figure 1. LCA Stages

In 1997, the European Committee for Standardization published their first set of international guidelines for the performance of LCA. This ISO 14040 standard series has become widely accepted amongst the practitioners of LCA and is continuously being developed along with progressions within the field of LCA. The guidelines for LCA are described in two documents; ISO 14040, that contains the main principles and structure for preforming an LCA, and ISO 14044, which includes detailed requirements and recommendations. Furthermore, information about the format for data-documentation, as well as technical reports with guidelines for the different stages of an LCA are available in this standard series.

LCA is performed according to the ISO 14040-44 series standards.

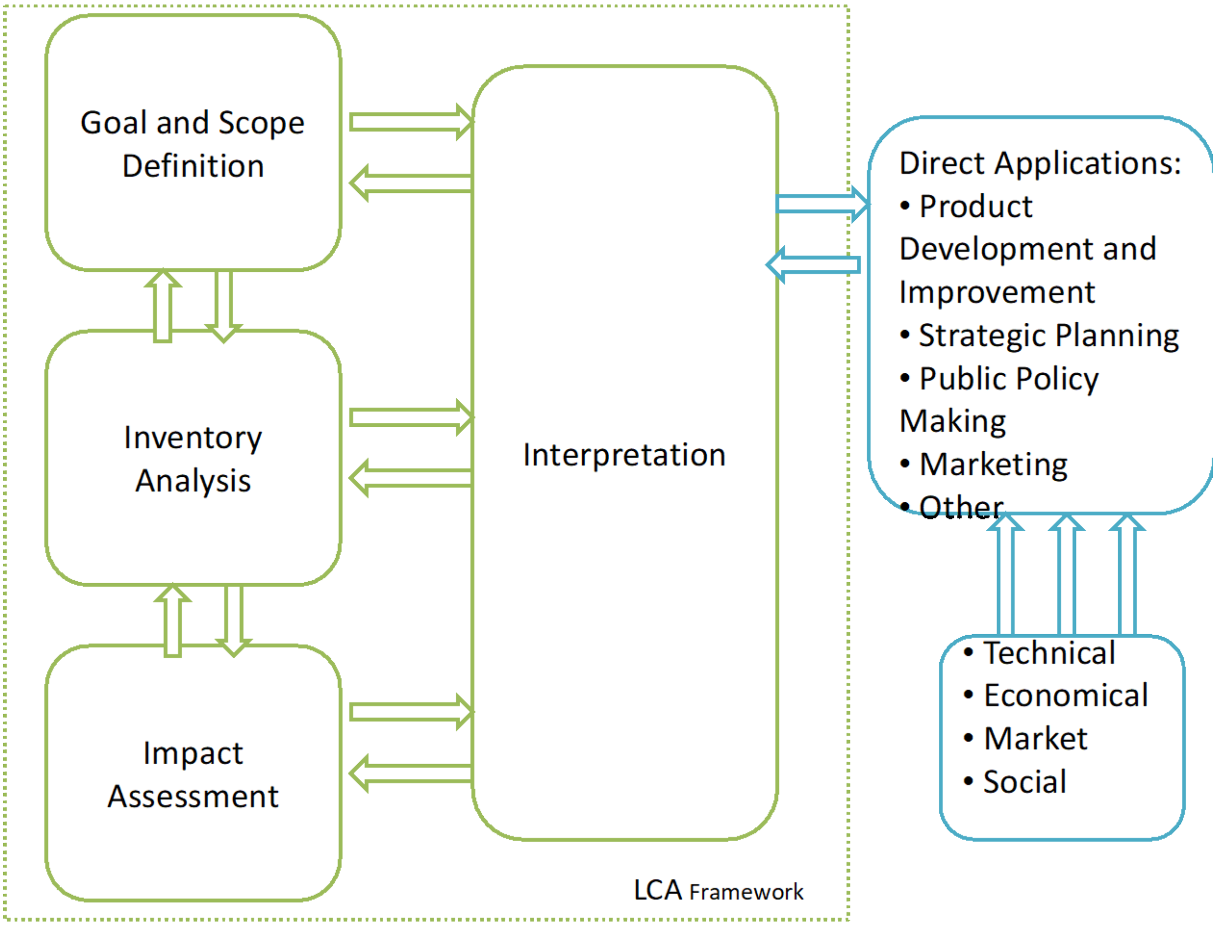

Figure 2. The four phases of LCA

1. The scope, including system boundary and level of detail, of an LCA depends on the subject and the intended use of the study. The depth and the breadth of LCA can differ considerably depending on the goal of a particular LCA.

2. The life cycle inventory analysis phase (LCI phase) is the second phase of LCA. It is an inventory of input per output data with regard to the system being studied. It involves the collection of the data necessary to meet the goals of the defined study.

3. The life cycle impact assessment phase (LCIA) is the third phase of the LCA. The purpose of LCIA is to provide additional information to help assess a product system's LCI results so as to better understand their environmental significance.

4. Life cycle interpretation is the final phase of the LCA procedure, in which the results of an LCI or an LCIA, or both, are summarized and discussed as a basis for conclusions, recommendations and decision-making in accordance with the goal and scope definition.

LCA addresses the environmental aspects and potential environmental impacts) (e.g. use of resources and environmental consequences of releases) throughout a product's life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e. cradle-to-grave).

5. AIM OF THE STUDY

This LCA study evaluates the environmental impacts of 1 tonne of Washed Aggregate Stone Powder, Aggregate No:1 and Aggregate No:2 from cradle to factory gate before delivery. The background data and the results will be used for business-to-business communications (B2B).

The result of this LCA study will provide a better understanding of the environmental impacts resulting from the manufacturing of the Danış Madencilik. Therefore, the company may start to work for reducing their carbon footprint and the other environmental impacts.

6. SCOPE OF THE STUDY

6.1. Product Description and Characterization

Washed Aggregate Stone Powder

The stone which is obtained by drilling and blasting in the quarry, sized and classified in crushing and screening facilities. It is called finest sized aggregate. It is obtained by washing dry stone powder.

Aggregate No:1

The stone which is obtained by drilling and blasting in the quarry, sized and classified in crushing and screening facilities. It is 4-11.2 mm in size

Aggregate No:2

The stone which is obtained by drilling and blasting in the quarry, sized and classified in crushing and screening facilities. It is 4-22.4 mm in size

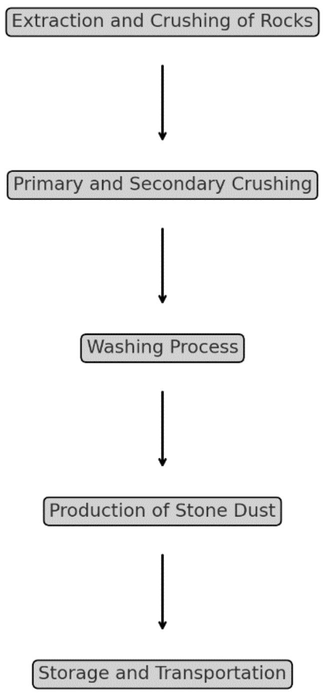

Figure 3. Production Flow Diagram

6.2. Declared Unit

The declared unit represents the quantified performance of a product system for use as a reference unit for the LCA study. The declared unit is used instead of a functional unit when the precise function of the product is not stated or known, or when the LCA does not cover a full life cycle.

The declared units studied in this LCA report are:

- 1 tonne of Washed Aggregate Stone Powder,
- 1 tonne of Aggregate No:1
- 1 tonne of Aggregate No:2.

6.3. Composition of the Products

Products produced from single raw material gravel. Raw materials compositions are given below tables per each product.

Table 2. Materials Used in the Production of Washed Aggregate Stone Powder, Aggregate No:1 and Aggregate No:2.

Product components	Weight, kg	Post-consumer recycled material, weight-%	Biogenic material, weight-% and kg C/kg
Gravel	1000	0%	0%

6.4. Product Area of Application

Washed Aggregate Stone Powder, Aggregate No: 1 (4-11.2 mm), and Aggregate No: 2 (4-22.4 mm) are quarry products used in construction. Stone Powder is used in concrete, asphalt, fill, landscaping, and manufacturing. Aggregate No. 1 is for concrete, asphalt, ballast, drainage, and fill. Aggregate No. 2 is for large concrete projects, high-performance asphalt, ballast, large drainage, and foundations. These materials ensure durable, long-lasting structures.

6.5. System Boundary

According to the PCR of Construction Products and Construction Services, A1 – A3 product stages ('Raw material supply', 'Transport' and 'Manufacturing') shall be considered in the LCA studies. This rule is applied throughout.

The review framework comprises the following details:

- Raw materials acquisition and transport,
- Production and storage operations,
- Energy and water consumption, waste management,

The system boundary of Danış Madencilik products are given below.

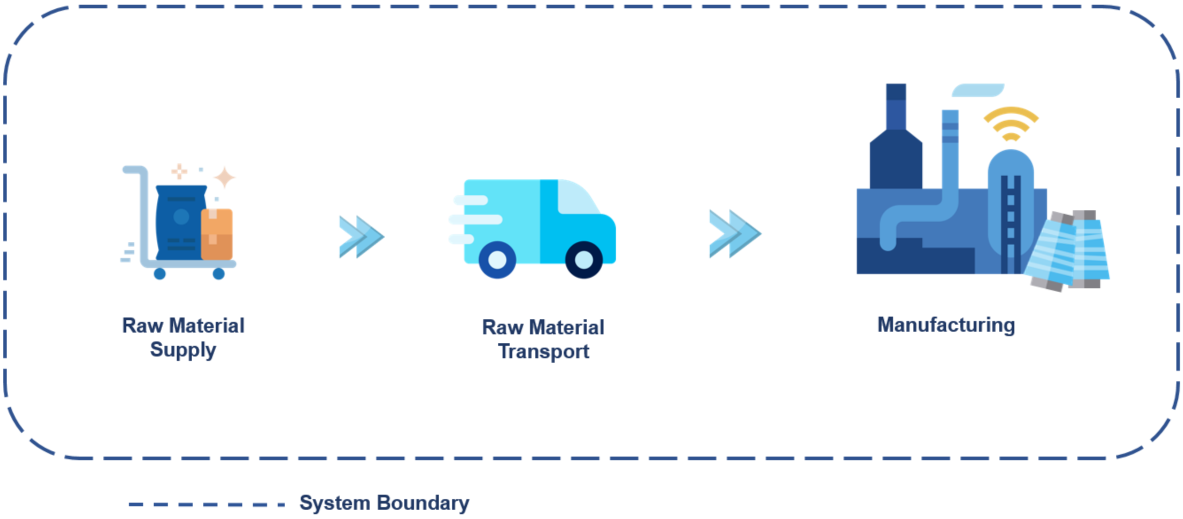

Figure 4. System boundary of the LCA Study Conducted on Danış Madencilik Washed Aggregate Stone Powder, Aggregate No:1 and Aggregate No:2

6.5.1 System Boundary

A1: Raw Material Supply

The main raw material for Danış Madencilik's investigated product is gravel. The company acquires gravel from the quarry which is in the same area where the final production process takes place. The stone is obtained by drilling and blasting in the quarry.

A2: Raw Material Transport

Transport of raw materials to production site is taken as the weight average values for transport from raw materials supplier in 2023. Quarry is in the same place with the production line. Raw materials are transported via trucks.

A3: Manufacturing

Large rock pieces are extracted from the quarry and brought to the crushing plant. Jaw crushers are used to break down the large rocks into smaller pieces. After the initial crushing, the stones are directed to a secondary crusher. In these crushers, Aggregate No:1 (5-12 mm) and Aggregate No:2 (12-22 mm) is produced. The aggregate is washed with powerful water jets in the washing plant to remove dust and dirt. This process ensures that both Aggregate No:1 and No:2 is clean and suitable for construction. Fine material produced during crushing and screening is washed to obtain washed stone dust. Washed stone dust is used as an additive in concrete production and other construction projects. The cleaned and sorted aggregates are transported to storage areas. These materials, now ready for use, are shipped to construction sites. These processes ensure that raw rock extracted from quarries is processed for use in the construction industry.

6.6. Electricity Power Mix

Local data from the Ecoinvent was used for the electricity power mix. (Electricity, medium voltage {TR}| market for | Cut-off, S.)

Electricity for the manufacture is supplied from the Turkish grid. According to Ecoinvent 3.9.1 Database, the carbon impact of Turkish country electricity mix is 0.588 kg CO_2 eq./kWh.

6.7. CO_2 Certificates

Danış Madencilik does not currently have CO_2 certification.

7. LIFE CYCLE INVENTORY ANALYSIS

7.1. Collecting Data

Throughout this project ISO 14040 and ISO 14044 guidelines are followed. The data used in this study were primary and secondary. Primary data are those collected directly from manufacturer/producer relevant to the life cycle stages modelled. If there is no primary data available, then data from the latest Ecoinvent database (Version: 3.9.1) available for SimaPro are used as secondary data.

Apart from environmental impacts from upstream supply chain of raw materials production, all production data collected from Danış Madencilik production lines. Raw materials production data were taken from the Ecoinvent database.

Transport data were taken from the Ecoinvent, but the tonnages hauled were all provided by Danış Madencilik. The source and amount of every raw material used in production were identified and locations for transport with their means are obtained from the company. When more than one source and/or transport method was utilised, allocations were based on weighted averages.

Production-relevant data were all primary data collected from Danış Madencilik, Turkey, İstanbul Plant with the reference year to 2023.

7.2. Calculation Methods

After collecting all relevant data for each of the life cycle stages, the modelling was conducted using SimaPro life cycle assessment software. These impact categories and their associated methods are retrieved from EN 15804 A2 document. Methods are present in SimaPro within EF Method (adapted) v1.0.

Table 3. Mandatory Indicators Used for the LCA

Impact Category	Indicator	Unit	Method
Climate change – total [a]	Global Warming Potential total (GWP-total)	kg CO_2 eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
Climate change - fossil	Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
Climate change - biogenic	Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
Climate change - land use and land use change [b]	Global Warming Potential land use and land use change (GWP-luluc)	kg CO_2 eq.	Baseline model of 100 years of the IPCC based on IPCC 2013
Ozone Depletion	Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	Steady-state ODPs, WMO 2014

Acidification	Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008
Eutrophication aquatic marine	Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq.	EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe
Eutrophication terrestrial	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	Accumulated Exceedance, Seppälä et al. 2006, Posch et al., 2008
Photochemical ozone formation	Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	LOTOS-EUROS, Van Zelm et al., 2008, as applied in ReCiPe
*Depletion of abiotic resources minerals and metals [c d]	Abiotic depletion potential for non-fossil resources (ADP minerals & metals)	kg Sb eq.	CML 2002, Guinée et al., 2002, and van Oers et al. 2002
*Depletion of abiotic resources fossil fuels [c]	Abiotic depletion for fossil resources potential (ADP-fossil)	MJ, net calorific value	CML 2002, Guinée et al., 2002, and van Oers et al. 2002
*Water use	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m^3 world eq. deprived	Available WAter REmaining (AWARE) Boulay et al., 2018
[a] The total global warming potential (GWP-Total) is the sum of: • GWP-fossil • GWP-biogenic • GWP-luluc			
[b] It is permitted to omit GWP-luluc as separate information if its contribution is < 5% of GWP-Total over the declared modules excluding module D.			
[c] The abiotic depletion potential is calculated and declared in two different indicators: - ADP- minerals & metals include all non-renewable, abiotic material resources (i.e., excepting fossil resources). - ADP-fossil includes all fossil resources and includes uranium.			
[d] ultimate reserve model of the ADP-minerals & metals model			

Table 4. Additional Indicators Used for the LCA

Impact Category	Indicator	Unit
Particulate Matter emissions	Potential incidence of disease due to PM emissions (PM)	Disease incidence
**Ionizing radiation, human health	Potential Human exposure efficiency relative to U235 (IRP)	kBq U235 eq.
*Eco-toxicity (freshwater) Potential Comparative	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe
*Human toxicity, cancer effects	Potential Comparative Toxic Unit for humans (HTP-c)	CTUh

*Human toxicity, non-cancer effects	Potential Comparative Toxic Unit for humans (HTP-nc)	CTUh
*Land use related impacts/ Soil quality	Potential soil quality index (SQP)	dimensionless

7.3. Selecting Data / Background Data

Primary data used in this study were taken from Danış Madencilik's production figures based on the year of 2023. Use of raw materials, electricity, water use, and waste data were taken for the relevant products.

Secondary data used in this study are taken from the latest version of the Ecoinvent database, mainly because primary data from the upstream supply chain were not available (e.g. production of raw materials). However, Ecoinvent has comprehensive data on raw materials and the ones used here were less than 10 years old.

7.4. Data / Background Data Quality Requirements

As a measure of data quality, all primary data collected from Danış Madencilik's plant is for the year of 2023. Primary datasets were produced in SimaPro using these data. Necessary background data (secondary data) relevant to life cycle stages were taken from the Ecoinvent (version 3.9.1) database. The data used within Ecoinvent was less than 10 years old.

7.5. Allocations

Water consumption, energy consumption and raw material transportation were weighted according to 2023 production figures. In addition, hazardous and non-hazardous waste amounts were also allocated from the 2023 total waste generation.

There is no product allocation.

8. LIFE CYCLE IMPACT ASSESSMENT

8.1. Indicators for the Life Cycle Inventory Analysis as Per EN 15804

Table 5. Description of System Boundary

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Geography	TR	TR	TR	-	-	-	-	-	-	-	-	-	-	-	--	-	-
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<1%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	<1%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

The results of the LCA study with the indicators according to EPD requirement are given in the following tables for product manufacture. The system boundaries in tabular form for all modules are shown in the table above.

All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while freshwater use is calculated with the addition of the water flows within the inventory. As per PCR requirements, net freshwater does not include cooling, turbine, salt (sole) and salt (ocean) water.

Output flows are given in the following tables according to following waste categories: Hazardous waste disposed (HWD), Non-hazardous waste disposed (NHWD), Radioactive waste disposed (RWD), Components for re-use (CRU), Materials for recycling (MFR), Materials for energy recovery (MER), Exported energy per energy carrier (EE).

8.2. LCA Result

Washed Aggregate Stone Powder

Table 6. Results of LCA analysis per declared/functional unit- Washed Aggregate Stone Powder

Core environmental impact indicators (Mandatory)	Unit	A1	A2	A3	A1-A3
GWP-Fossil	kg CO_2 eq	4,57E+00	1,69E-05	8,60E+00	1,32E+01
GWP-Biogenic	kg CO_2 eq	2,90E-02	5,69E-09	1,17E-01	1,46E-01
GWP-Luluc	kg CO_2 eq	2,31E-02	8,70E-09	1,02E-01	1,25E-01
GWP-Total	kg CO_2 eq	4,62E+00	1,69E-05	8,82E+00	1,34E+01
ODP	kg CFC11 eq	5,19E-08	2,53E-13	5,77E-08	1,10E-07
AP	mol H+ eq	3,64E-02	5,98E-08	6,15E-02	9,80E-02
EP – Freshwater	kg P eq	2,59E-03	1,37E-09	9,87E-03	1,25E-02
EP – Marine	kg N eq	1,06E-02	1,96E-08	1,03E-02	2,09E-02
EP – Terrestrial	mol N eq	1,16E-01	2,08E-07	9,27E-02	2,08E-01
POCP	kg NMVOC eq	3,45E-02	8,04E-08	2,71E-02	6,16E-02
*ADPE	kg SB eq.	2,42E-05	5,39E-11	9,22E-06	3,35E-05
*ADPF	MJ	5,17E+01	2,38E-04	8,99E+01	1,42E+02
*WDP	m^3 depriv.	7,11E+01	1,05E-06	4,82E+00	7,59E+01
Additional environmental impact indicators (Mandatory)	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
**GWP-GHG	kg CO_2 eq.	4,61E+00	1,69E-05	8,74E+00	1,33E+01
Additional environmental impact indicators (Optional)	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
PM	disease inc.	6,05E-07	1,34E-12	2,80E-07	8,85E-07

***IR	kBq U-235 eq.	5,12E-02	2,02E-07	7,10E-02	1,22E-01
*HTP-C	CTuh	3,81E-09	7,64E-15	1,84E-09	5,65E-09
*HTP-NC	CTUh	4,79E-08	1,71E-13	7,49E-08	1,23E-07
*SQP	Pt	7,47E+01	1,42E-04	8,85E+00	8,35E+01
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, 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, A4: Transport, C1: Deconstruction/Demolition, C2: Waste transport, C3: Waste Processing, C4: Disposal, D: Benefits and loads			

Table 7. Resource and energy use per declared/functional product- Washed Aggregate Stone Powder

Core environmental impact indicators (Mandatory)	Unit	A1	A2	A3	A1-A3
PERE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	7,41E+00	3,03E-06	2,98E+01	3,72E+01
PENRE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRM	sMJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	5,17E+01	2,38E-04	8,99E+01	1,42E+02
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,65E+00	4,04E-08	3,69E-02	1,69E+00

Abbreviations	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; PENRE = Use of non-renewable primary energy excluding nonrenewable primary energy 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 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

Table 8. Waste & Output flows per declared/functional unit- Washed Aggregate Stone Powder

Indicator	Unit	A1	A2	A3	A1-A3
Hazardous Waste	kg	6,72E-03	5,95E-09	6,44E-03	1,32E-02
Non-Hazardous Waste	kg	6,73E-01	1,15E-05	5,23E-01	1,20E+00
Radioactive waste	kg	1,24E-05	4,81E-11	1,67E-05	2,91E-05
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
*Disclaimer 1	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 2	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology The indicator includes all greenhouse gases included in the GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013				
*Disclaimer 3	This impact category deals mainly with the eventual impact of low dose ionising radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, or due to radioactive waste disposal in underground facilities. This indicator also does not measure potential ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.				

Aggregate No: 1

Table 9. Results of LCA analysis per declared/functional unit- Aggregate No: 1

Core environmental impact indicators (Mandatory)	Unit	A1	A2	A3	A1-A3
GWP-Fossil	kg CO_2 eq	4,57E+00	1,85E-05	3,91E+00	8,48E+00
GWP-Biogenic	kg CO_2 eq	2,90E-02	6,25E-09	5,33E-02	8,23E-02
GWP-Luluc	kg CO_2 eq	2,31E-02	9,54E-09	4,64E-02	6,96E-02
GWP-Total	kg CO_2 eq	4,62E+00	1,86E-05	4,01E+00	8,63E+00
ODP	kg CFC11 eq	5,19E-08	2,77E-13	2,62E-08	7,81E-08
AP	mol H+ eq	3,64E-02	6,56E-08	2,80E-02	6,44E-02
EP – Freshwater	kg P eq	2,59E-03	1,50E-09	4,49E-03	7,08E-03
EP – Marine	kg N eq	1,06E-02	2,16E-08	4,68E-03	1,52E-02
EP – Terrestrial	mol N eq	1,16E-01	2,28E-07	4,21E-02	1,58E-01
POCP	kg NMVOC eq	3,45E-02	8,82E-08	1,23E-02	4,68E-02
*ADPE	kg SB eq.	2,42E-05	5,92E-11	4,19E-06	2,84E-05
*ADPF	MJ	5,17E+01	2,61E-04	4,09E+01	9,25E+01
*WDP	m^3 depriv.	7,11E+01	1,15E-06	2,18E+00	7,32E+01
Additional environmental impact indicators (Mandatory)	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
**GWP-GHG	kg CO_2 eq.	4,61E+00	1,86E-05	3,97E+00	8,58E+00
Additional environmental impact indicators (Optional)	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
PM	disease inc.	6,05E-07	1,47E-12	1,27E-07	7,33E-07
***IR	kBq U-235 eq.	5,12E-02	2,22E-07	3,22E-02	8,35E-02

*HTP-C	CTuh	3,81E-09	8,38E-15	8,38E-10	4,64E-09
*HTP-NC	CTUh	4,79E-08	1,87E-13	3,41E-08	8,19E-08
*SQP	Pt	7,47E+01	1,55E-04	4,02E+00	7,87E+01
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, 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, A4: Transport, C1: Deconstruction/Demolition, C2: Waste transport, C3: Waste Processing, C4: Disposal, D: Benefits and loads			

Table 10. Resource and energy use per declared/functional product- Aggregate No: 1

Core environmental impact indicators (Mandatory)	Unit	A1	A2	A3	A1-A3
PERE	MJ	7,41E+00	3,32E-06	1,35E+01	2,09E+01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	7,41E+00	3,32E-06	1,35E+01	2,09E+01
PENRE	MJ	5,17E+01	2,61E-04	4,09E+01	9,25E+01
PENRM	sMJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	5,17E+01	2,61E-04	4,09E+01	9,25E+01
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,65E+00	4,43E-08	1,65E-02	1,67E+00
Abbreviations	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; PENRE = Use of non-renewable primary energy excluding				

nonrenewable primary energy 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 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

Table 11. Waste & Output flows per declared/functional unit- Aggregate No: 1

Indicator	Unit	A1	A2	A3	A1-A3
Hazardous Waste	kg	6,72E-03	6,53E-09	2,93E-03	9,65E-03
Non-Hazardous Waste	kg	6,73E-01	1,26E-05	2,38E-01	9,11E-01
Radioactive waste	kg	1,24E-05	5,28E-11	7,60E-06	2,00E-05
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
*Disclaimer 1	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 2	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology The indicator includes all greenhouse gases included in the GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013				
*Disclaimer 3	This impact category deals mainly with the eventual impact of low dose ionising radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, or due to radioactive waste disposal in underground facilities. This indicator also does not measure potential ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.				

Aggregate No: 2

Table 12. Results of LCA analysis per declared/functional unit- Aggregate No: 2

Core environmental impact indicators (Mandatory)	Unit	A1	A2	A3	A1-A3
GWP-Fossil	kg CO_2 eq	4,57E+00	1,52E-05	4,80E+00	9,37E+00
GWP-Biogenic	kg CO_2 eq	2,90E-02	5,12E-09	6,55E-02	9,45E-02
GWP-Luluc	kg CO_2 eq	2,31E-02	7,82E-09	5,70E-02	8,01E-02
GWP-Total	kg CO_2 eq	4,62E+00	1,52E-05	4,92E+00	9,54E+00
ODP	kg CFC11 eq	5,19E-08	2,27E-13	3,22E-08	8,41E-08
AP	mol H+ eq	3,64E-02	5,37E-08	3,43E-02	7,08E-02
EP – Freshwater	kg P eq	2,59E-03	1,23E-09	5,51E-03	8,10E-03
EP – Marine	kg N eq	1,06E-02	1,77E-08	5,75E-03	1,63E-02
EP – Terrestrial	mol N eq	1,16E-01	1,87E-07	5,17E-02	1,68E-01
POCP	kg NMVOC eq	3,45E-02	7,23E-08	1,51E-02	4,96E-02
*ADPE	kg SB eq.	2,42E-05	4,85E-11	5,15E-06	2,94E-05
*ADPF	MJ	5,17E+01	2,14E-04	5,02E+01	1,02E+02
*WDP	m^3 depriv.	7,11E+01	9,46E-07	2,68E+00	7,37E+01
Additional environmental impact indicators (Mandatory)	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
**GWP-GHG	kg CO_2 eq.	4,61E+00	1,52E-05	4,88E+00	9,49E+00
Additional environmental impact indicators (Optional)	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
PM	disease inc.	6,05E-07	1,21E-12	1,56E-07	7,62E-07
***IR	kBq U-235 eq.	5,12E-02	1,82E-07	3,96E-02	9,08E-02

*HTP-C	CTuh	3,81E-09	6,87E-15	1,03E-09	4,83E-09
*HTP-NC	CTUh	4,79E-08	1,53E-13	4,18E-08	8,97E-08
*SQP	Pt	7,47E+01	1,27E-04	4,94E+00	7,96E+01
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, 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, A4: Transport, C1: Deconstruction/Demolition, C2: Waste transport, C3: Waste Processing, C4: Disposal, D: Benefits and loads			

Table 13. Resource and energy use per declared/functional product- Aggregate No: 2

Core environmental impact indicators (Mandatory)	Unit	A1	A2	A3	A1-A3
PERE	MJ	7,41E+00	2,72E-06	1,66E+01	2,40E+01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	7,41E+00	2,72E-06	1,66E+01	2,40E+01
PENRE	MJ	5,17E+01	2,14E-04	5,02E+01	1,02E+02
PENRM	sMJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	5,17E+01	2,14E-04	5,02E+01	1,02E+02
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,65E+00	3,63E-08	2,02E-02	1,67E+00
Abbreviations	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; PENRE = Use of non-renewable primary energy excluding				

	nonrenewable primary energy 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 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

Table 14. Waste & Output flows per declared/functional unit- Aggregate No: 2

Indicator	Unit	A1	A2	A3	A1-A3
Hazardous Waste	kg	6,72E-03	5,35E-09	3,60E-03	1,03E-02
Non-Hazardous Waste	kg	6,73E-01	1,04E-05	2,92E-01	9,65E-01
Radioactive waste	kg	1,24E-05	4,33E-11	9,34E-06	2,17E-05
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
*Disclaimer 1	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 2	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology The indicator includes all greenhouse gases included in the GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013				
*Disclaimer 3	This impact category deals mainly with the eventual impact of low dose ionising radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, or due to radioactive waste disposal in underground facilities. This indicator also does not measure potential ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.				

9. LIFE CYCLE INTERPRETATION & CONCLUSION

9.1. Overall Summary

This section discusses the outcomes of this life cycle assessment study based on the key findings and hot-spots. Interpreting the impact assessment results are the key to be able to understand the hot-spots (strong emission sources) and to act accordingly to reduce the overall impact.

9.2. Breakdown of LCA Results

Washed Aggregate Stone Powder

When the environmental impact categories of the product are evaluated, the raw material supply stage (A1) and manufacturing stage (A3) seem more dominant than other life cycle stages. The most dominant phase in the POCP, ADPE and water depletion potential categories is the raw material supply stage, while the manufacturing stage is dominant in all other impact categories, especially in GWP indicators. The use of electricity in the manufacturing stage is the reason for the prominent impacts here. It has the highest GWP value compared to other products because the electricity usage is highest for stone powder since it is the smallest version of the stone. The table below lists the share of life cycle stages in each impact category. Impact category of GWP-biogenic and D module is not included in the percentage display because they contain negative values.

Table 15. Environmental Impact Distribution by LCA Stages-Washed Aggregate Stone Powder

Parameter		A1	A2	A3
Global Warming Potential	Fossil	34,7%	0,0%	65,3%
	Biogenic			
	Luluc	18,4%	0,0%	81,6%
	Total	34,4%	0,0%	65,6%
ODP		47,3%	0,0%	52,7%
AP		37,2%	0,0%	62,8%
EP - Freshwater		20,8%	0,0%	79,2%
EP - Marine		50,6%	0,0%	49,4%
EP - Terrestrial		55,5%	0,0%	44,5%
POCP		56,0%	0,0%	44,0%

ADPE	72,4%	0,0%	27,6%
ADPF	36,5%	0,0%	63,5%
WDP	93,6%	0,0%	6,4%

The chart below examines the GWP-fossil comparison between life cycle stages. The graph shows that the manufacturing stage (A3) has the highest GWP-fossil value. The raw material supply stage, following this stage, has the second highest GWP-fossil value. Due to the proximity of the mine to the operation site, the value of the raw material transport (A2) remained minimum.

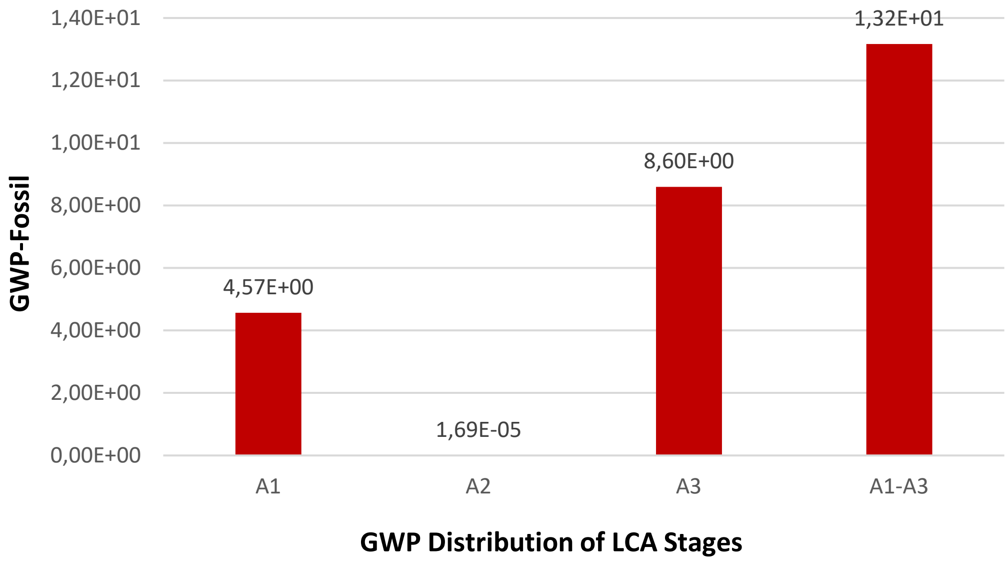

Figure 5. GWP Distribution of LCA Stages-Washed Aggregate Stone Powder

Aggregate No:1

When the environmental impact categories of the product are evaluated, the raw material supply stage (A1) and manufacturing stage (A3) seem more dominant than other life cycle stages. The most dominant phase in the GWP-luluc and EP-freshwater potential categories is the manufacturing stage, while the raw material supply stage is dominant in all other impact categories. The use of electricity in the manufacturing stage is the lowest for Aggregate No:1. Because it is the biggest form of stone among the three products. So, the electricity need is lower than the other two products. The table below lists the share of life cycle stages in each impact category. Impact category of GWP-biogenic and D module is not included in the percentage display because they contain negative values.

Table 16. Environmental Impact Distribution by LCA Stages-Aggregate No:1

Parameter		A1	A2	A3
Global Warming Potential	Fossil	53,9%	0,0%	46,1%
	Biogenic			
	Luluc	33,2%	0,0%	66,8%
	Total	53,6%	0,0%	46,4%
ODP		66,4%	0,0%	33,6%
AP		56,6%	0,0%	43,4%
EP - Freshwater		36,6%	0,0%	63,4%
EP - Marine		69,3%	0,0%	30,7%
EP - Terrestrial		73,3%	0,0%	26,7%
POCP		73,7%	0,0%	26,3%
ADPE		85,2%	0,0%	14,8%
ADPF		55,9%	0,0%	44,1%
WDP		97,0%	0,0%	3,0%

The chart below examines the GWP-fossil comparison between life cycle stages. The graph shows that the raw material supply stage (A1) has the highest GWP-fossil value. The manufacturing stage (A3), following this stage, has the second highest GWP-fossil value. Due to the proximity of the mine to the operation site, the value of the raw material transport (A2) remained minimum.

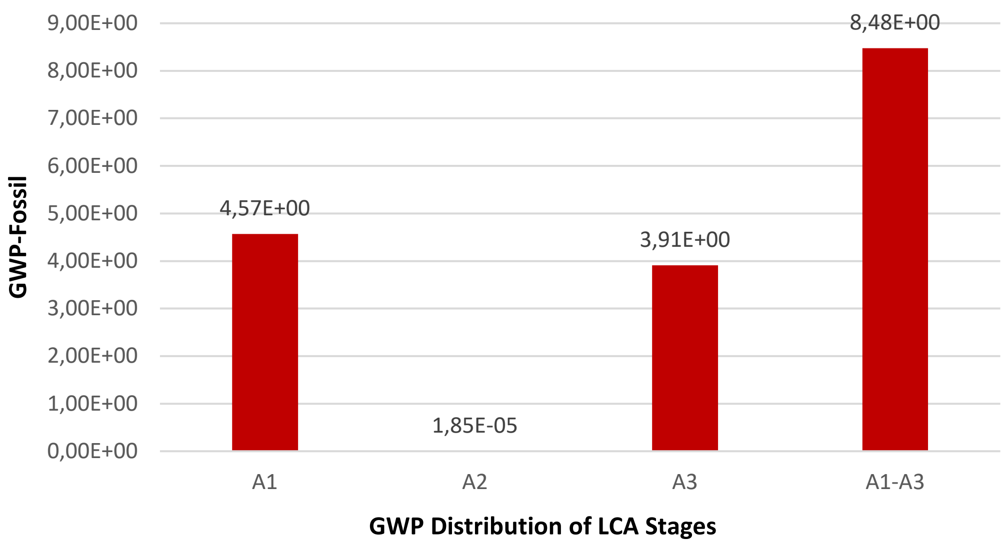

Figure 6. GWP Distribution of LCA Stages-Aggregate No:1

Aggregate No:2

When the environmental impact categories of the product are evaluated, the raw material supply stage (A1) and manufacturing stage (A3) seem more dominant than other life cycle stages. The most dominant phase in the ODP, POCP, EP-marine, EP-terrestrial, ADPE and water depletion potential categories is the raw material supply stage, while the manufacturing stage is dominant in all other impact categories, especially in GWP indicators. The use of electricity in the manufacturing stage is the reason for the prominent impacts here. The table below lists the share of life cycle stages in each impact category. Impact category of GWP-biogenic and D module is not included in the percentage display because they contain negative values.

Table 17. Environmental Impact Distribution by LCA Stages-Aggregate No:2

Parameter		A1	A2	A3
Global Warming Potential	Fossil	48,8%	0,0%	51,2%
	Biogenic			
	Luluc	28,8%	0,0%	71,2%
	Total	48,4%	0,0%	51,6%
ODP		61,7%	0,0%	38,3%
AP		51,5%	0,0%	48,5%
EP - Freshwater		32,0%	0,0%	68,0%

EP - Marine	64,7%	0,0%	35,3%
EP - Terrestrial	69,1%	0,0%	30,9%
POCP	69,6%	0,0%	30,4%
ADPE	82,5%	0,0%	17,5%
ADPF	50,7%	0,0%	49,3%
WDP	96,4%	0,0%	3,6%

The chart below examines the GWP-fossil comparison between life cycle stages. The graph shows that the manufacturing stage (A3) has the highest GWP-fossil value. The raw material supply stage, following this stage, has the second highest GWP-fossil value. Due to the proximity of the mine to the operation site, the value of the raw material transport (A2) remained minimum.

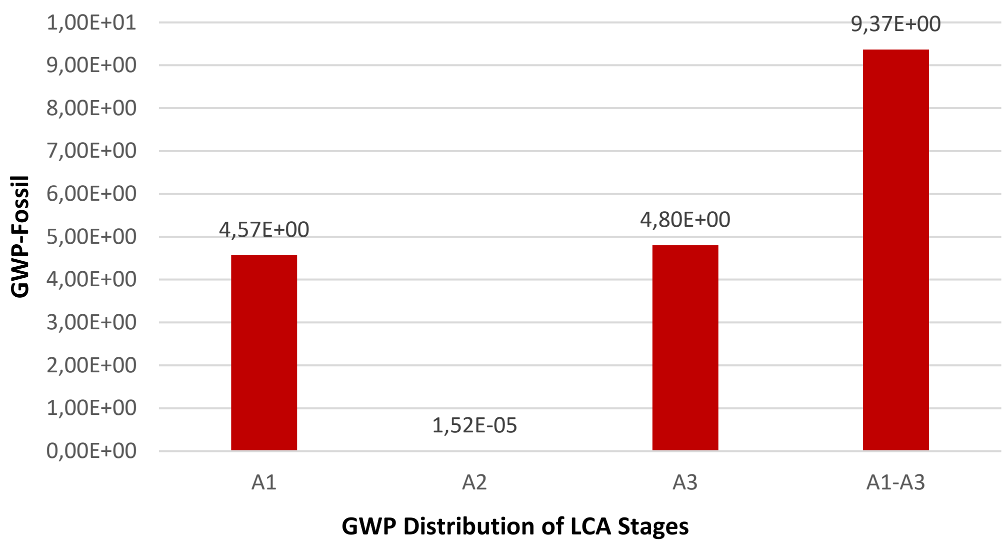

Figure 7. GWP Distribution of LCA Stages-Aggregate No:2

10. ADDITIONAL INFORMATION

10.1. Documentation for Calculating the Reference Service Life (RSL)

RSL is not relevant in this study.

10.2. Disclaimer

This report has been prepared by Metsims Sustainability Consulting with all reasonable skill and diligence within the terms and conditions of the contract between Metsims Sustainability Consulting, and the client. Metsims Sustainability Consulting is not accountable to the client, or any others, with respect to any matters outside the scope agreed upon for this project. Regardless of report confidentiality, Metsims Sustainability Consulting does not accept responsibility of whatsoever nature to any third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk. Interpretations, analyses, or statements of any kind made by a third party and based on this report are beyond the responsibility of Metsims Sustainability Consulting.

11. 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

Ecoinvent / Ecoinvent Centre. www.ecoinvent.org

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 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 1.2.5 DATE 2024-12-20

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

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

Danış Madencilik/ www.danismaden.com

DANISMADEN

DANIS MADENCİLİK HARFİYAT İNSAAT SAN. TİC. A.S.

Ayazağa Mh. Kemerburgaz Cd. No:10/5 Sarıyer, İSTANBUL

info@danismaden.com

+902122891010