EPD®

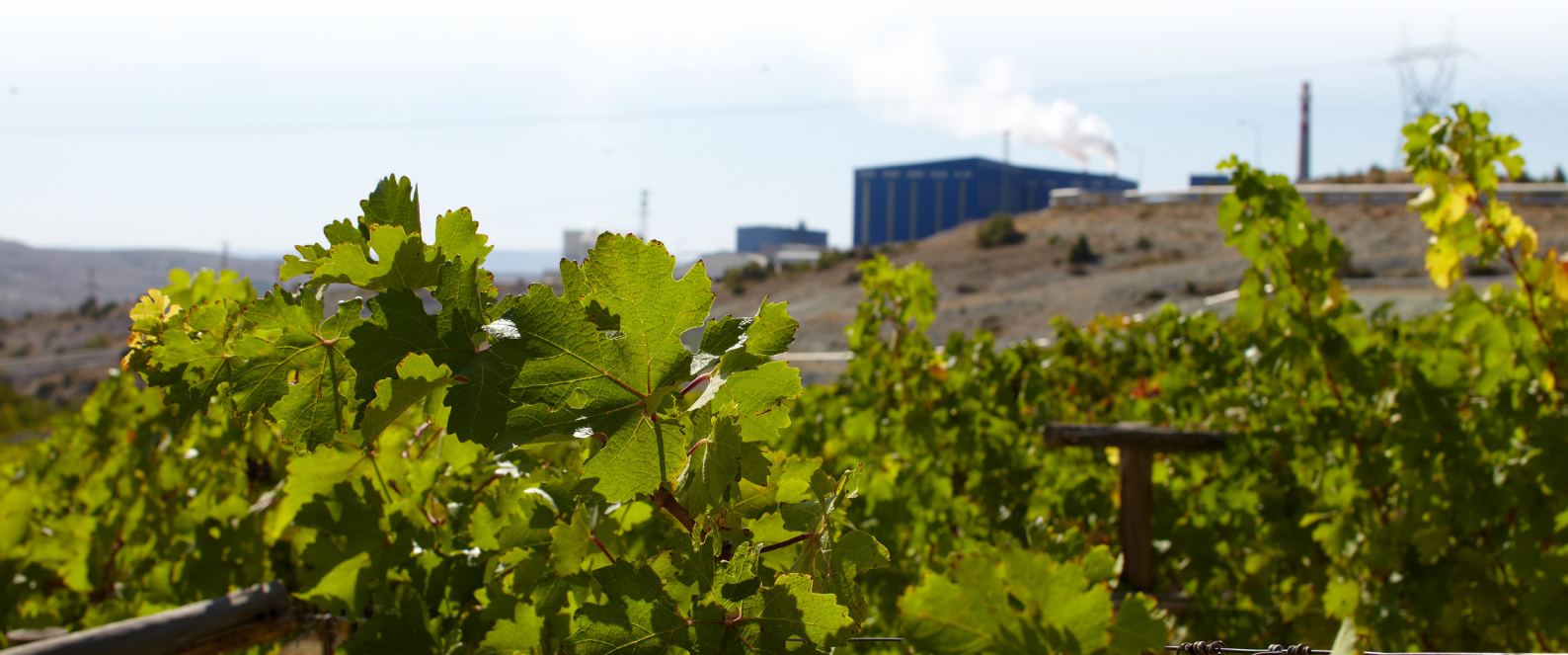
THE INTERNATIONAL EPD® SYSTEM

ETİ SODA

Environmental Product Declaration

of sodium salts

in accordance with ISO 14025



THE INTERNATIONAL EPD® SYSTEM

Sodium Carbonate - Sodium Bicarbonate in accordance with ISO 14025

CPC Code: 34240 - Phosphates of triammonium; salts and peroxysalts of inorganic acids and metals n.e.c.

Validity of EPD:

from 27/11/2017
until 14/11/2020

Geographic Scope: Worldwide
Declaration Number: S-P-01129

For further information about this EPD or its content, please contact Mrs Ahu S. Kilic at ahu.kilic@etisoda.com.

General Information

Products	Sodium Carbonate - Sodium Bicarbonate
Owner of the Declaration	Eti Soda
Manufacturer	ETİ SODA Production Marketing Transportation and Electricity Generation Industry and Trade Inc. Yeşilagac Mah. Guragac Kumeevler Trona Tesisleri No:47/A 06730 Beypazari/ANKARA - TURKEY
Programme Operator	The International EPD® System, information available at the website: www.environdec.com
Functional Unit	1000 kg of sodium salt
Product Category Rules (PCR)	PCR for BASIC INORGANIC CHEMICALS N.E.C. 2011:18 Version 2.01 The International EPD® System
PCR Review	The Technical Committee of the International EPD® System. Contact via info@environdec.com Chair: Lars-Gunnar Lindfors
EPD Type	Cradle to gate
Verification Type	Independent verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third Party Verifier	Vladimír Kočí, PhD Šárecká 5, 16000 Prague 6, Czech Republic www.lcastudio.cz Accredited or approved by: The International EPD® System
LCA Study & EPD Design Conducted By	Semtrio Sustainability Consulting AND Plaza No:10-12 Kozyatagi Istanbul/Turkey www.semtrio.com

Company

Eti Soda has a partnership structure whose 74% share belongs to Ciner Group, being a leading organization in mine, energy and media sectors in Turkey and whose 26% share belongs to Eti Mining Corporation being a government entity.

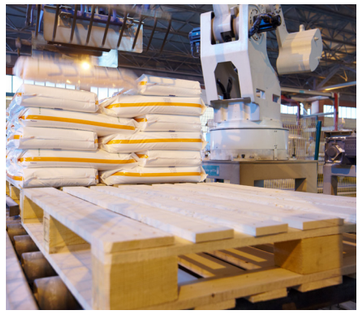
The company is the first and only natural soda production plant within Europe. ETİ SODA INC. was established in 1998 to extract, operate and bring in economy trona mine reserves, found during routine coal boring operation carried out in Beypazarı, Ankara in 1979.

In order to reach the vision of becoming a world leading brand, Eti Soda is continuously improving product and service quality via ISO 9001, ISO 14001, ISO 22000, OHSAS 18001, ISO/IEC 17025 management systems and certifications. To provide the safety of the chemical products exported upon the human health and environment, ETİ SODA has completed the regulations determined in the REACH Legislation, which is effective in the European Union Countries.

Trona mine, located in Beypazarı district of Ankara, is extracted from the ground by the solution mining method, which is a safe and environment friendly operating technique.

The trona solution is taken into the monohydrate process and converted to the Sodium Carbonate and Sodium Bicarbonate products. The products of ETI SODA, which are used in many sectors such as glass production and baking powder, are exported all over the world, especially to European countries.

Product Specification

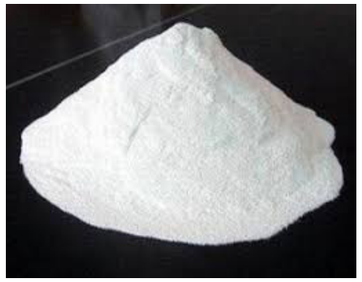


Sodium Carbonate

Dense Soda Ash, Sodium Carbonate also known as disodium carbonate is a chemical substance white in colour and its aqueous solution is clear and colourless (chemical formula Na_2CO_3).

Use Areas	
• Glass • Chemical industry • Soap and detergent	• Paper • Flue gas treatment • Water and waste water treatment

Eco-labelling (ISO Type I) : N/A



Sodium Bicarbonate

Technical Grade Sodium Bicarbonate also known as sodium hydrogen carbonate is a chemical substance white in colour and its aqueous solution is clear and colourless (chemical formula $NaHCO_3$).

Use Areas	
• Chemical industry • Cleaners • Powder fire extinguishers • Paper production	• Leather industry • Waste gas desulphurization • Textile industry • Water and waste water treatment

Eco-labelling (ISO Type I) : N/A

Composition	Sodium Carbonate	Sodium Bicarbonate
Trona, kg	94-99%	99-99,9%
Anti-Foam, kg	<1%	--
Lime, kg	3-8%	--

System Boundary

The International EPD® System has adopted an LCA calculations procedure, which is separated into three different life cycle stages:

- Upstream module (from cradle-to-gate);
- Core module, manufacturing processes (from gate-to-gate);
- Downstream module (from gate-to-grave).

The lifecycle of the products encompasses the following main stages:

- Extraction of natural resources,
- Transportation of natural resources,
- Processing and refinement of natural resources into chemical intermediates,
- Manufacturing of the chemical product,
- Manufacturing of packaging materials.

Upstream Processes

The upstream process includes raw materials production and the manufacturing of the primary and secondary packaging.

Core Processes

The scope of the core module is defined by the organizational boundaries and includes all activities which the manufacturing organization is in control of. In this LCA Study the core process includes transportation of raw materials to production plant, impacts generated by diesel burned in the core process, impacts due to the electricity production according the country energy mix. Production of trona solution also operated by ETi Soda and considered under core processes. Energy consumption during the trona solution delivery to the manufacturing plant has been included into core processes.

Downstream Processes

According to PCR, it is not mandatory to declare any quantitative information about the use and end-of-life phases. Therefore, downstream is excluded from the system boundary. Sodium Carbonate and Sodium Bicarbonate have many different applications and are often used as input materials to other production processes. It is difficult to allocate an environmental burden from the use phase to the chemical input. Also, the end-of-life management depends on the application and location of the use and disposal of the chemical. No relevant data is available for the use and end of life phases of the products manufactured by Eti Soda.

EPDs within the same product category but from different programmes may not be comparable.

LCA Information

LCA Statement

This study has been conducted in accordance with ISO 14040 and 14044 standards the requirements stated in Product Category Rules (PCR) document for BASIC INORGANIC CHEMICALS N.E.C., and also ISO 14020. The inventory for the LCA study was carried based on the 01/01/2016 - 31/12/2016 production figures for Sodium Salts as Sodium Carbonate and Sodium Bicarbonate from Eti Soda manufacturing plant.

Data Collection

Specific data (primary data) was used for the Core Module and was gathered from the Eti Soda Manufacturing Plant. The manufacturing processes were modelled and Life Cycle Impact Assessment stage was conducted in SimaPro software v8.4 with Ecoinvent v3.3 database.

Scope

This EPD evaluates the potential environmental impact of Inorganic Sodium Salts manufactured by Eti Soda. The environmental impacts include Sodium Carbonate and Sodium Bicarbonate production processes during their life cycle from raw material supply to factory gate. According to the PCR document, the functional unit is 1000 kg of sodium salts with packaging. The System boundary includes Upstream, Core and Downstream processes with a cradle-to-gate approach. There has been no cut-off rule conducted for this LCA study.

Allocation

The raw materials are purchased from different locations of Turkey and from Spain via different transportation ways such as roadway and seaway. Therefore, transport has been allocated per tonnage per mileage for products transported to manufacturing plant. Transport data within the plant has been also allocated per 1 ton of product. There has been no allocation conducted for energy consumption as electricity consumption was provided by the company specifically sodium carbonate and sodium bi carbonate processes.

Calculation Methods

Materials and energy uses have been determined from life cycle inventory results from SimaPro outputs. Potential environmental impacts are calculated with the CML-IA baseline V 3.04, ReCiPe Midpoint (H) V1.13 / Europe Recipe H, USEtox (recommended + interim) V1.04 / Europe 2004 methods in SimaPro software.

Environmental Performance

Use of Material and Energy Resources for 1000 kg of Sodium Carbonate

Non - Renewable Resources					
Parameter		Unit	Upstream Raw Materials	Core Production	Total
Material	Trona	kg	0	946	946
	Gravel	kg	1.05	3.11	4.17
	Others	kg	47	0.403	47.4
Energy	Uranium	MJ	20.5	1.45	21.9
	Coal	kg	1.76	5.44	7.20
	Oil, Crude	kg	1.99	1.10	3.09
Renewable Resources					
Parameter		Unit	Upstream Raw Materials	Core Production	Total
Energy	Biomass	MJ	55.6	0.637	56.2
	Geothermal	MJ	0.085	0.013	0.098
	Wind	MJ	0.47	2.08	2.55
	Hydropower	MJ	7.38	20.6	28
Water Use					
Parameter		Unit	Upstream Raw Materials	Core Production	Total
Total amount of water		m3	0.310	0.065	0.375
Direct amount of water used by the core process		m3	-	0.625	0.625

Waste Production for 1000 kg of Sodium Carbonate

Waste Production				
Parameter	Unit	Upstream Raw Materials	Core Production	Total
Hazardous waste	kg	-	4.28E-05	4.28E-05
Non-hazardous waste	kg	-	0.06	0.06
Radioactive waste	kg	-	0	0
Material subject for recycling	kg	-	0	0

Potential Environmental Impacts for 1000 kg of Sodium Carbonate

Environmental Impacts				
Parameter	Unit	Upstream Raw Materials	Core Production	Total
Global Warming Potential (including land use and biogenic carbon)	kg CO2 eq.	9.15	16.9	26.1
Global Warming Potential (including land use, excluding biogenic carbon)	kg CO2 eq.	7.92	16.8	24.7
Ozone Depletion Potential	kg CFC11 eq.	9.21E-07	8.87E-07	1.81E-06
Ozone Creation Potential	kg ethene eq.	2.78E-03	3.62E-03	6.40E-03
Acidification Potential	kg SO2 eq.	0.042	0.086	0.128
Oxygen depletion potential (expressed as the sum of eutrophication potential, EP)	kg PO43- eq.	0.006	0.008	0.014
Abiotic depletion potential for non-fossil resources	kg Sb eq.	2.16E-05	1.04E-05	3.20E-05
Resource depletion	MJ eq.	190	56.7	247
Freshwater eutrophication	kg P eq	3.33E-04	1.36E-03	1.70E-03
Marine eutrophication	kg N eq	1.50E-03	1.30E-03	2.81E-03
Human toxicity, cancer	CTUh	7.47E-08	4.29E-08	1.18E-07
Human toxicity, non-cancer	CTUh	7.73E-07	9.78E-07	1.75E-06
Freshwater ecotoxicity	CTUe	2.78	5.50	8.28

Other Environmental Indicators for Sodium Carbonate

Air, Water and particulates emissions are declared according to the “Life Cycle Metrics for Chemical Products” (WBCSD Chemicals, 2014). All emission parameters are calculated from CML-IA baseline V3.04 / EU25 method Inventory outputs in Simapro v8.4.

Additional Environmental Indicators for Sodium Carbonate

Biotic matter is not used as feedstock and ends up in the chemical product. To provide the safety of the chemical products exported upon the human health and environment, ETİ SODA has completed the regulations determined in the REACH Legislation.

According to the GHS Hazard statement, Sodium Carbonate reported as H319: Causes serious eye irritation.

Use of Material and Energy Resources for 1000 kg of Sodium Bicarbonate

Non - Renewable Resources					
Parameter		Unit	Upstream Raw Materials	Core Production	Total
Material	Trona	kg	0	1176	1176
	Gravel	kg	4	0.493	4
	Others	kg	1.26	0.353	1.62
Energy	Uranium	MJ	28.4	0.791	29.2
	Coal	kg	2.59	7.80	10.4
	Oil, Crude	kg	4.39	0.14	4.53
Renewable Resources					
Parameter		Unit	Upstream Raw Materials	Core Production	Total
Energy	Biomass	MJ	582	0.527	583
	Geothermal	MJ	0.111	0.009	0.12
	Wind	MJ	0.657	3.020	3.68
	Hydropower	MJ	6	30	60
Water Use					
Parameter		Unit	Upstream Raw Materials	Core Production	Total
Total amount of water		m3	0.08	0.07	0.15
Direct amount of water used by the core process		m3	-	0.71	0.71

Waste Production for 1000 kg of Sodium Bicarbonate

Waste Production				
Parameter	Unit	Upstream Raw Materials	Core Production	Total
Hazardous waste	kg	-	4.87E-05	4.87E-05
Non-hazardous waste	kg	-	0.59	0.59
Radioactive waste	kg	-	0	0
Material subject for recycling	kg	-	0	0

Potential Environmental Impacts for 1000 kg of Sodium Bicarbonate

Environmental Impacts				
Parameter	Unit	Upstream	Core	Total
		Raw Materials	Production	
Global Warming Potential (including land use and biogenic carbon)	kg CO2 eq.	15.38	16.96	32.34
Global Warming Potential (including land use, excluding biogenic carbon)	kg CO2 eq.	10	14	24
Ozone Depletion Potential	kg CFC11 eq.	1.03E-06	3.55E-07	1.39E-06
Ozone Creation Potential	kg ethene eq.	6.24E-03	3.85E-03	1.01E-02
Acidification Potential	kg SO2 eq.	0.070	0.096	0.167
Oxygen depletion potential (expressed as the sum of eutrophication potential, EP)	kg PO43- eq.	0.009	0.009	0.019
Abiotic depletion potential for non-fossil resources	kg Sb eq.	4.04E-05	1.89E-06	4.23E-05
Resource depletion	MJ eq.	352	57	409
Freshwater eutrophication	kg P eq	6.40E-04	1.63E-03	2.27E-03
Marine eutrophication	kg N eq	2.46E-03	1.35E-03	3.81E-03
Human toxicity, cancer	CTUh	2.17E-07	2.89E-08	2.46E-07
Human toxicity, non-cancer	CTUh	1.59E-06	6.28E-07	2.22E-06
Freshwater ecotoxicity	CTUe	10	3	13

Other Environmental Indicators for Sodium Bicarbonate

Air, Water and particulates emissions are declared according to the “Life Cycle Metrics for Chemical Products” (WBCSD Chemicals, 2014). All emission parameters are calculated from CML-IA baseline V3.04 / EU25 method Inventory outputs in Simapro v8.4.

Additional Environmental Indicators for Sodium Bicarbonate

Biotic matter is not used as feedstock and ends up in the chemical product. To provide the safety of the chemical products exported upon the human health and environment, ETİ SODA has completed the regulations determined in the REACH Legislation.

According to the GHS Hazard statement, there is no harmonised classification and there are no notified hazards by manufacturers, importers or downstream users for this substance.

Other Environmental Indicators

Water Emissions for 1000 kg of Sodium Carbonate				
Parameter	Unit	Upstream	Core	Total
		Raw Materials	Production	
Chloride	kg	0.417	0.114	0.532
Sodium	kg	0.242	0.037	0.279
COD, Chemical Oxygen Demand	kg	0.064	0.012	0.076
BOD5, Biological Oxygen Demand	kg	0.063	0.012	0.075

Air Emissions for 1000 kg of Sodium Carbonate				
Parameter	Unit	Upstream	Core	Total
		Raw Materials	Production	
Carbon dioxide, fossil	kg	8	16	23
Nitrogen oxides	kg	0.022	0.029	0.051
Sulfur dioxide	kg	0.026	0.059	0.085
Carbon monoxide, fossil	kg	0.014	0.010	0.025
Methane, fossil	kg	0.042	0.026	0.067
Non-methane volatile organic compounds	kg	0.011	0.005	0.016
Particulates	kg	0.022	0.109	0.130

Water Emissions for 1000 kg of Sodium Bicarbonate				
Parameter	Unit	Upstream	Core	Total
		Raw Materials	Production	
Chloride	kg	0.072	0.107	0.178
Sodium	kg	0.027	0.025	0.052
COD, Chemical Oxygen Demand	kg	0.040	0.002	0.042
BOD5, Biological Oxygen Demand	kg	0.038	0.002	0.040

Air Emissions for 1000 kg of Sodium Bicarbonate				
Parameter	Unit	Upstream	Core	Total
		Raw Materials	Production	
Carbon dioxide, fossil	kg	13	16	29
Nitrogen oxides	kg	0.077	0.001	0.078
Sulfur dioxide	kg	0.047	0.031	0.078
Carbon monoxide, fossil	kg	0.044	0.007	0.051
Methane, fossil	kg	0.066	0.029	0.094
Non-methane volatile organic compounds	kg	0.030	0.003	0.033
Particulates	kg	0.030	0.128	0.158

References

ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework

ISO 14044: 2006 Environmental management -- Life cycle assessment -- Requirements and guidelines

ISO 14025: 2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

The International EPD® System / www.environdec.com

The International EPD® System / The General Programme Instructions / http://www.environdec.com/tr/The-International-EPD-System/General-Programme-Instructions/

PCR for Basic inorganic chemicals n.e.c. / The International EPD® System / http://environdec.com/en/PCR/Detail/?Pcr=8313

Ecoinvent 3.3 / http://www.ecoinvent.org/

SimaPro LCA Software / https://simapro.com/

Eti Soda Production Marketing Transportation and Electricity Generation Industry and Trade Inc. / http://www.etisoda.com/en/about-us.html

Life Cycle Metrics for Chemical Products (WBCSD Chemicals, 2014). / http://www.wbcsd.org/Projects/Chemicals/Resources/Life-Cycle-Metrics-for-Chemical-Products

Product Category Rules (PCR) review was conducted by:
The Technical Committee of the International EPD® System. Chair: Lars-Gunnar Lindfors
Contact via info@environdec.com

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

☐ EPD process certification ☒ EPD verification

Third party verifier:

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Accredited or approved by: The International EPD® System

Owner of the Declaration

ETİ SODA

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