

# Environmental Product Declaration



In accordance with ISO 14025:2006 for:

***$\epsilon$ -caprolactam***

from

**Spolana s.r.o.**

***Spolana***

Programme:

The International EPD® System, [www.environdec.com](http://www.environdec.com)

Programme operator:

EPD International AB

EPD registration number:

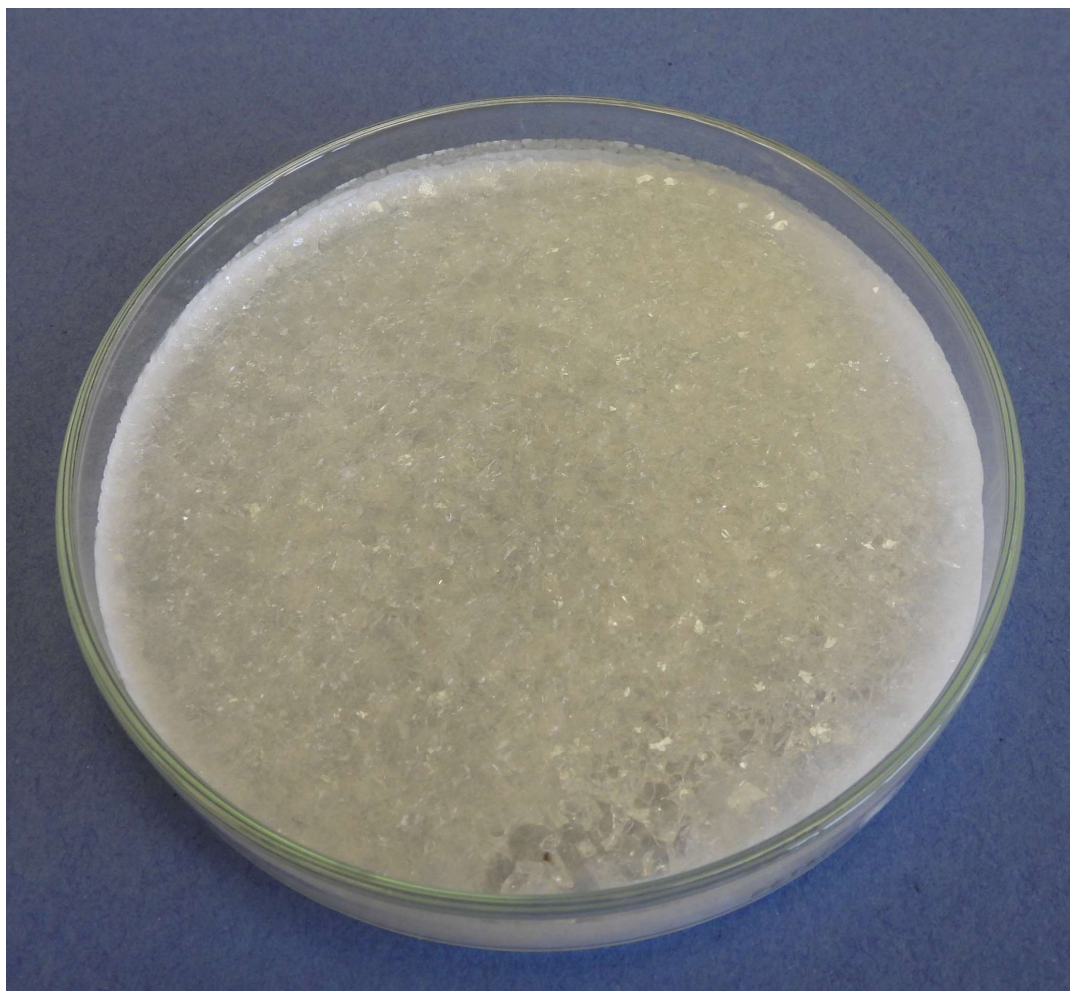
S-P-08833

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## Programme information

<b>Programme:</b>	<p>The International EPD® System</p> <p>EPD International AB Box 210 60 SE-100 31 Stockholm Sweden</p> <p><a href="http://www.environdec.com">www.environdec.com</a> <a href="mailto:info@environdec.com">info@environdec.com</a></p>
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### Accountabilities for PCR, LCA and independent, third-party verification

#### Product Category Rules (PCR)

PCR: Basic Chemicals, 2021:03, version 1.1., 2022-01-14

PCR review was conducted by: The Technical Committee of the International EPD® System. Chair of the PCR review is Lars-Gunnar Lindfors. The review panel may be contacted via [info@environdec.com](mailto:info@environdec.com).

#### Life Cycle Assessment (LCA)

LCA accountability: LCA Studio s.r.o.  
Ing. et Ing. Tatiana Trecáková, Ph.D., prof. Ing. Vladimír Kočí, Ph.D., MBA  
Šárecká 1962/5, 16000 Prague 6, Czech Republic  
[www.lcastudio.cz](http://www.lcastudio.cz)



#### Third-party verification

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

EPD verification by individual verifier

Third-party verifier: Hüdai Kara, PhD., Metsims Sustainability Consulting, United Kingdom  
[www.metsims.com](http://www.metsims.com)



Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third-party verifier:

Yes  No

## Company information

Owner of the EPD: SPOLANA s.r.o. ,Práce 657, 277 11 Neratovice, Czech Republic, E-Mail: info@spolana.cz

Description of the organisation: Spolana is the only producer of PVC (sold under the brand name Neralit®) and caprolactam in the Czech Republic. It also produces hydrochloric acid, oleum and sulphuric acid. It also produces fertiliser, which is produced in the manufacture of caprolactam containing nitrogen in ammonium form and also sulphur in the form of sulphate anion. It also contains a small admixture of ammonium nitrate, the concentration of which does not exceed 1,5 %. It is used for direct fertilisation. The fertiliser is sold under the brand name Spolsan® and is available in crystalline and granular form.

Product-related or management system-related certifications: Certificates of Approvals for ISO 9001, ISO 14001, ISO 45001, ISO 50001, RESPONSIBLE CARE

Name and location of production site: Neratovice, Czech Republic

## Product information

Product name: ε-caprolactam

Product identification: Organic heterocyclic substance, CAS 105-60-2

Product description: Caprolactam is produced via Beckmann rearrangement, which is the conversion of cyclohexanone to caprolactam through the oxime with the help of catalyst - sulphuric acid, which is the most commonly used acid for commercial lactam production. Caprolactam is the feedstock in the production of Nylon 6. Product is supplied in flake or fused form. It is the basic raw material for the production of polyamide 6, which is used thereafter in the textile or plastics industry. Polyamide fibres have a very broad range of uses in the production of nylon and polycaprolactam mesh (perlon). Its flexibility means that it is used primarily in the production of sports clothing and other sporting equipment - e.g. for water sports, winter sports, or mountaineering and mountain climbing. Caprolactam is readily biodegradable.

UN CPC code: 34160

Other codes for product classification: CZ-CPA 20.14.52

Geographical scope: Europe

## LCA information

Functional unit / declared unit: Declared unit is 1 kg of caprolactam

Time representativeness: Site specific data from producer are based on 1 year average for process data (reference year 2021). Time scope less than 10-years were applied for background data. Time scope less than 2-years were applied for specific data.

Database(s) and LCA software used: GaBi software, GaBi database and ecoinvent database

Description of system boundaries: cradle-to-grave

In the following system diagram, boundaries using modules included in the study are visualized.

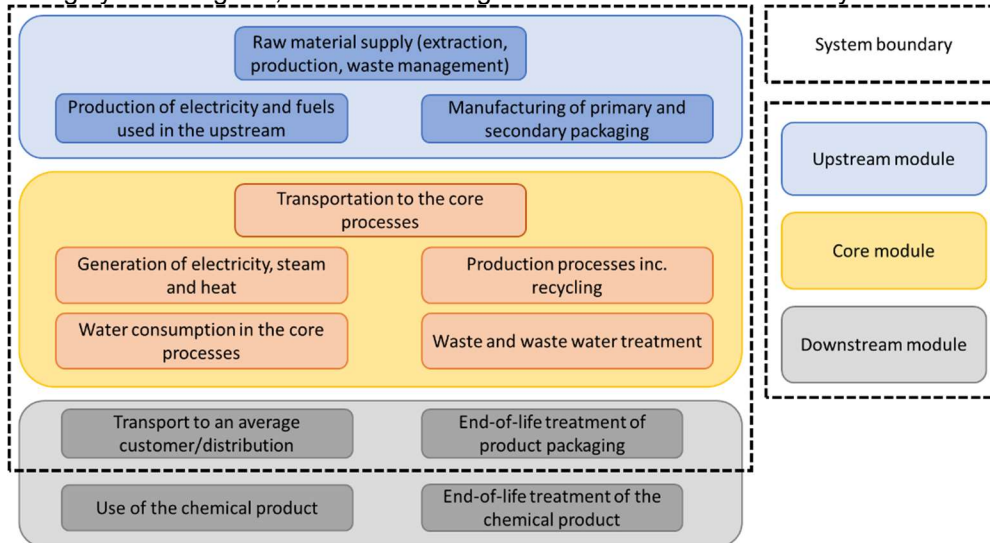


Figure 1 System boundary of the LCA study conducted on caprolactam produced by Spolana

Excluded lifecycle stages: End-of-life of the chemical product and use phase are excluded.

In accordance with PCR, end-of-life treatment of the chemical products is excluded, because all following criteria are fulfilled:

- the product is physically integrated with other products in subsequent life-cycle process so they cannot be physically separated from them at end of life,
- the product or material is no longer identifiable at end-of-life as a result of a physical or chemical transformation process,
- the product or material does not contain biogenic carbon, and
- the EPD shall not be used for business-to-consumer communication.

According to the PCR, it is not mandatory to declare any quantitative information about the use and end-of-life phases as most basic chemical products have many different applications and are often used as input materials to other production processes.

More information:

Cut off rules: The cut-off criterion was chosen based on the used PCR. According to the used PCR, more than 99 % of flows were included.

Allocations: The chemical production is complex where more than one product can be produced within one technological unit. In this case, the technological unit is divided into sub-processes in order to specify inputs and outputs related to a specific output (product or internal product). All internally produced intermediate products that are used in the production of final products have been modelled on the basis of site specific data. Also, internally produced energy carriers were modelled on the basis of site specific data. In the case of produced energy (heat) in the production of hydroxylamine, the allocation rule based on carbon footprint of thermal energy from natural gas is applied.

Geographical scope: Europe, Global

Electricity consumption: Generation of electricity consumed within Spolana production was based on the Czech residual electricity grid mix.

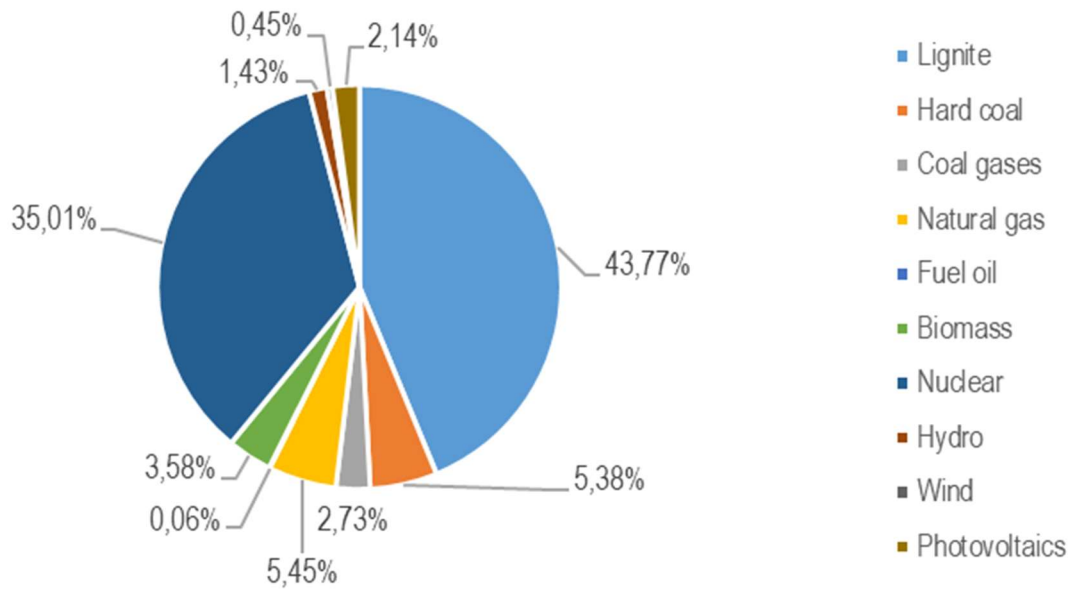


Figure 2 Residual grid mix from GaBi (Sphera, 2017)

## Content declaration

### Product

Product components	Unit	%	Environmental / hazardous properties
ε-caprolactam	wt.	100	Acute Tox. 4, Eye Irrit. 2, Skin Irrit. 2, STOT SE 3

### Packaging

Distribution packaging: no packaging is used, product is distributed in tankers

### Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product: no recycled materials used in the product

## Environmental performance

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

### Potential environmental impact

PARAMETER		UNIT	Upstream	Core	Downstream	TOTAL
Global warming potential (GWP)	Fossil	kg CO <sub>2</sub> eq.	2.91E+00	3.31E+00	6.44E-02	6.28E+00
	Biogenic	kg CO <sub>2</sub> eq.	1.30E-02	6.79E-03	-8.74E-05	1.97E-02
	Land use and land transformation	kg CO <sub>2</sub> eq.	1.88E-04	1.02E-04	3.54E-04	6.44E-04
	TOTAL	kg CO <sub>2</sub> eq.	2.92E+00	3.32E+00	6.46E-02	6.30E+00
Ozone layer depletion (ODP)		kg CFC 11 eq.	4.25E-09	4.93E-12	1.03E-14	4.25E-09
Acidification potential (AP)		kg mol H <sup>+</sup> eq.	2.87E-03	5.94E-03	6.48E-05	8.87E-03
Eutrophication potential (EP)	Aquatic freshwater	kg P eq.	6.40E-06	1.78E-06	1.90E-07	8.37E-06
	Aquatic marine	kg N eq.	9.08E-04	1.60E-03	2.09E-05	2.53E-03
	Aquatic terrestrial	mol N eq.	9.82E-03	1.64E-02	2.48E-04	2.65E-02
Photochemical oxidant creation potential (POCP)		kg NMVOC eq.	3.91E-03	4.44E-03	5.77E-05	8.41E-03
Abiotic depletion potential (ADP)	Metals and minerals	kg Sb eq.	4.88E-07	1.48E-07	5.39E-09	6.41E-07
	Fossil resources	MJ, net calorific value	7.52E+01	3.69E+01	8.63E-01	1.13E+02
Water deprivation potential (WDP)		m <sup>3</sup> world eq.	-2.59E-02	1.90E-01	6.19E-04	1.65E-01

### Use of resources

PARAMETER		UNIT	Upstream	Core	Downstream	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	2.39E+00	1.64E+00	5.03E-02	4.08E+00
	Used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	2.39E+00	1.64E+00	5.03E-02	4.08E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	7.52E+01	3.70E+01	8.65E-01	1.13E+02
	Used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	MJ, net calorific value	7.52E+01	3.70E+01	8.65E-01	1.13E+02
Net use of fresh water		m <sup>3</sup>	5.07E-03	9.41E-02	5.76E-05	9.92E-02

## Waste production and output flows

### Waste production

PARAMETER	UNIT	Upstream	Core	Downstream	TOTAL
Hazardous waste disposed	kg	7.94E-09	5.26E-09	5.08E-12	1.32E-08
Non-hazardous waste disposed	kg	1.97E-02	1.01E-02	1.25E-04	2.99E-02
Radioactive waste disposed	kg	2.73E-04	1.75E-03	3.38E-06	2.03E-03

### Other environmental indicators

PARAMETER	UNIT	Upstream	Core	Downstream	TOTAL
Particulate matter	Disease indices	1.85E-08	3.30E-08	3.98E-10	5.19E-08
Ionising radiation. human health	kBq U235 eq.	2.90E-02	1.28E-01	4.95E-04	1.57E-01
Ecotoxicity. freshwater	CTUe	3.36E+01	1.04E+01	5.94E-01	4.46E+01
Human toxicity. cancer	CTUh	8.56E-10	2.85E-10	1.20E-11	1.15E-09
Human toxicity. non-cancer	CTUh	4.12E-08	1.92E-08	6.21E-10	6.10E-08
Land use	Pt	1.66E+00	2.59E+00	2.93E-01	4.54E+00

## References

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

Product Category Rules (PCR) document for Basic Chemicals (PCR 2021:03 Version 1.1. 2022-01-14)

ISO 14020:2000 Environmental labels and declarations — General principles. 2000-09

ISO 14025: EN ISO 14025:2006-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework. 2006-07

ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines. 2006-07

Ecoinvent: Ecoinvent Centre. [www.Eco-invent.org](http://www.Eco-invent.org)

Sphera: GaBi software version 10. 2021. Sphera solutions

Spolana: [www.spolana.cz](http://www.spolana.cz)



