



ENVIRONMENTAL PRODUCT DECLARATION (EPD) CERTIFIED



BIRRIFICIO ANGELO PORETTI 5 LUPPOLI BOCK CHIARA® and BIRRIFICIO ANGELO PORETTI 6 LUPPOLI BOCK ROSSA® BEER

RINA	HEAD OFFICE Via Corsica, 12 16128 GENOVA
	ENVIRONMENTAL PRODUCT DECLARATION (EPD) VALIDATION IN COMPLIANCE WITH THE REQUIREMENT'S GENERAL PROGRAMME INSTRUCTIONS FOR EPD V. 3.0
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Laura Severino Sustainability & Food Certification Compliance, Head	
RINA Services S.p.A.	
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International EPD® operated by EPD International AB
CPC code: 24310 – Beer made from malt (<http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=9&Lg=1&Co=24310>)
Geographical scope of application: Europe
Environmental Product Declaration Certificated – Registration Number: S-P-00314
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1. SCOPE OF THE DECLARATION

This document, known as an EPD (Environmental Product Declaration), is aimed at those interested in understanding and verifying the environmental impact generated through the entire life cycle of Birrificio Angelo Poretti 5 Luppoli Bock Chiara® and Birrificio Angelo Poretti 6 Luppoli Bock Rossa® beer. The document provides a reliable quantification and certification of the environmental performance of the product, according to a scientific methodology that contemplates the impacts of the product's life cycle, the Life Cycle Assessment – LIFE CYCLE ASSESSMENT (ISO 14040-14044). *An EPD should provide current information, and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com*".

2. COMPANY DESCRIPTION

The story of Carlsberg Italy dates back almost two centuries to 1876, when Angelo Poretti founded the Induno Olona establishment that took the name Poretti Industries.

It was only after the war that Poretti industries, one of the cornerstones of beer production in Italy, attracted the interest of an international group that in the 1970s began to broaden their horizons: the United Breweries Group A/S (which later took the name of the Carlsberg Group), was born from the merger in 1970 of two historical Danish companies, Carlsberg and Tuborg. In 1975 the industries signed with the Danish group the first agreement for the production and marketing of the Tuborg and Carlsberg brands.

This innovative agreement proved decisive for the fortune of Poretti industries, as the Carlsberg Group acquired the company's shares over the years and in 1998 became Carlsberg Italy, and in 2002 became wholly Danish.

Today, Carlsberg Italy manufactures and sells approximately 1 million and 500 thousand hectolitres of beer through the following brands: Carlsberg, Tuborg, BAP 4 Luppoli Originale, BAP 5 Luppoli Bock Chiara and BAP 6 Luppoli Bock Rossa, Kronenbourg 1664 (covered by certified EPDs), BAP 3 Luppoli, BAP 7 Luppoli, BAP 8 Luppoli, BAP 9 Luppoli, BAP 10 Luppoli, Carlsberg Elephant, Carlsberg Special Brew, Tuborg Light, Corona-Extra, Splügen, Holsten, Tucher, Negra Modelo, Modelo Especial, Devil's Kiss, Super Devil's Kiss, Grimbergen and Felschlösschen.

Carlsberg Italy, moreover, through the acquisition of numerous companies of beverage distributors throughout Italy, has created Carlsberg Ho.Re.Ca, the distribution network dedicated to the Ho.Re.Ca (*Hotellerie-Restaurant-Café*) channel that offers an extensive catalogue of products and services able to meet all the various needs and strategies of sales outlets.

Since February, 9th 2005 the production factory of Induno Olona, in which are produced Carlsberg Italia beers, has incorporated an environmental management system conforming to ISO 14001: 2004, certified by Lloyds's Quality Assurance register (certificate of approval No.: LRC 141249/14).

The environmental management system applies to:

"the production of beer from the receiving of raw materials up to the consignment of the finished product to the pallet".

3. PRODUCT DESCRIPTION

3.1. Characteristics

The characteristics of the product covered by this statement are the beer brand Birrificio Angelo Poretti 5 Luppoli Bock Chiara® and Birrificio Angelo Poretti 6 Luppoli Bock Rossa®, produced by Carlsberg Italy at its plant in Induno Olona and intended for sale at pubs, bars, restaurants and points of sale of mass retail channels.

The identifier of the product according to the classification CPC (Central Product Classification) is: Beer made from malt – CPC 2431.

The same product is evaluated in two different distribution scenarios:

- Draught Master Modular 20 (DM Modular 20) kegs of 20 l;
- Disposable glass bottles of 33 cl.

For the two distribution scenarios, the shelf life of the beer within specific containers was considered as follows:

- 9 months for beer stored in DM Modular 20 kegs;
- 15 months for beer in glass bottles.

Regarding the annual consumption of beer per year, the size of the container, as well as the shelf life have an impact on the quantity of product purchased from outlets, and therefore on the frequency of supply of each store.

The composition of the product as supplied in three different containers is as follows (values in kg)¹:

DM Modular 20 keg (100 l – 5 kegs)			Glass Bottle (100 l – 303 bottles)		
Beer ²	100	95,3%	Beer	100	61,97%
Keg (78% PET, 21% PP, other <1%)	1,50	1,4%	Bottle (glass, 40% recycled)	57,58	35,68%
Packaging (paperboard)	3,49	3,3%	Cap POC (aluminium)	0,61	0,38%
			Label (paper)	0,16	0,10%
			Packaging for selling unit	2,93	1,82%

3.2. Functional Unit

The functional unit is represented by **100 l of beer drummed/bottled and delivered to final consumers** (pubs, bars, restaurants, mass retail channel points of sale).

The functional unit is based on the production during the reference year 2018, and represents the reference unit of all results of this Declaration.

¹ In the current study both primary and secondary packaging are included and the recycled content of packaging materials has been measured “post consumer”

² Beer density assumed to be 1 kg/l

3.3. Declaration of Contents

5 Luppoli Bock Chiara is a beer made of barley malt and maize, of low fermentation, belonging to the Lager segment. The product has a round and consistent body and a fruity aroma, both balanced by a strong bitter taste not particularly marked³.

The product characteristics are as follows:

PRODUCT CHARACTERISTICS	
COMMERCIAL CAT.	Specialty
LEGAL CAT.	Double Malted
STYLE	Bock
COLOR TYPE	Pale
FOAM	Thin, Adherent
ASPECT	Clear
COLOR	Rich Gold
AROMA INTENSITY	Normal
AROMA ELEGANCE	Rich
CARBONATION	Moderate
BODY	Round
BITTERNESS	Moderate
BALANCED TASTE	Intense
STRENGTH OF AFTERTASTE	Rich
DURATION OF AFTERTASTE	Moderate
RAW MATERIALS	Water
	Malt
	Glucose syrup
	Maize
	Hops

PRODUCT SPECIFICS	
ALCOHOL CONTENT	6,5% alc. vol.
ATTENUATION	65%
REAL EXTRACT	5,0%
COLOR	13,0
BITTER UNITS (BU)	31

NUTRITIONAL INFORMATION PER 100 ml OF PRODUCT	
ENERGY	56 kcal (231 kJ)
PROTEIN	0,3 g
FAT	0,0 g
CARBOHYDRATES	5,0 g

6 Luppoli Bock Rossa is a beer made of Munich barley malt and maize, of low fermentation, belonging to the Lager segment. The product has a round and consistent body and a roasted cereal aroma, with marked caramel and liquorice fragrances.

The product characteristics are as follows:

PRODUCT CHARACTERISTICS	
COMMERCIAL CAT.	Specialty
LEGAL CAT.	Double malt
STYLE	Bock
COLOR TYPE	Amber
FOAM	Thin
ASPECT	Clear
COLOR	Rich Amber
AROMA INTENSITY	Intense
AROMA ELEGANCE	Fine

PRODUCT SPECIFICS	
ALCOHOL CONTENT	6,5% alc. vol.
ATTENUATION	65%
REAL EXTRACT	5,0%
COLOR	35,0
BITTER UNITS (BU)	31

NUTRITIONAL INFORMATION PER 100 ml OF PRODUCT	
ENERGY	56 kcal (231 kJ)

³ All characteristics reported in this chapter refer to a classification used in beer world, developed by a trade magazine in 1994 with Assobirra partnership and with brewer technician association AITB support.

CARBONATION	Average	PROTEIN	0,3 g
BODY	Structured	FAT	0,0 g
BITTERNESS	Accentuated	CARBOHYDRATES	5,0 g
BALANCED TASTE	Bitter		
STRENGTH OF AFTERTASTE	Rich		
DURATION OF AFTERTASTE	Intense		
RAW MATERIALS	Water		
	Barley Malt		
	Glucose Syrup		
	Maize		
	Hops		

3.4. Description of the Production Process

Beer production can be divided into three main phases: cooking the wort, fermentation, and filtration.

During the first stage, which takes place in the cooking room, the barley malt is milled until a certain type of flour is obtained. This is then mixed with hot water, thereby obtaining the wort (the brew).

The liquid part of the wort is separated from the solid part through filtration and grains, through which a waste product is obtained, recovered and sold on as animal feed. In this respect, the environmental impacts associated with the percentage of barley malt, which contributes to the production of spent grains, have already been allocated and therefore are not borne by the present LCA study. Allocation of environmental impacts of spent grains is based on mass.

The next step is to filter the wort cooking inside appropriate boilers. This is essential for the type of beer to be produced and the sterilization of the wort. It is during this phase that hops are also added. During boiling, insoluble complexes are formed that constitute the so-called trub, that is eliminated through clarification.

The next stage is that of fermentation. The wort is cooled down to temperatures which allow fermentation to occur, oxygen is then injected in the process at an early stage, which takes place under aerobic conditions.

Next is the addition of yeast and the fermentation process itself. From this process we have the production of CO₂, which is almost entirely recovered to be used in other production phases in which it is required.

At the end of fermentation, the beer is left in maturing tanks so that residues of yeast can settle on the bottom.

The final phase is that of filtration, where the beer undergoes a series of operations to remove residues of yeast and other murky substances present, therefore, such a stabilisation process is designed to make the beer unalterable before being drummed or bottled. The bottling and packaging process of the bottles consists of the following phases: depalletizing empty bottles, washing, filling, pasteurization, labelling, packaging, palletizing. In the drumming process, the drums are blown and labelled, filled, closed and transferred to packaging in cardboard boxes. The can packaging line carries out the following phases: depalletizing empty cans, washing, filling, pasteurization, packaging, palletizing.

3.5. The Boundaries of the Analysed System

The system boundaries analysed in the LCA study include all phases of the life cycle of production of beer, from the cultivation of ingredients to the disposal of kegs and bottles after consumption.

In particular, the system includes the following life cycle phases:

- "upstream processes"⁴:
 - the production phase of kegs, bottles and cans (including all related packaging materials, of all typologies and with the highest degree of detail achievable);
 - the production phase and transport of raw materials and ancillary materials for the beer production process;
- "core processes":
 - the beer production phase;
 - the beer keggling and bottling phases;
 - transport of all the input of the production process;
- "downstream processes":
 - the phases of distribution of the finished product;
 - maintenance activities of plants located at final points of sale;
 - consumption occurring during usage phase of beer lines, included cooling of the product;
 - the end of life phases of the packaging of the product (transport to disposal and collection centres, landfill disposal and potential recovery of materials and energy⁵).

Emissions associated to production of used electricity are ascribed to phases where consumption occurs.

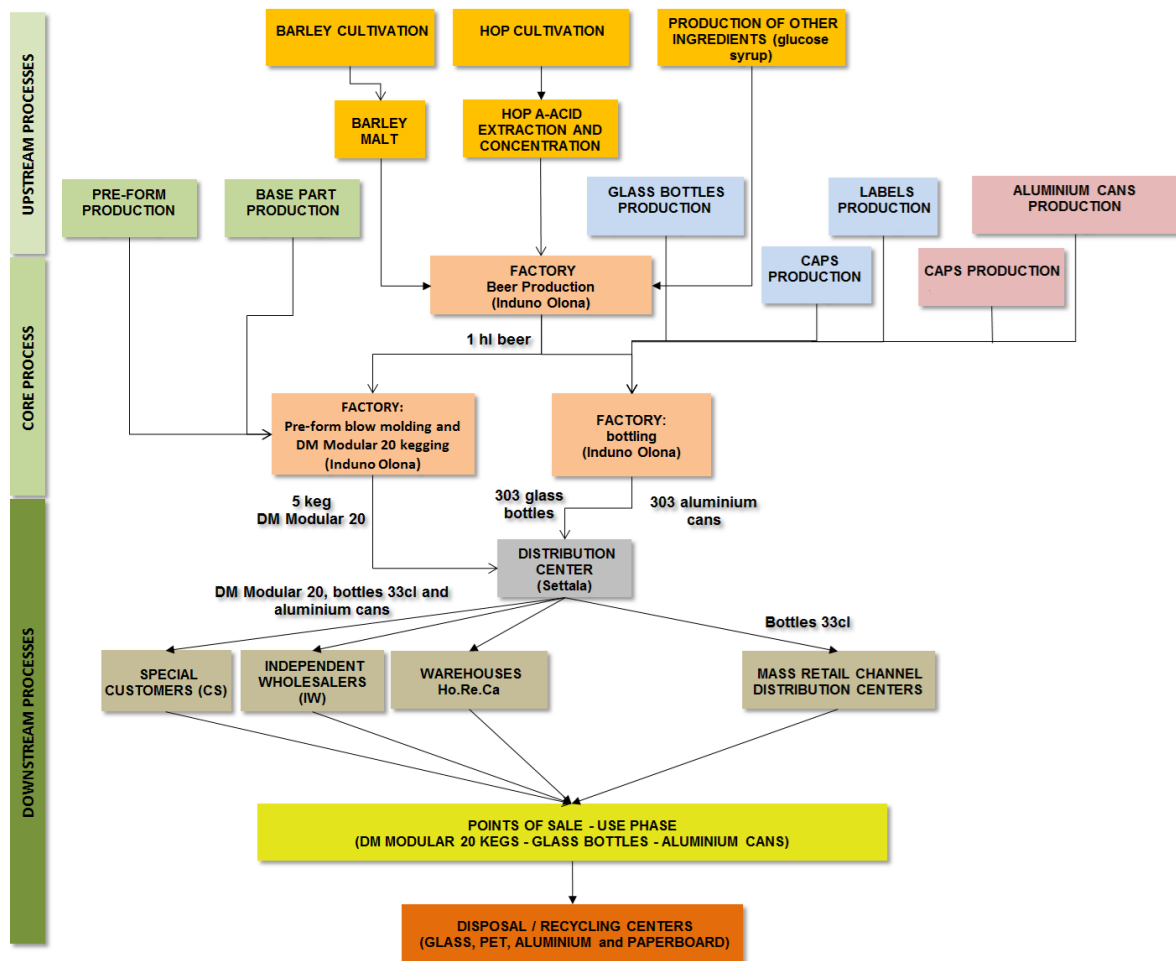
Excluded from the system boundaries are the environmental loads associated with construction and maintenance of production facilities.

To assure the homogeneity of the results, a unique distribution scenario of finished product has been adopted, defined on the base of weighted average distances for each route on all distribution channels actually used during the reference year. For the reported brand, the total distribution distance is 449 km.

The boundaries of the system are schematically represented in the figure below:

⁴ In the "General Programme Instructions" of the international EPD® IEC (www.environdec.com) "upstream processes" are considered as those which include the acquisition of raw materials and semi-finished or intermediate components, "core process" those undertaken in the establishment of production of products covered by the EPD, "downstream processes" processes related to the use phase and end of life scenario.

⁵ For plastic, glass, paper and aluminium end of life scenarios, national percentages published in the annual Sustainability report of Consorzio Nazionale Imballaggi (CONAI) (data 2018) were used.



3.6. Time Periods and Data Sources

The comparability between EPDs of different products must also be ensured on the basis of time. To this end, it is clarified that the LCA study that gave rise to this EPD refers to the production of beer Birrificio Angelo Poretti 5 Luppoli Bock Chiara® and Birrificio Angelo Poretti 6 Luppoli Bock Rossa® in the establishment in Induno Olona in one calendar year. The base year for the data and indicators presented in this EPD is 2018.

The data used for the LCA were directly measured at the establishment of Induno Olona and supplied directly by the main suppliers of the plant. According to *General Programme Instructions* “other generic” data do not exceed 10%.

Excluded from the system, due to their contribution lower than 1% on total impacts, are:

- the supply of yeast;
- additives of the beer recipe.

4. DECLARATION OF ENVIRONMENTAL PERFORMANCE

All data quantities below relate to the functional unit chosen for the EPD: 100L of beer bottled/barrelled and delivered to final consumers (at pubs, bars, restaurants). Since the PCR (Product Category Rules) were updated, the results reported in the current EPD cannot be compared to previous versions.

Reported data refer to both 5 Luppoli Bock Chiara and 6 Luppoli Bock Rossa beer and they are presented together considering that impact differences between the two products are lower than 5%.

✓ POTENTIAL IMPACTS

BEER IN DM MODULAR 20 KEG

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Global warming potential (GWP)	Fossil	kg CO ₂ eq.	19,12	7,89	19,51	46,52
	Biogenic	kg CO ₂ eq.	0,27	0,06	0,34	0,67
	Land use and land transformation	kg CO ₂ eq.	2,07E+00	2,50E-03	4,39E-03	2,08
	TOTAL	kg CO ₂ eq.	21,46	7,95	19,85	49,27
Acidification potential (AP)		kg SO ₂ eq.	0,183	0,042	0,136	0,36
Eutrophication potential (EP)		kg PO ₄ ³⁻ eq.	0,136	0,009	0,020	0,17
Photochemical oxidant formation potential (POFP)		kg NMVOC eq.	0,078	0,021	0,075	0,17
Abiotic depletion potential – Elements		kg Sb eq.	2,35E-05	8,97E-06	4,77E-05	8,01E-05
Abiotic depletion potential – Fossil fuels		MJ, net calorific value	233,53	108,97	240,82	583,32
Water scarcity potential		m ³ eq.	8,12	12,37	9,69	30,18

BEER IN GLASS BOTTLE

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Global warming potential (GWP)	Fossil	kg CO ₂ eq.	7,74E+01	12,86	25,54	115,76
	Biogenic	kg CO ₂ eq.	0,48	0,06	0,77	1,31
	Land use and land transformation	kg CO ₂ eq.	2,03E+00	2,67E-03	5,80E-03	2,04
	TOTAL	kg CO ₂ eq.	79,87	12,93	26,31	119,11
Acidification potential (AP)		kg SO ₂ eq.	0,496	0,053	0,172	0,72
Eutrophication potential (EP)		kg PO ₄ ³⁻ eq.	0,172	0,011	0,026	0,21
Photochemical oxidant formation potential (POFP)		kg NMVOC eq.	0,266	0,035	0,129	0,43
Abiotic depletion potential – Elements		kg Sb eq.	2,73E-04	1,30E-05	6,20E-05	3,48E-04
Abiotic depletion potential – Fossil fuels		MJ, net calorific value	745,77	167,77	330,50	1.244,04
Water scarcity potential		m ³ eq.	134,01	13,83	9,97	157,81

✓ RESOURCE USE

BEER IN DM MODULAR 20 KEG

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	140,86	17,49	65,62	223,96
	Used as raw materials	MJ, net calorific value	2,75E-03	2,59E-03	7,70E-03	1,30E-02
	TOTAL	MJ, net calorific value	140,86	17,49	65,62	223,97
Primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	389,72	124,20	280,41	794,33
	Used as raw materials	MJ, net calorific value	69,52	-	-	69,52
	TOTAL	MJ, net calorific value	459,24	124,20	280,41	863,85
Secondary material		Kg	3,52	0	0	3,52
Renewable secondary fuels		MJ, net calorific value	0	0	0	-
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	-
Net use of fresh water		m ³	0,85	0,17	0,26	1,27

BEER IN GLASS BOTTLE

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - Renewable	Used as energy carrier	MJ, net calorific value	191,51	16,99	67,49	276,00
	Used as raw materials	MJ, net calorific value	2,32E-02	2,59E-03	8,01E-03	0,03
	TOTAL	MJ, net calorific value	191,54	16,99	67,50	276,03
Primary energy resources – Non renewable	Used as energy carrier	MJ, net calorific value	998,62	183,11	371,99	1.553,72
	Used as raw materials	MJ, net calorific value	-	-	-	-
	TOTAL	MJ, net calorific value	998,62	183,11	371,99	1.553,72
Secondary material		Kg	49,71	0	0	49,71
Renewable secondary fuels		MJ, net calorific value	0	0	0	-
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	-
Net use of fresh water		m ³	3,93	0,20	0,28	4,41

✓ OTHER INDICATORS

BEER IN DM MODULAR 20 KEG

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg	1,40E+00	2,19E+00	4,89E+00	8,47E+00
Non Hazardous waste disposed	kg	4,83E-04	2,75E-04	1,00E-03	1,76E-03
Radioactive waste disposed	kg	3,22E-03	4,31E-04	1,31E-03	4,96E-03
PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	kg	-	-	-	-
Material for recycling	kg	-	-	3,53	3,53
Materials for energy recovery	kg	-	-	0,93	0,93
Exported energy, electricity	kg	-	-	-	-
Exported energy, thermal	kg	-	-	-	-

BEER IN GLASS BOTTLE

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg	6,34E+00	5,42E+00	1,56E+01	2,73E+01
Non Hazardous waste disposed	kg	5,36E-03	3,20E-04	1,18E-03	6,87E-03
Radioactive waste disposed	kg	4,26E-03	6,93E-04	1,94E-03	6,89E-03
PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	kg	-	-	-	-
Material for recycling	kg	-	-	46,52	46,52
Materials for energy recovery	kg	-	-	0,25	0,25
Exported energy, electricity	kg	-	-	-	-
Exported energy, thermal	kg	-	-	-	-

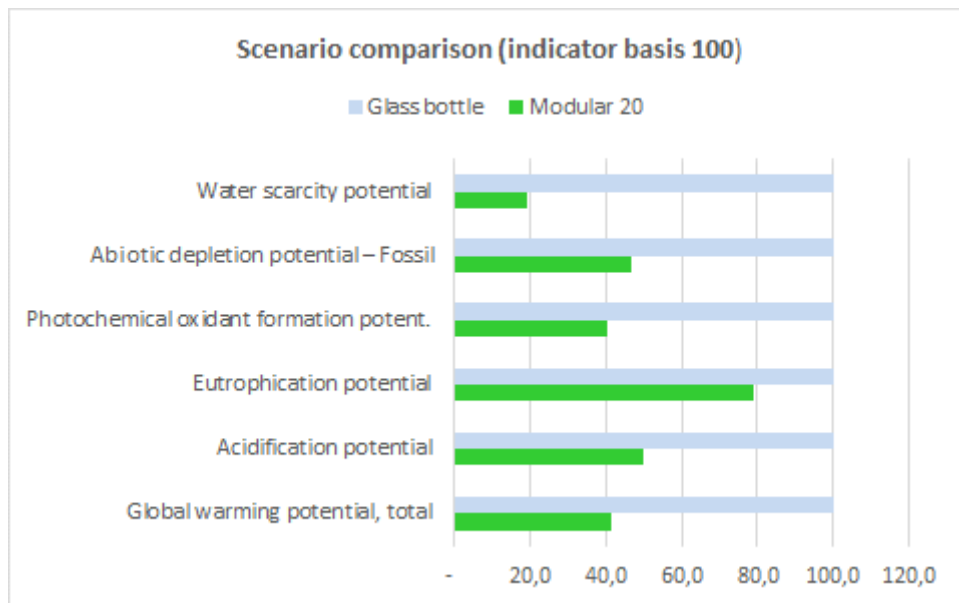
USE OF RECYCLED PACKAGING MATERIAL

BEER IN MODULAR 20 KEG	Cardboard (kg)	3,52
BEER IN GLASS BOTTLE	Glass (kg)	23,13
	Cardboard (kg)	3,18

5. INTERPRETATION OF THE RESULTS

The chart and graph shown below are useful to understand the environmental performance related to the life cycle of the beer brand Birrificio Angelo Poretti 5 Luppoli Bock Chiara® and Birrificio Angelo Poretti 6 Luppoli Bock Rossa® in the two distribution scenarios. It should be remembered that, for a strict comparison of environmental performance, indicators noted above should be compared with those related to competing products referring to the same functional unit.

Impact category	Unit	Bottle	Modular 20 keg
Global warming potential (GWP) - Total	kg CO2 eq.	119,11	49,27
			-59%
Acidification potential (AP)	kg SO2 eq.	0,72	0,36
			-50%
Eutrophication potential (EP)	kg PO43- eq.	0,21	0,17
			-21%
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	0,43	0,17
			-60%
Abiotic depletion potential – Elements	kg Sb eq.	0,00	0,00
			-77%
Abiotic depletion potential – Fossil fuels	MJ	1.244,04	583,32
			-53%
Water scarcity potential	m3 eq.	157,81	30,18
			-81%



6. CHANGES FROM PREVIOUS VERSION OF THE EPD

Compared to the previous version, this EPD is characterized by:

- update of the reference PCR, following the publication of the new "General Program Instructions" 3.0, with modification of some methods for measuring the impact indicators;
- "SimaPro 9.0" LCA software update, with related updated databases.

Therefore, the results reported in this EPD cannot be compared with previous studies.

7. INFORMATION FROM THE ORGANISATION

The distribution technology in DM Modular 20 kegs in PET is associated with new dispensing equipment developed by Carlsberg Italy that replaces that traditionally used. Whilst the latest kegs dispense beer through applying CO₂ pressure inside the kegs, DM Modular 20 technology provides for the application of air pressure outside the body, thereby eliminating the use of CO₂ cylinders.

Managers of final sales outlets must dispose of the DM Modular 20 kegs, once exhausted, in the differentiated recycling of plastics, according to the directions of the local authorities. There is currently no system for returnable glass bottles, which must be disposed of in separate glass recycling as indicated by the local authorities.

Carlsberg Italy s.p.a., in accordance with the commitments set out in its environmental policy, approved under the environmental management system certificate ISO 14001, aims at pursuing pollution prevention, minimization of environmental impacts linked to production processes, optimizing the use of natural resources and continuous improvement of its environmental performance, has extended the use of the innovative solution DM Modular 20 to all produced and marketed brands, thus enhancing the environmental performance, as demonstrated by data presented in this EPD.

At present Carlsberg Italy s.p.a. has undergoing studies on new distribution opportunities of finished product through PET kegs of different dimension, subjected to Life Cycle Design studies, to limit environmental impacts of product life cycle.

8. INFORMATION FROM THE CERTIFICATION BODY

This EPD was approved by the certification body RINA Services S.p.a. (www.rina.org), accredited from ACCREDIA (Registration Number 001H), in compliance with the requirements of the standard "General Programme Instructions" of the international system EPD® (www.environdec.com) and of PCR 2011:21.

RINA Services S.p.a is member of international certification network IQNet (www.iqnet-certification.com).

Product category rules (PCR): Beer made from malt, PCR 2011:21, Version 2.1, CPC 24310.
PCR review was conducted by: The Technical Committee of the International EPD® System. Review chair: Adriana Del Borghi Contact via info@environdec.com .
Independent third-party verification of the declaration and data, according to ISO 14025:2006: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: <i>RINA Services S.p.A, Via Corsica 12, 16128 Genova, Italy, Tel: +39 010 53051, Fax: +39 010 5351000, www.rina.org</i> <i>Accredited by ACCREDIA: n. 001H</i>
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

The following information shall be considered:

- address of programme operator: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com
- "EPDs within the same product category but from different programmes may not be comparable."
- Carlsberg Italia has the sole ownership, liability and responsibility of the current EPD

9. REFERENCES

For LCA study and EPD declaration fulfilment, the following documents were used:

- General Programme Instructions (GPI) for Environmental Products Declarations (Version 3.0);
- PCR 2011:21 (Version 2.11);
- UN CPC 24310: Beer made from malt;

- LCA Analysis and Comparison between Distribution Scenario of Carlsberg, Tuborg, BAP 4 Luppoli Originale, BAP 5 Luppoli Bock Chiara and BAP 6 Luppoli Bock Rossa Beers, Kronenbourg (06/03/2018, Rev. 2);
- Databases required from reference PCR;
- *Ecoinvent 3.5* Database (<http://www.ecoinvent.ch>);
- Agrifootprint 3.0 Database (<http://www.agri-footprint.com>)
- “*The Carbon Footprint of Fat Tire® Amber Ale*”, *THE CLIMATE CO₂NSERVANCY*.

For disposal of kegs and bottles within differentiated waste collection, managers of final sales outlets must refer to directions of local authorities

Contacts for environmental product declaration:

Antonella Reggiori – Carlsberg Italia S.p.a

e-mail: antonella.reggiori@carlsberg.it

Fabio Iraldo – IEFE Bocconi

e-mail: fabio.iraldo@unibocconi.it

In realizing this EPD and the LCA study, which forms the scientific basis, Carlsberg Italia S.p.a. avails itself of technical and methodological support of a research team of **Bocconi University - Milan**, composed by **Prof. Fabio Iraldo** and **Doc. Matteo Donelli**.

10. GLOSSARY

LCA: Life Cycle Assessment is a methodology governed by the ISO 14040 series that aims to quantify the energy and environmental load of the life cycle of a product or activity, through the quantification of energy and waste materials and emissions (solid, liquid and gaseous) released into the environment from the extraction of raw materials to final waste disposal.

FUNCTIONAL UNIT: is the measurement unit to which all results listed in the EPD refer. That measurement serves as the basis for comparison to compare the data presented in two or more EPD's for products belonging to a specific category of homogeneous goods/services, i.e. the same PCR.

GREENHOUSE EFFECT: atmosphere global warming phenomenon, calculated for the next 100 years, due to the emission into the atmosphere of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), nitrogen protoxide (N₂O), etc.

ACIDIFICATION: lowering the pH of the soil, lakes, forests, due to the release of acidic substances into the atmosphere, with harmful effects on living organisms (e.g. "acid rain")

EUTROPHICATION: the reduction of required oxygen in water bodies and ecosystems due to the excessive intake of nutrients such as nitrogen and phosphorus

PHOTOCHEMICAL OXIDANT FORMATION POTENTIAL: formation of ozone in the earth's surface due to the release into the atmosphere of unburnt hydrocarbons and nitrogen oxides in the presence of

solar radiation. This phenomenon is harmful to living organisms, and is often found in large urban centres

GROSS ENERGY REQUIREMENT (GER): is an indicator, expressed in MJ or kWh, of the total energy extracted from the environment throughout the entire life cycle of a functional unit of a product/service. Contributing to this indicator are dimensions of energy consumed for manufacturing processes to produce fuels used in processes, for the phases of transport, in addition to the share of energy contained and "frozen" in potentially combustible materials.

SHELF LIFE: The length of time a food product can be preserved, that is the time, after packaging, a product, remains safe in pre-defined environmental conditions.