DICHIARAZIONE AMBIENTALE DI PRODOTTO DELL'ACQUA MINERALE FRASSASSI

Mineral water: still, lightly sparkling and sparkling
in PET bottles in formats: 0,5 – 1 – 1,5 – 2 liters

An environmental product declaration provides up-to-date information and needs to be reviewed should conditions change. The declared validity is therefore subject to continuous registration and publication on:
www.environdec.com.

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Program
The International EPD® System www.environdec.com

Program Operator
EPD International AB

Product Category Rules
PCR 2010:11 “Bottled waters, not sweetened or flavoured”, 2010 ver. 3.11 del 09/06/2019 (valida fino al 03/03/2021)

UN CPC code
UN CPC 24410

System boundaries
Cradle-to-Grave

Geographic application
Global

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Chapter 1

Company Profile

The Togni Company entered the market of mineral water in 1960, as a result of the willingness and intuition of Luigi Togni, who purchased the company's first spring located in the heart of the Marche Apennine Mountains. The history of the Frasassi Mineral Water Plant began in the 1980's and with the new generation of company owners at the wheel, new important results were achieved and strategic guidelines for future growth were laid down.

Frasassi mineral water originated within the Gola della Rossa and Frasassi Natural Park, defined as the "green heart" of the Marche Region which, with its 10,026 hectares, is the largest protected area in the Marche, rich in fauna and flora species, history, archaeology and culture. An area with uncontaminated nature, clean air and sheltered from pollution sources, where mankind meets and safeguards the surrounding natural environment.

In order to maintain this harmony, the bottling plant has adopted an Environmental Management System certified according to the UNI EN ISO 14001: 2015 standard

Frasassi Today

In 2017 the company began working on new strategies for long- term growth and undertook a process of internal reorganization involving the family's third generation. At this time Paola Togni, daughter of founder Luigi Togni, took control of Togni SpA and delineated a development plan based on innovation and internationalization.

The Origins: A Journey that Began Millions of Years Ago

Frasassi water surfaces rising from the fractures of the Scaglia Rossa, an ancient rock formed millions of years ago. Geological evolution has given origin to the Mount Frasassi mountain ridge, where the incessant 'action' of water has carved out the engraved Gorges and the extraordinary Frasassi Caves.

The purity and naturalness of Frasassi water is protected thanks to the safeguarding of Gola della Rossa and Frasassi Natural Park, which is aimed at preserving landscape and ecological processes, as well as keeping biodiversity components in a good state of conservation.

Frasassi water surfaces after having passed through the ancient calcareous rock formations for decades, thus becoming purified and acquiring special characteristics of clarity and mineral elements during its long journey.

Product Information

The product being examined is mineral water bottled in polyethylene terephthalate (PET) bottles of the following sizes and types: 0.5; 1 liter, 1.5 liters and 2 liters, still, lightly sparkling and sparkling water (UN CPC 24410).
Water is drawn from artesian wells and comes from the Frasassi 1, Frasassi 2, Frasassi 3, Frasassi 4, Gaia 1, Gaia 2 and Fonte Elisa springs.

Organoleptic Properties

Thanks to its chemical composition, our Frasassi mineral water, has greatly balanced properties, as confirmed by clinical studies recognized by the Ministry of Health:

- May have diuretic effects;
- Is suitable in the preparation of food for infants;
- Is indicated in low-sodium diets (thanks to its low level of sodium ions).

Controls

As far as controls carried out on our mineral water are concerned, our internal laboratory carries out daily microbiological, chemical, chemical-physical and organoleptic analysis. On average, over 5,000 chemical analysis and 40,000 microbiological analysis are carried out every year by our laboratories, as well as external ones on water bottled at our Genga plant.
Any special analysis, such as the Official Annual ones, are delegated to the Chemistry and Microbiology laboratories of the University of Camerino, an institution recognized by the Ministry of Health.

The Frasassi Product Line

Frasassi water is bottled using PET material in the following sizes:

- 2lt still
- 1,5 still-sparkling-lightly sparkling
- 1,0 still-sparkling-lightly sparkling
- 0,5 still-sparkling-lightly sparkling

Certifications:

All products bottled by TOGNI S.p.A. do comply with any requirements specified in the following certification protocols:

- Quality Management System Certification - ISO 9001:2015 standard granted by SGS ITALIA for the Genga mineral water PET bottling plant, the Fabriano mineral water glass bottling plant and the Serra San Quirico sparkling wine production and bottling plant.

- Environmental Management System Certification - ISO 14001:2015 granted by SGS ITALIA for the Genga mineral water PET bottling plant.

- IFS (International Food Standard) certification granted by UREAU VERITAS for the Genga mineral water PET bottling plant, the Fabriano mineral water glass bottling plant and the Serra San Quirico sparkling wine production and bottling plant.

- BRC (Global Standard for Food Safety) certification granted by BUREAU VERITAS for the Genga mineral water PET bottling plant, the Fabriano mineral water glass bottling plant and the Serra San Quirico sparkling wine production and bottling plant.

- EQM certification for the United Arab Emirates market, for the Genga mineral water PET bottling plant.

Chemical and Physical Characteristics

The chemical-physical characteristics of the most representative waters under examination are shown below.

Table 1 - Chemical-physical characteristics

Characteristics of FRASASSI still mineral water	
Chemical - physical analysis	
Specific electrical conduction at 20°C	512 μS/cm
pH (at collection point)	7,33
Fixed residue at 180 °C	327,7 mg/l
Free carbon dioxide (average at sources)	23,50 mg/l
Label analytical parameters	
Bicarbonates	312,3 mg/l
Calcium	97,2 mg/l
Chlorides	19,9 mg/l
Sodium	17,9 mg/l
Silica	10,9 mg/l
Magnesium	4,2 mg/l
Nitrates	2,3 mg/l
Potassium	1,7 mg/l
Università degli Studi di Camerino - 23/05/2019	

Characteristics of FONTE ELISA still mineral water	
Chemical - physical analysis	
Specific electrical conduction at 20°C	470 μS/cm
pH (at collection point)	7,37
Fixed residue at 180 °C	291,9 mg/l
Free carbon dioxide	19,8 mg/l
Label analytical parameters	
Bicarbonates	280,0 mg/l
Calcium	94,2 mg/l
Chlorides	17,9 mg/l
Sodium	10,0 mg/l
Silica	10,0 mg/l
Magnesium	3,8 mg/l
Nitrates	2,8 mg/l
Potassium	1,7 mg/l
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Characteristics of GAIA still mineral water	
Chemica l- physical analysis	
Specific electrical conduction at 20°C	4733 μS/cm
pH (at collection point)	7,51
Fixed residue at 180 °C	298,0 mg/l
Free carbon dioxide (average at sources)	18,4 mg/l
Label analytical parameters	
Bicarbonates	280,0 mg/l
Calcium	91,2 mg/l
Chlorides	18,0 mg/l
Sodium	13,7 mg/l
Silica	9,2 mg/l
Magnesium	2,9 mg/l
Nitrates	3,0 mg/l
Potassium	1,4 mg/l
Università degli Studi di Camerino - 23/05/2019	

Chapter 3

Goal and Purpose of the Study

The subject of the study is the water bottled in the "Frasassi" plant located in the Municipality of Genga (AN).
The plant covers an area of 11116 m2 and is made up of: production department, offices, warehouse and technical spaces. The plant performs the bottling of water in PET bottles. The reception of raw materials, the production of PET bottles, bottling and packaging operations take place at the production site. There are four bottling lines.
Production is marketed under the Blues, Elisa, Ferretti, Frasassi, Gaia, Ginevra and Gocciablu brands in the following sizes and types: 0.5 liter; 1 liter, 1.5 liters and 2 liters; still, lightly sparkling and sparkling water.
Bottled water is intended for distribution platforms and large-scale distribution (GDO) sold both in Italy and abroad.
Total production in 2019 reached 314,430,696 bottles corresponding to 330,918,513 liters of water.
The functional unit selected is 1 liter of PET bottled water, including its packaging, to be consumed as a food product.
Life cycle analysis was carried out according to the UNI ISO 14040: 2006 and UNI ISO 14044: 2018 reference standards. Furthermore, the general indications in the International EPD System, the reference PCR "Bottled waters, not sweetened or flavored" and the ISO 14025: 2010 standard were followed.
A cradle-to-grave approach based on an attributional model, was followed.
Impact assessment methods implemented are as follows:

- EPD 2018 v.1.0 for environmental impact calculation;
- CML-IA baseline v.3.05 / EU25 for the calculation of the impacts due to photochemical oxidation expressed in terms of kg C_2H_4 equivalent;
- Cumulative Energy Demand (CED) v.1.11 for the calculation of the total consumption of primary resources, expressed in Megajoules.

The processing was performed with the support of the SimaPro software v.9.0.0.48

Chapter 4

Content Declaration

Table 2,3,4 show the list of materials and chemicals in the product concerned per liter bottled. Such materials do not contain dangerous substances.

Table 2 - Content declaration for bottled sparkling water per liter (U.F.).

Component		Material	U.o.M.	Size 0,5 l		Size 1 l		Size 1,5 l	
Semi-finished product	Mineral water	Water	kg	1	80,487%	1	94,2317%	1	91,956%
	Carbon dioxide	Carbon dioxide	kg	0,140	11,268%	0,070	6,5962%	0,047	4,291%
Primary packaging	Preform (PET)	Plastic	kg	0,02984	2,402%	0,01492	1,4061%	0,00995	0,915%
	Capsule	HPDE	kg	0,00275	0,221%	0,00137	0,1294%	0,00092	0,084%
	Label	Plastic	kg	0,00091	0,073%	0,00046	0,0429%	0,00030	0,028%
	Glue	Glue	kg	0,00007	0,006%	0,00004	0,0034683%	0,00002	0,002%
Secondary packaging	Pack heat-shrink film	Plastic	kg	0,00419	0,337%	0,00210	0,1974%	0,00140	0,128%
	Pack handle	Paper	kg	0,00028	0,022%	0,00014	0,0130%	0,00009	0,008%
	Pack tape	Plastic	kg	0,00006	0,004%	0,00003	0,0026%	0,00002	0,002%
	Label	Paper	kg	0,00004	0,003%	0,00002	0,0017%	0,00001	0,001%
Tertiary packaging	Cardboard interlayer	Cardboard	kg	0,00467	0,376%	0,00234	0,2202%	0,00156	0,143%
	Stretch film	Plastic	kg	0,00048	0,038%	0,00024	0,0224%	0,00016	0,015%
	Wooden pallet	Wood	kg	0,05915	4,761%	0,02957	2,7869%	0,01972	1,813%
	Plastic pallet	Plastic	kg	0,02000	1,610%	0,01000	0,9423%	0,00667	0,613%
	Total		kg	1,24243	100%	1,06121	100%	1,08748	100%

Table 3 - Content declaration for bottled lightly sparkling water per liter (U.F.).

Component		Material	U.o.M.	Size 0,5 l		Size 1 l		Size 1,5 l	
Semi-finished product	Mineral water	Water	kg	1	83,165%	1	89,992%	1	93%
	Carbon dioxide	Carbon dioxide	kg	0,100	8,316%	0,050	4,500%	0,033	3,1%
Primary packaging	Preform (PET)	Plastic	kg	0,02984	2,482%	0,01492	1,343%	0,00995	0,9%
	Capsule	HPDE	kg	0,00275	0,228%	0,00137	0,124%	0,00092	0,1%
	Label	Plastic	kg	0,00091	0,076%	0,00046	0,041%	0,00030	0,028%
	Glue	Glue	kg	0,00007	0,006%	0,00004	0,003%	0,00002	0,002%
Secondary packaging	Pack heat-shrink film	Plastic	kg	0,00419	0,349%	0,00210	0,189%	0,00140	0,1%
	Pack handle	Paper	kg	0,00028	0,023%	0,00014	0,012%	0,00009	0,009%
	Pack tape	Plastic	kg	0,00006	0,005%	0,00003	0,002%	0,00002	0,002%
	Label	Paper	kg	0,00004	0,003%	0,00002	0,002%	0,00001	0,002%
Tertiary packaging	Cardboard interlayer	Cardboard	kg	0,00467	0,389%	0,00234	0,210%	0,00156	0,1%
	Stretch film	Plastic	kg	0,00048	0,040%	0,00024	0,021%	0,00016	0,015%
	Wooden pallet	Wood	kg	0,05915	4,919%	0,02957	2,661%	0,01972	1,8%
	Plastic pallet	Plastic	kg	0,02000	1,663%	0,01000	0,900%	0,00667	0,6%
	Total		kg	1,20243	100,000%	1,11121	100,000%	1,07414	100,0%

Table 4: Content declaration for bottled still water per liter (U.F.).

	Component	Material	U.o.M.	Size 0,5 l		Size 1 l		Size 1,5 l		Formato 2 l	
Semi-finished product	Mineral water	Water	kg	1	91%	1	94,232%	1	96,1%	1	97,030%
	Carbon dioxide	Carbon dioxide	kg	0	0%	0	0%	0	0%	0	0%
Primary packaging	Preform (PET)	Plastic	kg	0,02984	3%	0,01492	1,406%	0,00995	0,956%	0,00746	0,724%
	Capsule	HPDE	kg	0,00275	0,249%	0,00137	0,129%	0,00092	0,088%	0,00069	0,067%
	Label	Plastic	kg	0,00091	0,083%	0,00046	0,043%	0,00030	0,029%	0,00023	0,022%
	Glue	Glue	kg	0,00007	0,007%	0,00004	0,003%	0,00002	0,002%	0,00002	0,002%
Secondary packaging	Pack heat-shrink film	Plastic	kg	0,00419	0,380%	0,00210	0,197%	0,00140	0,134%	0,00105	0,102%
	Pack handle	Paper	kg	0,00028	0,025%	0,00014	0,013%	0,00009	0,009%	0,00007	0,007%
	Pack tape	Plastic	kg	0,00006	0,005%	0,00003	0,003%	0,00002	0,002%	0,00001	0,001%
	Label	Paper	kg	0,00004	0,003%	0,00002	0,002%	0,00001	0,001%	0,00001	0,001%
Tertiary packaging	Cardboard interlayer	Cardboard	kg	0,00467	0,424%	0,00234	0,220%	0,00156	0,150%	0,00117	0,113%
	Stretch film	Plastic	kg	0,00048	0,043%	0,00024	0,022%	0,00016	0,015%	0,00012	0,012%
	Wooden pallet	Wood	kg	0,05915	5%	0,02957	2,787%	0,01972	1,894%	0,01479	1,435%
	Plastic pallet	Plastic	kg	0,02000	2%	0,01000	0,942%	0,00667	0,640%	0,00500	0,485%
	Total		kg	1,10243	100%	1,06121	100%	1,04081	100,0%	1,03061	100%

Chapter 5

System Boundaries

The water bottled in the Frasassi plant is destined for final consumers and the analyzed system includes the following processes:

- supply of primary water packaging (production of the material and transport from the supplier to the plant, including the related packaging);
- supply of secondary packaging (production of the material and transport from the supplier to the plant, including the related packaging);
- supply of tertiary packaging (production of the material and transport from the supplier to the plant, including the related packaging);
- supply of auxiliary materials (sanitizers, lubricants) and transport to the plant (production of materials and transport to the plant, including the related packaging);
- production and storage of carbon dioxide and food nitrogen;
- production of compressed air;
- supply of consumables such as ink and ribbon for labels (production of the material and transport to the plant, including the related packaging);
- production of refrigerant;
- company electricity and thermal energy consumption;
- company water consumption;
- water collection;
- storage in tanks;
- reception of preforms and blowing;
- saturation;
- filling;
- capping;
- labeling;
- packaging;
- warehouse storage;
- transport of waste for disposal purposes;
- distribution;
- end-of-life of primary, secondary and tertiary water packaging.
-

The entire life cycle has been split into steps called *Upstream*, *Core* and *Downstream* to which the processes of the system in question have been assigned.

The *Upstream* step includes the processes related to raw materials to be implemented in the Core step: production of the semi-finished product (water collection), production of materials for water packaging, production of auxiliary materials such as sanitizers and lubricants, production of carbon dioxide, food grade nitrogen and compressed air, production of consumables, production of packaging (plastic, paper, cardboard and wood) of bottle components as well as other in-coming materials, production of energy necessary for *Upstream* processes and all of the transportation from suppliers to the plant.

The *Core* step includes all the processes of the production cycle: blowing, bottling, packaging, maintenance, washing operations, waste management, wastewater management, air and water emissions, production of energy necessary for the *Core* processes and all of the inbound and outbound transportation from suppliers to the plant.

The *Downstream* step involves the distribution of the product to distribution centers based in Italy and abroad, transportation from the distribution

center to the customer and the end-of-life of packaging.
As per indications in the reference PCR, the following were excluded: usage step, machinery production, the building's construction; transport of personnel to the plant; research and development activities.
The system boundaries are shown in the flowchart in Figure 1.

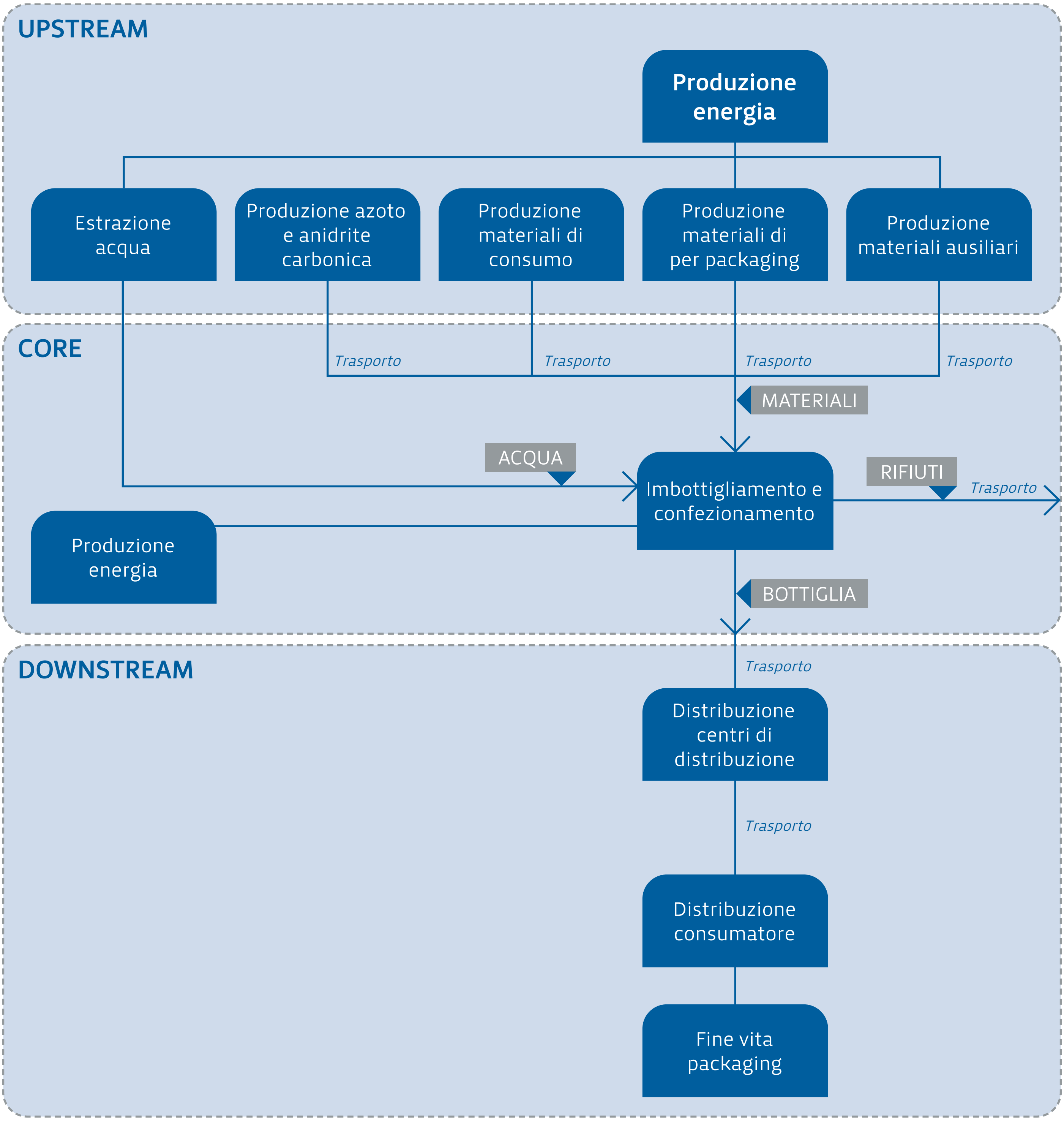

Figure 1: Flow chart of processes included in the life cycle.
The dashed line represents the boundary of the system under consideration

Chapter 6

Requirements and Quality of Data

Any information concerning the number of bottles bottled, the total volume of water sold, the quantity and weight of primary, secondary and tertiary water packaging materials, auxiliary materials, refrigerants, consumables and related packaging (plastic and paper), with which they are delivered to the company, the distance from the various suppliers and the means of transport used, the company energy and water consumption, the storage of water before and after bottling, the transport of waste from the plant to the disposal / recycling site, the distribution of the finished product to the distribution centers, comes mainly from direct surveys and was collected through interviews and specific questionnaires administered to operators as well as the consultation of technical documentation.

As far as data on electricity consumption for water collection, pumping lines and compressed air cooling are concerned, reference was made to the 2018 production year.

Distances in the transportation of materials from the supplier to the plant and from the plant to the disposal / recycling site are the actual ones, communicated by the company.

As far as transportation from the distribution / customer selling point is concerned, reference was made to the data made available by the reference PCR, as primary data was not available.

End-of-life disposal scenarios of water packaging have been outlined according to the statistical data obtained from official sources.

Values hereby declared refer to the 2019 production year.

Data was validated mainly through mass and energy balances.

As far as secondary data is concerned, reference was made to Literature data and to LCA Ecoinvent v. 3 database.

As far as production processes of single materials, means of transport and energy carriers are concerned, reference was made to the European average values of the Ecoinvent database v. 3, as direct information was not available.

In order to standardize data, processes were chosen from the Ecoinvent database according to the "Cut-off" model and with RER (Europe) geographical location. In the case that the use of RER processes was not possible, because it was not available in the database, the GLO (global) geographical location was chosen.

The "proxy data" used does not exceed 10% of each impact category.

Table 5 lists the primary data used in the analysis. Table 6 shows the details of the temporal, geographical and technological coverage.

Table 5: Primary data

Upstream	Core	Downstream
Methods of water collection and required energy consumption.	Year of production under examination.	Number of bottles distributed in Italy and abroad and means of transport.
Storage in tanks.	Plant built-on area.	Destination of the bottle in Italy (region) and abroad (country and city of destination).

Upstream	Core	Downstream
Annual quantity required by the company and weight of the water primary packaging and related packaging.	Information on production lines and production lines lay-out.	
Annual quantity required by the company. and weight of the water secondary packaging and related packaging.	Bottled water yearly production	
Annual quantity required by the company and weight of the water tertiary packaging and related packaging.	For each article produced, divided by size and type: quantity of bottles produced per year; number of bottles per pack; quantity and weight of materials used to produce the total number of bottles; weight of each single component.	
Annual quantity required by the company and weight of consumables and related packaging.	Type of machinery used.	
Annual quantity required by the company and weight of auxiliary materials and related packaging.	Plant energy consumption.	
Distance from suppliers, means of transport, type and specific fuel consumption.	Plant fuel consumption.	
	Production of renewable energy in the plant.	
	Amount of refrigerant and refrigerant leaks.	
	Bottled water storage method.	
	Quantity of waste in the company and disposal methods.	
	Waste water management.	
	Air emissions and waste analysis.	
	Washing of equipment.	

Table 6: Temporal, geographical and technological coverage.

Geographical coverage	Water collection, bottling and packaging are carried out in the Province of Ancona (Italy). Where it was not possible to refer to primary data, average values taken from literature and statistics valid on national and European territory have been considered.
Temporal coverage	Data of water collection, preform blowing, bottling, packaging and distribution refer to the year of production 2019.
Technological coverage	Reference is made to mineral water production practices implemented in the Marche.

Assumptions

Incoming and outgoing mass and energy flows have been split according to the volume bottled in the reference year of production.
Input and output data have been calculated with respect to the process they refer to. Where necessary, they have been converted based on the functional unit considered.
Process units considered are summarized in Table 7.

Table 7: Process unit

Process	Process unit
Water collection	Bottled volume
Reception, storage, distribution of carbon dioxide	Bottled bottle of lightly sparkling / sparkling water
Reception, storage, distribution of nitrogen	Bottled bottle
Bottling	Bottled bottle
Energy and water consumption per production process	Bottled volume
Transportation - From supplier to plant	Bottled bottle
Transportation-From plant to distribution center/consumer	Distributed bottle
Packaging end-of- life	Distributed bottle

Allocation procedures

Where necessary, the inventory flows, and consequently the impacts, have been allocated considering the physical relationships existing between processes.

Data on electricity consumption are available at the single process level and it was possible distinguish consumption for the production part and from those for other services.
In particular, energy consumption for the extraction of water, the production of bottles and for bottling (filling, capping and labeling), lighting and the activities of warehouse. The remainder of consumption was attributed to other activities.

Limits of the Study

The analysis is based on the LCA method standardized by ISO 14040 and 14044 standards. Any constraints and choices resulting from the method application can influence the results and therefore the assessment shall be accurate and complete.

Cut-off Criteria

Mass flows accounting for less than 1% of the total incoming flow were excluded from the analysis.

Chapter 7

Water Packaging End of Life

In order to calculate the end-of-life impacts after usage of bottled water primary, secondary and tertiary packaging (PET bottle body, plastic label, plastic cap, plastic shrink film, cardboard handle, plastic, plastic stretch film, wooden pallets), some scenarios were hypothesized based on statistical data, subdivided by disposal and material types.
As for Italy, it was taken into account that a part of the waste is recycled and a part is disposed of in landfills or incinerated (without energy recovery). The recycling rates were derived from data published by ISPRA.
As for European and Extra-European countries, it was taken into account that a part of the packaging is recycled and a part is sent to landfills.
As for Extra -European countries, the same apportions between recycling and landfill for the various materials were taken into account, as data detailing the apportionment of waste flows by type of material were not available.
Recycling rates in Europe were derived from the statistics compiled by Eurostat.
Division of waste management between recycling and landfill in the rest of the world was deduced from data published by the World Bank.
Tables 8 show the recycling rates of the various materials in the various countries examined.

Table 8: Recycling rates

Country/Region	Plastic	Paper and Cardboard	Wood
Italy	41,8%	79,8%	60,1%
Europe	41,9%	84,6%	40,3%
Central Asia	20%	20%	20%
Eastern Asia	9%	9%	9%
North America	33%	33%	33%
Middle East and North Africa	9%	9%	9%
South Africa	7%	7%	7%

Chapter 8

Environmental Performance

Tables 9-18 show the environmental performance of sparkling, lightly sparkling and still water bottled in the f 0.5,1,1,1.5 and 2 liters sizes. Environmental performance is expressed in terms of environmental impact, use of resources and disposed of waste.
The environmental impacts were calculated implementing appropriate impact assessment methods (EPD 2018 v.1.0 and CML-IA baseline v.3.5). The quantities indicated in the “Use of resources” and “Production of waste and outflows” sections were derived from the inventory analysis. Following the indications given in the reference PCR, the primary resources used as an energy vector were separated from the primary resources used as raw material by difference from the total value of the primary resources used. In particular, in the calculation of non-renewable primary resources, which are not used as an energy vector, the primary energy content of plastic used as raw material was considered, while in the calculation of renewable resources the primary energy content of paper, cardboard and paper wood used as raw material, was considered.

Table 9: Environmental performance of sparkling water in the 0.5 liter size.

SPARKLING PET 0.5 l						
ENVIRONMENTAL IMPACTS						
Impact category		U.o.M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,002460	0,001174	0,000109	0,001177
Potential eutrophication		kg PO4--- eq	0,000790	0,000476	0,000027	0,000287
Global warming (GWP100a)	Fossil	kg CO2 eq	0,658584	0,322151	0,019363	0,317070
	Biogenic	kg CO2 eq	0,002255	0,000481	0,000146	0,001628
	Land use and transformation	kg CO2 eq	0,000340	0,000263	0,000006	0,000071
	Total	kg CO2 eq	0,661	0,323	0,020	0,319
Potential photochemical oxidation		kg C2H4 eq	0,000135	0,000082	0,000004	0,000049
Potential depletion of abiotic resources, elements		kg Sb eq	0,000002	0,00000126	0,00000005	0,00000029
Potential depletion of abiotic resources, fossil fuels		MJ	10,57	5,99	0,27	4,31
Water shortage		m3 eq	0,162	0,133	0,008	0,021
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,35	0,26	0,05	0,04
	Used as raw material	MJ	1,59	1,59	0	0
	Total	MJ	1,94	1,86	0,05	0,04
Primary/non-renewable energy resources	Used as an energy carrier	MJ	6,34	1,37	0,32	4,64
	Used as raw material	MJ	5,87	5,87	0	0
	Total	MJ	12,21	7,25	0,32	4,64
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,001	0,00102	0,00005	0,00020
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	1,08E-17	0,0000007	0
Non-hazardous waste disposed of		kg	0,123	2,29E-17	0,0008	0,122
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

Table 10: Environmental performance of lightly sparkling water in the 0.5 liter size

LIGHTLY SPARKLING PET 0.5 l						
ENVIRONMENTAL IMPACTS						
Impact category		U.o.M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,002373	0,001087	0,000109	0,001177
Potential eutrophication		kg PO4--- eq	0,000740	0,000426	0,000027	0,000287
Global warming (GWP100a)	Fossil	kg CO2 eq	0,627703	0,291271	0,019363	0,317070
	Biogenic	kg CO2 eq	0,002380	0,000606	0,000146	0,001628
	Land use and transformation	kg CO2 eq	0,000298	0,000242	0,000006	0,000050
	Total	kg CO2 eq	0,630	0,292	0,020	0,319
Potential photochemical oxidation		kg C2H4 eq	0,000129	0,000076	0,000004	0,000049
Potential depletion of abiotic resources, elements		kg Sb eq	0,000001	0,000001	0,00000005	0,00000029
Potential depletion of abiotic resources, fossil fuels		MJ	10,31	5,74	0,27	4,31
Water shortage		m3 eq	0,155	0,127	0,008	0,021
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,31	0,23	0,05	0,04
	Used as raw material	MJ	1,59	1,59	0	0
	Total	MJ	1,91	1,82	0,05	0,04
Primary/non-renewable energy resources	Used as an energy carrier	MJ	6,47	1,51	0,32	4,64
	Used as raw material	MJ	5,38	5,38	0	0
	Total	MJ	11,85	6,89	0,32	4,64
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,0017	0,0009	0,0006	0,0002
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	1,08E-17	0,0000007	0
Non-hazardous waste disposed of		kg	0,123	2,29E-17	0,0008	0,122
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

Table 11: Environmental performance of still water in the 0.5 liter size

STILL PET 0.5 l						
ENVIRONMENTAL IMPACTS						
Impact category		U.o.M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,002167	0,000880	0,000109	0,001177
Potential eutrophication		kg PO4--- eq	0,000622	0,000308	0,000027	0,000287
Global warming (GWP100a)	Fossil	kg CO2 eq	0,551706	0,215273	0,019363	0,317070
	Biogenic	kg CO2 eq	0,002257	0,000483	0,000146	0,001628
	Land use and transformation	kg CO2 eq	0,000245	0,000192	0,000006	0,000047
	Total	kg CO2 eq	0,554	0,215	0,020	0,319
Potential photochemical oxidation		kg C2H4 eq	0,000114	0,000061	0,000004	0,000049
Potential depletion of abiotic resources, elements		kg Sb eq	0,000001	0,000001	0,00000005	0,00000029
Potential depletion of abiotic resources, fossil fuels		MJ	9,69	5,116965	0,266085	4,308502
Water shortage		m3 eq	0,141	0,112040	0,008079	0,020510
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,22	0,14	0,05	0,04
	Used as raw material	MJ	1,59	1,59	0	0
	Total	MJ	1,82	1,73	0,05	0,04
Primary/non-renewable energy resources	Used as an energy carrier	MJ	5,59	0,63	0,32	4,64
	Used as raw material	MJ	5,38	5,38	0	0
	Total	MJ	10,97	6,0	0,32	4,64
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,0008	0,00056	0,00005	0,00020
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	1,08E-17	0,0000007	0
Non-hazardous waste disposed of		kg	0,123	2,29E-17	0,0008	0,122
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

Table 12: Environmental performance of sparkling water in the 1 liter size

SPARKLING PET 1 l						
ENVIRONMENTAL IMPACTS						
Impact category		U. o. M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,001295	0,000597	0,000109	0,000589
Potential eutrophication		kg PO4--- eq	0,000411	0,000240	0,000027	0,000143
Global warming (GWP100a)	Fossil	kg CO2 eq	0,340437	0,162539	0,019363	0,158535
	Biogenic	kg CO2 eq	0,001300	0,000340	0,000146	0,000814
	Land use and transformation	kg CO2 eq	0,000162	0,000133	0,000006	0,000023
	Total	kg CO2 eq	0,341899	0,163012	0,019515	0,159372
Potential photochemical oxidation		kg C2H4 eq	0,000070	0,000041	0,000004	0,000024
Potential depletion of abiotic resources, elements		kg Sb eq	0,000001	0,000001	0,00000005	0,00000015
Potential depletion of abiotic resources, fossil fuels		MJ	5,47	3,055	0,266	2,154
Water shortage		m3 eq	0,085842	0,067509	0,008079	0,010255
USE OF RESOURCE						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,2033	0,135	0,050	0,018
	Used as raw material	MJ	0,7960	0,796	0	0
	Total	MJ	0,999	0,931	0,050	0,018
Primary/non-renewable energy resources	Used as an energy carrier	MJ	3,635	0,994	0,319	2,322
	Used as raw material	MJ	2,690	2,690	0	0
	Total	MJ	6,325	3,684	0,319	2,322
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,00022	0,00018	0,00002	0,00003
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	5,41E-18	0,0000007	0
Non-hazardous waste disposed of		kg	0,062	1,15E-17	0,0008	0,061
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

Table 13: Environmental performance of lightly sparkling water in the 1 liter size

LIGHTLY SPARKLING PET 1 l						
ENVIRONMENTAL IMPACTS						
Impact category		U. o. M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,001253	0,000555	0,000109	0,000589
Potential eutrophication		kg PO4--- eq	0,000387	0,000216	0,000027	0,000143
Global warming (GWP100a)	Fossil	kg CO2 eq	0,325238	0,147340	0,019363	0,158535
	Biogenic	kg CO2 eq	0,001275	0,000315	0,000146	0,000814
	Land use and transformation	kg CO2 eq	0,000152	0,000123	0,000006	0,000023
	Total	kg CO2 eq	0,326665	0,1478	0,0195	0,1594
Potential photochemical oxidation		kg C2H4 eq	0,000067	0,000038	0,000004	0,000024
Potential depletion of abiotic resources, elements		kg Sb eq	0,000001	0,0000004	0,00000005	0,00000010
Potential depletion of abiotic resources, fossil fuels		MJ	5,35	2,93	0,27	2,15
Water shortage		m3 eq	0,082912	0,064578	0,008079	0,010255
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,1859	0,117	0,050	0,018
	Used as raw material	MJ	0,7960	0,796	0	0
	Total	MJ	0,982	0,913	0,050	0,018
Primary/non-renewable energy resources	Used as an energy carrier	MJ	3,466	0,825	0,319	2,322
	Used as raw material	MJ	2,690	2,690	0	0
	Total	MJ	6,156	3,515	0,319	2,322
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,00060	0,00045	0,00005	0,00010
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	5,41E-18	0,0000007	0
Non-hazardous waste disposed of		kg	0,062	1,15E-17	0,0008	0,061
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

Table 14: Environmental performance of still water in the 1 liter size

STILL PET 1 l						
ENVIRONMENTAL IMPACTS						
Impact category		U. o. M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,001148	0,000450	0,000109	0,000589
Potential eutrophication		kg PO4--- eq	0,000327	0,000157	0,000027	0,000143
Global warming (GWP100a)	Fossil	kg CO2 eq	0,287239	0,109341	0,019363	0,158535
	Biogenic	kg CO2 eq	0,001214	0,000254	0,000146	0,000814
	Land use and transformation	kg CO2 eq	0,000128	0,000099	0,000006	0,000023
	Total	kg CO2 eq	0,289	0,110	0,020	0,159
Potential photochemical oxidation		kg C2H4 eq	0,000059	0,000031	0,000004	0,000024
Potential depletion of abiotic resources, elements		kg Sb eq	0,000000	0,000000	0,000000	0,000000
Potential depletion of abiotic resources, fossil fuels		MJ	5,04	2,618848	0,266085	2,154251
Water shortage		m3 eq	0,075585	0,057252	0,008079	0,010255
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,1425	0,074	0,050	0,018
	Used as raw material	MJ	0,7960	0,796	0	0
	Total	MJ	0,938	0,870	0,050	0,018
Primary/non-renewable energy resources	Used as an energy carrier	MJ	3,026	0,386	0,319	2,322
	Used as raw material	MJ	2,690	2,690	0	0
	Total	MJ	5,716	3,076	0,319	2,322
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,00044	0,00029	0,00005	0,00010
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	5,41E-18	0,0000007	0
Non-hazardous waste disposed of		kg	0,062	1,15E-17	0,0008	0,061
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

<table>
<tr><th colspan="7">Table 15: Environmental performance of sparkling water in the 1,5 liter size</th></tr>
<tr><th colspan="7">SPARKLING PET 1,5 l</th></tr>
<tr><th colspan="7">ENVIRONMENTAL IMPACTS</th></tr>
<tr><td colspan="2">Impact category</td><td>U. o. M.</td><td>Total</td><td>Upstream</td><td>Core</td><td>Downstream</td></tr>
<tr><td colspan="2">Potential acidification</td><td>kg SO2 eq</td><td>0,000906</td><td>0,000405</td><td>0,000109</td><td>0,000392</td></tr>
<tr><td colspan="2">Potential eutrophication</td><td>kg PO4--- eq</td><td>0,000285</td><td>0,000162</td><td>0,000027</td><td>0,000096</td></tr>
<tr><td rowspan="4">Global warming (GWP100a)</td><td>Fossil</td><td>kg CO2 eq</td><td>0,234549</td><td>0,109496</td><td>0,019363</td><td>0,105690</td></tr>
<tr><td>Biogenic</td><td>kg CO2 eq</td><td>0,000923</td><td>0,000235</td><td>0,000146</td><td>0,000543</td></tr>
<tr><td>Land use and transformation</td><td>kg CO2 eq</td><td>0,000112</td><td>0,000090</td><td>0,000006</td><td>0,000016</td></tr>
<tr><td>Total</td><td>kg CO2 eq</td><td>0,236</td><td>0,110</td><td>0,020</td><td>0,106</td></tr>
<tr><td colspan="2">Potential photochemical oxidation</td><td>kg C2H4 eq</td><td>0,000048</td><td>0,000028</td><td>0,000004</td><td>0,000016</td></tr>
<tr><td colspan="2">Potential depletion of abiotic resources, elements</td><td>kg Sb eq</td><td>0,000001</td><td>0,0000004</td><td>0,00000005</td><td>0,0000001</td></tr>
<tr><td colspan="2">Potential depletion of abiotic resources, fossil fuels</td><td>MJ</td><td>3,78</td><td>2,076611</td><td>0,266085</td><td>1,436167</td></tr>
<tr><td colspan="2">Water shortage</td><td>m3 eq</td><td>0,060742</td><td>0,045827</td><td>0,008079</td><td>0,006837</td></tr>
<tr><th colspan="7">USE OF RESOURCES</th></tr>
<tr><td rowspan="3">Primary-renewable energy resources</td><td>Used as an energy carrier</td><td>MJ</td><td>0,1549</td><td>0,092</td><td>0,050</td><td>0,012</td></tr>
<tr><td>Used as raw material</td><td>MJ</td><td>0,5307</td><td>0,531</td><td>0</td><td>0</td></tr>
<tr><td>Total</td><td>MJ</td><td>0,686</td><td>0,623</td><td>0,050</td><td>0,012</td></tr>
<tr><td rowspan="3">Primary/non-renewable energy resources</td><td>Used as an energy carrier</td><td>MJ</td><td>2,581</td><td>0,714</td><td>0,319</td><td>1,548</td></tr>
<tr><td>Used as raw material</td><td>MJ</td><td>1,793</td><td>1,793</td><td>0</td><td>0</td></tr>
<tr><td>Total</td><td>MJ</td><td>4,374</td><td>2,507</td><td>0,319</td><td>1,548</td></tr>
<tr><td colspan="2">Secondary material</td><td>kg</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Renewable secondary fuels</td><td>MJ</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Non-renewable secondary fuels</td><td>MJ</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Water net usage</td><td>m3</td><td>0,00046</td><td>0,00035</td><td>0,00005</td><td>0,00007</td></tr>
<tr><th colspan="7">WASTE PRODUCTION AND OUTGOING FLOWS</th></tr>
<tr><td colspan="2">Hazardous waste disposed of</td><td>kg</td><td>0,0000007</td><td>3,6E-18</td><td>0,0000007</td><td>0</td></tr>
<tr><td colspan="2">Non-hazardous waste disposed of</td><td>kg</td><td>0,042</td><td>7,6E-18</td><td>0,0008</td><td>0,041</td></tr>
<tr><td colspan="2">Radioactive waste disposed of</td><td>kg</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Components for reuse</td><td>kg</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Materials for recycling</td><td>kg</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Materials for energy recovery</td><td>kg</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Exported energy, electricity</td><td>MJ</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="2">Exported energy, thermal energy</td><td>MJ</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Table 16: Environmental performance of lightly sparkling water in the 1,5 liter size

LIGHTLY SPARKLING PET 1,5 l						
ENVIRONMENTAL IMPACTS						
Impact category		U. o. M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,000899	0,000378	0,000129	0,000392
Potential eutrophication		kg PO4--- eq	0,000280	0,000147	0,000038	0,000096
Global warming (GWP100a)	Fossil	kg CO2 eq	0,232271	0,099686	0,026894	0,105690
	Biogenic	kg CO2 eq	0,000923	0,000219	0,000162	0,000543
	Land use and transformation	kg CO2 eq	0,000105	0,000084	0,000006	0,000016
	Total	kg CO2 eq	0,233	0,100	0,027	0,106
Potential photochemical oxidation		kg C2H4 eq	0,000047	0,000026	0,000005	0,000016
Potential depletion of abiotic resources, elements		kg Sb eq	0,000001	0,00000036	0,00000005	0,00000010
Potential depletion of abiotic resources, fossil fuels		MJ	3,81	2,00	0,37	1,44
Water shortage		m3 eq	0,055270	0,043729	0,004705	0,006837
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,1134	0,080	0,022	0,012
	Used as raw material	MJ	0,5307	0,531	0	0
	Total	MJ	0,644	0,610	0,022	0,012
Primary/non-renewable energy resources	Used as an energy carrier	MJ	2,557	0,601	0,408	1,548
	Used as raw material	MJ	1,793	1,793	0	0
	Total	MJ	4,350	2,394	0,408	1,548
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,0004	0,00030	0,00007	0,00007
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	3,61E-18	0,0000007	0
Non-hazardous waste disposed of		kg	0,042	7,64E-18	0,0008	0,041
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

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Table 17: Environmental performance of still water in the 1,5 liter size

STILL PET 1,5 l						
ENVIRONMENTAL IMPACTS						
Impact category		U. o. M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,000829	0,000308	0,000129	0,000392
Potential eutrophication		kg PO4--- eq	0,000240	0,000107	0,000038	0,000096
Global warming (GWP100a)	Fossil	kg CO2 eq	0,206938	0,074354	0,026894	0,105690
	Biogenic	kg CO2 eq	0,001422	0,000718	0,000162	0,000543
	Land use and transformation	kg CO2 eq	0,000089	0,000067	0,000006	0,000016
	Total	kg CO2 eq	0,208	0,075	0,027	0,106
Potential photochemical oxidation		kg C2H4 eq	0,000042	0,000021	0,000005	0,000016
Potential depletion of abiotic resources, elements		kg Sb eq	0,0000004	0,0000002	0,0000001	0,0000001
Potential depletion of abiotic resources, fossil fuels		MJ	3,60	1,79	0,37	1,44
Water shortage		m3 eq	0,050386	0,038844	0,004705	0,006837
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,0845	0,051	0,022	0,012
	Used as raw material	MJ	0,5307	0,531	0	0
	Total	MJ	0,615	0,581	0,022	0,012
Primary/non-renewable energy resources	Used as an energy carrier	MJ	2,264	0,308	0,408	1,548
	Used as raw material	MJ	1,793	1,793	0	0
	Total	MJ	4,057	2,101	0,408	1,548
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,00041	0,00025	0,00008	0,00008
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	3,61E-18	0,0000007	0
Non-hazardous waste disposed of		kg	0,042	7,64E-18	0,0008	0,041
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

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Table 18: Environmental performance of still water in the 2 liter size

STILL PET 2 l						
ENVIRONMENTAL IMPACTS						
Impact category		U. o. M.	Total	Upstream	Core	Downstream
Potential acidification		kg SO2 eq	0,000660	0,000236	0,000129	0,000294
Potential eutrophication		kg PO4--- eq	0,000191	0,000082	0,000038	0,000072
Global warming (GWP100a)	Fossil	kg CO2 eq	0,162861	0,056699	0,026894	0,079268
	Biogenic	kg CO2 eq	0,000708	0,000140	0,000162	0,000407
	Land use and transformation	kg CO2 eq	0,000069	0,000052	0,000006	0,000012
	Total	kg CO2 eq	0,164	0,057	0,027	0,080
Potential photochemical oxidation		kg C2H4 eq	0,000033	0,000016	0,000005	0,000012
Potential depletion of abiotic resources, elements		kg Sb eq	0,00000028	0,00000016	0,00000005	0,00000007
Potential depletion of abiotic resources, fossil fuels		MJ	2,82	1,37	0,37	1,08
Water shortage		m3 eq	0,039546	0,029713	0,004705	0,005127
USE OF RESOURCES						
Primary-renewable energy resources	Used as an energy carrier	MJ	0,0704	0,040	0,022	0,009
	Used as raw material	MJ	0,3980	0,398	0	0
	Total	MJ	0,468	0,438	0,022	0,009
Primary/non-renewable energy resources	Used as an energy carrier	MJ	2,713	1,174	0,387	1,152
	Used as raw material	MJ	1,345	1,345	0	0
	Total	MJ	3,181	1,612	0,408	1,161
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ	0	0	0	0
Non-renewable secondary fuels		MJ	0	0	0	0
Water net usage		m3	0,00027	0,00015	0,00007	0,00005
WASTE PRODUCTION AND OUTGOING FLOWS						
Hazardous waste disposed of		kg	0,0000007	2,7E-18	0,0000007	0
Non-hazardous waste disposed of		kg	0,042	5,7E-18	0,0008	0,041
Radioactive waste disposed of		kg	0	0	0	0
Components for reuse		kg	0	0	0	0
Materials for recycling		kg	0	0	0	0
Materials for energy recovery		kg	0	0	0	0
Exported energy, electricity		MJ	0	0	0	0
Exported energy, thermal energy		MJ	0	0	0	0

Chapter 9

Result Interpretation

The analysis of environmental impacts shows that the *Upstream* e and the *Downstream* steps have the greatest impact on the impact categories selected. In general, we can observe a decreasing trend in the value of environmental impacts as the size of the bottle in which water is bottled increases.
Furthermore, it is noted that in the Global Warming Potential impact category, expressed in kg CO_2 equivalent, the contribution of fossil sources, in particular attributable to the *Upstream* and *Downstream steps, prevails*.
The analysis of the use of primary resources shows that the *Upstream* e *Downstream*steps have the greatest impact. The use of fossil resources prevails in all steps. In addition, we can observe that, similarly to environmental impacts, the use of primary resources decreases as the bottle size increases. The *Core* e la fase *Downstream steps have a major impact on produced waste flows*.
The comparison of results between the various types and sizes shows that the higher values of environmental impacts, use of resources and the produced waste flows are attributable to the liter of sparkling water bottled

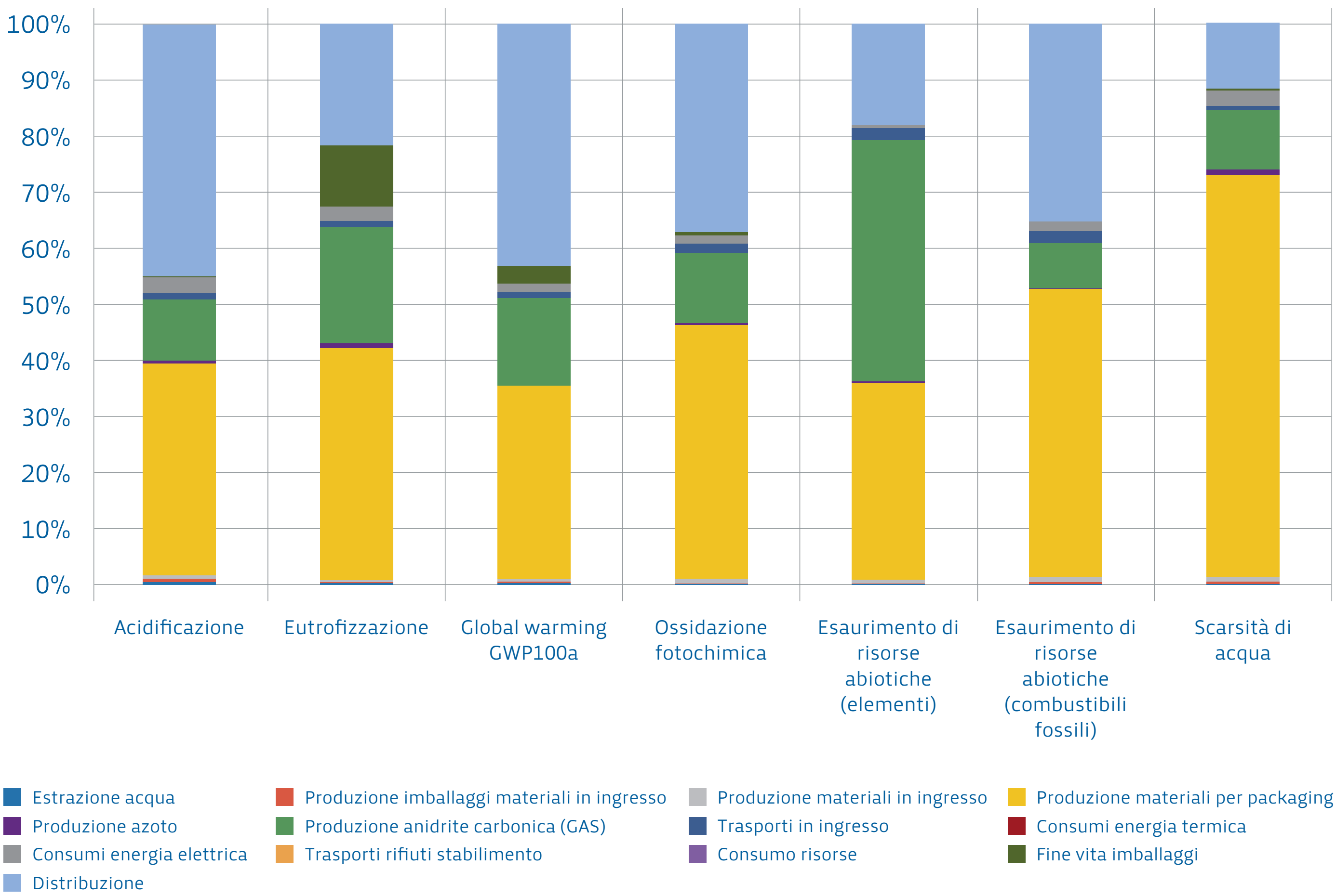

Figure 2: Environmental impacts for one liter of sparkling water bottled in 0.5 liter size.

in the 0.5 liter size, thus an analysis of the contributions for this type of product has been carried out.
Among the various impact categories, the greatest impacts in the aforementioned water type and size are due to the production of materials for water packaging, the production of carbon dioxide and the distribution of the finished product, as shown in Figure 2.

In the production of packaging materials, there is a higher incidence of primary water packaging production for each impact category.
In particular, the use of virgin PET preform has the greatest impact on the production of primary water packaging, which is due to the raw material production process (the polyethylene terephthalate granule) and the HDPE cap production, as shown in Figure 3.

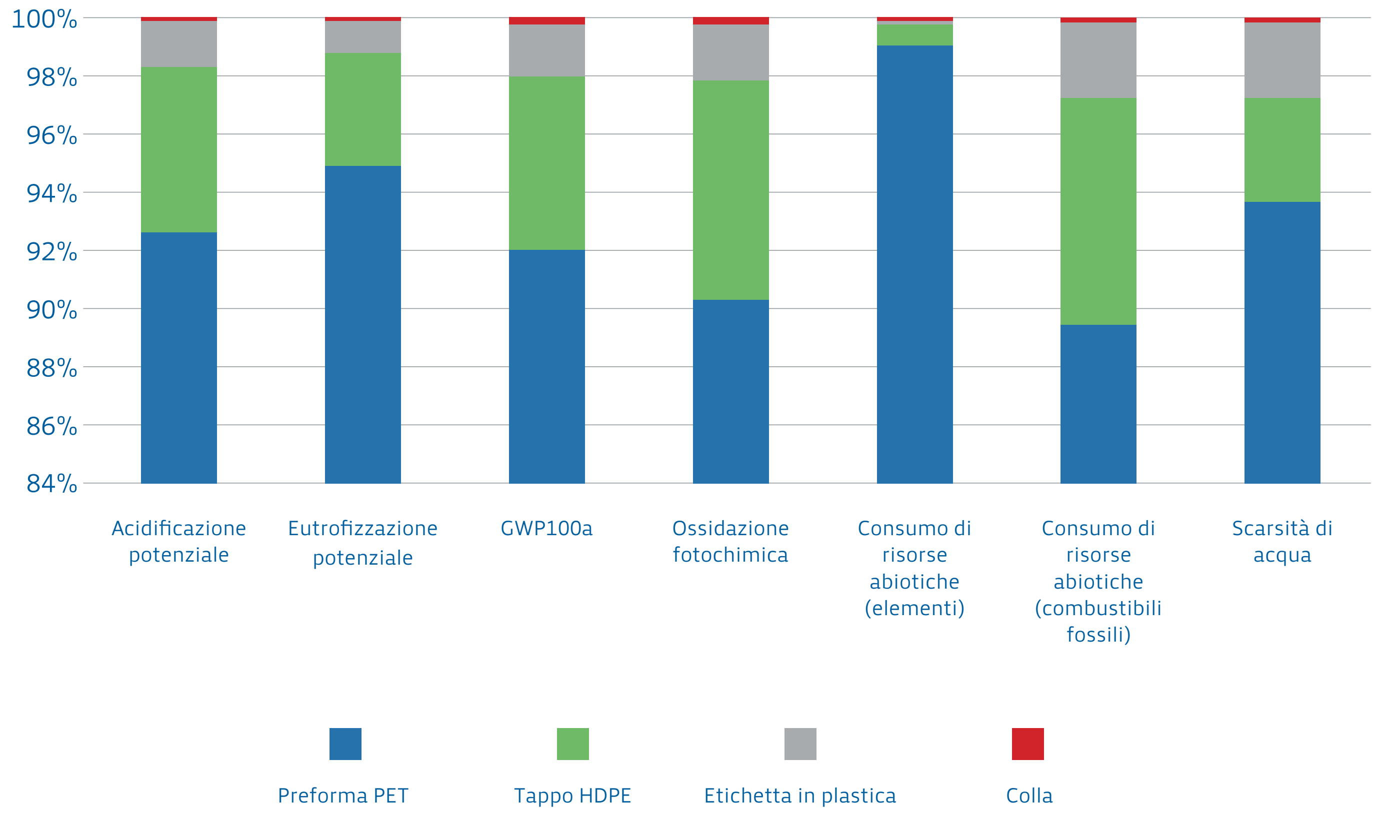

Figure 3:. Contributions of the primary water packaging components to impact categories.

In the *Core* step, the greatest impacts are attributable to the consumption of electricity and the transportation of materials from the manufacturers /retailers to the plant under consideration.
In the *Downstream* step, the greatest impacts are attributable to the distribution of the finished product to the distribution centers, where transport by air has the greatest impact.

Uncertainty Analysis

An uncertainty analysis of environmental impacts was carried out for the liter of sparkling water bottled in the 0.5 liter size, using the Monte Carlo method, with a confidence interval of 95% and 1000 iterations. The standard deviation is shown in Table 19.

Table 19: Uncertainty analysis

Impact category	U.o.M.	Average	Median	SD
Consumption of abiotic resources (elements)	kg Sb eq	1,61921E-06	1,47979E-06	6,8596E-07
Consumption of abiotic resources (fossil fuels)	MJ	10,64512061	10,59038997	0,741055116
Potential acidification	kg SO2 eq	0,002488162	0,002462669	0,000195147
Potential eutrophication	kg PO4--- eq	0,000803169	0,000760643	0,000195357
GWP100a	kg CO2 eq	0,672845776	0,670075438	0,030361013
Photochemical oxidation	kg NMVOC	0,002321126	0,002309996	0,00013683
Water shortage	m3 eq	0,234221771	0,333882574	2,041443351

Sensitivity Analysis

Based on the processes that mainly contribute to the impact and the evidence of the uncertainty analysis, reference was made to the liter of sparkling water bottled in the 0.5 liter size.
The following variation was considered for the sensitivity analysis: in the preform production process, it is assumed a 75% reduction of virgin PET in the bottle body, to be replaced with secondary raw material. The analysis carried out, shows that an increase in recycled material in the primary packaging of water leads to a reduction in environmental impacts in the percentages indicated in table 20, especially in terms of demand for primary resources and water.

Table 20: Sensitivity analysis

Impact category	U. o. M.	GAS 0,5 l 100% virgin PET	GAS 0,5 l 75% virgin PET	Initial impact reduction
Acidification	kg SO2 eq	0,002	0,002	6%
Eutrophication	kg PO4--- eq	0,001	0,001	4%
GWP	kg CO2 eq	0,666	0,631	5%
Photochemical oxidation	Kg NMVOC	0,002	0,002	5%
Consumption of abiotic resources (elements)	kg Sb eq	0,000002	0,000001	13%
Consumption of abiotic resources (fossil fuels)	MJ	10,57	9,66	9%
Water shortage	m3 eq	0,162	0,143	11%

Chapter 10

Conclusions

Summary

Togni S.p.a. company operates in the production and distribution of bottled mineral water. The object of the analysis is mineral water, which is bottled in various types and sizes: still, lightly sparkling and sparkling water in 0.5 liter, 1 liter, 1.5 liter and 2 liter bottles, in the Frasassi plant in Genga (AN).
The life cycle has been conceived in an eco-sustainable perspective following the Life Cycle Assessment methodology, a systematic procedure allowing for the identification of any possible environmental impacts and taking appropriate and necessary actions in order to reduce them. Furthermore, it has been split into three macro-steps: *Upstream*, *Core* e *Downstream*. The functional unit selected is a liter of mineral water including its packaging, intended for food use.
The system aspects under consideration are: water collection, production of materials for primary, secondary and tertiary water packaging, production of auxiliary materials such as sanitizers and lubricants, production of carbon dioxide, food grade nitrogen and compressed air, production of consumables, production of packaging (plastic, paper, cardboard and wood) of the bottle components as well as other in-coming materials, blowing, bottling, packaging, maintenance, washing operations, transport of waste materials , waste water management, air and water emissions, product distribution to distribution centers in Italy and abroad, transport from the distribution center to the consumer and the end-of- life of water packaging. Furthermore, in each process, the necessary energy production and inbound and outbound transports have been taken into account.
After analyzing the production sector under examination, data was collected and then validated and processed. Data is mainly primary data provided by the company, both through the compilation of specific questionnaires and interviews with operators as well as the analysis of technical documentation provided for by the Company.
The mass and energy flows identified for each process have been allocated and normalized with respect to the functional unit.
The environmental performance of a liter of water in the various types and formats was assessed both in terms of environmental impacts, calculated according to appropriate impact assessment methods, and in terms of use of resources and disposed of waste, calculated through the inventory analysis.
The results show that the *Upstream* and *Downstream* phases affect mainly the environmental performance, in terms of environmental impact and use of resources, for the types and sizes in question. The *Core* and *Downstream* phases impact more on produced waste flows.
In the global warming potential impact category, expressed in kg CO_2 equivalent, the contribution of fossil sources prevails, in particular in the *Upstream* e *Downstream* phases.
In the use of primary resources, there is a prevalent contribution of fossil resources.
Comparing the impact values of the *Upstream* phase and the *Downstream* Downstream phase for the various bottles of 0.5 liter, 1 liter, 1.5 liters and 2 liters, it can be seen that they decrease as

the bottle size increases.
The analysis shows that the greatest impacts are related to the liter of sparkling water bottled in the 0.5 liter bottle. In particular, the most impacting processes are: the production of primary water packaging, the production of carbon dioxide and the distribution of the finished product. In fact, the quantity of material necessary to make the packaging and the quantity of carbon dioxide to be added for one liter of bottled water is greater than in the other sizes and water types.
Among the components of water packaging, the one that has the greatest impact in the various impact categories is the polyethylene terephthalate (PET) bottle body, as a result of the polyethylene terephthalate granule production process.
In the *Core* phase, electricity consumption and transport of materials to the plant have the greatest impact.
In the *Downstream*, phase, the greatest impact is attributable to the distribution of the finished product to the distribution centers.
Finally, a sensitivity analysis was conducted for 1 liter of sparkling water bottled in the 0.5 liter size, in which part of the body of the bottle is likely to be made with recycled materials. The increase in the percentage of recycled material allows for environmental impact reduction, especially in terms of primary resources and water used.

English summary

Product information

The examined product is mineral water (still, sparkling and slight sparkling) in bottle format of 0.5 l, 1 l, 1.5 l and 2 l (UN CPC 24410). Bottle was made of PET body, HDPE cup and plastic label.

Declared unit

The declared unit is one litre of mineral water, including its packaging.

Potential environmental impact

See Tables 9-18.

Indicazioni sul programma

- Address of the program operator: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com.
- An EPD that belongs to the same category of products but comes from different programs it may not be comparable.
- The owner of the EPD has the exclusive ownership and responsibility of the EPD.

Product category rules (PCR): PCR 2010:09 Bottled waters, not sweetened or flavoured, version 3.1. UN CPC 24410
PCR review was conducted by: The Technical Committee of the International EPD® System. Chair: Filippo Sessa Contact via info@environdec.com.
Independent third-party verification of the declaration and data, according to ISO 14025:2010: ☐ EPD process certification ☑ EPD verification
Third party verifier: RINA Services s.p.a. Via Sandro Totti, 3, 60131 Ancona AN Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up of data during EPD validity involves third party verifier: ☑ Yes ☐ No

Bibliography and Websites

Ecoinvent v.3 database.

EPD, General Program Instruction for the International EPD System, 2019.

EPD, PCR 2010: 11 “Bottled waters, not sweetened or flavored”, 2010 version 3.11 dated 09/06/2019 (valid until 03/03/2021).

Fantin V. et al., A method for improving reliability and relevance of LCA reviews: The case of life-cycle greenhouse gas emissions of tap and bottled water, Science of the Total Environment 476–477, pp. 228–241, 2014.

ISPRA, Urban Waste Report- 2019 Edition, December 2019.

Hiskier R., Life Cycle Inventories of Packaging and Graphical Papers. Ecoinvent report n.11, Swiss Life Cycle Inventories, 2007.

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

UNI ISO 14044:2018, Environmental management - Life cycle assessment - Requirements and guidelines

World Bank Group, Waste Disposal in: What a Waste 2.0-A Global Snapshot of Solid Waste Management to2050, pp.34-35, 2018.

Eurostat, Recycling rates for packaging waste, available online at: https://ec.europa.eu/eurostat/web/products-datasets/product?code=ten00063

Product Environmental Footprint Category Rules (PEFCR) of packed water-version 1.0 dated 23/04/2018 available online at:

hiips://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_PackedWater_FinalPEFCR_2018-04-23_V1.pdf

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