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Ohyo collapsible water bottle vs. Disposable water bottle – environmental footprint

The environmental footprint of an Ohyo bottle has been compared with that of an average disposable 500ml bottle of water as purchased from a retail outlet.

Based purely on the production of the plastic bottle, and not including other sources of carbon emissions such as the processing of water for human consumption and the transportation or cooling of the product, the results show:

	Times you need to use your Ohyo bottle to offset the manufacturing environmental impact:
Carbon emissions	3
Energy consumption	4
Water consumption	5

Using data produced by the Beverage Industry Environmental Roundtable on the carbon footprint of bottled water, which completes a full life cycle assessment of bottled water, we have calculated it takes 2.1 uses of an Ohyo bottle to offset the **carbon** impact because of the extra carbon emissions from processing the water in the bottle and refrigerating the water before sale (see page 2).

Summary

- The manufacturing of an Ohyo water bottle emits 2.6 times more carbon emissions than the manufacturing of an average disposable 500ml drinks bottle
- The manufacturing of an Ohyo water bottle uses 3.2 times more energy than the manufacturing of an average disposable 500ml drinks bottle
- The manufacturing of an Ohyo water bottle uses 4.8 times more water than the manufacturing of an average disposable 500ml drinks bottle

The figures:

	Ohyo water bottle			Average disposable 500ml bottled water bottle		
	Bottle	**Lid**	**Whole bottle**	**Bottle**	**Cap**	**Whole bottle**
Material	**LLDPE**	**HDPE**		**PET**[1]	**PP**[2]	
Weight (g)	35.8	9.9	**45.6g**	13.8[1]	1.4[3]	**15.2g**
Carbon emissions (gCO_2e)	88.0	16.7	**111.6 gCO_2e**	38.5	3.7	**42.2 gCO_2e**
Gross energy consumption (MJ)	3.5	0.7	**4.5 MJ**	1.3	0.1	**1.4 MJ**
Gross water consumption (litres)	181.0	124.1	**356.3 litres**	69.2	4.5	**73.6 litres**

Note: The manufacture of both the Ohyo and disposable water bottles is assumed to use 100% virgin plastic material, with no recycled plastic content.

[1] International Bottled Water Association: http://www.bottledwater.org/content/bottled-water-containers-now-single-most-recycled-item-curbside-programs

[2] NPR: http://www.npr.org/templates/story/story.php?storyId=92510162

[3] Elipso: http://www.bpf.co.uk/Document/Default.aspx?DocumentUid=BADF42E4-0FFF-4FB3-A4A4-E536A2F7D037

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BIER Research on the Carbon Footprint of Bottled Water

Since the original Ohyo carbon footprint was last revised in February 2012, the Beverage Industry Environmental Roundtable (BIER) has completed its own research into the carbon footprint of bottled water. Their calculations include carbon emissions from the full lifecycle of bottled water, including additional packaging around bottled water products, and energy use in producing the water to be bottled and in cooling bottled water at the point of sale and at home.

The BIER research is available from: http://www.bieroundtable.com/bier-presents-carbon-footprint

Table 3. Largest Contributors to Bottled Water Carbon Footprint [a]

	Europe (1.5 l bottle)		North America (500 ml bottle)	
	CO2e (grams)	Percent of Total	CO2e (grams)	Percent of Total
PET Bottle	60.8	38.0	31.0	38.8
Distribution Transportation	63.1	39.4	23.6	29.5
Corrugated Tray	18.0	11.2	4.5	5.6
Production Electricity & Natural Gas	8.5	5.3	4.1	5.1
Cap	2.7	1.7	2.7	3.4
Electricity for Consumer Cooling	2.4	1.5	2.0	2.5
Label Adhesive	2.3	1.4	2.3	2.8
Retail Electricity & Natural Gas	2.1	1.3	10.0	12.5
Others [b]	0.1	0.1	-0.1	-0.1
Total (grams CO2e per package)[c]	160	100	80	100
Total (grams CO2e per package)	100		160	

[a] Baseline scenario
[b] Individually less than one percent
[c] Given the uncertainty inherent to secondary data points utilized in conducting these analyses, all "Total" values have been rounded to the nearest 10's value for Tables 3,4, and 5 in this report.

BIER have used a similar weight for an average 500ml water bottle (13.5g) but have calculated slightly lower total carbon emissions for solely the packaging (PET bottle + cap + label adhesive = 36 gCO_2e) compared to the study completed by EHS Projects. However, the wider scope of the BIER life cycle assessment demonstrates the additional main carbon emission contributors resulting from purchasing bottled water compared to refilling an Ohyo bottle. Data on the carbon impact of transportation and secondary packaging of Ohyo bottles is not available at this time, so has not been compared.

A rough comparison:

	Ohyo bottle	Disposable PET bottle (bottle+ cap+ label adhesive)
Bottle	111.6 gCO_2e	36.0 gCO_2e
Water production electricity and natural gas (per 500ml water)	0.17205 gCO_2e*	4.1 gCO_2e
Electricity for consumer cooling	n/a	2.0 gCO_2e
Retail electricity and natural gas	n/a	10.0 gCO_2e
TOTAL	**111.7 gCO_2e**	**52.1 gCO_2e**

*** Based on 2010/11 UK water supply emissions of 344 $kgCO_2e$/million litres of tap water**

Using the additional BIER data, it shows a drink of water from an Ohyo bottle during its first use emits 2.1 times more carbon emissions than a bottle of purchased, cooled bottled water. However, after the third use of the Ohyo bottle the carbon emissions would be just 0.2 gCO_2e per 500ml water, compared to 52.1 gCO_2e per fresh 500ml bottle of water.

Footnote: When quoting the environmental and carbon figures in relation to the Ohyo water bottle, the consumer should be made aware that a full life-cycle assessment of the Ohyo water bottle has not been completed. However, the main impacts of an Ohyo bottle will come from its manufacture and therefore the figures are a good representation of the Ohyo bottle's impacts.

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References for emission factors
All emission factors available from: http://www.plasticseurope.org/plasticssustainability/eco-profiles

Emission factor sources	Document source	Document name	Comments
LLDPE resin production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: Linear Low Density Polyethylene (LLDPE)	
LLDPE bottle production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: PET Injection Stretch Blow Moulding	Eco-profile for PET bottle production substituted as LDPE bottle production data not available. The PET bottle injection eco-profile data has now officially expired, but has not been replaced by Plastics *Europe*, therefore the data is retained for this exercise in the absence of an alternative.
HDPE resin production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: High Density Polyethylene (HDPE)	
HDPE bottle top production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: Injection Moulding of PVC, HDPE and PP	The HDPE injection eco-profile data has now officially expired, but has not been replaced by Plastics *Europe*, therefore the data is retained for this exercise in the absence of an alternative.
PET resin production	Plastics *Europe*	Eco-profiles of the European Plastics Manufacturers: Poly-ethyleneterephthalate (bottle grade)	
PET bottle production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: PET Injection Stretch Blow Moulding	The PET bottle injection eco-profile data has now officially expired, but has not been replaced by Plastics *Europe*, therefore the data is retained for this exercise in the absence of an alternative.
PP resin production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: Polypropylene	
PP bottle top production	Plastics *Europe*	Eco-profiles of the European Plastics Industry: Injection Moulding of PVC, HDPE and PP	The PP injection eco-profile data has now officially expired, but has not been replaced by Plastics *Europe*, therefore the data is retained for this exercise in the absence of an alternative.
Polyether polyols	Plastics *Europe*	Long and Short-chain Polyether Polyols for Polyurethane Products, ISOPA, April 2012	Emission factor only available for the production of polyurethane precursors, no information on production of polyurethane compound from the polyols. Uncertain of the distinction between long and short-chain polyester polyols, therefore the average of the emission factors has been used.
PVC resin (suspension)	Plastics *Europe*	Eco-profiles of the European Plastics Manufacturers:	Emission factor only available for the production of PVC film precursors. The PP injection eco-profile data has now officially expired, but has not been replaced by Plastics *Europe*, therefore no data is available to complete the emissions from the conversion of the PVC suspension to PVC film.
UK water supply	UK Government	GHG conversion factors for company reporting	Annex 9 Bioenergy and Water, Table 9a, Water supply, 2010/11