LIFE CYCLE ANALYSIS

of our GLASS MILK BOTTLES

modern milkman

WHY WE COMMISSIONED *a* SCIENTIFIC REPORT

The truth, the whole truth, and nothing but the truth

We're big believers in the environmental benefits of returnable glass bottles. But some customers, and many plastics industry professionals, have questioned whether we have the facts to back up our sustainability claims. And rightly so!

So, we've put our money where our mouth is and commissioned a scientific report by Utrecht University to compare the carbon footprint of glass bottles vs plastic bottles – considering everything from production and recycling to weight and transportation.

The full scientific report is available to download, which is fascinating but long! So, we've provided some background on the subject and condensed the main points for you here.

BEFORE THE SCIENCE, LET'S START *with* SOME HISTORY...

Glass has been replaced by a plastic waste crisis

The iconic glass milk bottle was a common sight on doorsteps across the UK until the turn of the millennium. But in recent decades, we've seen the traditional milkround replaced by supermarket milk packaged in plastic cartons and tetra packs. And while this might seem like a cheap alternative, the environmental costs are catastrophic.

NOW *for* SOME GENERAL KNOWLEDGE

What is HDPE plastic, and why is it so harmful?

The problem with HDPE is that it has a higher carbon footprint to produce than glass (as it's made from fossil fuels) and takes hundreds of years to break down. But in 2020, the UK produced 15.8 billion litres of milk, with around 80% packaged in single-use HDPE plastic bottles. That's more plastic than a Beverly Hills surgeon sees in a lifetime!

Uberoi, E. (2020). UK Dairy Industry Statistics. House of Commons Library. Retreived from: https://commonslibrary.parliament.uk/research-briefings/sn02721/

DOWNCYCLING *is* LIKE PEDDLING UPHILL

Let's call plastic 'recycling' what it is...

When HDPE cartons and bottles are sorted for 'recycling', it's unlikely they'll be made into more cartons and bottles because it's a complex process and cheaper to create virgin plastic. And tetra packs are tough to recycle because they have more laminated layers than a fake ID. The cost, combined with consumer behaviour and inadequate recycling infrastructure, means plastic packaging tends to be downcycled instead of recycled.

THE SIMPLE SOLUTION *is* RETURN AND REUSE

Return and reuse glass bottles reduce waste

Reusable packaging is becoming widely accepted by experts and consumers as a sustainable solution for our plastic waste crisis. A great example of this is the shift to reusable shopping bags and the return of the humble glass milk bottle, which can be reused around 25-30 times.

Don't trust us, trust

Dame Ellen Patricia MacArthur DBE

The Ellen MacArthur Foundation (EMF, 2019) states that reusable packaging is a critical part of the solution to eliminate plastic pollution. Compared to recycling a single-use bottle, reusing prevents new bottles from being made altogether, reducing raw material extraction and waste generation. (Mortensen et al., 2021).

Mortensen, L. F., Tange, I., Stenmarck, Å., Fråne, A., Nielsen, T., Boberg, N., & Bauer, F. (2021). Plastics, the circular economy, and Europe' s environment-A priority for action.

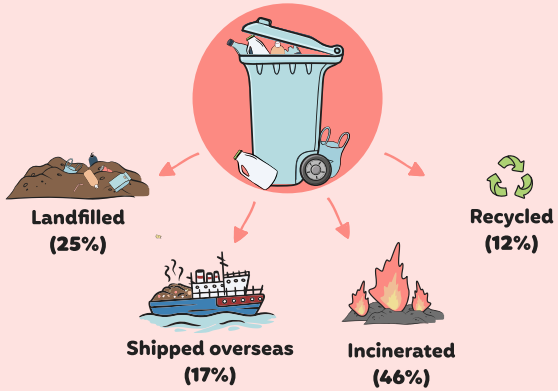
TO INFINITY *and* BEYOND

Glass can be recycled over and over and over...

The beautiful thing about glass bottles is they're made from natural materials - around 55% sand, 25% soda ash, and 20% limestone. But they can also be made from cullet, a material sourced from used glass, mixed with the raw materials. And this process can be repeated infinitely without leaching any harmful chemicals (because there are none).

Glass bottles are 100% recyclable and can be endlessly recycled with no loss of quality or value, making it an ideal example of a closed-loop system (Modak, 2018).

Only 2% of global plastics are in a closed-loop recycling system (EMF, 2016). Therefore, it is assumed that most HDPE bottles have a recycled content of 0%.



Ellen MacArthur Foundation (EMF). (2017).The New Plastics Economy. Rethinking the Future of Plastics & Catalysing Action

Modak, N. M., Modak, N., Panda, S., & Sana, S. S. (2018). Analyzing structure of two-echelon closed-loop supply chain for pricing, quality, and recycling management. Journal of Cleaner Production

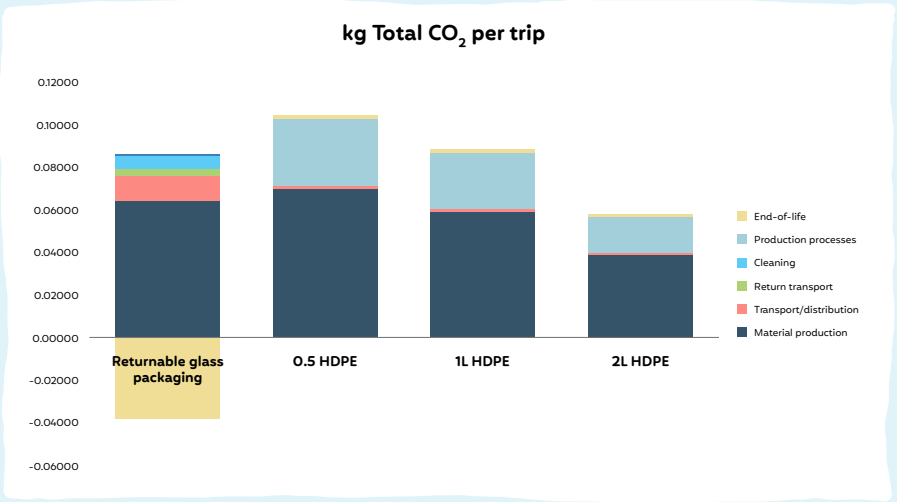
NOW FOR *the* HARD FACTS

Our glass bottles have a lower carbon footprint than plastic

Our returnable glass bottles have a lower carbon footprint than the equivalent 1-pint plastic cartons after just one delivery, return and reuse (two uses). And the return rate of our glass bottles is 81%, which means they're reused just over five times. Plus, the more our bottles are reused, the lower the average carbon emission is per bottle.

That's why we're keen for our customers and milkies to return, collect and reuse as many bottles as possible to increase our return rate.

Packaging	Total CO2 emmisions (kg)
Glass	
Reusable glass bottle with 81% return rate	0.0476
Reusable glass bottle with 90% return rate	0.0360
Reusable glass bottle with 95% return rate	0.0296
Reusable glass bottle with 81% return rate and electric vans	0.0419
HDPE plastic	
0.5L HDPE	0.1047
1L HDPE	0.0882
2L HDPE	0.0579
Carton	
0.5L Beverage carton	0.1129
1L Beverage carton	0.0920
HDPE with recycled content	
1L HDPE with 15% recycled content	0.0870
1L HDPE with 30% recycled content	0.0830
Reusable glass bottle	
Reusable glass bottle with minimum milkround route	0.0438
Reusable glass bottle with maximum milkround route	0.0510



HERE COMES *the* SCIENCE BIT

When increasing the volume of any packaging, there is a decrease in carbon emissions as more product is transported per mass of packaging. Therefore, our comparisons are size dependent.

Here are our findings:

The reusable glass bottle needs to be used just over 1.6 times to produce fewer carbon emissions than the 0.5L HDPE bottle, over 2.0 times for fewer carbon emissions than the 1L bottle, and over 3.7 times for fewer carbon emissions than the 2L HDPE bottle.

The reusable glass bottle needs to be used just over 1.4 times to produce fewer carbon emissions than the 0.5L beverage carton and over 1.9 times to produce fewer carbon emissions than the 1L carton.

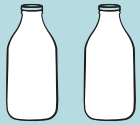
Carbon comparison of glass vs plastic

How many times our bottles need to be used to have lower carbon emissions than the plastic equivalent.

1.6x

0.5L HDPE bottle

2x



1L HDPE bottle

3.7x

2L HDPE bottle

1.4x

0.5L Beverage carton

1.9x

1L Beverage carton

MANY THANKS TO ELEANOR CARTER FOR HER MSC THESIS

A comparative life cycle analysis of the Modern Milkman's reusable glass bottle

Eleanor Carter is a talented chemistry graduate and MSc student with a bright future in environmental research. But when she first told us of her plans to follow the life cycle of a glass milk bottle, we thought she was mad – how can you keep your eye on a pint of milk when it's in someone else's fridge? Turns out she had much more scientific techniques and analysis tools at her fingertips. And as far as we know, her research into the returnable glass milk bottle is the first of its kind. So, we can't thank her enough!

A FINAL THANKS TO OUR CUSTOMERS AND MILKIES

Without you, the iconic return and reuse bottle would just be a bottle.
And your support is helping to reduce plastic waste and support independent suppliers.

No self-respecting report is worth the paper its written on.

So we've produced ours as an e-doc to save trees and reduce our carbon footprint.

Thanks for reading.