PET PACKAGING
IS THERE AN ALTERNATIVE?

SAN BWA

SOUTH AFRICAN NATIONAL
BOTTLED WATER ASSOCIATION

Make a clear choice.

INTRODUCTION

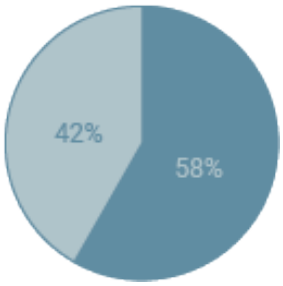
PET, the recyclable and food-grade plastic most often used for beverage bottles, is often criticised as the cause of the plastic waste that pollutes our environment.

As a result, there are various alternatives being touted to consumers, manufacturers, retailers, hoteliers and restauranteurs, including biodegradable and compostable plastics, cardboard or paper bottles or cartons, cans, and glass recycling or refilling.

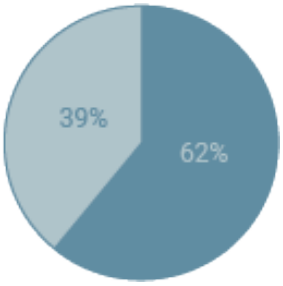
But, the solution is not as simple as replacing PET with one of these alternatives, no matter what the people who sell them say.

This is South Africa, and we need to consider how these alternatives perform in a South African context, not Sweden, Germany, Japan, Australia or the UK and USA.

Forgetting for a moment that people litter, not inanimate objects which have been made to be recycled, it is important to consider the following:



2019: 42% of Plastic Collected for Recycling was packaging.



2019: 62% of all PET plastic placed on the market was recylced.

Glass on-site refilling systems (like those used in restaurants) do not comply with SA food and beverage legislation.

1. Pre-Covid lockdowns, 503 600 tons of plastic waste was collected for recycling in 2019, of which more than half (362 800 tons) was packaging. South Africa's input recycling rate in that year was 45.7%. (Source: Plastics SA)
2. South Africa's recycling ecosystem, when it comes to PET, is an efficient system. 62% of all polyethylene terephthalate (PET) plastic placed on the market in 2019 (pre-Covid) was recycled. (Source: PETCO) This dropped during the Covid lockdown, and as the pandemic restricted the movement of people, including collectors.
3. South Africa's recycling ecosystem, in general, is not set up to handle the packaging alternatives currently making waves overseas. To recycle or process biodegradable and compostable plastics, cardboard, paper bottles or cartons, would require considerable investment in new equipment and infrastructure. If this investment is not made, and these alternatives are used, they will simply go to landfills.
4. On-site glass refilling systems (like those used in restaurants) are not as green as they are made out to be, given the amount of water they use, and further do not comply with South Africa's food and beverage legislation. While tins do conform and are recyclable, the energy required to make and recycle them is exorbitant.

www.sanbwa.org.za | Tel: +27 11 884 5916 | sanbwa@worldonline.co.za
Facebook: @SouthAfricanNationalBottledWaterAssociation

WHAT ARE SUSTAINABLE PACKAGING ALTERNATIVES THEN?

What follows are the facts when it comes to beverage packaging alternatives in South Africa. Also below, is a summary of the results from a study conducted by Trayak LLC, a packaging design and manufacturing consultancy based in the USA, into the most sustainable packaging option for beverages plus a report into the climate impact of plastics by McKinsey & Company, a global management consulting firm committed with more than 90 years' experience as its clients' most trusted external adviser.

The authors of this paper concluded that plastics are frequently maligned when it comes to leakage to the environment, toxicity, use of resources, production emissions, and ocean pollution, but argued that, while these important considerations need to be addressed, an opportunity exists for a more balanced, science-based perspective on plastics versus alternative materials.

We also give you links to several credible articles that will provide you with additional information under the final headline 'Additional Reading'.

In conclusion, consider this quote from The Plastics Paradox, by Chris DeArmitt PHD FRSC CCHEM: "Plastics make up less than 0,5% of the material we use and the waste we create. It is wise to keep that perspective in mind …"

www.sanbwa.org.za | Tel: +27 11 884 5916 | sanbwa@worldonline.co.za
Facebook: @SouthAfricanNationalBottledWaterAssociation

CONTENTS

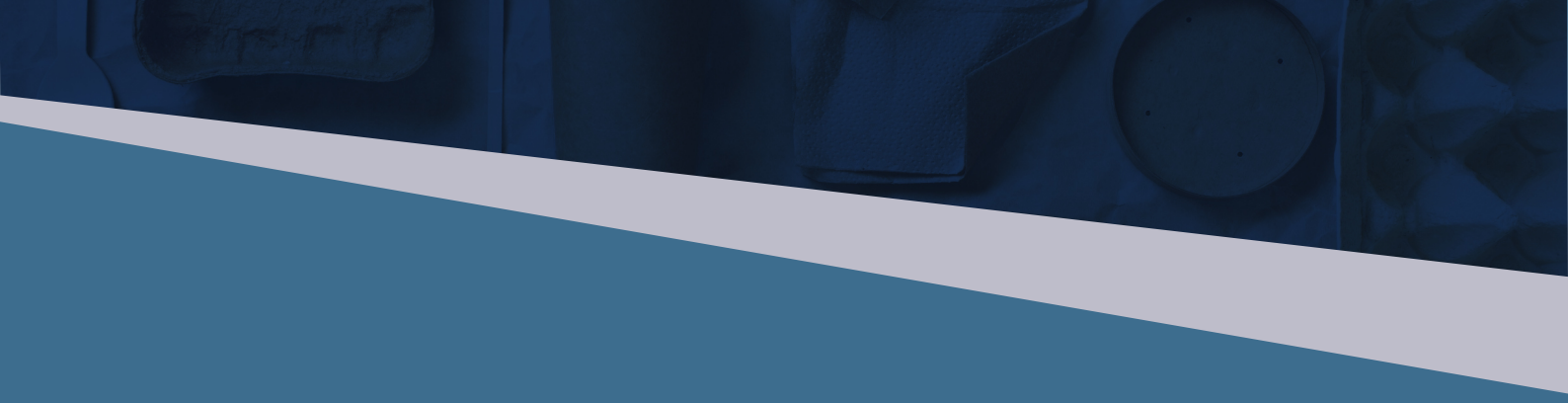
01 | ALTERNATIVES TO PET PACKAGING

1. BIODEGRADABLE AND COMPOSTABLE PACKAGING
2. PLANT-BASED PACKAGING
3. CARDBOARD OR PAPER CARTON PACKAGING
4. ALUMINIUM CAN PACKAGING
5. GLASS PACKAGING
6. ON-SITE REFILL

02 | MOST SUSTAINABLE OPTION

1. WHAT DO THE EXPERTS SAY IS THE MOST SUSTAINABLE OPTION?
2. ADDITIONAL READING

www.sanbwa.org.za | Tel: +27 11 884 5916 | sanbwa@worldonline.co.za
Facebook: @SouthAfricanNationalBottledWaterAssociation



01 | ALTERNATIVES TO PET PACKAGING

www.sanbwa.org.za | Tel: +27 11 884 5916 | sanbwa@worldonline.co.za
Facebook: @SouthAfricanNationalBottledWaterAssociation

1 | BIODEGRADABLE AND COMPOSTABLE PACKAGING FACTS AS THEY APPLY TO SOUTH AFRICA

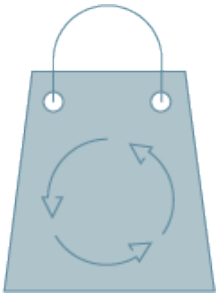
If something is biodegradable, given the right conditions and presence of microorganisms, fungi, or bacteria, it will eventually break down to its basic components and blend back in with the earth.

Ideally, but not always, these substances degrade without leaving any toxins behind, such as food waste. The key word is 'eventually' because even steel, eventually will rust through and disintegrate. So, too, are some plastics biodegradable.

In terms of environmental benefits, the best biodegradable material will break down quickly rather than taking years and without leaving any toxins behind. These materials are often labelled 'compostable'.

Compostable products are all biodegradable, but they are specifically intended for a composting environment. In the right setting, these products break down even more quickly, usually within 90 days, and they leave behind humus, a nutrient-rich organic material that benefits the soil. Whether an item is compostable or simply biodegradable, it needs to be placed in an environment that facilitates its breakdown.

Biodegradable packaging cannot be re-used or recycled.



Compostable packaging cannot be re-used or recycled.

In South African context biodegradable and compostable plastics are regarded as single use packaging.

In South Africa at present, biodegradable packaging cannot be re-used or recycled. It can be composted, but only when it meets the appropriate composting standard.

Compostable packaging cannot be re-used or recycled; it can be composted, but under very specific conditions, in facilities that are designed to keep materials at 60°C for 10 consecutive days – these are very different from most home or garden centre composting streams. For example, PLA or Polylactic acid, is a thermoplastic monomer derived from renewable, organic sources such as corn starch or sugar cane. Using biomass resources makes PLA production different from most plastics, which are produced using fossil fuels through the distillation and polymerisation of petroleum. It can be recycled in some parts of the world, but South Africa currently has no dedicated recycling plants specifically for PLA.

Biodegradable and compostable plastics – in a South African context – therefore present a complete waste of material in that they are not recycled and sent to landfill. They must therefore be regarded as single-use packaging (the same complaint that is often levelled at PET).

It also means that both biodegradable and compostable packaging – if placed into South Africa's existing plastic recycling stream – will contaminate that stream resulting in it all being sent to landfill, as well as a loss of revenue for the recycler. Any business or person buying a product packaged in biodegradable or compostable packaging must therefore accept responsibility for keeping it out of the recycling stream.

Finally, by-products of the composting and biodegradation process include methane and CO_2, the very gases that are contributing to global warming, as well as microplastics.

BIODEGRADABLE

Products that break down naturally into organic material in an undefined (but reasonable) amount of time.

No human intervention needed.
The action of naturally occurring micro-organisms such as bacteria, fungi and algae.

It takes less time than the 1000s of years needed for some plastics to break down.

Sometimes leave behind metal residue.

COMPOSTABLE

Products that break down to biomass at the same rate as other organics (like plants) and leave no residue after roughly 3 months.

Human intervention needed. Capable of breaking down in a compost environment (worms, compost bins).

The composting process usually takes about 90 days.

Leaves no distinguishable visible or toxic residue.

Hyperlinks in this section:
https://bpiworld.org/BPI-Resources
https://www.thebalancesmb.com/what-does-biodegradable-mean-2538213
https://www.factssa.com/news/understanding-sans-1728-guidance-on-labelling-of-degradable-plastic/
https://www.plasticsinfo.co.za/wp-content/uploads/2019/11/Alliance-Biodegradable-position-paper.pdf
https://epe.global/2019/11/25/compostable-biodegradable-or-recyclable-packaging-materials/
https://www.engineeringnews.co.za/article/beware-of-biodegradable-and-compostable-plastics-plastics-sa-2020-02-14
https://ecopack.co.za/compostable-packaging/

2 | PLANT-BASED PACKAGING FACTS AS THEY APPLY TO SOUTH AFRICA

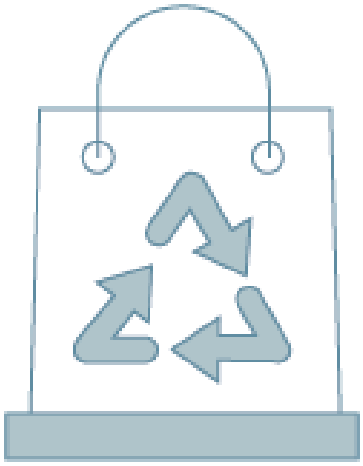
Packaging containing a percentage of plant-based plastic is recyclable except when there is printing directly onto the bottle or packaging. However, a high percentage of plant-based plastic content in the overall packaging is undesirable because it causes 'haze' and devalues the recycling stream.

If you use any products packaged in plant-based packaging, you will need to ensure that the nearby recycling streams can accommodate plant-based plastics. All of PETCO's member recyclers can accommodate plant-based packaging for recycling.

Hyperlinks used in this section:
https://petco.co.za/find-a-recycling-drop-off-site/
https://petco.co.za/our-partners/

3 | CARDBOARD OR PAPER CARTON PACKAGING FACTS AS THEY APPLY TO SOUTH AFRICA

It is entirely possible to recycle all beverage-, custard- and long-life milk cartons, but there are only a handful of companies that have the hydro-pulping facilities required to do so.



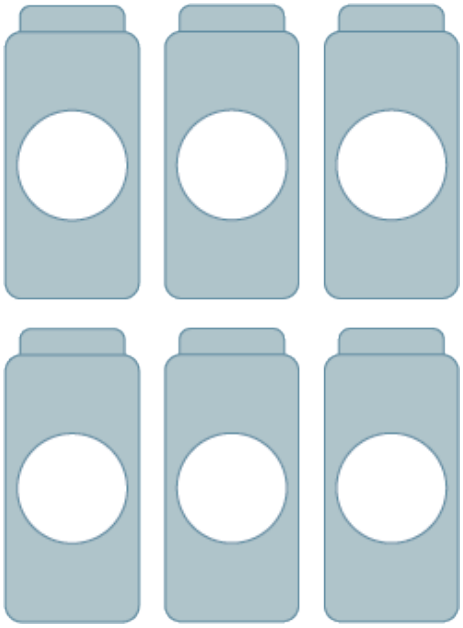
Mpact, for example, has one hydro-pulping plant in Gauteng, so the opportunity to recycle these there is high. Not so in the Western Cape, where there are no facilities. This means the recycling rate is very low, with most of this type of packaging ending up in landfills or the environment.

The average beverage carton recycling rate in South Africa is 10%. Compared to 60+% PET recycling rates. Carton packaging do not offer the greener option as claimed, nor does it offer any product visibility for visual quality inspection.

Hyperlinks used in this section:
https://www.westerncape.gov.za/service/household-recycling
https://www.engineeringnews.co.za/article/renewable-carton-packaging-to-reduce-environmental-impact-2020-11-18/rep_id:4136

4 | ALUMINIUM CAN PACKAGING FACTS AS THEY APPLY TO SOUTH AFRICA

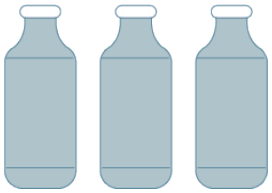
Currently, the recycling rate of all beverage cans recycled in South Africa is estimated at 72%. To recycle aluminium is very simple, it just needs to be melted down and repurposed for something new - that's it! As the whole of aluminium is recyclable, this process can happen over and over again, too. However, the environmental impact of mining for aluminium, and the energy required for the initial production process, as well as to melt and repurpose it is extremely environmentally unfriendly. Also, the tin can offers no product visibility for a visual quality inspection.



Hyperlink used in this section:
https://www.cantechonline.com/news/5707/south-africa-converts-to-aluminium-cans/#:~:text=%E2%80%9CCurrently%2C%20the%20recycling%20rate%20of,South%20Africa%2C%E2%80%9D%20he%20adds.

www.sanbwa.org.za | Tel: +27 11 884 5916 | sanbwa@worldonline.co.za
Facebook: @SouthAfricanNationalBottledWaterAssociation

5 | GLASS PACKAGING FACTS AS THEY APPLY TO SOUTH AFRICA



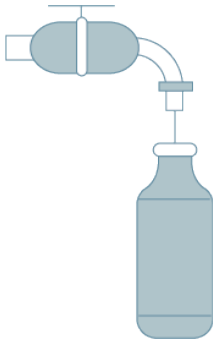
The glass recycling rate in South Africa is 44%, according to The Glass Recycling Company (TGRC) but more than 80% of all glass packaging is now diverted from landfills.

There are environmental gains to re-using glass, but also heavy losses because of its weight, which impacts transport costs and emissions and the additional energy used to melt it. Where the glass is not melted and new bottles are produced in other words, the bottles are rinsed and reused through re-filling, the water footprint spirals as a result of the rigorous washing process returned bottles are required to be put through. Re-using glass is always advisable if done within an environment that is able to maintain its hygiene and exclude the risk of any pathogens and foreign bodies. Logistics are unfortunately not simple and play a major part in contributing to the risk of contamination. For this reason, it is not ideal to re-fill all food products, such as water. Natural water contains no added preservatives and in a closed bottle system any added microbiological contaminants can proliferate.

Furthermore, the additional transport and rigorous cleaning process contributes unfavourably to the water and carbon footprint, which yields a much less 'green' effect than aspired to. With respect to labelling, most label information is printed on bottles and therefore cannot be updated. Also, batch codes and Best Before dates are still required, and must be changed upon every re-fill. Finally, collection points can also be a hazard if the glass or containers that hold them are shattered.

Hyperlink used in this section:
https://theglassrecyclingcompany.co.za/118363-2/#:~:text=The%20latest%20recently%20announced%20glass,held%20virtually%20during%20June%202020.

6 | ON-SITE REFILLING FACTS AS THEY APPLY TO SOUTH AFRICA



This is a very popular quick-fix for restaurants and hotels looking to quickly boost their green credentials. However, it should fill consumers with fear given the 'lurgies' that can lurk in bottles and caps that are not adequately sterilised before re-use. Also, refilling on-site into re-usable glass bottles may look like an environmentally-friendly option but often results in drinking water being passed off on the consumer as bottled water.

Specifically, South African legislation dictates that, when water prepared by a filtration device is offered in a closed bottle, it constitutes packaged water. This means that the legislation governing the production of bottled water needs to be adhered to, including the requirement for a hermetic tamper-proof seal, label information based on annual averages, chemical and microbiological tests done per daily production batch, water licences, registration as producer of waste, operation controls, etc. etc.

These safeguards, required of packaged water, mostly do not happen. To legally use a refill system, the water needs to be served in glasses or wide neck open jugs or containers.

02 | MOST SUSTAINABLE OPTION

www.sanbwa.org.za | Tel: +27 11 884 5916 | sanbwa@worldonline.co.za
Facebook: @SouthAfricanNationalBottledWaterAssociation

1 | WHAT DO THE EXPERTS SAY IS THE MOST SUSTAINABLE OPTION?

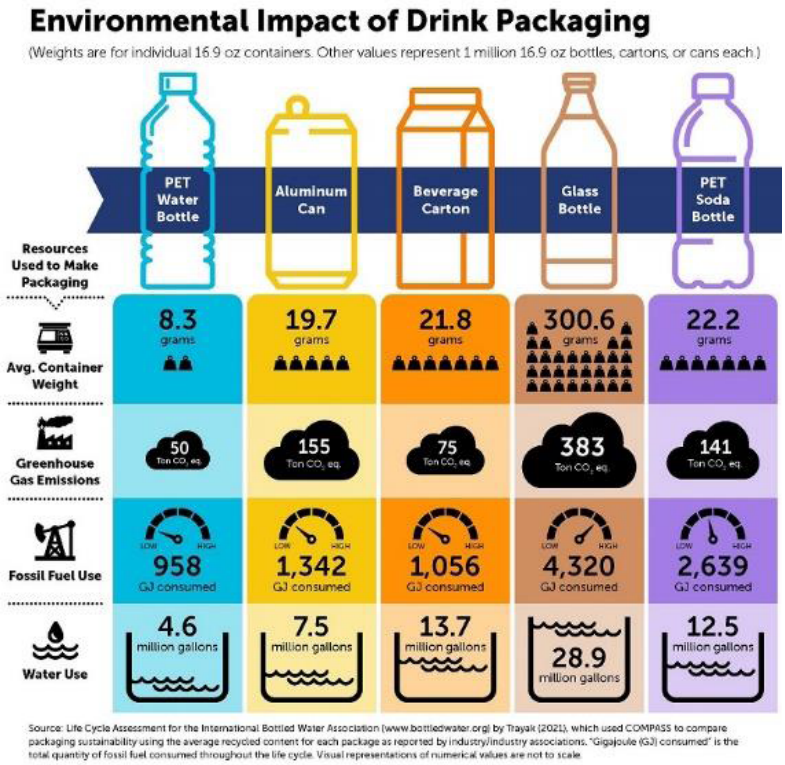
A study conducted by Trayak LLC, a packaging design and manufacturing consultancy based in the USA, into the life cycle assessment of five industry average water containers, shows that the PET water bottle is the least environmentally impactful option, and therefore the preferred container for packaged water.

Using its independent and science-based software platform and Comparative Packaging Assessment (COMPASS) methodology, it conducted a life cycle assessment (LCA) of five different industry average packaging formats – the polyethylene terephthalate (PET) water bottle, a PET soda bottle, an aluminium can, a beverage carton and a glass bottle.

According to the report (read the executive summary here), the packaging systems were analysed according to seven different environmental impact categories, and a detailed breakdown provided for fossil fuel usage, GHG emissions, and water usage.

The PET bottle produced the lowest environmental impact across the seven indicators measured, including fossil fuel use, greenhouse gas (GHG) emissions, and water use. The beverage carton was the second least impactful package across many of the seven indicators. The glass bottle was the most environmentally impactful container.

The infographic below puts the Trayak's findings into perspective.



The study was commissioned by the USA's International Bottled Water Association (IBWA).
Critical to its engagement with Trayak, was collecting data for all of the packaging formats and establishing a reliable standard structure and packaging system for each. Within the LCA, the

materials and processes were modelled with industry average data from the ecoinvent database.

This is the world's leading LCI database delivering transparency and consistency. It provides well-documented process data for thousands of products, helping companies and individuals make truly informed choices about their environmental impact.

Importantly, too, the study considered the likelihood that each packaging type and material format will be recycled, landfilled, or incinerated based on the current infrastructure in the USA. South Africa's recycling streams are less sophisticated, hence the outlook is worse for some PET alternatives in South Africa.

Published more recently, is a report into the climate impact of plastics by McKinsey & Company, a global management consulting firm committed with more than 90 years' experience as its clients' most trusted external adviser.

The authors of this paper concluded that plastics are frequently maligned when it comes to leakage to the environment, toxicity, use of resources, production emissions, and ocean pollution, but argued that, while these important considerations need to be addressed, an opportunity exists for a more balanced, science-based perspective on plastics versus alternative materials.

"Multiple environmental factors should be considered in material selection," they wrote. "This paper examines the total greenhouse gas (GHG) contribution of plastics versus its alternatives, including product life cycle (cradle to grave) and impact of use. Our objective is to contribute to the dialogue on material choice and broaden the available fact base for the evolving discussion around plastics."

The analysis conducted by the team was based on 2020 information from the United States and excluded ocean pollution.

As part of its methodology, they looked closely at examples from five sectors with the highest consumption of plastics—packaging, building and construction, automotive, textiles, and consumer durables—representing around 90% of global plastics volume.

The three critical steps were:

- Selecting application categories based on the top five sectors with the highest plastics consumption, and representative applications for which at-scale, viable choices between plastics and alternatives exist today, avoiding niche or new solutions.
- Creating detailed greenhouse gas assessments for selected applications within each application category.
- Assessing the total greenhouse gas contribution of applications throughout the product's life cycle, including its value-chain impact.

There were two important overall findings. The first was that plastics have a lower greenhouse gas impact in 13 of the 14 non-plastic alternative applications analysed, including both direct and indirect value-chain emissions. The second was that, for the majority of food packaging applications, there are few viable alternatives to plastics.

To further illustrate how the analysis was carried out, what follows is the report's in-depth review of soft drink containers (page 13 of the report):

"We began our deep dive with an application most people are familiar with: soft drink containers. The majority of soft drinks today are packaged in PET bottles, aluminium cans, or glass bottles. We based

our analysis on 20-ounce PET bottles, 12-ounce aluminium cans, and 12-ounce glass bottles, which account for 17.0, 60.0, and 0.3 percent of the carbonated soft drink market in the United States, respectively. These specific sizes were selected because they represent the most common beverage container sizes for their respective material substrates.

“Comparing a 20-ounce PET bottle with a 12-ounce aluminium can favours the PET bottle because the material-to-volume ratio is significantly higher for smaller containers. In other words, it would require more plastic to distribute 100,000 fluid ounces of soda in 12-ounce PET bottles than in 20-ounce PET bottles, which would increase the GHG emissions. However, these sizes represent what consumers typically choose to purchase.

“PET bottles have the lowest emissions because of their lightweight properties and the low amount of energy required to produce them. By contrast, aluminium cans have two times the emissions of PET bottles, and emissions from glass bottles are three times higher. Although the PET bottle has the lowest production emissions, it has the least favourable GHG emissions for its end-of-life disposition.

“PET has the lowest recycling rate and credits from avoided virgin production among these three materials. It also has the highest emissions from WtE. (PET releases CO2 when burned, whereas aluminium and glass do not.) However, the GHG impact of production emissions is more significant than end-of-life disposition emissions, resulting in PET having the lowest GHG impact.

“The value-chain impact for soft drink containers is relatively small. The average shelf life is approximately 13 weeks for PET bottles versus 52 weeks for aluminium cans and glass bottles. PET bottles also have slightly higher spoilage rates (loss of carbonation) than aluminium and glass. That said, glass bottles break more easily than PET and aluminium. In both cases, additional GHG emissions are incurred from soft drink and bottle production to compensate for incremental spoilage and breakage of PET and glass bottles. However, in neither case is the total GHG contribution the result of incremental spoilage or breakage of materials.”

Hyperlinks referred to in this section
https://trayak.com/
https://bottledwater.org/wp-content/uploads/2021/06/Trayak-LCA_2021.pdf

2 | ADDITIONAL READING

https://plasticsparadox.com/
https://www.plasticstoday.com/materials/two-new-books-plastics-two-different-stories
https://plasticsparadox.com/wp-content/uploads/2021/10/The-Plastics-Paradox_ENG.pdf
https://www.mckinsey.com/industries/chemicals/our-insights/climate-impact-of-plastics
https://bioplasticsnews.com/2022/08/16/mckinsey-report-on-climate-impact-of-plastics/
https://www.dailymaverick.co.za/article/2022-08-19-focus-on-single-use-plastics-ignores-the-greater-hazard-of-microplastic-contamination/
https://www.dailymaverick.co.za/article/2022-08-16-why-biodegradable-packaging-might-not-actually-be-biodegradable/