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Research Council

Life cycle analysis

Soft drinks: plastic glass or can?

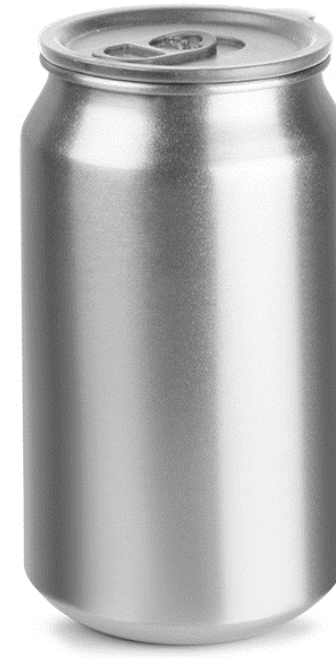
Prepared by the EPSRC CDT in Sustainable Chemistry

Based on the study from Amienyo *et al.*

D. Amienyo, H. Gujba, H. Stichnothe and A. Azapagic, *The International Journal of Life Cycle Assessment*, 2012, 18, 77-92.



Which way to drink a fizzy drink is better for the environment?





Which part of making a fizzy drink has the most impact on the environment?



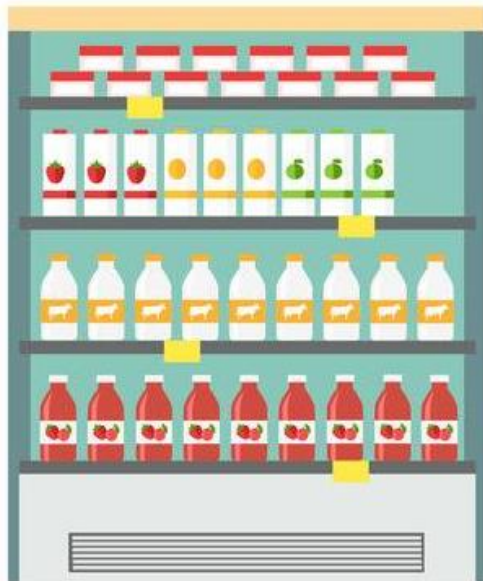
Ingredients



Packaging



Transport



Retail



Waste management



Fill in the table with the Global Warming Potentials for each option. Which is the best for the environment based on this measurement?

	Plastic	Glass	Can
Ingredients			
Packaging			
Transport			
Retail			
Waste Management			
Total			



Ingredients

Of all the ingredients in fizzy soft drinks, sugar has the biggest environmental impact. This is because pesticides and fertilizers are needed to grow sugar cane and the production of these needs to be considered too.

Global Warming Potential : 40



Packaging

The packaging of the drink has the biggest environmental impact. This doesn't just include the bottle or can, but also the pallets and plastic used to hold them while being transported. Cans are usually made from 48% recycled material so this reduces the GWP. However obtaining the rest of the aluminium takes a lot of energy.

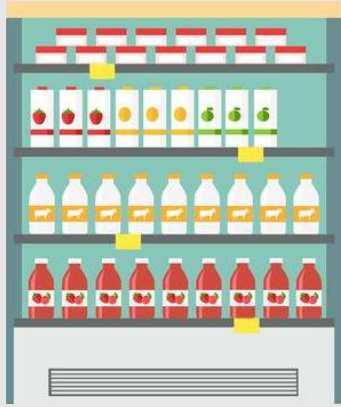
Global Warming Potential : 248



Transport

Transporting the drink from where it's made to the shop does is not just impacted by the fuel it takes to drive there, but also the manufacture of the lorry and all of the extra packaging. Cans have the lowest GWP because they are very lightweight and are really easy to stack in the lorry.

Global Warming Potential : 5



Retail

The GWP of keeping fizzy drinks in the fridge is very large. The main reason for this is all the electricity needed to run the fridges. Soft drinks do not need to be kept cool to last longer, but customers prefer cold drinks. Cans have a higher GWP than plastic as they don't contain as much fizzy drink.

Global Warming Potential : **155**



Waste

The waste from the drink is not just the bottle that you throw away at the end. This also includes any extra packaging, any of the drink that isn't used and any bottles or cans that are broken or damaged while filling or transporting. Cans have a low GWP as there is a low amount of waste created in the process, and they are widely recycled.

Global Warming Potential : **7**



Ingredients

Of all the ingredients in fizzy soft drinks, sugar has the biggest environmental impact. This is because pesticides and fertilizers are needed to grow sugar cane and the production of these needs to be considered too.

Global Warming Potential : 40



Packaging

The packaging of the drink has the biggest environmental impact. This doesn't just include the bottle or can, but also the pallets and plastic used to hold them while being transported. Glass bottles are usually made from 35% recycled material so this reduces the GWP. However to make the glass and form it into the right shape, you have to heat it up to 1,500°C (or higher).

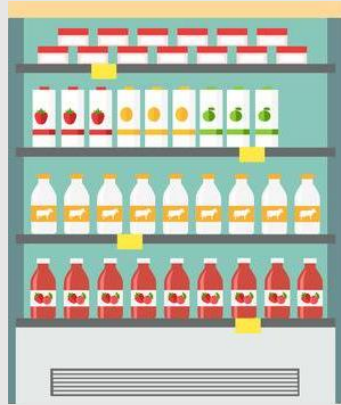
Global Warming Potential : 414



Transport

Transporting the drink from where it's made to the shop does is not just impacted by the fuel it takes to drive there, but also the manufacture of the lorry and all of the extra packaging. Glass bottles have the highest GWP because the packaging is very heavy and requires a lot of fuel.

Global Warming Potential : 8



Retail

Glass bottles are currently less common than cans and plastic. When they are available in shops, they are usually not refrigerated, this results in 0 GWP. If glass bottles were to become more popular and were refrigerated, this would increase.

Global Warming Potential : 0



Waste

The waste from the drink is not just the bottle that you throw away at the end. This also includes any extra packaging, any of the drink that isn't used and any bottles or cans that are broken or damaged while filling or transporting. Glass bottles generate the smallest amount of waste when being made but to recycle them uses lots of energy so they have a high GWP.

Global Warming Potential : 37



Ingredients

Of all the ingredients in fizzy soft drinks, sugar has the biggest environmental impact. This is because pesticides and fertilizers are needed to grow sugar cane and the production of these needs to be considered too.

Global Warming Potential : 40



Packaging

The packaging of the drink has the biggest environmental impact. This doesn't just include the bottle or can, but also the pallets and plastic used to hold them while being transported. Plastic bottles are not usually made from recycled material. This means that there is no cleaning or additional transport needed. In addition, obtaining oil and turning it into plastic is a very efficient process.

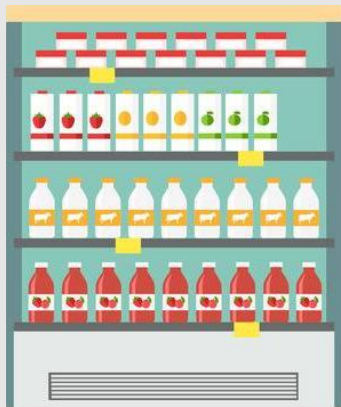
Global Warming Potential : 174



Transport

Transporting the drink from where it's made to the shop does is not just impacted by the fuel it takes to drive there, but also the manufacture of the lorry and all of the extra packaging. Plastic bottles are much lighter than glass so have a lower GWP. However because they are a weird shape they are not as efficient as cans.

Global Warming Potential : 6



Retail

The GWP of keeping fizzy drinks in the fridge is very large. The main reason for this is all the electricity needed to run the fridges. Soft drinks do not need to be kept cool to last longer, but customers prefer cold drinks. Plastic has a lower GWP because a bottle holds more fizzy drink than a can.

Global Warming Potential : 95



Waste

The waste from the drink is not just the bottle that you throw away at the end. This also includes any extra packaging, any of the drink that isn't used and any bottles or cans that are broken or damaged while filling or transporting. Plastic bottles generate the most amount of waste when being made but less energy is needed to recycle them, so they have a lower GWP than glass.

Global Warming Potential : 35



Which way to drink a fizzy drink is better for the environment?





Based on this life cycle analysis, plastic bottles are best.



As there is not enough data on all of the parts analysed the researchers had to make some assumptions. Because of this, the answer might change in the future when there has been more research done. Things that could also be thought about are how likely people are to recycle their packaging, how much things cost and whether the packaging will have an effect on wildlife if it is not recycled.



Extension: Would making the plastic from renewable resources like corn husks improve it's life cycle analysis?

Write a short essay about whether you think renewable plastics made from things like corn husks and sugar cane will be better for the environment.

Think about:

How do you grow the material source?

Where you grow it?

What else could this source be used for?

Would you need any extra equipment to make plastic from corn husk?

What kind of waste will there be?