INTERNATIONAL ALUMINIUM

COST-COMPETITIVENESS OF PET, ALUMINIUM AND GLASS BEVERAGE CONTAINERS

The International Aluminium Institute (IAI) engaged Wood Mackenzie to evaluate the economics of PET, aluminium and glass beverage containers in 2021 and the impact of carbon taxes. The study considered the costs and greenhouse gas (GHG) emissions at each stage of the value chain for each material in the USA, Western Europe (EU15, EFTA countries) and China.

The key objectives of the study were to understand:

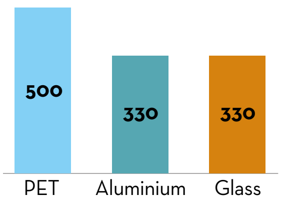
- the relative cost-competitiveness of PET, aluminium and glass beverage containers in each region
- the sensitivity of the economics to different recycled content and carbon tax.

Please contact Marlen Bertram for the full report.

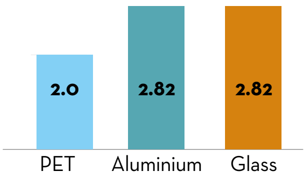
STUDIED BEVERAGE CONTAINER TYPES

A standard (most common) container type for each material in each region was selected.

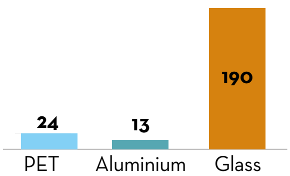
Container sizes – ml



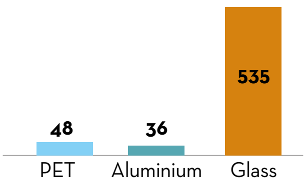
Containers per litre – #/l



Mass per 1,000 containers – kg



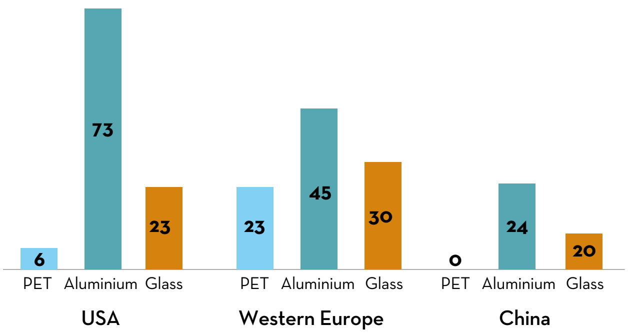
Container mass per litre – g/l



BEVERAGE CONTAINER AVERAGE RECYCLED CONTENT BY REGION

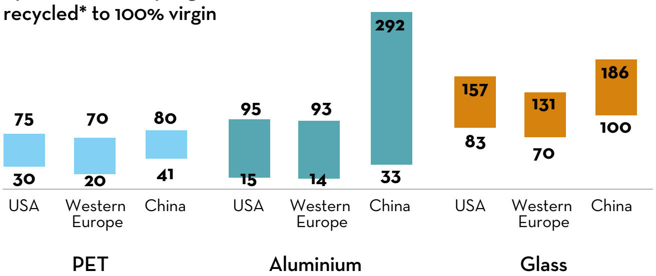
Recycled content and how it varies across regions and materials was a key consideration as it affects both costs and emissions. A regional average recycled content was used in the study. It is worthy to note that the actual recycled content will vary significantly from plant to plant and from product to product. Recycled content – as opposed to the end-of-life recycling rate – was selected as the metric of choice.

% by mass



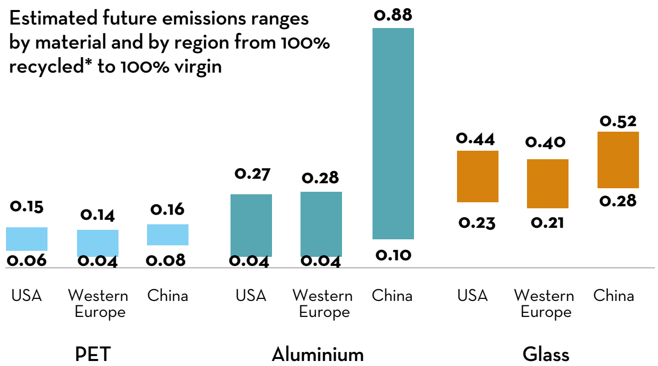
BEVERAGE CONTAINER AVERAGE GHG EMISSION RANGES – KG CO2 PER 1,000 CONTAINERS

Estimated future emissions ranges by material and by region from 100% recycled* to 100% virgin



BEVERAGE CONTAINER AVERAGE GHG EMISSION RANGES – KG CO2 PER LITRE

Estimated future emissions ranges by material and by region from 100% recycled* to 100% virgin



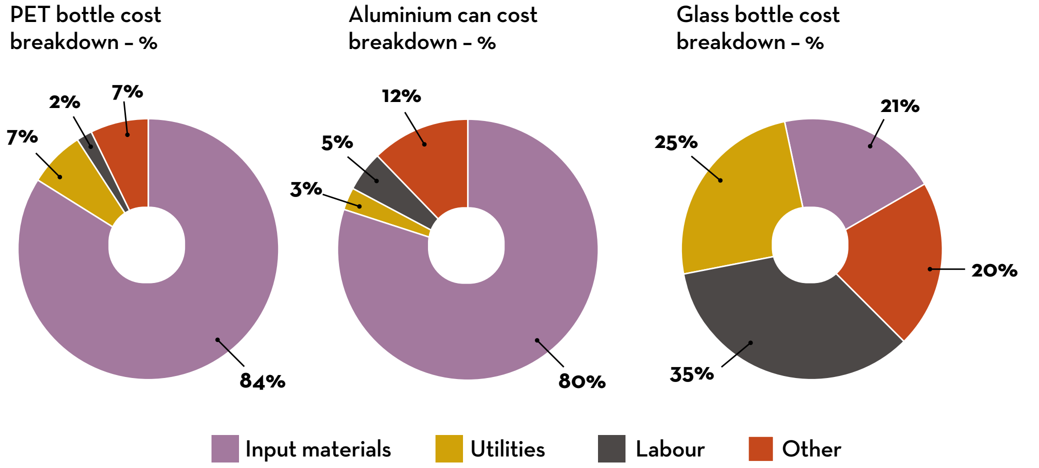
**A close to 100% recycled content is currently only achieved with aluminium, but it is presented here as an aspirational number.*

Visit international-aluminium.org for more information.

COST STRUCTURE

Input materials make up most of the cost of producing a PET bottle (PET resin – primary; PET flakes – recycling) or an aluminium can (aluminium sheet – primary and recycling), but a much smaller fraction of a glass bottle (silica sand, soda ash and limestone – primary; glass cullets – recycling).

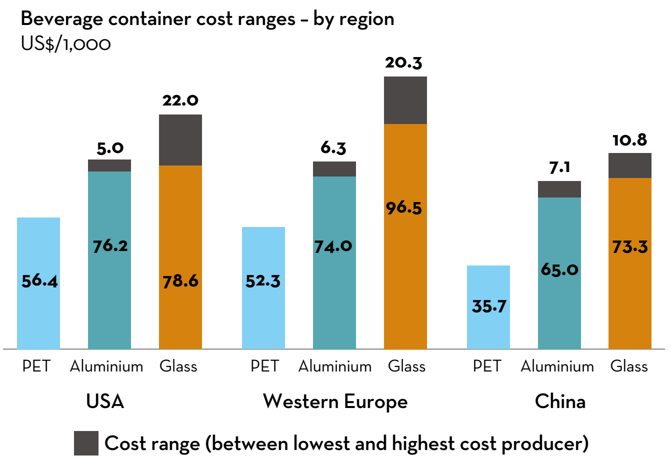
Labour and utilities – gas and electricity – make up the largest fractions of glass bottle costs as the raw materials are relatively cheap.



Logistics costs have not been included.
Some figures may have been rounded up and totals may not equal 100%.

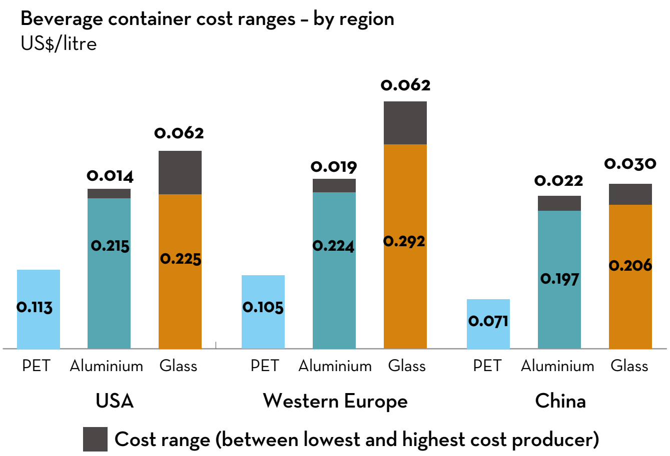
2021 BEVERAGE CONTAINER COST RANGES BY REGION: PER 1,000 CONTAINERS

Costs per 1,000 containers (based on 2021 average input prices and costs) follow a similar trend across all three regions.



2021 BEVERAGE CONTAINER COST RANGES BY REGION: PER LITRE

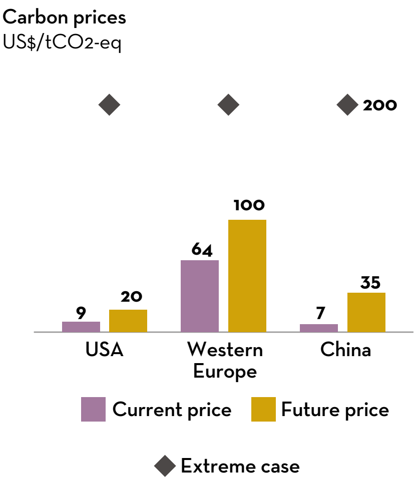
Costs per litre range from 7.1 cents for PET bottles in China to 35.4 cents for high-cost glass bottles produced in Western Europe. PET is the cheapest material in all three regions, with aluminium cans in the middle and glass bottles the most expensive; the difference between materials is most stark in Europe.

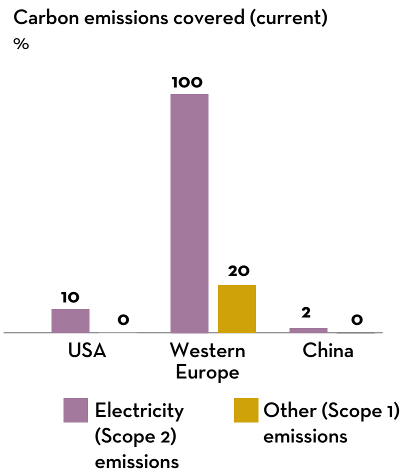


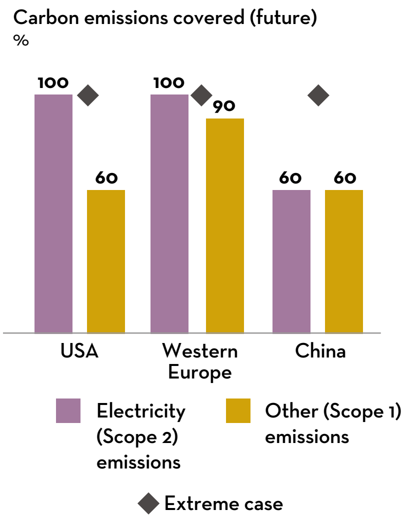
All cost analysis was based on 2021 average prices for raw materials inputs and 2021 average costs for utilities, labour and consumables. Logistics costs have not been included. Variation in production costs of PET bottles within each region were ignored.

CURRENT AND FUTURE (2030) ESTIMATED CARBON PRICES

The future of carbon pricing in the USA and China is uncertain. However, the study assumed that carbon prices will be implemented at higher levels, covering a larger proportion of emissions (both Scope 1 and Scope 2). An extreme case was also considered, with a very high carbon price applied to all Scope 1 and 2 emissions.







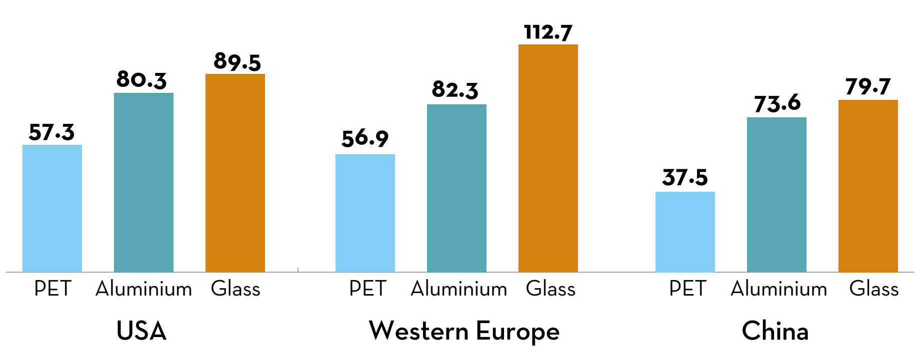
**Other emissions include all non-electricity emissions, including direct process emissions (due to chemical reactions and on-site emissions associated with burning fuel).*

FUTURE BEVERAGE CONTAINER COST RANGES BY REGION*

CURRENT RECYCLED CONTENT AND FUTURE EXPECTED CARBON PRICE: PER 1,000 CONTAINERS

Applying expected future carbon prices to manufacturing emissions at current recycled content rate has a small impact on costs. The largest impact will be felt by glass bottle manufacturers in Western Europe, where carbon costs could make up 10% of total costs per 1,000 containers.

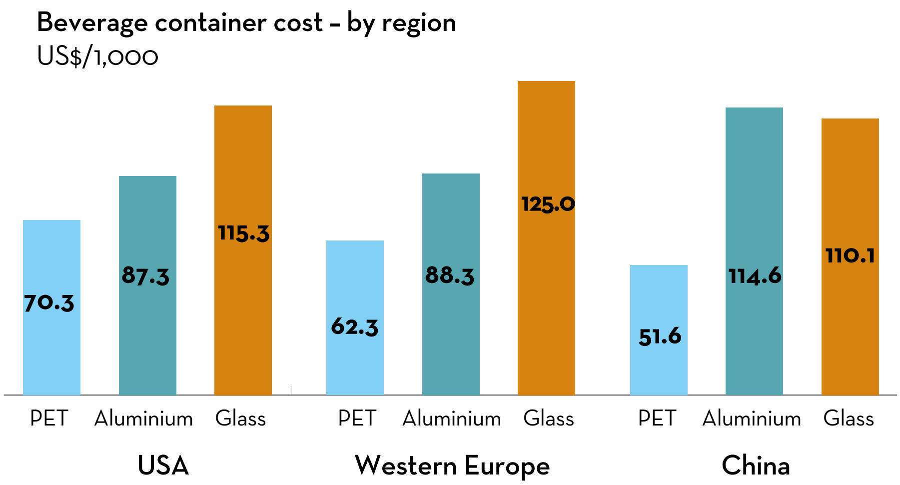
Beverage container cost – by region (including carbon costs)
US$/1,000



**The average between the lowest and highest cost producer was used for aluminium and glass for the scenarios.*

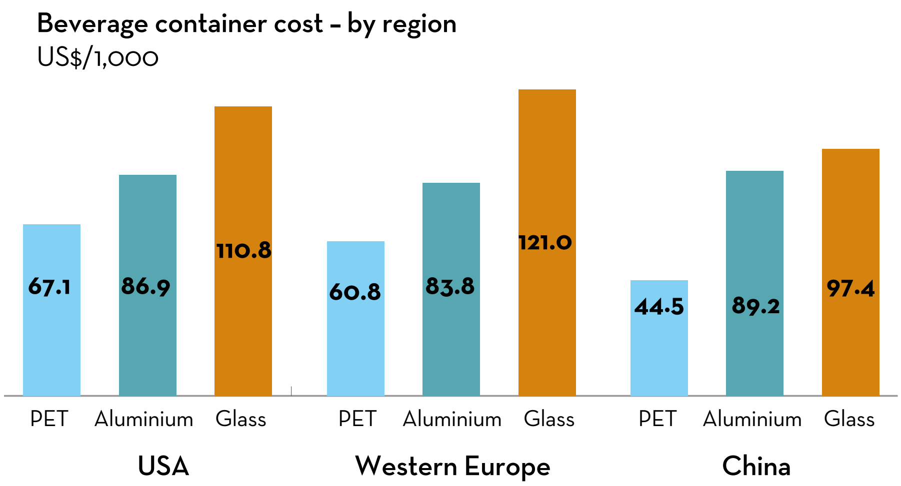
CURRENT RECYCLED CONTENT AND EXTREME CARBON PRICE: PER 1,000 CONTAINERS

Applying very high carbon costs has a much bigger impact, but this impact does not materially alter the relative competitiveness of the three materials. Aluminium in the USA would be least affected, but carbon costs could make up 40% of the cost of can manufacturing in China.



INCREASED RECYCLED CONTENT* AND EXTREME CARBON PRICE: PER 1,000 CONTAINERS

Increasing recycled content would limit the impact of carbon prices on costs, even in the extreme case. Higher carbon prices would be likely to lead to higher recycled content, limiting the impact of carbon prices on manufacturing costs even in an extreme carbon price scenario.



**70% for aluminium, 50% for PET and glass.*