



COMPARATIVE LIFE CYCLE ASSESSMENT: BRAZIL

JULY 2020



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About Life Cycle Assessment	Sphera Comparative LCA Study	Sensitivity Analysis	Plans to further improve the beverage can
Methodology	Carbon Footprint	Recycling Rates	Carbon footprint opportunities mapping
Limitations	Circularity indicator	Recycled Content	Why recycling yields matter
Circular LCAs	All indicators Spider graphs	Refill rates	
	Conclusions		



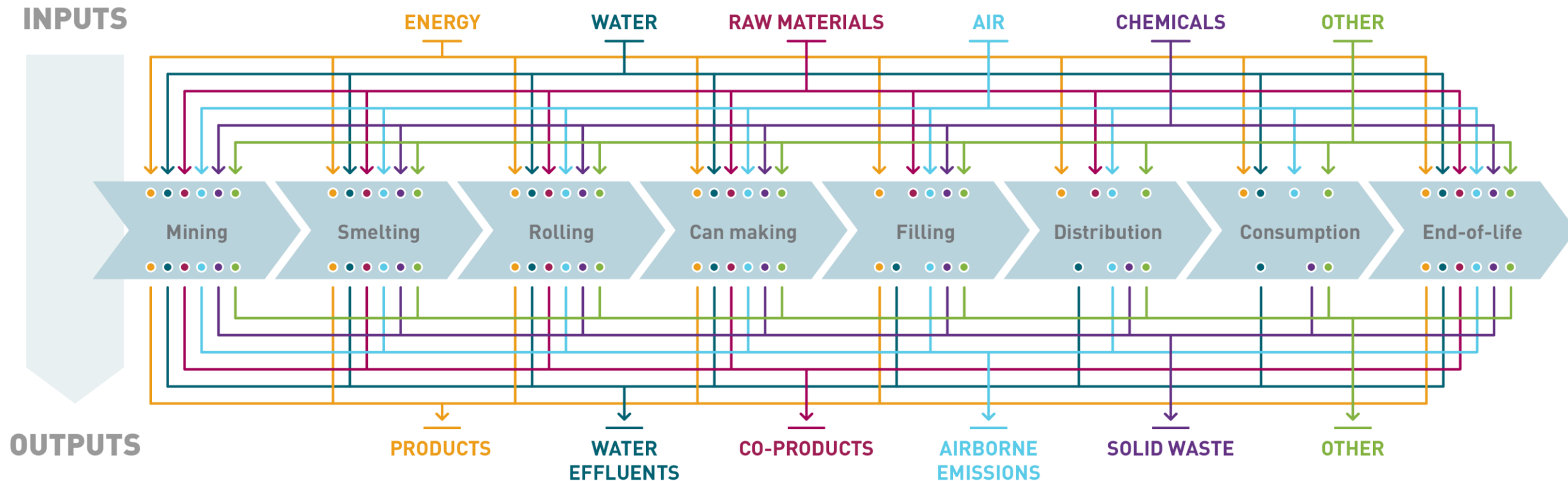
About Life Cycle Assessment

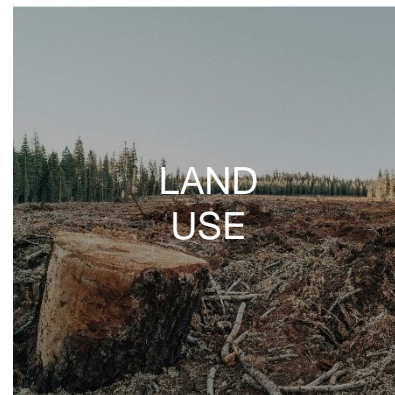
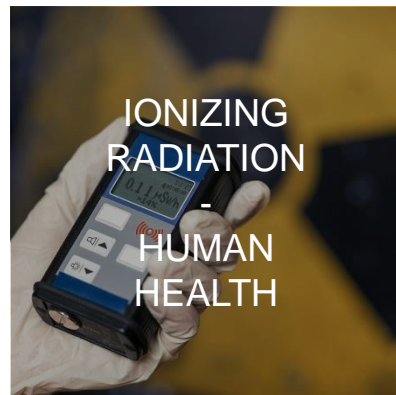
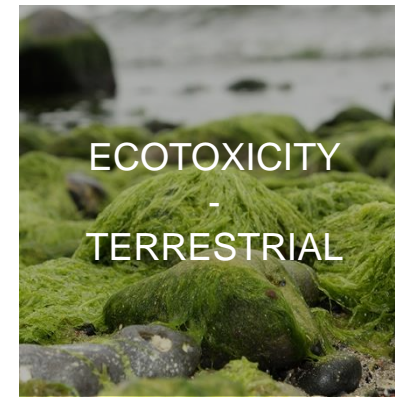
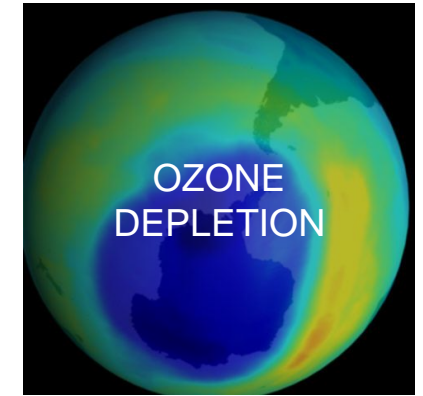
WHAT IS LIFE CYCLE ASSESSMENT (ISO 14040 DEFINITION)



LCA is a technique for assessing the environmental impacts associated with a product, by

- Compiling an **inventory** of relevant inputs and outputs of a product system,
- Evaluating the potential **environmental impacts** associated with those inputs and outputs,
- **Interpreting** the results of the inventory analysis and impact assessment phases in relation to the objectives of the study.





While this presentation focuses on Global Warming Potential and some other environmental impact categories, the full Sphera LCA considered all categories recommended by ReciPe Guidelines



PURPOSE

- Identify environmental hotspots along a product's life cycle.
- Add an environmental dimension for decision-makers to explore new design solutions.
- Monitor environmental footprint improvements of a product over time.
- Inform internal decision makers.
- Compare existing products with alternatives.
- Inform and educate external stakeholders, incl. legislators.
- Support product claims.

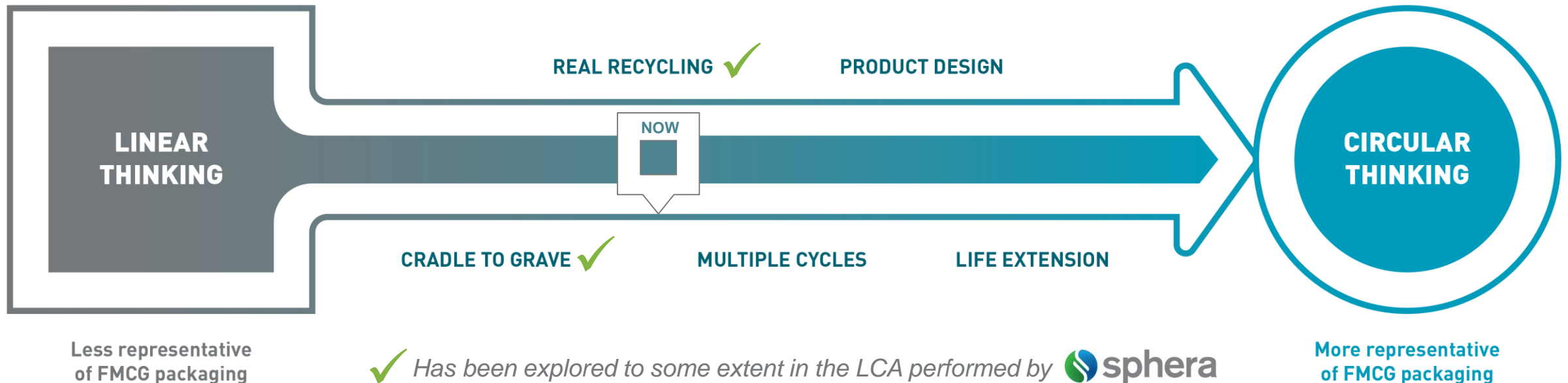


LIMITATIONS

- Not an exact science (methodologies, models and assumptions shape results).
- For the same product, different LCAs can suggest opposing findings.
- Not the single answer to all environmental questions.
- Circularity, real recycling rates, recycling yields, economics of recycling, and impacts of e.g. microplastics on the environment and human life are not considered in LCAs.
- Describe one specific situation, cannot be generalised for all.

> A high level of transparency and offering various sensitivity analysis and scenarios in a LCA is important to allow readers to understand the study design, interpret results and draw their own conclusions

- LCAs today are mostly linear instead of **applying circular thinking**, which would be more appropriate for fast moving consumer goods such as beverage packaging.
- That is why Ball is sponsoring a multi-year PhD program at the University of Barcelona to research limitations of packaging LCAs and develop **new and scientifically sound approaches** to overcome these limitations.
- Ball will build on these findings and **initiate discussions with stakeholders** to ensure future LCAs adequately capture the true sustainability performance of beverage packaging.



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Sphera Comparative LCA study



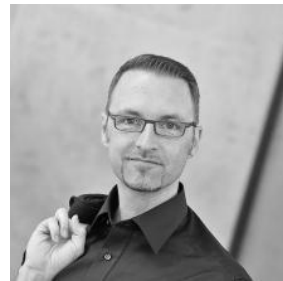


Critical Peer Review Panel



Dr Pere Fullana

Director of the UNESCO Chair in Life Cycle and Climate Change



Ivo Mersiowsky

Sustainability and leadership consultant, LCA expert (focus chemical and plastics industry)



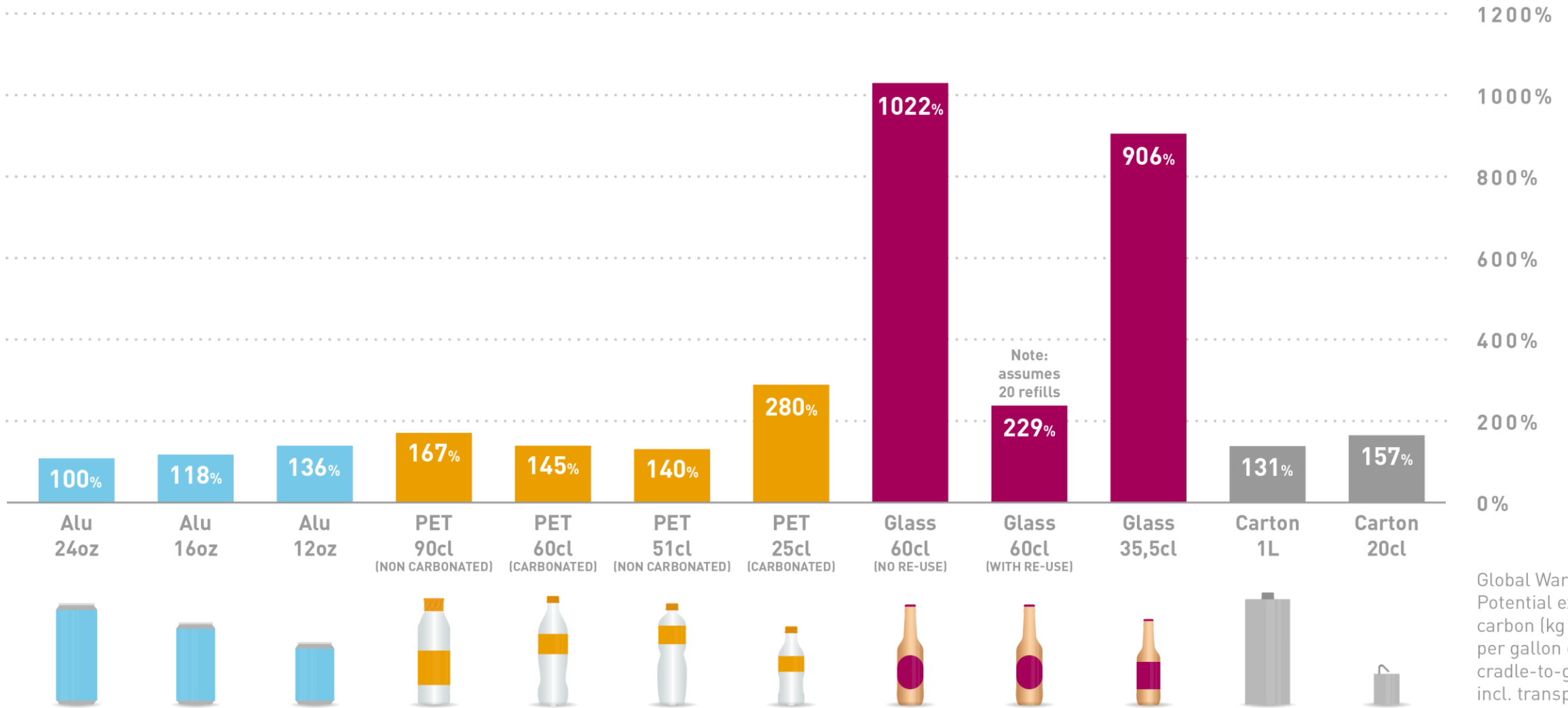
Angela Schindler

Environmental management consultant, LCA expert (focus modelling, packaging), reviewer for the International Journal of Life Cycle Assessment

GLOBAL WARMING POTENTIAL (CARBON FOOTPRINT) PER LITRE



Carbon footprint comparison per litre

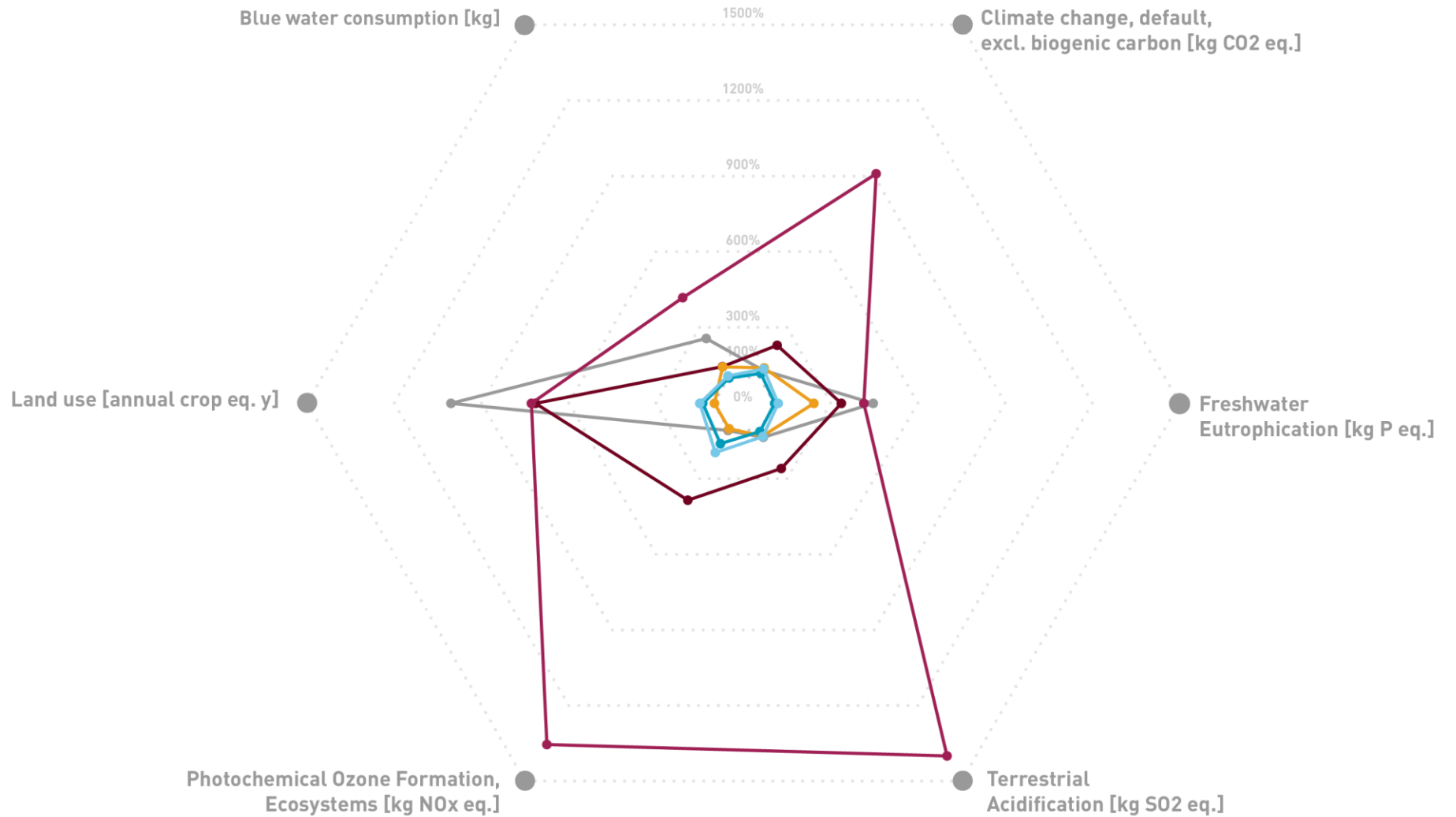


Global Warming Potential excl. biogenic carbon (kg CO₂ eq.) per gallon of fill volume cradle-to-grave incl. transports BR, ReCiPe 2016

SUMMARY WITH SOME ENVIRONMENTAL IMPACT CATEGORIES



-  Alu. 12oz
-  Alu. 16oz
-  **PET 510ml**
(NON-CARBONATED)
-  **Glass 355ml**
-  **Glass 600ml**
(20X REFILL)
-  Carton 1L



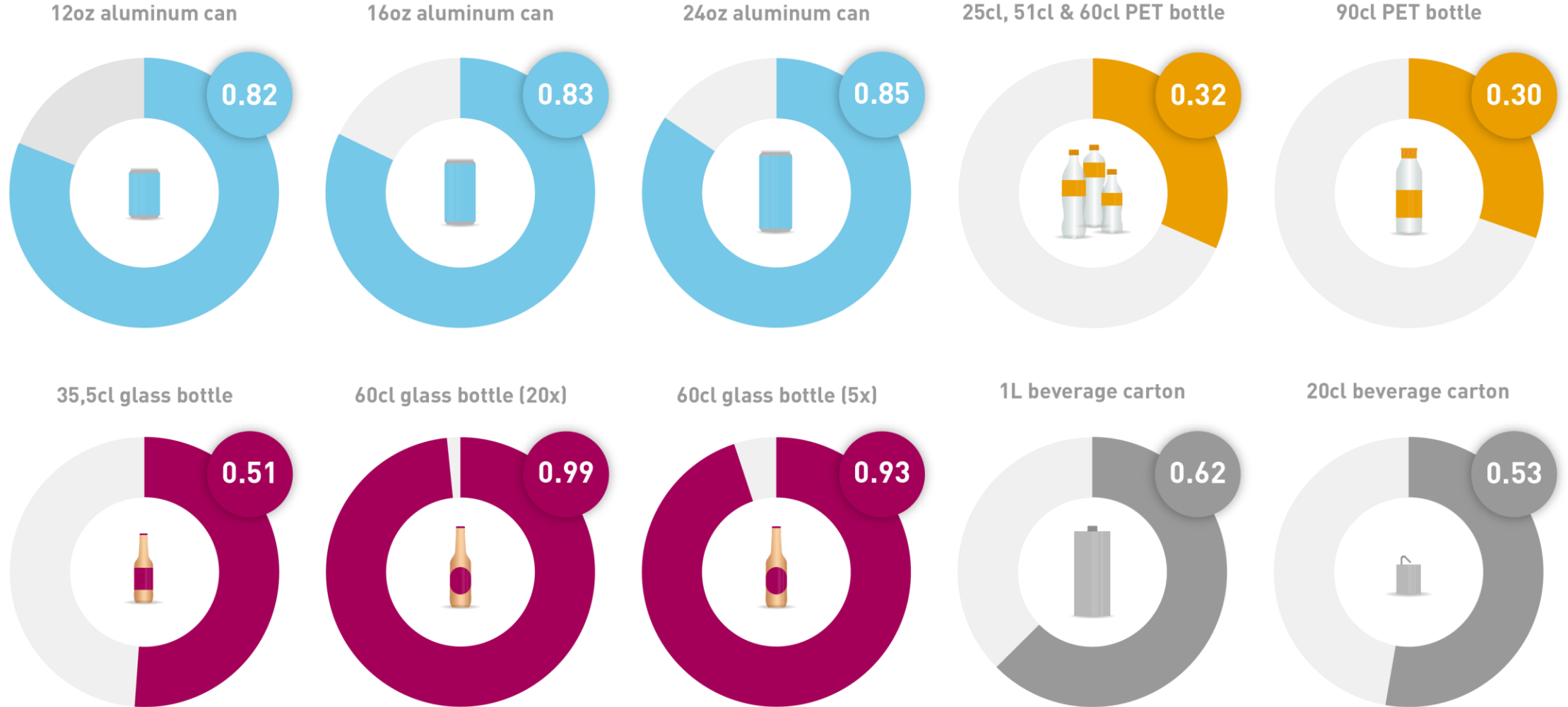
SUMMARY OF ALL ENVIRONMENTAL IMPACT CATEGORIES



-  **Alu. 12oz**
-  **Alu. 16oz**
-  **PET 25cl**
(CARBONATED)
-  **PET 51cl**
(NON-CARBONATED)
-  **PET 60cl**
(CARBONATED)
-  **Glass 35.5cl**
-  **Glass 60cl**
(REFILLABLE)
-  **Carton 20cl**



MATERIAL CIRCULARITY INDICATOR (MCI): 0.1 = LINEAR, 1 = FULLY CIRCULAR



Note: Assumes 20 Refills

Note: MCI methodology includes non-recycled renewables fibres as circular. Other methodologies do not.



- Strongest performance of all substrates on **Global Warming Potential (GWP)**, benefiting from light weight and extremely high recycling rate and recycled content in Brazil
- Also best scores on **Eutrophication** and **Freshwater Consumption**
- Best **material circularity scores** of all single-use packaging options (>0.8)



- Higher burdens than cans **across all major impact categories**, primarily due to oil and gas-related impacts and low recycled content (average GWP 1.5 x that of cans)
- Low recycling rates (55%) and recycled content (0-23%) as well as high recycling yield losses result in **worst material circularity scores** of all substrates (~0.3)



- Highest environmental impacts for **single-use glass** in most categories, driven by heavy weight, and very resource and energy intensive glass production and recycling
- Much lower impacts for **refillable glass**, when considering **20 trips** (less favorable when trip number decreases); even with 20 trips, not close to the cans
- Best **circularity scores** for refillable bottles, average for single-use bottles



- Decent scores on several impact categories close to cans driven by relatively **small manufacturing impacts** and the fact that integrated pulp and paper mills generate most of their energy from biomass intake such as wood offcuts
- Material circularity scores in the 0.5-0.6 range, recycling of cartons results in **no net-environmental benefits** (the more recycled material us used, the worse for LCA results)



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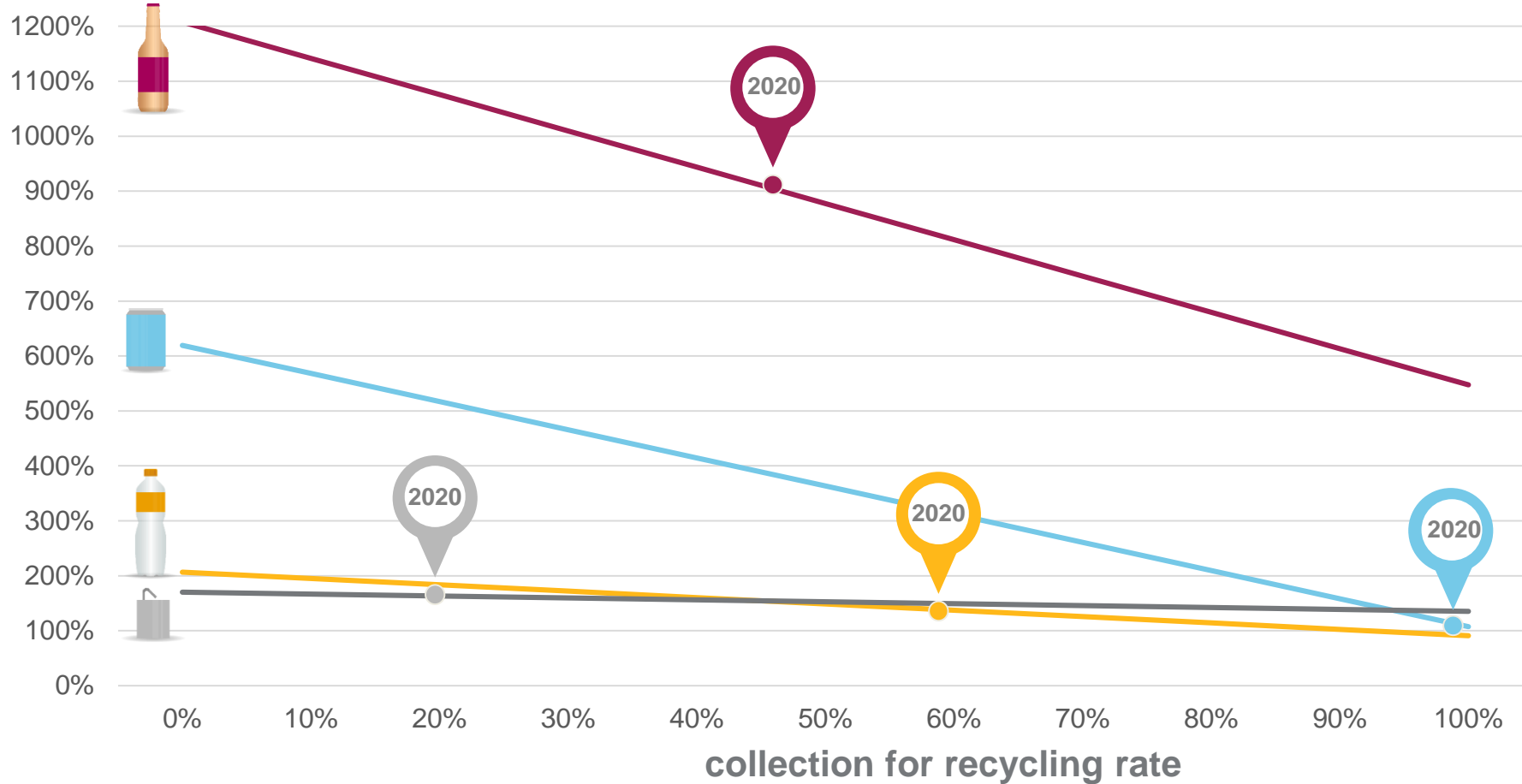
Sensitivity Analysis



EFFECT OF RECYCLING RATE INCREASES ON CARBON FOOTPRINT



Climate change
(% CO2 eq.)
per liter of fill volume

Effect of Recycling Rate Increases on Carbon Footprint



-  **Glass bottle**
0.35L
-  **PET Bottle 60cl**
(CARBONATED)
-  **Beverage cartons**
20cl
-  **Alu 16.0oz**

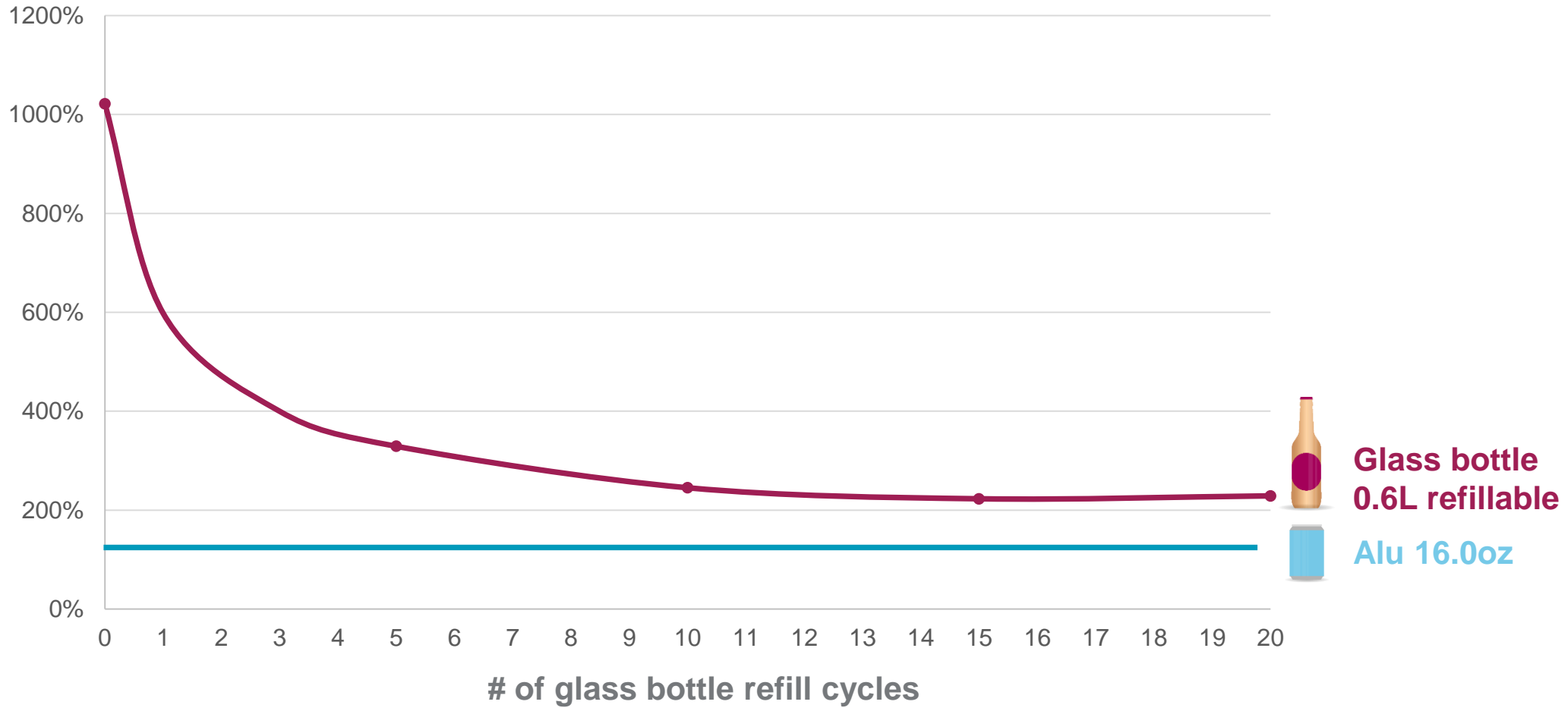
Source: Ball's graph based on the sensitivity data from peer reviewed comparative beverage packaging LCA, Sphera, 2020

CANS OUTPERFORM REFILLABLE GLASS BOTTLES, REGARDLESS OF THE NUMBER OF REFILL CYCLES



Climate change
(% CO2 eq.)
per liter of fill volume

Effect of refill cycles on Carbon Footprint

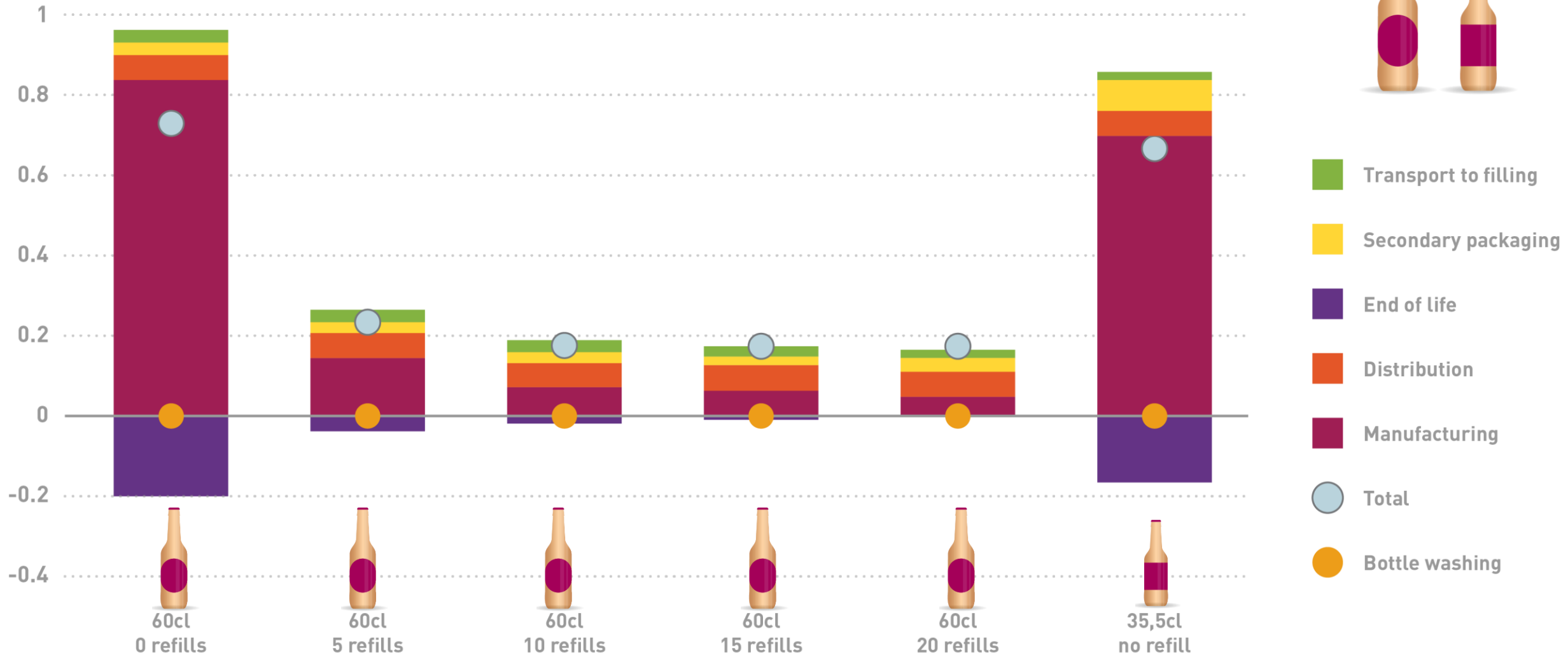


Source: Ball's graph based on the sensitivity data from peer reviewed comparative beverage packaging LCA, Sphera.

HOW REFILL RATES AFFECT CARBON FOOTPRINT FOR RETURNABLE GLASS



Global Warming Potential excl. biogenic C [kg CO2 eq.] per litre of fill volume cradle-to-grave incl. transports. BR, ReCiPe 2016

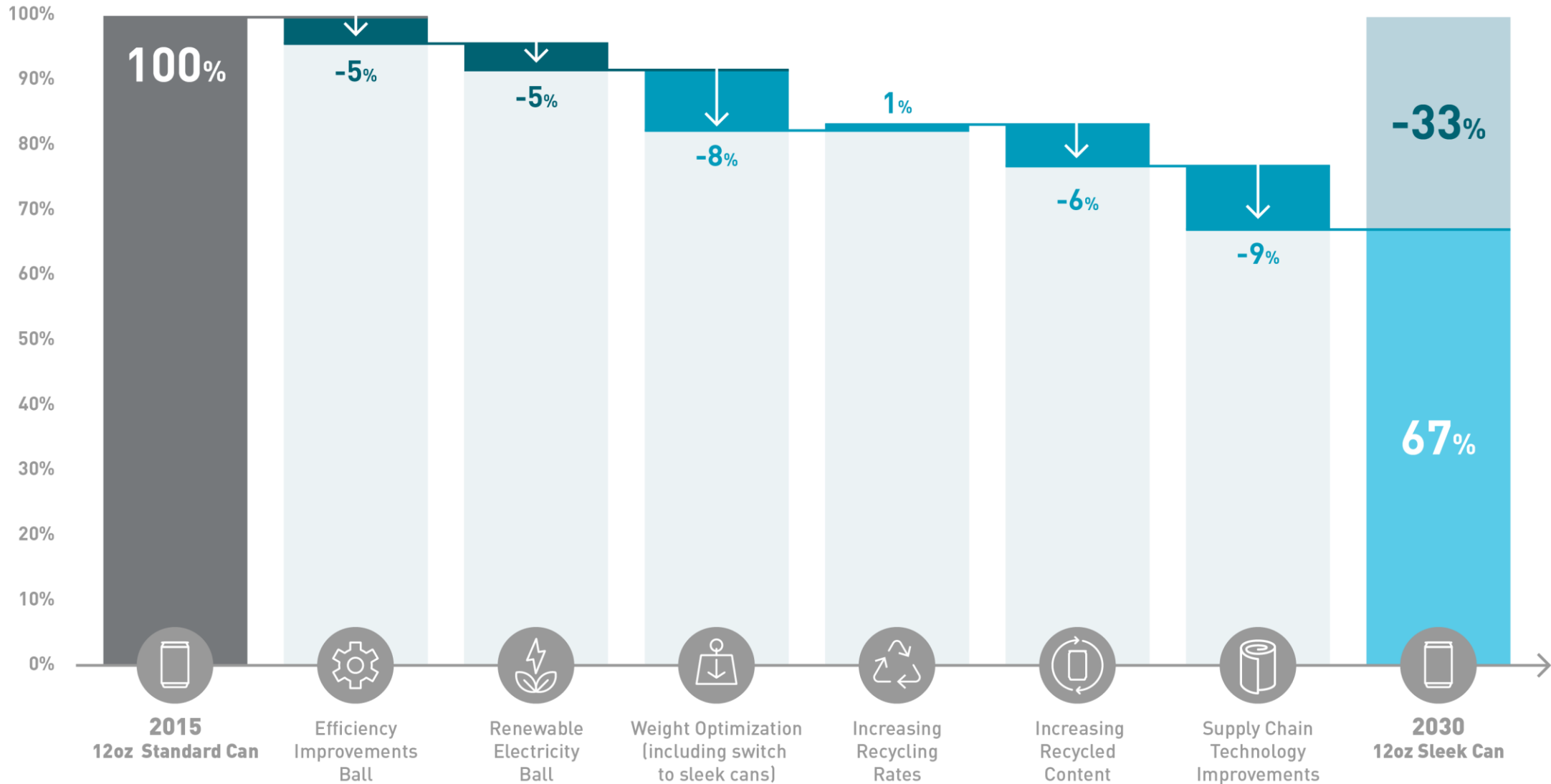


A hand holding a beverage can against a teal background. The hand is positioned in the center-left, holding the can vertically. The background is a solid teal color with a faint, textured pattern of small, dark spots. The number '4' is overlaid on the left side of the image.

4

**Plans to further
improve the
beverage can**

IDENTIFIED OPPORTUNITIES TO DECREASE CAN'S CARBON FOOTPRINT IN NEXT 5-10 YEARS (12OZ BPSA)



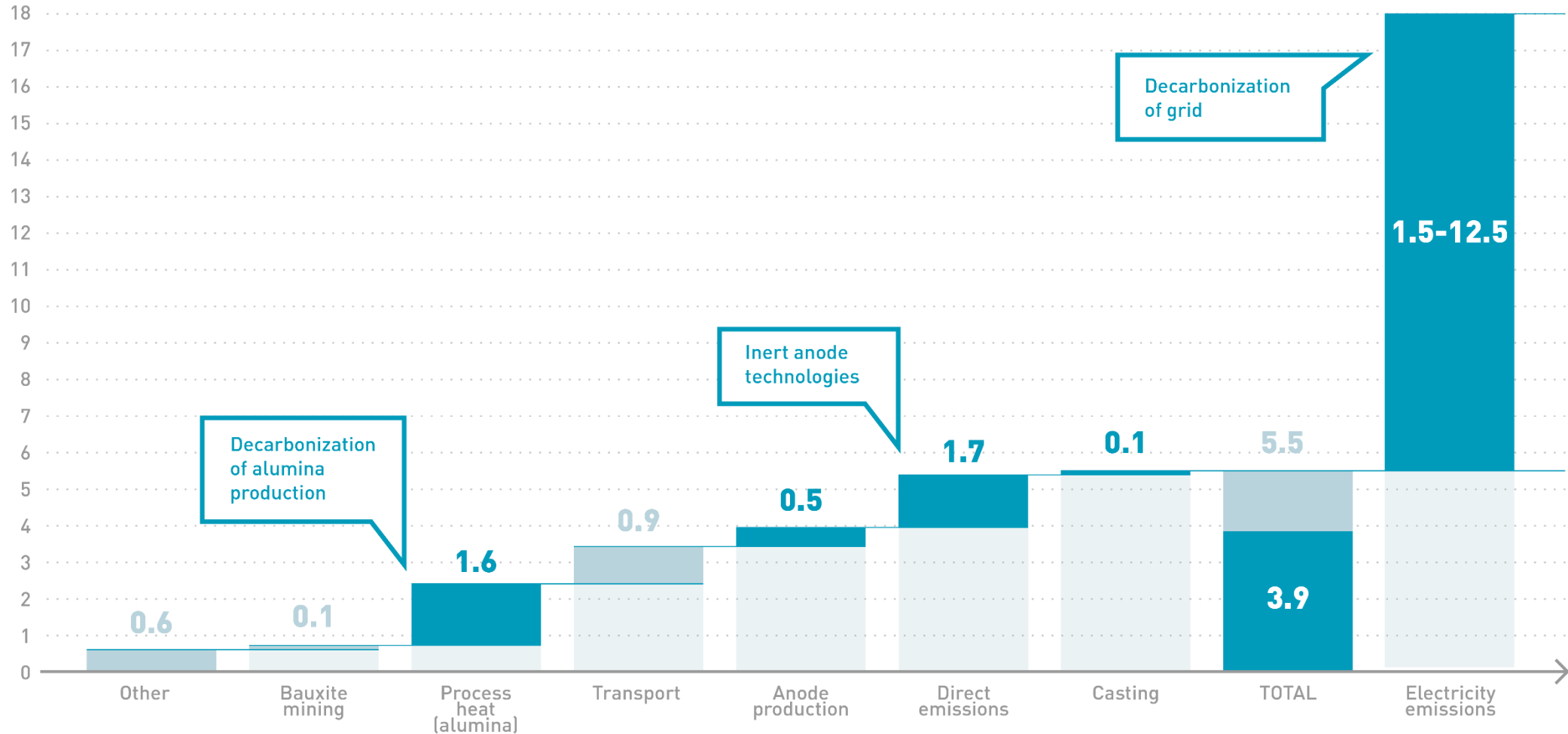
Source: Ball's own calculation based on Instant LCA software using a 50/50 allocation rule and build on own as well as industry data/estimates

FURTHER OPPORTUNITIES TO DECREASE CARBON FOOTPRINT OF VIRGIN ALUMINIUM



Emissions per ton of aluminum produced per production step - Ton CO₂ / Ton aluminum

■ In scope of roadmap



Source: Material Economic analysis via data from International Aluminium Institute, 2019 (<http://www.world-aluminium.org/statistics/>)

100% COLLECTION

**100% RECYCLED
CONTENT BACK
INTO SAME VALUE
PRODUCTS**



**100% OF THE
MATERIALS
ARE SORTED**

100% YIELD RECYCLING

ISSUES ACROSS ALL RECYCLING VALUE CHAIN FOR VARIOUS BEVERAGE CONTAINERS

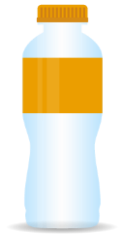


- Weight
- Breaks

- Color
- Breaks

- Fine particles

- Low value



- Minimum collection rate

- Black plastics
- Coloured PET
- Export market

- Cap, silicone valve, glue, label

- Opaque / TiO₂
- High Yield loss
- Degradation
- High cost

- Nurdles / pellet
- Minimum rPET content
- EFSA



- Contamination to paper and cardboard
- Low value

- Lack of Infrastructure

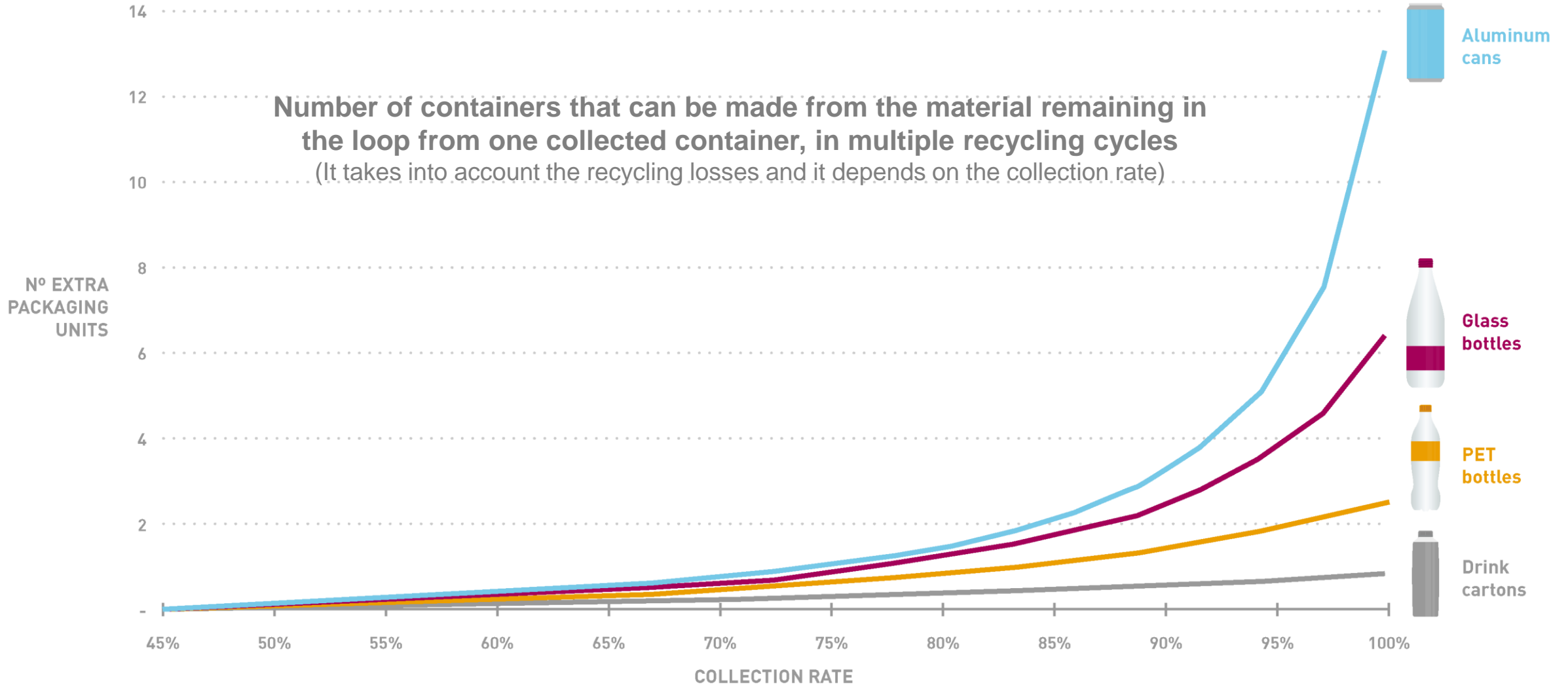
- Cap, straw, straw packaging

- Multi-material
- High yield loss
- PolyAl
- Fibre shortening

- End markets



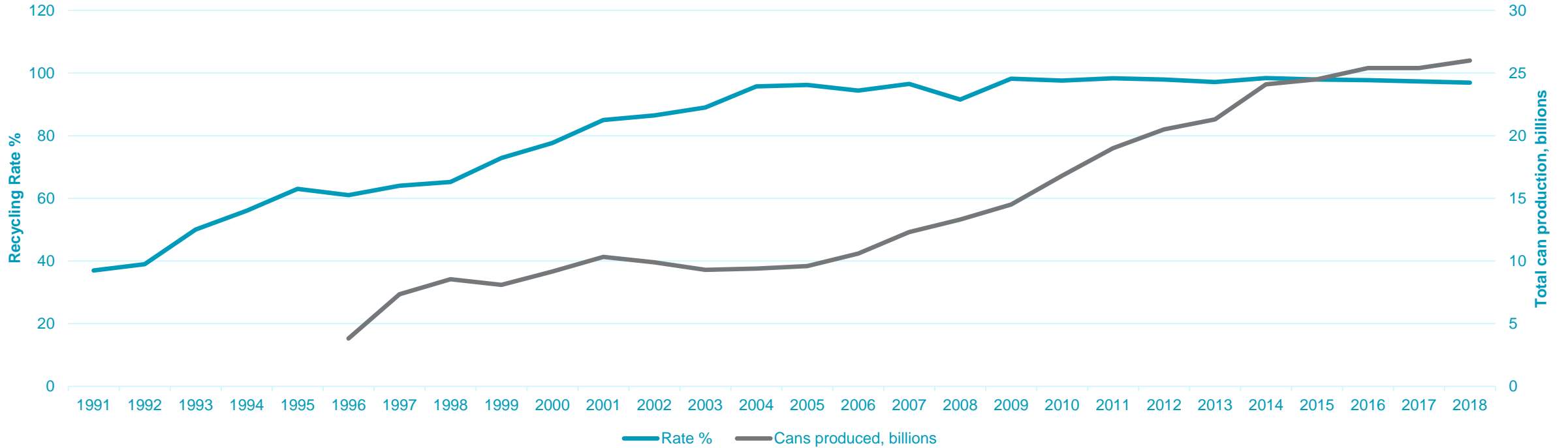
- Non aluminium labels and ends



Source: Eunomia's original idea. Ball's own analysis based on recycling yields assumptions for each packaging container. Real recycling yields are calculated as the ratio between the R2 factor of the PEF discussions (output recycling plant [R2], that can be download [here](#)) and the 'collection for recycling' rate for the aluminium can, PET bottle and glass bottle.



Aluminum Cans Recycling in Brazil





- Brazil has over 800.000 people workers in recycling cooperatives or individually*
- In Brazil can recycling generate almost twice more income per ton than PET and 46x more income than glass**.
- This makes aluminum the most valuable scrap in the recycling business, a key element in any truly circular Economy system in developing countries
- Brazil current recycles 96.9% of all its cans in a 60-day cycle.

* <http://www.mncr.org.br/sobre-o-mncr/duvidas-frequentes/quantos-catadores-existem-em-atividade-no-brasil>

** <http://cempre.org.br/cempre-informa/id/115/preco-dos-materiais-reciclaveis>

THANK YOU



Questions?

