INTERNATIONAL ALUMINIUM

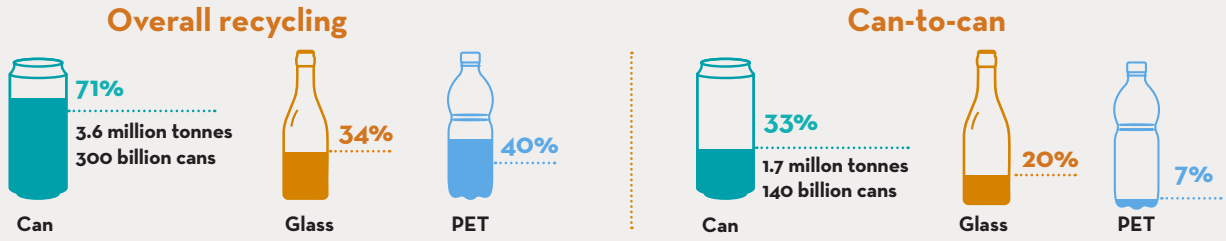
Aluminium, shaping a better tomorrow

CAN-TO-CAN RECYCLING: PERFORMANCE, POTENTIAL AND PATHWAYS

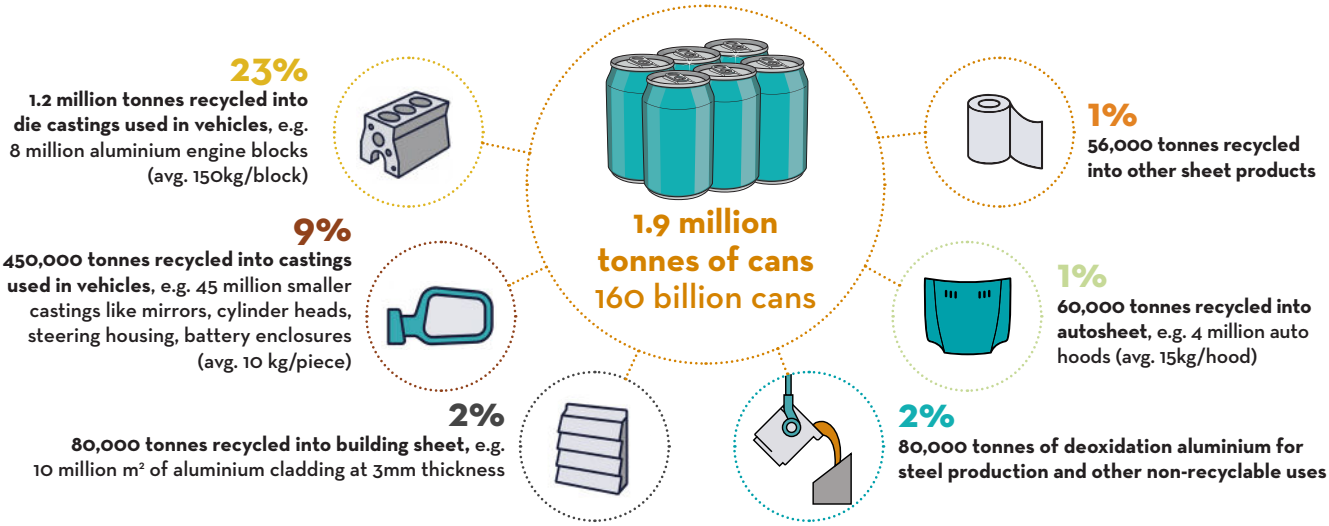
This factsheet explores the alloy composition of aluminium beverage cans, recycling rates and global waste management practices – highlighting the untapped potential of a truly circular aluminium system.

Aluminium cans are a highly recyclable product, and represent the most effective example of closed-loop recycling among beverage containers, as they can be recycled over and over again without loss of their inherent properties. In 2019, 71% of all aluminium beverage cans put on the market were recycled – 33% back into cans and 38% into other end-uses.

ALUMINIUM CAN RECYCLING RATES COMPARED TO OTHER MATERIALS



38% OF CANS PLACED ON THE MARKET ARE RECYCLED INTO PRODUCTS OTHER THAN CANS



One-third (33%) of all cans put on the market are recycled back into cans, 38% go into other uses, and 29% are not recycled and lost to the aluminium value chain.

Data is derived from University of Tokyo and the IAI project "A Circularity Case for Aluminium Compared with Glass and Plastic (PET)".

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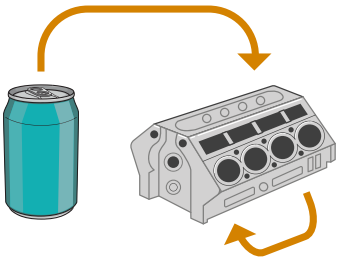
UNDERSTANDING DOWNCYCLING AND WHY IT SHOULD BE AVOIDED

Aluminium is alloyed with elements such as magnesium, copper, nickel or others to achieve specific properties. When cans are recycled into products like automotive engine blocks, they enter a different recycling cycle, and those products cannot be recycled back into cans. Because for a can alloy, copper, silicon or nickel found in a motor block are harmful to the desired properties of the can.

23% Close to one quarter of all cans put on the market are recycled into engine blocks, which cannot be recycled back into cans.

Composition: aluminium can	
Al	95.76%
Si	0.28%
Fe	0.63%
Cu	0.23%
Mn	1.07%
Mg	1.74%
Cr	0.02%
Ni	0.00%
Zn	0.25%
Ti	0.02%

Actual data: 1.2 million tonnes of cans go into engine blocks.
Possible: While not desired, all cans could currently be recycled into engine blocks. With this pull from other markets, industry and governments need to provide the support for can-to-can recycling.



Actual data: No engine scrap goes into cans.
Possible: Without extensive purification technology, no engine scrap can be recycled into cans.

Composition: engine block	
Al	81.42%
Si	10.50%
Fe	1.50%
Cu	3.50%
Mn	0.80%
Mg	0.50%
Cr	0.03%
Ni	1.50%
Zn	0.05%
Ti	0.20%

Highlighted alloying elements are the limiting factor for recycling into aluminium beverage cans

USED BEVERAGE CAN (UBC) RECYCLED CONTENT: UNTAPPED POTENTIAL

Raising the global real can-to-can recycling rate from today's 33% to the 60–70% range can be achieved without requiring changes to cast house operations nor changes to the alloys of the can. Within this range, a global 62% rate has been set as the milestone*.

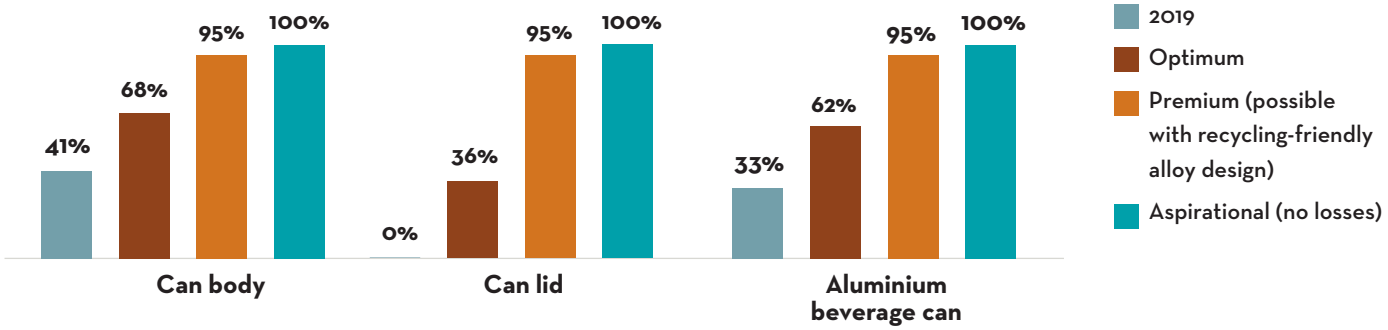
This means that up to 87% of the cans recycled today could be recycled repeatedly without losing their inherent properties or being downgraded. However, in practice, only 46% of all cans are recycled in a way that maintains their full quality.

Globally, the average recycled UBC content in a can body is 41%, while the lid is typically made from primary aluminium and non-UBC scrap sources. These figures could be increased to 68% for the body and 36% for the lid, averaging into a 62% recycled UBC content for an aluminum beverage can. Raising can-to-can recycling from 33% to 62% will require both reliable supplies of high-quality UBCs and market shifts to keep cans from being diverted into other products.

Achieving a premium solution would require a shift from the current use of two different alloys to either a single alloy system (uni-alloy), or two complementary alloys with more compatible characteristics. Both transitions would simplify the recycling process and help maximise the value retained in the material cycle.

**Higher recycled content can be achieved by using other scrap types.*

GLOBAL UBC RECYCLED CONTENT METRICS FOR ALUMINIUM CANS



These are global figures and may differ significantly from results at regional, company, plant or batch level.

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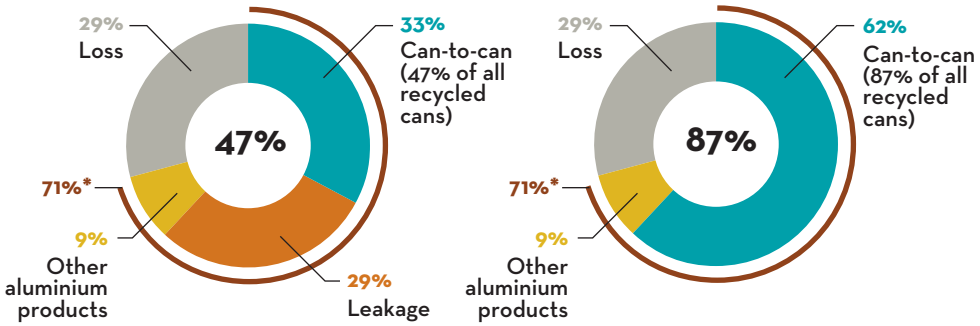
MAXIMISING THE UBC RECYCLED CONTENT

47% vs 87%



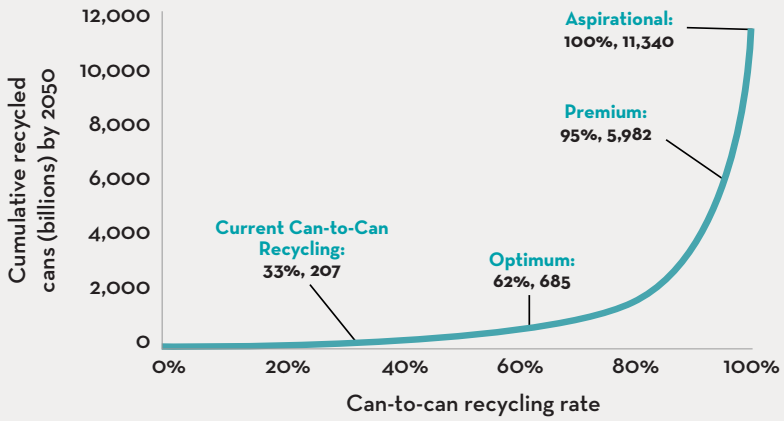
Increasing the UBC (Used Beverage Can) recycled content to 62% requires **87%** of all cans recycled to go back into cans, thereby avoiding downgrading or loss of valuable alloying elements such as manganese and magnesium. However, in practice, only **47%** of cans are currently recycled back into aluminium beverage cans.

**In 2019, 71% of all aluminium beverage cans put on the market were recycled – 33% back into cans and 38% into other end-uses.*

CUMULATIVE RECYCLED CANS (BILLIONS) BY 2050

This chart shows that if all 420 billion cans consumed today would be recycled over and over again with the can-to-can recycling rate of 33%, these cans would produce **207 billion cans by 2050**; a move to the optimum of 62% would mean that **685 billion cans could be produced** from the 420 billion.

The premium option would mean almost **six trillion cans could be produced** out of the 420 billion.



POTENTIAL RECYCLING PATHWAY FOR ALUMINIUM BEVERAGE CANS TO 2050

We are on a clear pathway to transform aluminium can recycling into a fully closed-loop system.
The timeline below illustrates the ambitious milestones.

2019 Current

33% Real can-to-can recycling rate
71% Total real recycling rate
46% Recycled cans recycled as cans

2030

62% Real can-to-can recycling rate
71% Total real recycling rate
87% Recycled cans recycled as cans

2040

70% Real can-to-can recycling rate
80% Total real recycling rate
87% Recycled cans recycled as cans

2050

95% Real can-to-can recycling rate
95% Total real recycling rate
100% Recycled cans recycled as cans

Call to action: 87%

of aluminium beverage cans recycled shall go back into the production of new cans globally.

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THE ALUMINIUM CAN ALLOY

Aluminium is not just aluminium – it is always a composition of aluminium and alloying additives, which are added depending on the product and its desired properties. For example, the aluminium beverage can is composed of a body alloy and a lid alloy. The body alloy is 3004 or 3104, depending on the can maker production line, and the lid alloy is 5182.

The primary difference between these two alloys lies in their manganese and magnesium content. When aluminium beverage cans are recycled, the entire mix of aluminium, manganese, magnesium and other alloying elements are recycled together.

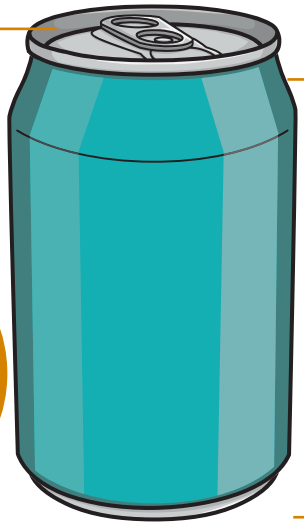
When producing a can from primary aluminium, alloying elements like manganese and magnesium need to be added. If recycling the can into other products, often these alloying element become impurities.

Aluminium, magnesium and manganese are listed as critical raw materials in the EU and other jurisdictions worldwide. Therefore it is critical to not downcycle but recycle all the three materials in a closed loop system and not only aluminium.

ALUMINIUM BEVERAGE CAN – USING THE AVERAGE ALLOY ELEMENT CONTENT

Lid: 20%
94% Aluminium
4.5% Magnesium
0.4% Manganese
1.2% Other alloying elements

80/20
The average composition of a can is 80% body and 20% lid, but can vary between 85%/15% and 70%/30% depending on the size of the can.



Body: 80%

ALLOY 3004
96.1% Aluminium
1.1% Magnesium
1.3% Manganese
1.7% Other alloying elements

ALLOY 3104
96.3% Aluminium
1.0% Magnesium
1.1% Manganese
1.7% Other alloying elements

Complete aluminium can: 100%
(Body and lid)

ALLOY 3004: (80%) & Alloy 5182 **(20%)** by weight
95.6w% Aluminium
1.7% Magnesium
1.1% Manganese
1.6% Other alloying elements

ALLOY 3104: (80%) & Alloy 5182 **(20%)** by weight
95.8% Aluminium
1.7% Magnesium
1.0% Manganese
1.5% Other alloying elements

REAL VS REPORTED RECYCLING RATES

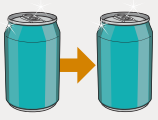
Recycling rates can be measured in different ways. The real recycling rate accounts for all losses that occur during the recycling process, including remelting losses. It shows how much of the material is truly recovered and returned into the production loop. This makes it a more reliable measure for comparing materials on the global level.

In contrast, national governments, associations or scientific institutions often use different definitions and methodologies when reporting "recycling", "recovery" or "collected for recycling" rates. While useful for tracking internal progress, making direct comparisons between countries and materials is difficult. The EU, the US, Brazil and Japan, for example, calculate recycling after sorting (recycling rate) but before remelting, without deducting coatings or lacquers. This standardises comparisons across countries, even if the final recycling stage occurs elsewhere.

GLOSSARY

Recycling rate: Aluminium beverage cans ready to send to remelter/ aluminium beverage cans put on the market.

Real recycling rate: Aluminium beverage cans collected, sorted and remelted into new aluminium products/ aluminium beverage cans put on the market.



Real can-to-can recycling rate: Aluminium beverage cans collected, sorted and remelted into new aluminium beverage cans/ aluminium beverage cans put on the market.

Globally, the real can-to-can recycling rate reflects the share of recycled content from used beverage cans in new beverage cans (or the used beverage can [UBC] recycled content).

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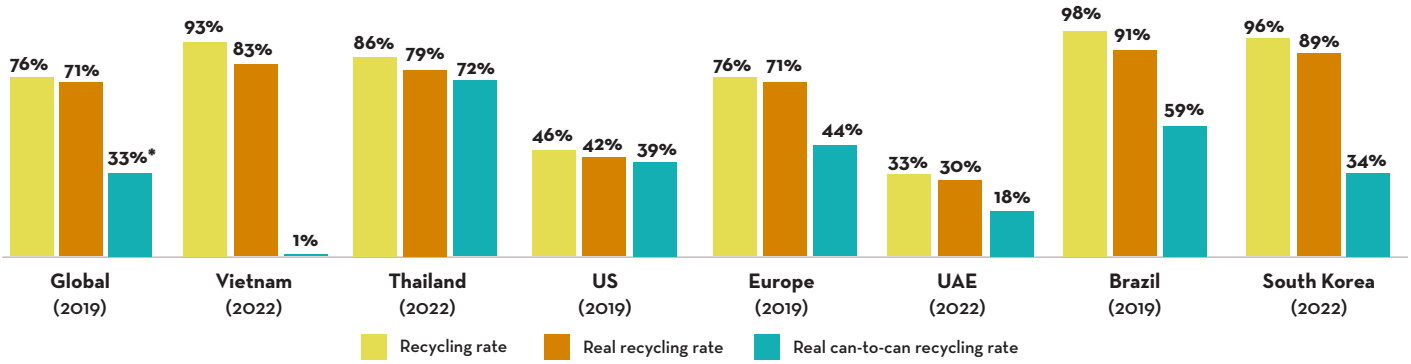
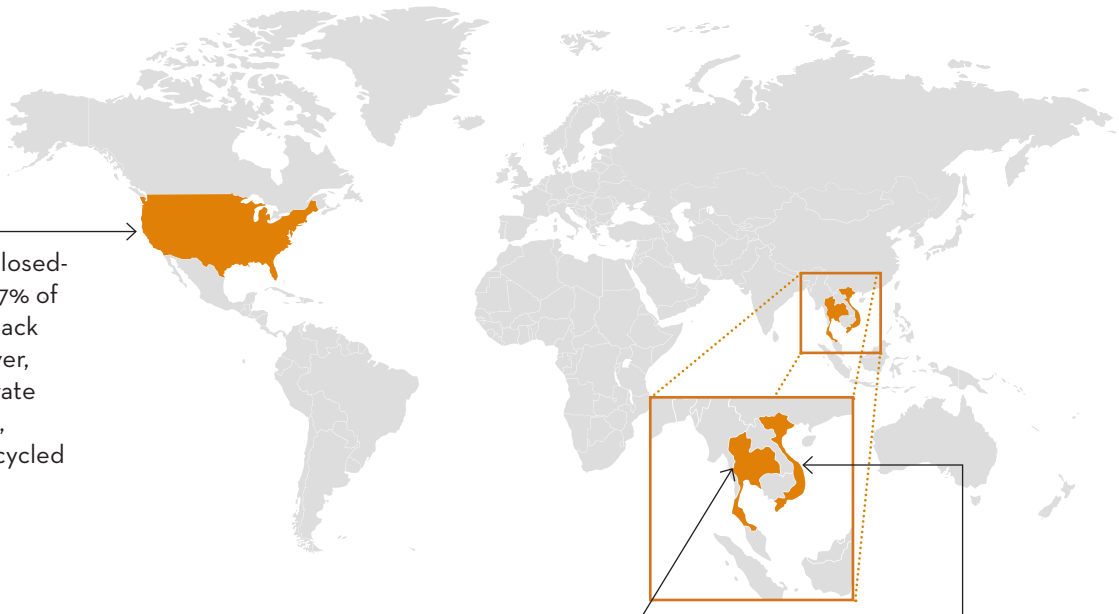
COMPARISON OF RECYCLING RATE, REAL RECYCLING RATE AND REAL CAN-TO-CAN RECYCLING RATE



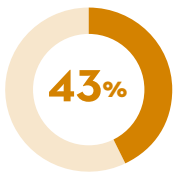
The study on a complete set of recycling rates was only undertaken for 2022 and 2019 by the IAI and does not include all countries. For updated data, please contact IAI and the relevant regional aluminium associations. Note that while the global UBC recycled content is equivalent to the real can-to-can recycling rate, this is not true for the regional data.

GLOBAL PERFORMANCE OF UBC RECYCLING: THREE EXTREME CASES



USA

The global leader in closed-loop recycling, with 97% of recycled cans going back into new cans. However, the overall recycling rate was only 43% in 2023, resulting in a UBC recycled content of below the optimum 62%.



While the USA leads in closed-loop recycling with 97%, the recycling rate is only **43%**.

2023 data

Thailand

Shows strong performance with a 79% real recycling rate and 72% real can-to-can recycling. This means 91% of cans recycled are returned to cans, close to the USA figure. However, collected and recycled UBCs from domestic sources contributes only 5% to the country's recycled content, as can sheet production far exceeds local can consumption.

Vietnam

Has the lowest can-to-can recycling globally, while collection is among the highest and scrap qualities are among the best. The key barriers are the export duties for both UBC and remelt scrap ingots that hinder reintegration of used cans into new aluminium beverage cans.

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