



CARBON UNIT

*The relatable new standard for
consumers waste diversion
measurement.*



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Executive Summary

The Carbon Unit (CU) represents a groundbreaking approach to standardizing carbon impact measurement by using the most universally recognizable divertible material as a reference point: the 500ml plastic water bottle. Based on EPA's Waste Reduction Model (WARM) version 16, one CU equals 18.408 grams of CO₂ equivalent diverted through recycling a single 500ml PET water bottle. This standardization enables intuitive comparison of carbon impacts across different materials and waste management practices.

Background and Rationale

The Need for Standardization

Current carbon impact measurements often rely on abstract units like metric tons of CO₂ equivalent (MTCO₂E), which fail to resonate with general audiences. The disconnect between scientific precision and public understanding hampers effective communication about environmental impact and sustainable behavior change.

Why the 500ml Water Bottle?

The 500ml plastic water bottle was selected as the CU standard for compelling reasons:

Universal Recognition: Found in virtually every country and community worldwide

Consistent Material: Predominantly made from PET plastic with standardized recycling processes

Tangible Reference: People can physically hold and visualize the reference unit

High Diversion Potential: Commonly recycled material with well-established collection infrastructure

Data Availability: Extensively studied in lifecycle assessments and waste management research



Technical Foundation

Calculation Methodology

The CU value derives from EPA's WARM v16 model, which provides scientifically validated emission factors for waste management practices.



Key Parameters:

- ▶ Material: PET (Polyethylene Terephthalate)
- ▶ Bottle Size: 500ml
- ▶ Average Empty Weight: 17.8 grams
- ▶ WARM Recycling Factor: -1.0357 MTCO₂E per ton
- ▶ Management Practice: Recycling vs. landfilling baseline

Calculation:

CO₂ Diverted = Bottle Weight (tons) × Recycling Factor (MTCO₂E/ton)

CO₂ Diverted = 0.0000178 tons × 1.0357 MTCO₂E/ton

CO₂ Diverted = 0.000018408 MTCO₂E = 18.408 grams CO₂

Therefore: 1 CU = 18.408 grams CO₂ equivalent diverted

Use Cases and Application Scenarios

The Carbon Unit (CU) is designed for everyone from households to municipalities, from startups to major brands. Its relatability makes it easy to integrate into everyday decisions and systems.

▶ Consumers

Track your personal waste diversion impact over time.

Example: Recycling 100 bottles = 100 CU = 1.84 kg CO₂ diverted.

▶ Businesses

Use CU as a part of your sustainability reports, impact dashboards, or employee/community challenges.

Example: A restaurant diverts 5,000 PET bottles monthly = 5,000 CU.

▶ Schools and Institutions

Incorporate CU into curriculum or green clubs. Engage students with real, visible progress.

▶ Local Governments & Cities

Launch incentive programs or gamify waste reduction using CU as a measurable unit.

Example: “Top 10 Neighborhoods by CU” leaderboard.

▶ Brands and Retailers

Add CU values to packaging or dashboards so customers can see the verified impact of recycling.

Material Comparison Table (CU Equivalents)

Material Type	Item Example	Avg. Weight (g)	Estimated CU
PET Plastic	500ml water bottle	17.8g	1 CU
Aluminum	Soda can (12 oz)	14.9g	~2.3 CU
Cardboard	Small cereal box	65g	~1.8 CU
Food Waste	1 lb (e.g., leftovers)	453g	~3.4 CU
Glass Bottle	Wine bottle (750ml)	500g	~0.5 CU

CU values are approximate and based on WARM v16 recycling/composting data.

CU vs Traditional Carbon Metrics

Metric	Scientific Accuracy	Public Understanding	Visual / Tangible
MTCO ₂ E	Yes	No	No
lbs/kg CO ₂	Yes	Partial	Limited
Carbon Unit (CU)	Yes (based on WARM)	Yes	Yes

CU bridges the gap between science and everyday understanding, making environmental impact actionable and relatable.



Limitations and Assumptions

- ▶ U.S.-Based Model: CU calculations are based on EPA WARM, which reflects U.S. infrastructure and energy systems.
- ▶ Average Weight Assumptions: Each material's CU estimate uses average item weights. Real weights may vary slightly.
- ▶ Baseline Comparison: CO₂ savings are calculated against a landfill baseline.
- ▶ Recycling Efficiency: Assumes materials are properly sorted and recycled through efficient recovery systems.
- ▶ Expansion Planned: Future versions will adapt CU for non-U.S. regions and localized waste data.

Disclaimer:

The Carbon Unit (CU) is a simplified metric derived from EPA's Waste Reduction Model (WARM) Version 16 and iWARM. CU is intended as a comparative awareness tool for individuals and communities to understand and track their waste diversion impact. It is not a certified GHG inventory tool and should not be used for official emissions reporting or site-specific environmental compliance.

Contact & Get Involved

We're actively onboarding partners, pilot cities, and early adopters.

Want to integrate CU into your business, city program, or school?
Have feedback or ideas?

Visit: www.natcycle.com/carbonunit

Email Us: cu@natcycle.com

X: [@natcycle0](https://twitter.com/natcycle0)

CU visual:
1 Bottle → 1 CU →
18.408g CO₂e saved

No action will take place if there is no motivation. The Carbon Unit (CU) represents a groundbreaking approach to standardizing carbon impact measurement by using the most universally recognizable divertible. This standardization enables intuitive comparison of carbon impacts across different materials and waste management practices.

For enquiry and collaboration
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