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The environmental and economic impacts of tire retreading

A Life Cycle Assessment of Citira's retreading process

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Introduction to Citira



Citira is a circular tire management provider

We provide tire service, collect and retread worn-out tires,
as well as sell and deliver replacement tires

Our ambition is to support our customers to make tire management even more convenient and more sustainable

With our services we help our customers

—
Increase uptime & mileage

—
Reduce environmental impact

—
Lower costs per kilometer

—
Meet safety requirements



We operate a fully circular business for truck and bus tires – extending their useful life far beyond the conventional lifecycle

→ Our circular model



Part of Citira's core offering is tire retreading – a technique to restore worn out truck & bus tires to quality on par with new ones

Key facts

- Citira restores up to 180,000 worn-out truck and bus tires every year through retreading — returning them to a quality on par with new ones.
- Retreading means applying a new tread layer (outer layer) to a worn-out tire, while retaining large parts of the original tire (the tire casing).
- Truck and bus tires can on average be retreaded three times, delivering up to 3× longer service life than a single-use tire.
- Retreading is both more cost-efficient and has significant environmental benefits:
 - lower resource consumption,
 - less waste compared to manufacturing new tires.
- Locally produced retreaded tires provide a cost-efficient, reliable, and climate-smart alternative for fleet operators.

The retreading process – step by step overview



1. Inspection and selection of worn tires to be retreaded



2. Buffing / removal of the old tread



3. Repair of the tire casing



4. Application of new tread



5. Vulcanization



6. Quality control

Citira's Life Cycle Assessment

The background of the slide shows two large BOSS tires standing upright in a workshop or garage. The tires have a prominent tread pattern and the brand name 'BOSS' is visible on the sidewall of the tire in the foreground. The lighting is dramatic, with strong highlights and deep shadows, creating a professional and industrial atmosphere.

We have quantified the environmental and economic impacts of tire retreading

Citira has conducted a Life Cycle Assessment (LCA) together with Valuing Impact, comparing retreaded tires with new budget alternatives.

The study quantifies the environmental and economic impacts of retreading — including lower carbon emissions, reduced resource use, and direct cost savings for clients.

The LCA follows ISO 14044 and the UL10006 Product Category Rule for tires and has been independently reviewed.

The study compares Citira’s retreaded tires with new Asian budget tires and follows internationally recognized standards

How Citira’s LCA study was conducted – scope, comparisons, and key assumptions

	What we compared	This LCA compares a Citira retreaded tire with a new Asian budget tire to quantify environmental and economic impacts. The study follows ISO 14044 and the UL10006 Product Category Rule and has been independently reviewed.
	What we included	All life cycle stages are included: manufacturing, inbound transport, use-phase fuel and microplastic emissions, outbound transport, and end-of-life. Retreaded tires additionally include the Citira retreading process, which replaces part of new tire manufacturing.
	How we measure performance	The functional unit is 640,000 km — the distance delivered by one premium casing retreaded three times or 4.9 new budget tires. Results are normalized to 100,000 km to enable clear comparison.
	Key assumptions	<ul style="list-style-type: none"> • Retread lifetime: 160,000 km (budget tire: 130,000 km) • Retreads per casing: up to three (Citira average) • Market comparison: low-cost Asian imports • Geography: retreading in Sweden; budget tires imported from Asia
	What impacts we assessed	Six environmental categories are assessed — climate change, resource use, water use, land use, air pollution, and water pollution — covering 16 midpoint indicators. Calculated using ecoinvent data and the Environmental Footprint (EF) 3.0 LCIA method.
	What Citira can influence	<ul style="list-style-type: none"> • Direct impacts: avoided tire manufacturing and Citira’s own retreading process • Indirect impacts: use-phase fuel consumption, transportation, and end-of-life treatment, which depend on partners and client operations

The results¹ from our LCA study validate the environmental and economic impacts of tire retreading

Carbon footprint

62%

Carbon footprint reduction over the full life cycle (excl. use stage), equal to 79kgCO₂eq avoided/100,000km

Circular economy

154 kg

Raw material reduced over the full life cycle (excl. use stage), equal to 24kg avoided/100,000km

Fuel efficiency

7%

Potential fuel saving during use phase

Financial benefit

EUR 98

Cost saving for clients per retread (excl. fuel efficiency cost saving)

¹The results include both direct retreading impacts and indirect lifecycle benefits.

Citira retreaded tires significantly reduce the CO₂ footprint across the full tire lifecycle vs new Asian budget tires

Avoided CO₂ emissions by tire life cycle stage (CO₂ per 100,000km)

57%

The total emissions from manufacturing and retreading are substantially lower than the emissions from the tire manufacturing stage of a new budget tire. Retreading corresponds to a **57% reduction in carbon emissions** (62 kg CO₂eq avoided).

7%

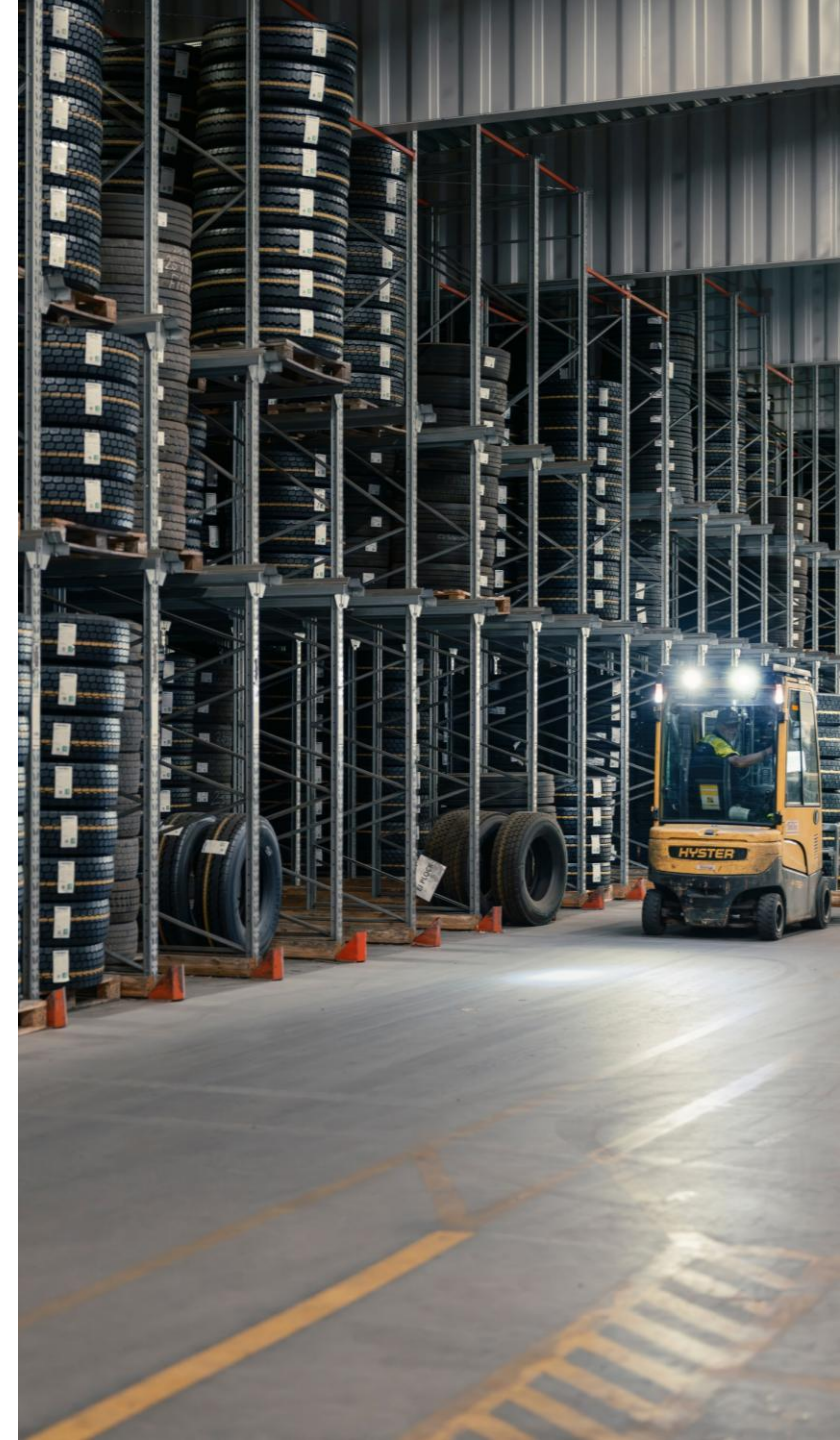
Use stage dominates total emissions of both retreaded and new tires, a typical pattern in tire LCAs. The **use-stage carbon footprint of the retreaded tire is 7% lower** than that of the budget tire.

80%

End-of-life emissions are a minor contributor to total tire emissions (<1%). However, by extending tire life and reducing the number of tires discarded, retreading avoids **80% of end-of-life CO₂eq emissions** compared to new budget tires.

94%

Transportation emissions represent a small share of the overall footprint (<1%). Still, retreading significantly reduces logistics-related emissions, avoiding **94% of CO₂eq from transportation**, mainly by eliminating long-distance imports of new tires.



Citira retreaded tires deliver clear direct environmental and economic benefits for our clients



Direct impact¹ avoided with Citira retreaded tires – environmental and economic results per 100,000km driven:

62 kg of CO_{2,eq}

Equivalent to a 57% reduction in emissions by avoiding the extraction and processing of virgin resources.

24 kg of raw material

A 60% reduction in material use compared to a new budget tire, by extending the product's lifespan and avoiding the extraction and processing of virgin resources.

EUR 61 of direct client savings

Savings related to buying retreaded tires instead of new budget tires (excluding the potential fuel saving).

EUR 28 of environmental externalities avoided

This corresponds to a 53% decrease in the environmental impact costs that would otherwise occur by increasing the manufacturing of new tires.

¹Impacts Citira can directly influence through its business model and operations (tire manufacturing avoidance and retreading process).

There is a clear rationale for our clients to use retreaded tires, as they provide environmental, financial and strategic value

01

Significant carbon and resource savings

By choosing Citira's retreaded tires, **clients can significantly reduce the environmental footprint of their fleet operations.**

During 2025, Citira's retreads have enabled our customers **to save 54k ton CO₂ and 6k ton in raw material.**

02

Societal and operational cost benefits

Citira's retreaded tires deliver **measurable economic value alongside environmental benefits.**

Reduced lifecycle emissions, air and water pollution, land use, and resource extraction translate into **lower societal costs**, while clients benefit directly from **lower tire procurement costs** compared to purchasing new budget tires.

During 2025, Citira's retreads have enabled our customers to **save SEK 157m in costs and avoid SEK 221m in environmental externalities.**

03

Strategic business value

Using retreaded tires allows clients to **translate sustainability performance into strategic value**, supported by robust LCA data for emission reductions, climate targets, and supplier engagement.

At the same time, **retreading strengthens supply chain resilience, reduces exposure to raw material and import price volatility**, and demonstrates responsible procurement to customers, investors, and business partners.

04

Regulatory preparedness and reporting

Citira's retreading solution helps clients **stay ahead of evolving sustainability and disclosure requirements**, supported by **verified, audit-ready LCA data.**

This data enables **CSRD reporting, double materiality assessments, EU Taxonomy alignment, and Scope 3 emissions disclosure**, while reducing reporting effort and ensuring consistent use across regulatory filings, ESG reporting, and stakeholder communications.

Appendix

Comparing Citira retreaded tires with Asian budget tires – the basis for the LCA scenarios

In the European market, retreaded tires primarily compete with low-cost imported alternatives, where Asian budget tires are widely represented. Accordingly, this LCA compares retreaded tires with Asian budget tires. The key data underpinning both scenarios are presented below:

Main KPI	Budget tires	Retreaded tires
Location	Asia (production)	Sweden
# of retreading cycles	-	3
Tire weight	48kg	48kg
# new tires required	4.92	1
Distance roll per tire in the use phase ¹	Approx. 130,000 km	Approx. 160,000 km
Fuel use per km in the use phase	Approx. 30 L/100km Typical long-haul heavy-duty trucks consume about 30–40 L of diesel per 100 km, so we assumed 30 L/100 km as baseline. Ref: Webfleet. Truck fuel efficiency [webpage]. Bridgestone Mobility Solutions B.V. Available at: https://www.webfleet.com/en_gb/webfleet/industries/transport/fuel-efficiency/	Approx. 28 L/100km EU tire-label information on fuel-efficiency grade indicates that moving from the least to the most efficient classes can change fuel consumption by up to about 7.5 %. Therefore, it is assumed 30 vs 28 L/100 km (6.7 % saving) between the budget and premium retread tire. Ref: Ford (2025) The 2021 EU tyre label explained. Ford Motor Company Ltd, UK. Available at: https://www.ford.co.uk/owner/your-vehicle/tyres/eu-tyre-labels .
Rubber use per tire in the manufacturing stage (incl. carbon black) ² :	24.25 kg Ref: 1) STTC. Understanding the Components of Commercial Truck Tires. March 2, 2018. 2) Julong Rubber. Which Synthetic Rubber Is Commonly Used in Tires? Rubber & Seal, n.d.	24.25 kg
Transportation of new tire from the manufacturing site to clients	Truck origin: approx. 100km Container ship: approx. 20,000km Truck destination: approx. 470km	Truck distance inside Sweden: approx. 100 km



Note: ¹ In practice, premium and retreaded tires on average last 160,000–180,000 km. A test conducted by a Citira client showed 170,000 km for a Boss retread versus 130,000 km for a budget tire. We therefore conservatively assume a lifetime of 160,000 km for retreads and 130,000 km for budget tires. ² For both the retreaded and budget truck tire, the overall compound composition is taken from public LCA data: 1) Michelin (2020; rev. 2021). Environmental Product Declaration: e-PRIMACY (225/45 R17 91V). The International EPD System, Reg. S-P-02119; 2) Dong, Y., Zhao, Y., Hossain, M. U., He, Y., & Liu, P. (2021). Life cycle assessment of vehicle tires: A systematic review. Cleaner Environmental Systems, 2, 100033. DOI: 10.1016/j.cesys.2021.100033. The only modelling difference is the split between synthetic and natural rubber within the rubber fraction that is adjusted for the budget tire.

We conducted an independent critical review to confirm the robustness and credibility of Citira's LCA

The key takeaways from the external critical review:

- The LCA was independently reviewed by external LCA experts eqlosion in accordance with the intent and principles of ISO 12044 for studies intended for external communication and comparative assertions.
- The goal, scope, functional unit, system boundaries, data sources, and impact assessment methods were found to be relevant, appropriate, and transparently documented.
- All material comments raised during the review were addressed, leading to documented improvements in assumptions, clarity, and consistency of the model and results.
- Based on the reviewed assumptions, the reviewers agree with the main conclusion: Citira's retreaded tires perform better environmentally than comparable budget tires, particularly for climate change impacts, which are suitable for external communication.
- The review confirms that external communication should focus on the indicators reviewed in detail, especially climate change, and that Citira's reported results are consistent with the reviewed evidence.
- Further details on the life cycle assessment and the independent critical review can be provided upon request.



