

Case Study: Resource Efficiency in the Telecommunications Sector

A Comparative Analysis of TIM S.A. and AT&T Inc.

Key Takeaways

- Telecommunication firms operating within cleaner energy grids and actively engaging in the self-generation of renewable energy tend to exhibit significantly greater carbon efficiency relative to their peers.
- The transition from company-operated data centers to cloud-based infrastructure represents a critical lever for enhancing energy and resource efficiency, particularly in reducing carbon and water intensity.
- Firms that implement comprehensive waste reduction strategies, emphasising recycling, reuse, and landfill diversion, are emerging as leaders in the sector.
- This case study compares the environmental performance of TIM S.A (“TIM”) and AT&T Inc. (“AT&T”), focusing on their respective approaches to decarbonisation, water use, and waste management.

Industry Context: Sustainability in the Telecoms Sector

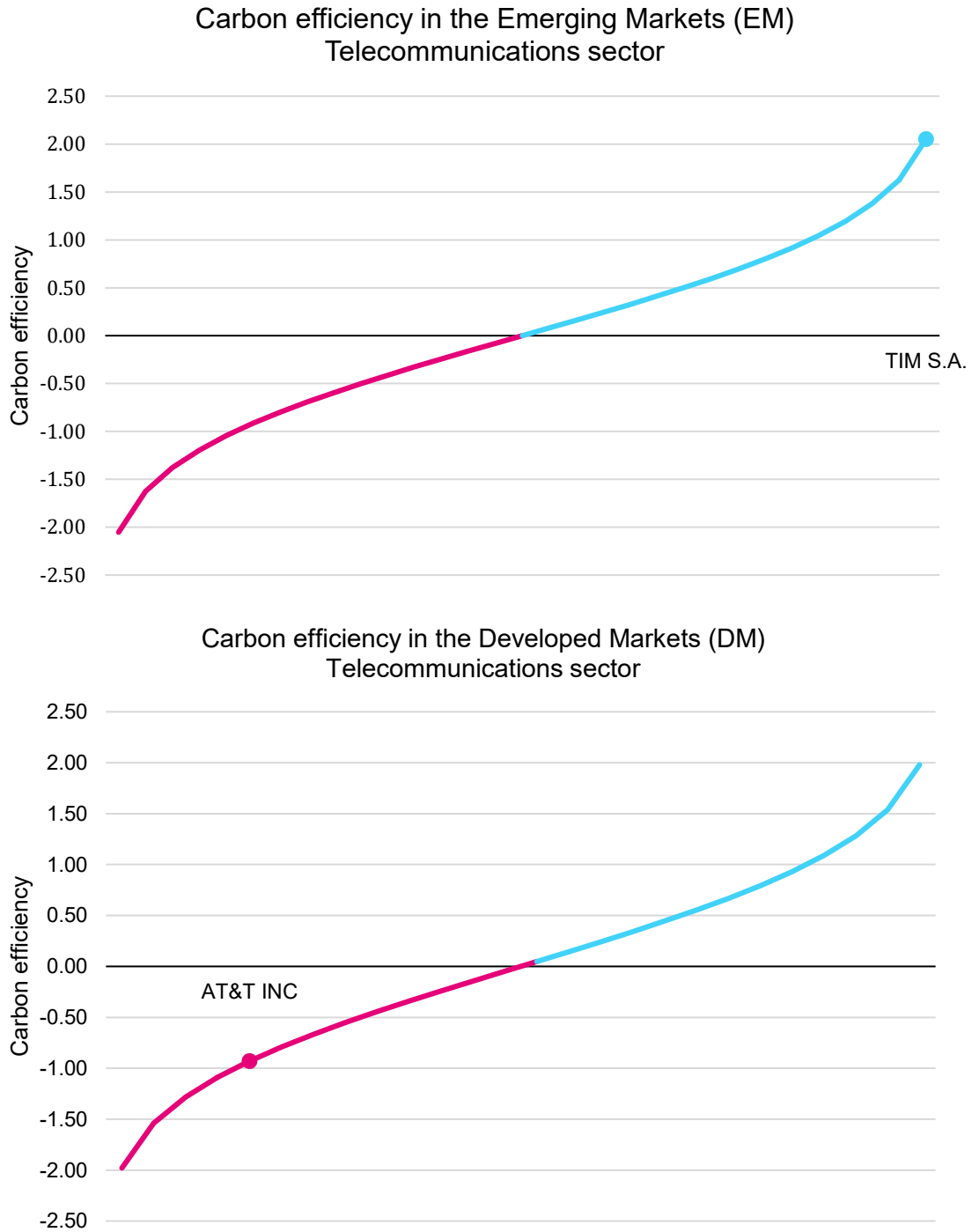
The telecommunications (telecoms) sector is a vital enabler of global digital infrastructure but faces growing scrutiny over its environmental impact. It is responsible for approximately 1.5 to 4% of global greenhouse gas emissions, and accounts for over 4% of electricity use, largely driven by network operations and data centers.

These environmental pressures are intensifying due to rising data demand, continued infrastructure expansion in emerging markets (EM), and the slow adoption of renewable energy across the sector. Sustaining base stations, mobile and fixed networks, and cooling systems requires continuous energy input, which contributes significantly to the sector's emissions profile.

As global connectivity continues to grow, particularly in developing regions, efficiency in carbon, water, and waste is becoming a critical measure of both environmental and operational performance.

Key Insight: As digital infrastructure expands, energy and emissions management will be central to long-term resilience in the telecoms sector.

Carbon Intensity: Renewable Energy and Emission Reduction



Source: Osmosis IM, as of end December 2024.

TIM: A Sustainability-Centric Leadership Model

TIM, a Brazilian telecommunications provider, has used 100% renewable electricity across its operations since 2021. Over 60% is sourced from 129 distributed generation units, including solar, hydro, and biogas. This model reduces reliance on the national grid and supports Brazil's clean energy transition.

TIM has appeared on the B3 Corporate Sustainability Index (ISE) for 17 consecutive years, the longest-standing telecom firm in the index. The ISE highlights companies with strong ESG performance through a multi-step process involving scoring and exclusion filters.

Scope 1 emissions come from diesel generators, distributed units powered by biogas or natural gas, and TIM's vehicle fleet. Scope 2 emissions, from purchased electricity, are addressed through a combination of International Renewable Energy Certificates (I-RECs) and the company's own generation capacity.

A regulatory change in 2012 allowed distributed energy to feed into Brazil's grid, enabling TIM to scale its infrastructure. The company is a signatory of the Science Based Targets initiative (SBTi) and has committed to net-zero emissions by 2040, with a 42% reduction in Scope 3 emissions by 2030.

AT&T: Incremental Progress, Lagging Transparency

AT&T, a major North American telecom operator, emits 17 times more carbon per unit than TIM. In 2023, Scope 1 emissions made up 4.2% of its total, largely from vehicles, refrigerants, and cooling systems. Scope 2 emissions, from electricity and steam, accounted for 23.5%. The remaining and most significant portion of emissions is attributed to Scope 3 emissions.

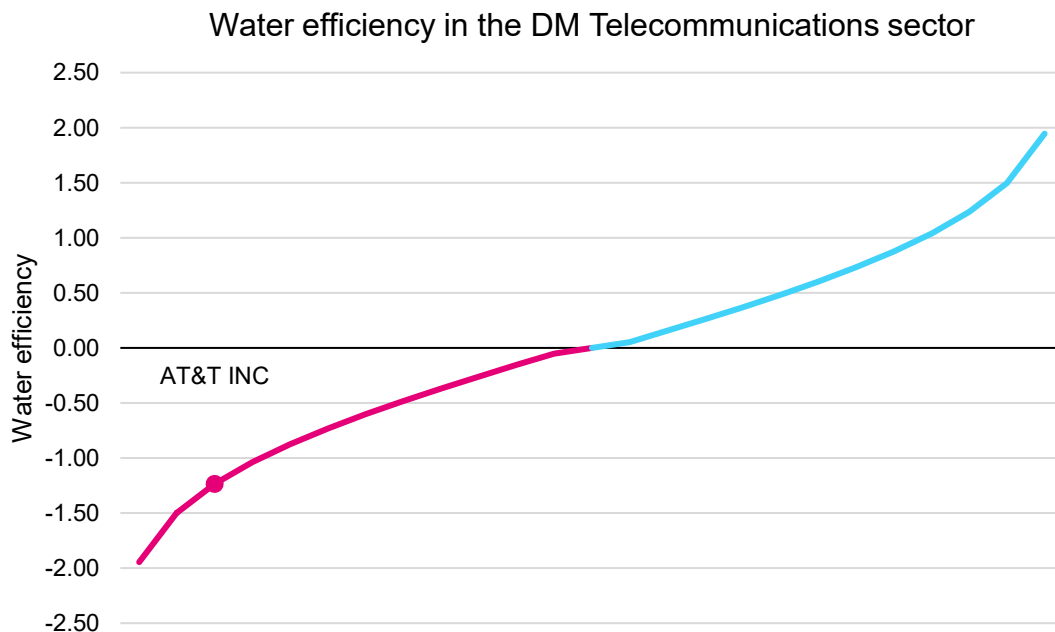
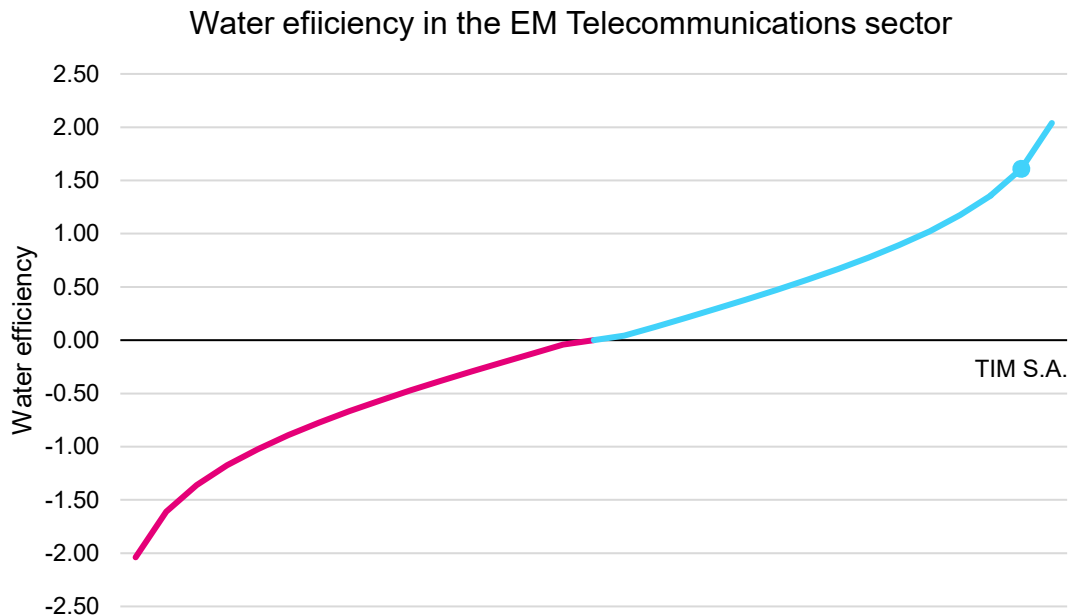
Despite initiatives to improve energy efficiency and expand renewables, only 17% of AT&T's operational energy comes from renewable sources. Most is secured through virtual power purchase agreements and International Renewable Energy Certificates (I-RECs) linked to wind and solar. While the company has expressed interest in developing its own infrastructure, progress has been limited.

AT&T is the highest absolute carbon emitter among developed market (DM) telecoms and ranks fifth in relative terms. It does not report sector-specific efficiency metrics such as emissions per terabit or network eco-efficiency. TIM includes these indicators, reflecting a more advanced and transparent approach.

Key Insight: TIM demonstrates significantly lower emissions and greater carbon efficiency than AT&T, highlighting the value of decentralised infrastructure, transparency, and firm emissions targets in driving environmental performance.

Water Intensity: A Journey to Cloud

Water management has traditionally been a secondary concern in the telecommunications sector. However, it is becoming increasingly important due to the high water demand required for cooling data centers, which are critical to maintaining stable network operations.



Source: Osmosis IM, as of end December 2024.

TIM: Reducing Water Through Cloud Transition

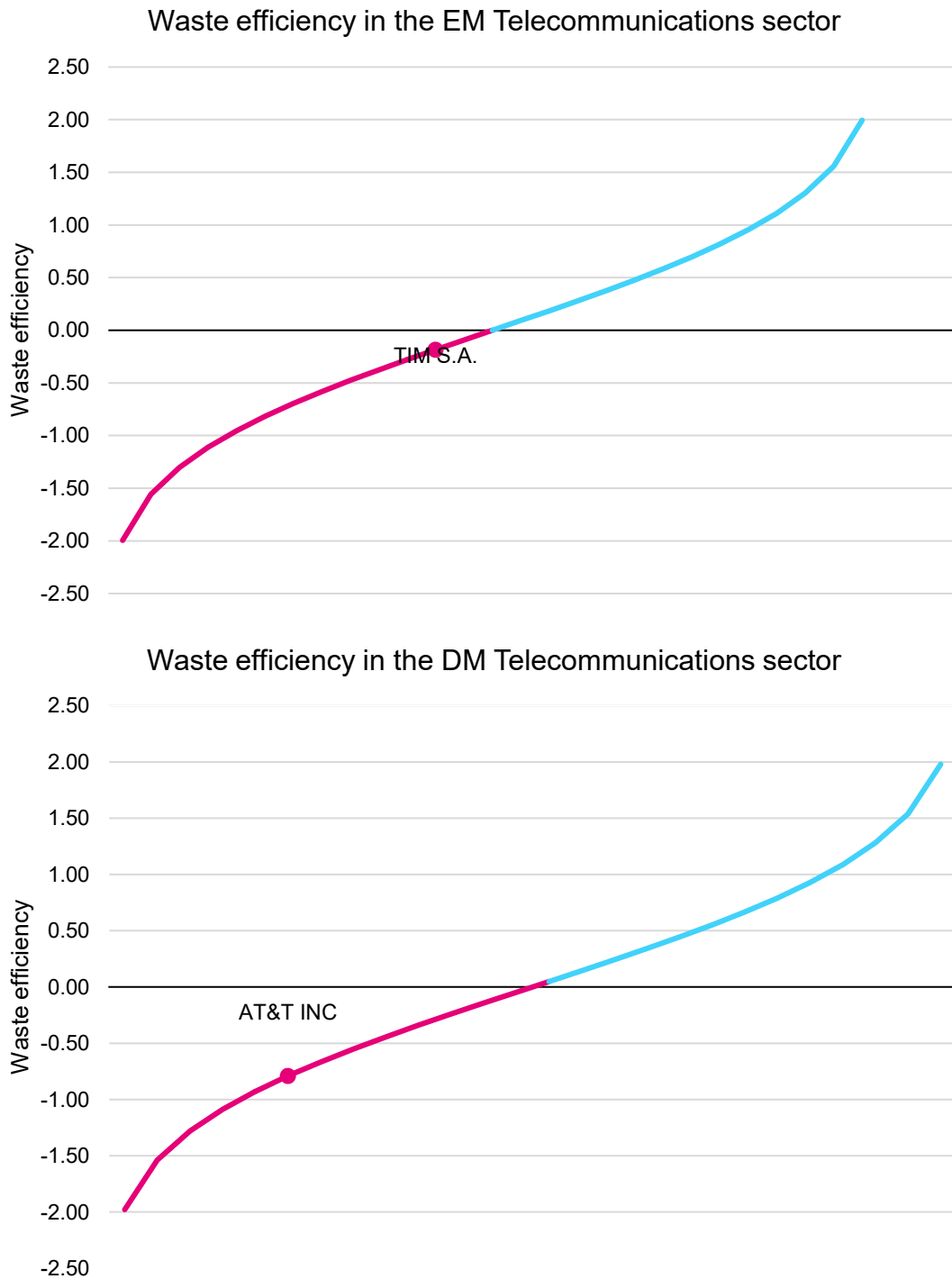
TIM began a multi-cloud migration in 2023 and fully decommissioned its physical data centers in Rio de Janeiro and São Paulo. These had previously accounted for more than half of its total water use. By 2024, total water consumption dropped to 52,000 cubic meters, a 3.7% year-over-year reduction. All withdrawals were from municipal sources. TIM now ranks as the second most water-efficient telecom operator in the emerging markets.

AT&T: Data Center Reduction Without Matching Impact

AT&T reported water use of 8.27 million cubic meters in 2023, with 99% drawn from municipal systems and 1% from on-site wells. The company began consolidating its data centers in 2020 and closed 10 of 34 sites by 2022, reducing costs by 30%. However, most water use remains tied to cooling infrastructure, and efficiency improvements have been limited. AT&T ranks as the third most water-intensive telecom operator in developed markets.

Key Insight: TIM's strategic shift to cloud infrastructure has delivered measurable reductions in water use, while AT&T's partial consolidation has yet to produce comparable efficiency gains.

Waste Intensity: Advancing Efficiency Through Circular Practices



Source: Osmosis IM, as of end December 2024.

TIM: Sector Leadership in Waste Diversion

TIM has implemented a comprehensive waste management strategy focused on recycling, reuse, and landfill diversion. In 2024, it generated 2,467 tonnes of solid waste, 95% of which was reused or recycled. Its “Zero Waste to Landfill” initiative diverted an additional 14.6 tonnes from disposal.

The company also addresses post-consumer waste. In partnership with ABREE, a non-profit managing electronics disposal in Brazil, TIM operates over 300 collection points for phones, batteries, and accessories. In 2024, it processed 3,560 kilograms of this waste, all routed to certified recyclers with final destination verification.

TIM exceeded its 2025 operational waste target one year early, achieving a 99.9% reuse and recycling rate. Although it leads in circularity, other emerging market peers such as Etisalat are advancing upstream approaches to reduce waste generation.

AT&T: High Waste Volumes Despite Incremental Progress

AT&T generated 126,771 tonnes of landfill waste and recovered 47,231 tonnes in 2024. Its waste streams include hazardous materials such as batteries and compressed gases, and non-hazardous components like e-waste, plastics, and packaging.

The company aims to cut landfill waste from its U.S. operations by 30% by 2030, compared to a 2019 baseline. It is pursuing various initiatives including local sourcing of waste vendors, improved tracking, and sector partnerships. Despite this, AT&T remains the second-largest telecom firm in total waste volume and seventh in relative terms across developed markets.

Key Insight: TIM’s circular model and early target achievement demonstrate strong waste management performance, while AT&T’s high volumes and limited reduction progress highlight the need for greater upstream action.

Conclusion: Action over Intent

TIM has embedded environmental efficiency across its operations, demonstrating strong performance in emissions reduction, water use, and waste management. Its decentralised energy model, cloud migration, and circular waste practices have delivered clear, measurable outcomes.

By contrast, AT&T has set commitments and articulated environmental goals, but the impact of these targets has yet to translate into material reductions. High emissions, water consumption, and waste volumes remain, underscoring the gap between stated intent and demonstrated action.

For Osmosis, this distinction is central. Resource efficiency is not judged by ambitions or targets, but by observable outcomes. Companies that consistently show measurable improvements in carbon, water, and waste intensity tend to exhibit stronger long-term resilience and profitability. TIM’s consistent delivery across environmental metrics reflects a more advanced and effective sustainability strategy.

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