



SUMMARY

Environmental Footprint in Transport Services and Mobility

Transport is essential for economic development, social connectivity, and global supply chains, but it also represents a major source of environmental impact. The sector contributes roughly one quarter of global energy-related CO₂ emissions and generates additional pressures such as air pollution, noise, land use, and resource consumption. Unlike manufacturing, transport is a service defined by movement across distance, meaning its environmental performance depends not only on vehicle technology but also on infrastructure, energy systems, occupancy rates, and user behaviour.

Environmental Footprint (EF) assessment in transport is based on Life Cycle Assessment (LCA), which evaluates impacts from vehicle production and energy supply to operation, infrastructure, and end-of-life stages. Key methodological aspects include defining system boundaries (e.g., well-to-wheel or door-to-door), using functional units such as emissions per passenger-kilometre or tonne-kilometre, and relying on accurate data on fuel consumption, distance, and load factors.

Transport environmental impacts extend beyond climate change. Important categories include energy use, local air pollutants, resource demand for electrification, water consumption, noise, and land occupation. These impacts often involve trade-offs: for example, electric vehicles reduce operational emissions but increase upstream impacts related to battery production. Therefore, a holistic and multi-criteria interpretation of results is necessary.

Comparisons of transport modes show significant differences in emission intensity. Electrified rail systems and high-occupancy public transport typically have lower emissions per passenger-kilometre, while aviation and low-occupancy car travel have higher impacts. Effective reduction strategies include improving operational efficiency, increasing occupancy and load factors, electrifying transport systems with renewable energy, using alternative fuels, applying digital traffic management, and promoting multimodal mobility solutions. Sustainable transport development requires coordinated technological, behavioural, and policy changes.