

Winner Essay

Towards a "Sustainable Future through Applications of Science and Technology – SFAST
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Reducing Greenhouse Gas Emissions with Improved Public Transportation

Jason Liao¹

¹ Beanstalk International Bilingual School, People's republic of China

* Correspondence: isbfollowup@outlook.com

The growing climate crisis requires urgent and transformative action to reduce global greenhouse gas emissions. One of the most promising strategies is to reassess and restructure the transport system, including by improving public transport and reducing the use of private cars (Givoni, 2020). Not only does this approach significantly reduce emissions, but it also offers multiple co-benefits that help create a more sustainable and equitable urban future.

Public transport, such as buses, trains, and subways, generally have a lower carbon footprint per passenger mile than private cars. High-capacity vehicles such as electric buses can efficiently transport large numbers of passengers, thereby reducing emissions per capita (IEA, 2021). This shift from individual to collective modes of transport is a powerful tool in the fight against climate change because it directly reduces CO₂ emissions.

Public transport systems are generally more energy efficient than individual vehicles, particularly when they run on cleaner, renewable energy. Adopting energy-efficient technologies in these systems further improves their environmental sustainability (Sperling and Gordon, 2019). By reducing the energy required to move people across urban landscapes, public transport can minimize emissions and promote responsible energy use.

A robust public transport network can alleviate congestion, thereby improving traffic flow and reducing fuel consumption (Barth and Boriboonsomsin, 2008). Reducing road congestion means that public and private vehicles operate more efficiently, use less fuel, and produce fewer emissions. Reducing congestion also improves air quality, reduces the urban heat island effect, and creates healthier cities.

Encouraging the shift from private cars to public transport is essential to reduce the number of vehicles on the road, which can directly reduce greenhouse gas emissions from the transport sector (Cervero, 2013). Complementing this shift with alternative modes of transport such as walking and cycling can further improve sustainability and foster a culture of active and healthy urban living.

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Smart technologies in public transport, such as real-time tracking, optimized routes, and digital payment systems can significantly improve operational efficiency and attract more users (Zhao et al., 2018). These innovations provide a seamless experience, making public transport a more attractive alternative to private cars.

Investment in public transport is consistent with sustainable urban development, reducing urban sprawl and promoting efficient land use (Newman and Kenworthy, 2015). Carefully planned systems promote mixed-use development, minimize long commutes, and support vibrant, walkable communities.

Prioritizing public transportation ensures equitable access across socioeconomic groups, thereby promoting environmental justice (Bullard et al., 2000). Reducing the use of private cars improves air quality, particularly in disadvantaged communities that are disproportionately affected by pollution, creating a healthier environment for all.

Improving public transportation and reducing the use of private cars are key strategies for reducing greenhouse gas emissions globally. This transformation promotes more sustainable, efficient, and equitable urban living. By investing in infrastructure, and smart technologies, and promoting public transportation, we can create a sustainable future in which public transportation becomes the backbone of urban mobility.

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