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Save money and time

by reducing greenhouse gas emissions from urban transport

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Key messages

- Low carbon urban transport offers a practical opportunity to save people's time and household income as well as government budgets.
- Policies that increase access to public transport and shift trips from motorized to non-motorized modes can reduce fuel consumption and congestion on the roads, making the transportation system more energy and time efficient.
- Public investment in low carbon transport combined with land use planning that favors shorter travel distances can lead to savings that extend beyond the scale, time, and budget of the investments themselves.
- For example:
    - Low carbon transport patterns save residents of Portland, USA 700,000 tons of carbon dioxide per capita and US$1,314 of individual income annually.
    - With the implementation of a bus rapid transit system in Guangzhou, China, the mixed traffic flow in the corridor has improved with a 20% increase in speed and has reduced emissions by an annual average of 86,000 tons of carbon dioxide.

Introduction

This paper shares two case studies from cities that have taken action in the transport sector to shift people out of private vehicles. With this shift, the residents of these cities have realized the benefits of saving money and time and reducing emissions by using their private vehicles less often. Similar principles may be applied to other metropolitan areas.

People need transport to reach basic services such as health care and education, and to get to their places of work. Promotion of low carbon transport substantially decreases private household expenditure on transport by reducing both fares for public transport (through subsidies and low carbon transport infrastructure) and fuel costs of private vehicles. Commuters also save time as traffic congestion is eased. Savings in both household expenditure and

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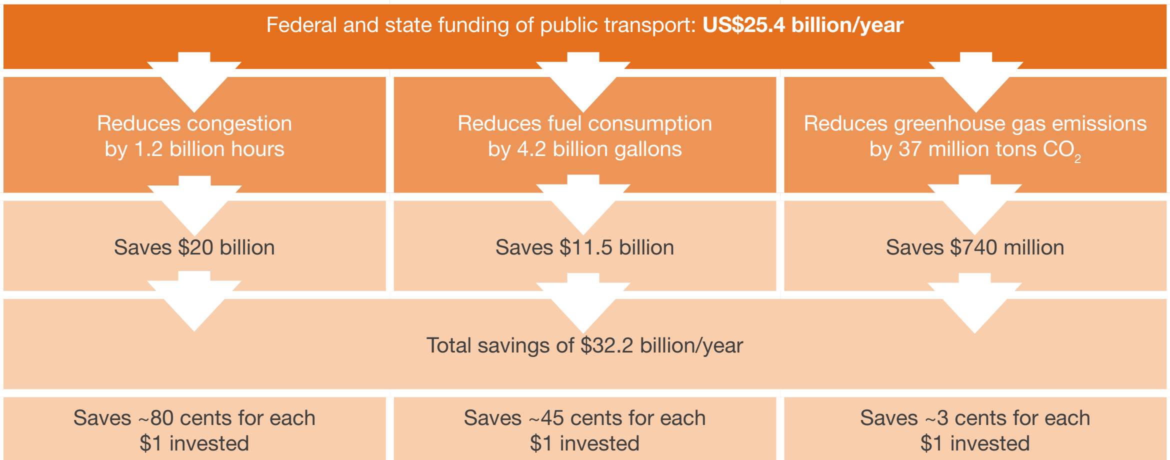
- *Create jobs*
- *Make roads safe*
- *Breathe clean*
- *Fight poverty*

This series of short papers aims to demonstrate how low carbon transport options can support national and local development agendas efficiently.

Figure 1 Investment and savings in the US public transport system



travelling time can potentially increase the productivity and efficiency of commuters at work, releasing more opportunities for the development of the local economy.

An increasing share of private household income is spent on transport, despite government efforts to reduce this burden through a variety of subsidies and programs for the transport sector. For instance, the average US household spends 19% of its income on transport.[1] The income share spent on transport increases for households in car-dependent locations from 19% to 25%, and decreases for those located closer to employment, grocery stores, and other amenities from 19% to 9%.[2] Also, overall income level influences expenditure on transport. The lowest income quintile of US households spend slightly less of their income on transport, 16% in total, but only 5% of the income is spent on public transport.[3] In other cities, such as Buenos Aires and Delhi, the lowest quintile spend 31.6% and 50% of their income on travel to work.[4] A two-adult household in the USA whose members do not own a car and use public transport services saves US$6,251 annually due to less driving, more walking, and no operation or maintenance costs of a private vehicle.[5]

As well as consuming a high level of private income, too many vehicles taking too many trips result in daily traffic gridlocks, wasting fuel, time, and subsequently large sums of money in national economies. Urban road congestion costs economies worldwide between 2% and 5% of their annual GDP, mainly due to employees losing productive time in traffic and to higher fuel consumption per passenger per kilometer.[6] In 2011, the average US commuter lost almost 40 hours annually in traffic, equivalent to US$818 per commuter, adding up to annual congestion costs of a total of US$121 billion for the US.[7] Reducing the number of cars on the road during peak periods by only 10% would decrease average travel times by about 25% and save over US$30 billion per year.[8]

Figure 2 CO_2eq emissions compared: per capita; per city; per car

Total global emissions (k tons CO_2eq): 34.65	Per capita emissions, 2011–15 (metric tons per capita):	US	17.0
		China	6.7
		Bangladesh	0.4
	City wide emissions, 2014 ($MMtCO_2$eq):	NYC	46
		Paris	7.4
		London	40
	Per car emissions (metric tons/year per car):	US	4.7
	Per car emissions (g CO_2/km per car):	EU	130

Public transport in the top 85 urbanized areas in the US saves US$20 billion annually by reducing congestion, which leads to time savings of more than 1.2 billion hours per year.[9] By reducing annual fuel consumption in the US by 4.2 billion gallons and saving 37 million tons of carbon dioxide equivalent (CO_2eq) each year, assuming that trips would otherwise be made by car, the government's investment in public transport translates into annual savings of US$11.5 billion through fuel savings, and an additional US$740 million savings assuming US$20 per ton for carbon external cost.[10]

By expanding low carbon transport options and reducing the carbon footprint in daily travel, city governments and residents are able to save valuable time and money. Those resources can be invested to pursue other development goals and strengthen the local economy by increasing demand for alternative goods to transport.

Case study

Low carbon transportation in Portland, USA

The city of Portland, Oregon actively opposes the high car dependency that dominates urban and especially suburban areas throughout the US. Instead, Portland's land use planning is oriented towards compact development, a mixture of land use and transit alternatives for commuters. In the metropolitan region of Portland, 30% of all jobs are within 3 miles of the central business district, and over 80% are within 10 miles.[11]

Portland's prioritization of dense land use patterns results in shorter and fewer trips by residents, who more often choose public transport or bicycles for their journeys. Portland residents travel about 20% fewer miles than residents of other large metropolitan areas in the US. Whereas the national trend is to travel increasing distances, the opposite trend is seen in Portland. Altogether, residents spend a total of about 100 million hours less than the national average on traveling, due to shorter and fewer trips. This translates into an additional US$1.5 billion saved per year.[12]

Urban density influences travel behavior within Portland: residents living in the most urbanized neighborhoods travel one third fewer miles than those in the least urbanized areas. As a result, Portland is reducing its annual greenhouse gas emissions in the transport sector by 1.4 million tons of CO_2eq, mainly due to fuel savings of 146 million gallons annually. Portland residents' choice of low carbon modes of transport and shorter travel distances decreases the annual carbon footprint by 0.7 tons of CO_2eq per capita, saving Portland US$28 million per year.[13]

Photo credit: Oregon Department of Transport

As well as its dense land use pattern, Portland's low carbon travel behavior results from its policy mix, with strategic encouragement for cycling giving it the reputation of the nation's most bicycle friendly city.[14] Bicycle trips in Portland grew 9.6% annually between 1991 and 2008, with 6.4% of all trips being made by bicycle—the highest share in the US.[15] This low carbon mobility brings a significant increase in the number of bicycle-related businesses, which boosted local economic activities nearly US$90 million in 2008.[16]

The overall impact of this unconventional low carbon travel behavior is remarkable:

If all 2 million Portland residents traveled as much as the average US metro resident, about 8 million more vehicle miles per day would be traveled on the roads. Due to their fuel savings of about 10% per capita compared with the US average, Portland residents save about US$1.1 billion per year on out-of-pocket spending, which is equivalent to about 1.5% of the total private household income in the metropolitan region in 2005.[17]

By reducing greenhouse gas emissions in their daily travel, Portland residents spend about 4% less of their household income on transport than other US residents.[18] And despite using a low carbon transport system in combination with a dense land use plan, Portland maintains high quality, customer oriented public transport—60% of residents rate their transport system as good or excellent, compared with only 35% on average from residents in other US metropolitan areas.[19]

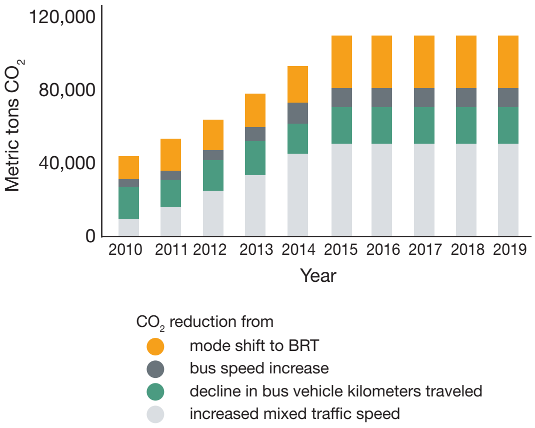
Case study

Bus rapid transit system in Guangzhou, China

Another example of how low carbon investment can reduce the income share spent on transport and generate revenues for the local economy and government is the bus rapid transit (BRT) system in China's third largest city, Guangzhou, which opened in 2010. With a city population of over 6 million and nearly 12 million in the metropolitan area, Guangzhou's central trunk road, the Zhongshan Avenue, suffered from an overloaded and slow public bus system and from daily congestion.[20] Instead of a rail based mass transit system, the Guangzhou Municipal Engineering Design and Research Institute, in partnership with the Institute for Transportation and Development Policy, proposed a 22.5 km corridor of fully segregated rapid bus lanes at a fraction of construction costs and time.[21] This decision proved to be a long term investment in a low carbon, clean future. Thus far, average annual savings of about 86,000 tons of CO_2eq and an additional 14 tons of particulate matter have been projected through the BRT system during the first 10 years of operation. This was mainly due to reduced blockages and easier flow of traffic, leading to a reduction in fuel consumption. A reduction in bus vehicle kilometers traveled, an increase in bus speed, and a mode shift to BRT all contribute to savings in travel time and reduction of greenhouse gas emissions.[22]

Today, the Guangzhou BRT system is one of the only two BRT systems worldwide to carry more than 29,000 passengers per hour in a single direction, which is higher than most metro and all light rail lines worldwide.[23] In addition, it is one of the most innovative systems worldwide, being planned and implemented together with a bike sharing system, with 133 stations and 5,000 bicycles along the corridor in nearby residential and commercial areas.[24] With a greenway on either side of the corridor connecting the BRT and bike sharing stations with public spaces such as parks and children's playgrounds, promotion of the bike share system has been another significant component of the BRT corridor.[25]

Figure 3 Guangzhou BRT yearly projected CO_2 reduction by source



Carrying over 850,000 people on a daily basis and encouraging an additional 20,000 people a day to share bikes, the Guangzhou package of BRT and bike sharing system supports an exemplary modal shift of 10–15% from private vehicles. The success of the Guangzhou package is evident from the number of bicycle trips along Zhongshan Avenue, which have increased by an average 45% in the first year of operation.[26] The high capacity system and the 29% increase in average bus speeds makes bus operation more efficient. Because it has a higher

Photo credit: Benjamin

capacity than most metros, with the world's highest BRT bus volumes (350 per hour in a single direction, or roughly one bus every 10 seconds), significant savings in fuel create economic savings worth US$14 million. Also, bus fares have been reduced by 50% through flat rates (median cash fare US$0.31) and discounted smart cards for frequent users (US$0.23) as part of the subsidized city-wide low fare program. In total, each year passengers now save US$103 million of out-of-pocket costs for bus trips and more than 30 million passenger hours by using the low carbon bus system.[27]

In addition, waiting times at bus stations have been reduced by 15%. The mixed traffic in the corridor also benefits from the improved traffic flow with a 20% increase in speed, saving another 22 million hours a year. Altogether, the low carbon investment translates into annual time savings for commuters of US$24 million. By reducing greenhouse gas emissions, Guangzhou's BRT system saves a great portion of the government's budget. It proves that investing in low carbon transport systems brings economic opportunities for both government and travelers, as well as benefits for environmental sustainability.[28]

Conclusion

As these two case studies show, public investment in low carbon transport solutions, combined with land use planning in favor of short travel distances, can result in savings that extend beyond the scale, time, and budget of the investments themselves. Shifting to low carbon transport has the potential to both reduce greenhouse gas emissions and achieve savings in the operating costs of public transport and in citizens' travel expenditure. Savings from low carbon transportation can be invested both in improving the low carbon transport system, and in other development areas. Introducing low carbon public transport helps travelers by saving travel time, which translates into potentially higher work productivity for commuters. Combining lower spending on transport with the financial and time savings from low carbon transport solutions is a triple win outcome for society, economy, and climate.

Notes

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