

Ask: NUS economists

Making healthy transport policies

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For The Straits Times

Q Can transport policy reduce pollution and improve health outcomes?

A Yes. Consider the Brazilian city of Sao Paulo, a megacity with a population of 20 million. Its story is one of how judicious transport policies can improve public health. By policies, we mean locating roads, pricing their use, regulating vehicle fleets, planning public transport, and the like.

You may ask: What do I care about a city with four times more people than Singapore, income per capita barely one-third of ours, and an earth's diameter away?

The experience our research uncovered may be relevant to Singapore and cities in which many heavy-duty vehicles circulate right by where people walk, work and live.

What we have in mind are commercial trucks, vans and buses that typically burn diesel fuel, some of which have been in use for many years. This is a feature both Sao Paulo and Singapore have in common. Air pollution is also similar, as measured by fine-particle levels in ambient air (PM_{2.5} averaging almost 20 µg/m³).

First, some geography. The Sao Paulo metropolis is located along the busy route linking Brazil's richest state, with economic activity about the size of Thailand's gross domestic product, to its largest port. Until recently, each day, about 20,000 trucks packed with export and import goods were forced to cross the heavily urbanised city, as they headed to and from the port.

Sao Paulo city, with its huge population, has the port on one side and the factories and farms on the other. Until 2010, lines of diesel trucks could be seen in broad

daylight on the inner city's roads, jostling for space with light vehicles and driving right by pedestrians, shops and residences.

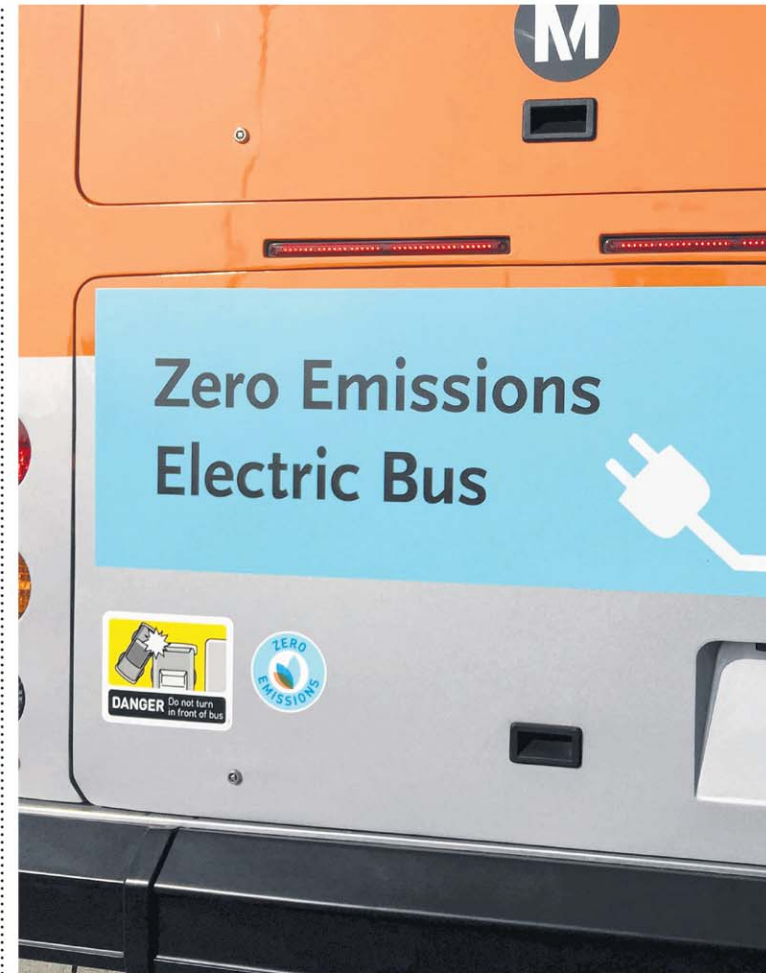
Now, the transport policy. An amazing thing happened in early 2010. An outer ring road, built along sparsely populated areas at a 25km radius from the city centre, was inaugurated. This "beltway" enabled the diesel trucks to bypass the dense urban area. Restrictions were also tightened on trucks circulating in the city during daylight hours, when demand for road space and human exposure to kerbside diesel pollution are at their peak.

So what were the effects? We studied how the beltway's opening, and the displacement of thousands of older diesel trucks, impacted the city's traffic congestion (short answer: a little); air pollution (a lot); and public health (a lot).

We found a short-lived reduction in traffic, with private cars soon filling the space left behind by the trucks that were now taking to the beltway. This is unsurprising, given the city's gridlocked roads and the repressed demand for private transport by an emerging middle class that perceives public transport to be less convenient and less safe.

Compared to the transient change in congestion, the beltway's effect on ambient air pollution persisted. We found a significant reduction in a class of pollutants – nitrogen oxides, also known as NO_x – that is a marker for diesel exhaust. NO_x is not only a harmful – and thus regulated – diesel pollutant, but is emitted alongside other harmful chemicals, including reactive hydrocarbons and small particles. Air quality improved the most precisely in those neighbourhoods through which the trucks used to transit.

We then examined admissions into public hospitals, by age and condition of the admitted patient. When linking changes in pollution to changes in hospitalisation by region of the city, we estimated that the beltway opening caused an



An electric bus being tested in Los Angeles, where natural gas has replaced diesel as the primary fuel for buses. Investing in buses which run on natural gas is one way Singapore can continue to progress towards a clean environment.

PHOTO: REUTERS

overall reduction of 5,000 admissions with respiratory and cardiovascular ailments per year.

Respiratory and cardiovascular are precisely those health categories epidemiologists and toxicologists have linked to air pollution. It is revealing that in our findings, the impact was greatest for children and the elderly – the more vulnerable subgroups – and insignificant for "placebo" (non-pollution-related) conditions such as trauma.

How may this be relevant to Singapore? The nation has made monumental progress in cleaning

up its environment. It leads the world in pricing and restricting road use, to account for the negative "externality" imposed by those who take cars instead of the MRT – in particular, road congestion and tailpipe emissions. Moreover, Singapore boasts a new light-vehicle fleet, equipped with modern onboard pollution control.

Sao Paulo's experience suggests that the Singapore authorities should continue investing in the abatement of roadside pollutant emissions, in particular from diesel-burning heavy vehicles. While such vehicles no doubt are

critical to our economy, cost-benefit analysis of the sort applied to Sao Paulo's beltway might support deepening certain transport policies.

We describe two sets of policies by way of example. First, investing the taxpayer's hard-earned dollars in renewing and retrofitting the commercial fleet, which is older than the light-vehicle fleet and may include a "right tail" of vehicles that accounts for a disproportionate amount of emissions – thick "smoky vehicles". Over 40 per cent of commercial vehicles in Singapore, compared to 2 per cent of passenger cars, are older than a decade.

An increasing share of buses might run on natural gas, which is cleaner. Possible retrofits include relatively inexpensive ones such as making tailpipes spew pollutants vertically, where they disperse several metres above ground, rather than horizontally at human height – think pedestrians waiting at bus stops.

Second, Singapore may fine-tune its pricing of urban road externalities, such as differentially charging heavy diesel vehicles for use of densely populated roads according to the hour of the day. For example, it can offer discounts on road use during night-time when fewer humans are exposed to kerbside emissions.

Similarly, new technologies may enable the pricing of idling engines – think of all those tourist buses (and diesel taxis), with air-conditioners running, as they await passengers.

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