



For least pollution exposure along Orchard Rd, take the ...

... MRT, according to study that also says those walking breathe in five times more harmful particles

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There are plenty of public transport options along Singapore's famous shopping belt.

To get from Ion Orchard to Plaza Singapura – two iconic malls that sit on opposite ends of Orchard Road – commuters can take a bus, a train, or hail a taxi. They also have the option of walking down the 1.5km stretch.

But as Singapore's car-lite vision takes hold, researchers here want to find out which public transport mode would expose a person to the least amount of pollution.

A recent study by researchers from institutions such as the Singapore-MIT Alliance for Research and Technology (Smart) and the National University of Singapore (NUS) has found that the cleanest public transport mode for commuting along Orchard Road is the MRT.

The study, published in the science journal *Atmospheric Environ-*

ment, found that after taking into consideration physical effort and travel time, commuters breathed in five times more harmful particles walking between Ion Orchard and Plaza Singapura, as compared with taking the MRT.

Both malls are linked via air-conditioned underground passageways to Orchard and Dhoby Ghaut MRT stations respectively.

Commuters travelling along Orchard Road via bus or taxi also breathed in up to two times more harmful particles compared with taking the train, the study also found.

"The absence of combustion sources, use of air-conditioning and screen doors at MRT station platforms are effective measures to protect passengers' health," said Dr Erik Velasco, a research scientist from Smart's Centre for Environmental Sensing and Modelling who was involved in the study.

The other researchers who did the study include Ms Tan Sok Huang, a former student from NUS' geography department, and Associate Professor Matthias Roth, also from NUS.

Dr Velasco said the pollution that a person breathes in when making one such trip is equivalent to smoking 0.12 cigarette when travelling by bus, 0.1 by taxi, 0.05

by MRT, and 0.3 if he decides to walk.

Dr Velasco said it was an interesting observation as underground train systems overseas in places such as his native Mexico City, for example, exposed commuters to up to three times more pollutant particles compared with Singapore's system.

He pointed to the double-door systems at MRT stations underground, which are effective in separating the tunnel environment from the platform where passengers wait, keeping toxic particles out.

Toxic particles from vehicular traffic are produced when fuel is burnt in the engine, or produced through chemical reactions once the exhaust gases have left the tailpipe.

The wear of tyres is also an important source, particularly when vehicles start up again after stopping, due to friction.

Walking along Orchard Road exposes pedestrians to the highest amount of these particles.

Commuters who choose to make the journey via bus or taxi would also be exposed to these particles when waiting at bus stops or taxi stands, and when doors of buses open at bus stops, noted Dr Velasco.

The combustion process produces thousands of particles of different sizes and compositions, he said.

"Some of them are like oily drops, others are formed by sooty black material and others contain harmful aromatic hydrocarbons."

Dr Velasco said that current technology in cars can efficiently remove large particles, but not tiny ones. The mean size of particles along Singapore's roads is about 25 nanometres – 100 times smaller than PM2.5, fine particles smaller than 2.5 microns in diameter, or a 30th the diameter of a human hair.

Exposure to fine particles is linked to premature death from heart and lung disease, and such fine particles are also known to trigger or worsen chronic disease such as asthma and heart attack.

"Singapore has a good system of ensuring that vehicles on the road comply with strict environmental standards," said Dr Velasco.

"But some toxic compounds, such as aromatic hydrocarbons, form only after they are discharged from the exhaust pipes."

He said public transport options such as electric buses and the MRT, promoted alongside walking, cycling and the use of electric scooters, would be a good way to reduce exposure to pollution.

A spokesman for the Ministry of Transport said it has adopted a three-pronged approach to address emissions from the land transport sector and to improve air quality.

This involves pushing for Singapore to be a car-lite society, managing the growth and use of vehicles, and encouraging fuel and carbon efficiency, as well as promoting the adoption of greener and cleaner vehicles such as hybrid buses and electric vehicles.

To this end, the spokesman pointed to a slew of measures that have been rolled out or will soon be implemented.

For example, last December, the Land Transport Authority called a tender to buy 60 electric buses, and commuters can expect to see electric buses being deployed for service by next year, she said.

Singapore's first electric car-sharing service, BlueSG, was also launched that same month, with the company planning to expand its electric vehicle fleet from the initial 80 vehicles to 1,000 by 2020. It also aims to have 2,000 charging points islandwide by then.

Up to 20 per cent of the charging points will be available for public use and will form the foundation for Singapore's future electric vehicle (EV) charging infrastructure to support the use of EVs in Singapore, said the spokesman.

"This also supports our vision for a car-lite Singapore, where you need not own a car but have the flexibility to drive one whenever you want to," she added.

"Such point-to-point services complement our public transport services as we move towards a greener and more sustainable urban transport system."

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