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**COMMUTE – CLEANER,
GREENER AND MORE
CONVENIENT TRAVEL**



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Over the years, Singapore has built an extensive public transport system and put in place policies to discourage car ownership and usage because we have limited land to build roads. We were one of the first cities in the world to implement vehicle ownership control and congestion pricing.

Today, travelling from place to place is relatively easy in Singapore and our city remains congestion free. But our roads already take up some 12% of our total land area. Our transport sector also accounts for about 13% of our overall energy consumption and 50% of the fine particles (specifically PM2.5¹) in the air. Therefore, we have to plan ahead to ensure that our transport system is able to meet two important objectives in the future: lower environmental footprint and more convenient travel. We have to achieve these goals without incurring disproportionately high costs for our people.

We will achieve a cleaner, greener and more convenient transport system by 2030 in three ways.

- Enhancing public transport to meet the commuting needs of a growing population
- Improving resource efficiency by reducing fuel consumption and adopting fuel efficient technologies
- Achieving cleaner transport through cleaner diesel vehicles and cleaner forms of commuting

¹ Fine Particulate Matter (PM2.5) refers to particulate matter that is 2.5 micrometers in diameter or smaller - 1/30th the diameter of a human hair. These fine particles can aggravate heart and lung diseases.

Key Recommendations

Enhancing Public Transport

- 1 Achieve a modal share of 70% of journeys made during morning peak hours via public transport by 2020, through doubling our rail network and developing a more integrated and seamless connection between our bus and rail services.

Improving Resource Efficiency

- 2 Manage the growth of private transport, by halving the annual vehicle population growth rate to 1.5%, refining our Electronic Road Pricing system, and improving schemes (e.g. Off-Peak Car scheme and Park and Ride scheme) to reduce car usage.
- 3 Improve the energy and fuel efficiency of both private and public transport, by implementing a mandatory Fuel Economy Labelling Scheme for passenger cars and light goods vehicles from April 2009, test-bedding new technologies such as diesel-hybrid buses, and developing a Green Framework for rail systems.

Achieving Cleaner Transport

- 4 Reduce PM2.5 level from $16\mu\text{g}/\text{m}^3$ in 2008 to $12\mu\text{g}/\text{m}^3$ by 2020 and maintain this level until 2030 with cleaner diesel vehicles.
- 5 Establish a vehicle emission test laboratory.
- 6 Encourage cycling and walking with investments in infrastructure such as covered linkways, cycling paths and parking facilities for cyclists at MRT stations.



MRT is the backbone of our public transport system



Real-time bus arrival information helps commuters plan their journeys

ENHANCING PUBLIC TRANSPORT

We can achieve a more sustainable transport system if more Singaporeans travel by public transport. Public transport is, by far, the more efficient mode of transport, both in terms of land and energy use. A single-deck bus transports up to 80 passengers while an average passenger car only carries up to 5 persons. A car carrying only the driver uses 9 times the energy used by a bus and 12 times that used by a train, on a per passenger-kilometre travelled basis.

To encourage more people to travel by public transport, we must make public transport more accessible and more convenient to commuters. The government has set aside more than \$40 billion to improve the public transport system to achieve the target of having 70% of journeys made by public transport during morning peak hours by 2020.

Doubling Our Rail Network

- The Land Transport Authority (LTA) will continue to upgrade our rail infrastructure to bring direct rail access to new areas. It will double the current rail network from the current 142km to 278km by 2020. This will be achieved with the completion of the Circle Line and Downtown Line and the addition of new lines and extensions, such as the North-South Line Extension, the Tuas Extension, the Thomson Line and the Eastern Region Line. Where demand justifies, more trains will also be added to improve the capacity of existing rail lines.

Ensuring a More Integrated and Seamless Hub-and-Spoke System

- LTA will take over the role of central bus planning to enhance the inter-connectivity between our bus and rail services to achieve

an integrated public transport system. There will be more frequent and direct feeder bus services so that commuters can reach the transfer hubs quickly, and enjoy seamless and efficient transfers to the Mass Rapid Transit (MRT) or trunk buses.

- LTA will also introduce more measures to give buses priority over other traffic (e.g. through more bus lanes, right of way at bus bays, signal priority at junctions) so that bus travel is faster and more reliable.
- LTA will also provide real-time and multi-modal public transport travel information through online and mobile platforms, to help commuters plan their journey more conveniently.

Together, these measures will reduce overall journey times for commuters using public transport.

IMPROVING RESOURCE EFFICIENCY

We can improve the resource efficiency of the transport system by managing the growth of private transport, improving fuel efficiency of both private and public modes of transport, and pricing fuels correctly.

Managing the Growth of Private Transport

Singapore is one of the few cities in the world to successfully implement a vehicle quota system, which has helped us maintain the annual vehicle population growth rate at 3%. At this growth rate, however, the current vehicle population will still increase by 40%

to about 1.2 million vehicles by 2020. This cannot continue because our road space grew by 1% per year over the last 15 years and is expected to increase by only 0.5% per year over the next 15 years.

- Therefore, we have lowered our vehicle population growth rate to 1.5% per year from 2009 and will further review this after three years.
- We will also have to continue to manage road usage. Congestion pricing, which Singapore pioneered, has now been adopted by other cities. We will refine our Electronic Road Pricing (ERP) system, and take advantage of technological developments to develop our next generation ERP system to ensure our roads remain congestion free.
- In addition, we will also review schemes such as the Off-Peak Car scheme and the Park and Ride scheme to reduce overall car usage.

Encouraging Fuel-Efficient Vehicles

Within the private transport sector, we will continue to encourage vehicle owners to switch to more fuel-efficient vehicles.

- From April 2009, NEA has introduced the Fuel Economy Labelling Scheme (FELS), which provides buyers of passenger cars and light goods vehicles with fuel economy information at the point of sale. This will empower consumers with information to make more fuel-efficient vehicle purchases.
- The government will also regularly review the Green Vehicle Rebate (GVR) scheme to encourage consumers to purchase green and fuel-efficient cars.



Drivers who opt for environmentally-friendly cars enjoy the Green Vehicle Rebate

- Global trends indicate that electric vehicles will eventually be introduced into the mainstream automobile market. Therefore, we will test-bed these vehicles in Singapore to enable us to facilitate their future adoption.

Making Buses and Trains More Energy Efficient

Within the public transport sector, we can similarly use new technologies to make buses and trains more energy efficient.

- LTA will carry out a trial of diesel hybrid buses with private and public bus operators to study the feasibility of applying this technology to our bus fleets. A diesel hybrid bus uses an electric motor to complement the diesel engine for propulsion. These

buses have been introduced in the UK, the US, Hong Kong, Tokyo and New Zealand. Based on trials conducted overseas, diesel hybrid technology for buses can improve fuel economy by 15-30%, as well as reduce PM2.5 emissions by up to 85%.

- In addition, LTA is working to develop a Green Framework for the Rapid Transit System (RTS) to improve the design and engineering of the RTS network to achieve greater energy efficiency.

Pricing Fuel Correctly

- The government will price fuel correctly and maintain our policy of not subsidising fuel usage. We will regularly review the rate of fuel duty as a form of general vehicular usage charge, to encourage commuters and

MAKING CYCLING A WAY OF LIFE: THE TAMPINES EXAMPLE

In Tampines Town, cycling has become a convenient mode of transport for intra-town travel and short trips to key transport nodes. A Committee comprising the Singapore Police Force, LTA and the Tampines Grassroots was formed to oversee a pilot trial and study if cycling on footways would be feasible. The trial has enabled the Committee to identify measures needed to improve the acceptance of cycling on footways, including stepping up public education and enforcement. The trial has also yielded useful information on infrastructural improvements that can better ensure pedestrian and cyclist safety.

LTA has been working with the relevant government agencies to firm up a comprehensive cycling path in Tampines Town, and will be adding an estimated 7km of cycling path by 2010. The cycling path will link cyclists to major transport nodes such as the bus interchange and the MRT station, making it easier for people to take public transport. LTA will also be building more and better bicycle parking facilities near the Tampines MRT station.

transport companies to save fuel, to encourage commuters to switch to public transport, and to take into account the environmental impact of fuel usage. However, the government is mindful of rising living and business costs associated with any increase in fuel duty and will consider the cost implications carefully in reviewing fuel taxes.

ACHIEVING CLEANER TRANSPORT

The diesel vehicles on our roads emit fine particles into the air (PM2.5), which can penetrate deep into the lungs and has been linked to respiratory and cardiovascular illnesses. To protect public health, we target to lower our ambient PM2.5 level from $16\mu\text{g}/\text{m}^3$ in 2008 to $12\mu\text{g}/\text{m}^3$ by 2020. We aim to maintain the PM2.5 level at $12\mu\text{g}/\text{m}^3$ up to 2030, even if our economy and vehicle population continue to grow.

Reviewing Emissions Regulations

We can reduce PM2.5 emissions by tightening emission regulations over time. Singapore has adopted the Euro IV emission standards for diesel vehicles. Euro IV diesel vehicles emit about 70% less PM2.5 compared to their Euro II counterparts. With effect from 1 October 2006, all new diesel vehicles are required to comply with the Euro IV emission standards. We expect all taxis to achieve Euro IV emission standards by 2014, and LTA will work with public bus operators to attain this standard for all their buses by 2020. The government will also consider tighter emission standards, such as the Euro V emission standard, for new diesel vehicles when it is cost effective to do so.

Using Cleaner Transport Technology

We will also use new technology to improve the environmental performance of vehicles.



Bicycle parking facilities help cyclists transfer to the public transport system



Covered linkways to MRT stations make public transport more accessible and convenient

For instance, Diesel Particulate Filters (DPFs) that are fitted to diesel vehicles can potentially reduce up to 85% of the vehicles' PM emissions. However, they cost two to three times more than traditional diesel oxidation catalytic technology². LTA will conduct trials on the use of the DPF on a range of diesel-driven vehicles and assess its feasibility and cost-effectiveness in reducing PM_{2.5} emissions. LTA will also study alternative fuel technologies that can make commuting cleaner.

Establishing Local Emission Testing Capability

LTA, in partnership with the private sector, will establish a vehicle emission test laboratory in Singapore to measure vehicle emissions. This

testing facility will be the first of its kind in Singapore and will support the trials on DPF installation and diesel hybrid buses.

Encouraging Cleaner Forms of Commuting

We will also promote cleaner forms of commuting, such as cycling. Bicycles do not pollute the air and require no fuel. Cycling is also good for the health. We have put in place infrastructure, such

² Diesel Oxidation Catalysts (DOCs) are one of the most common diesel emissions control technology used for retrofitting today. DOCs help control PM emissions by oxidising (i.e. burning) the soluble organic fraction of particulate matter, but are less efficient in doing so compared to DPFs.

as park connectors, to promote cycling as a recreational activity. More will be done to promote cycling as an alternative mode of transport, especially for travelling within towns and short distance commuting to key public transport facilities (such as MRT stations and bus interchanges).

- Over the next five years, LTA will, in partnership with community stakeholders, invest more than \$43 million to implement cycling networks in selected HDB towns including Tampines, Yishun, Sembawang, Pasir Ris and Taman Jurong. These will improve access for cyclists and enhance pedestrian and cyclist safety. Besides HDB towns, LTA will also examine the feasibility of implementing cycling paths in new districts such as Marina Bay.
- In addition, LTA will provide more and better-designed bicycle parking facilities near MRT stations to help cyclists transfer to the public transport system for longer distance travel.

As a start, LTA will build over 1,200 additional cycle parking lots in Tampines, Pasir Ris and Yishun towns by 2010.

- Beyond this, LTA has also worked with public transport operators to allow foldable bicycles on buses and trains during off-peak hours.

Promoting Pedestrian-Friendly Environment and Enhancing Connectivity

LTA will also make our public transport system more accessible and convenient for pedestrians.

- It will introduce more covered linkways and pedestrian overhead bridges around MRT stations and bus interchanges.
- Pedestrians can also enjoy more seamless transfers as LTA develops more integrated transport hubs and co-locates them with commercial developments.

CONCLUSION

A Singapore city with a first class living environment must have a cleaner, greener and more convenient transport system. We have made comprehensive plans to upgrade the transport infrastructure and enhance its environmental performance. We will have a cleaner and more fuel-efficient vehicle fleet by 2030. However, our city in 2030 will be shaped just as much by the individual commuting choices of our people as they are by these plans. If all of us choose to use public transport more, drive less and adopt cleaner and more fuel-efficient options, we can look forward to a better living environment for all in the future.