INFORMATION NOTE

Public transport facilities and traffic control measures in Singapore

1. Introduction

1.1 Singapore is the first city in the world to make use of Electronic Road Pricing ("ERP") system for managing road congestion. In recent years, Singapore has also installed a number of user-friendly public transport facilities, such as air-conditioned integrated transport hubs and the Intelligent Route Information System ("IRIS"), to facilitate the use of public transportation. The purpose of this information note is to provide the Panel on Transport with background information on the salient features of public transport facilities and traffic control measures in Singapore.¹

1.2 The study of Singapore should shed light on the transport-related policy initiatives that can be considered for solving Hong Kong's traffic congestion problem and enhancing the quality of the local public transport facilities. As to the latter, the air quality inside public transport interchanges ("PTIs") has been an area of particular concern for the general public. Many PTIs are located under the podiums of residential or commercial complexes and surrounded by structural columns or walls. The accumulation of air pollutants within these PTIs may pose risks to the respiratory health of both drivers and passengers alike.

2. Singapore

2.1 The Land Transport Authority ² ("LTA") implemented the ERP system as early as in 1998 to manage road congestion. Based on a pay-as-you-use principle, motorists are charged when they use priced roads during peak hours. In recent years, LTA has complemented its ERP system with the development of Intelligent Transport Systems ("ITS") as another traffic control measure in Singapore. ITS make use of sophisticated traffic control systems to maximize road network efficiency capacity and monitor and manage traffic flow.

¹ An overview of the public transport strategy in Singapore is provided in Appendix for reference.
² The Authority is responsible for planning, operating, and maintaining Singapore's land transport infrastructure and systems.
2.2 LTA went further in 2013 to publish a new *Land Transport Master Plan* that sets out its vision for land transport in Singapore for the next 20 years. In particular, the Master Plan seeks to achieve a "People-Centred Land Transport System" that can address the transport needs of the city and enhance the travel experience.

2.3 The *Land Transport Master Plan* has identified the following three objectives to be achieved in the years ahead:

(a) providing more connections by connecting commuters to more places, where they work, live and play;

(b) offering better public transport services by enhancing the reliability, comfort and efficiency of transport modes; and

(c) building and operating a public transport system that meets individual needs of the diverse community.

2.4 To achieve the objectives set out in paragraph 2.3, LRA will target at building more bus hubs with bigger and longer bus stops and integrated transport hubs where air-conditioned bus interchanges and rail stations are co-located with retail and commercial activities. The Authority also plans to provide more cycling infrastructure to better facilitate cycling as first-and-last-mile connections to the public transport system.

2.5 Apart from the government's policy initiatives, there are also other user-friendly measures implemented by private transport operators to encourage the use of public transport. For example, SBS Transit\(^3\) has put in place two IRIS applications to help commuters plan their trips by providing travel information with respect to (a) next bus arrival time and (b) the best way to get to their destination by bus or train based on the shortest travelling time or walking distance.

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\(^3\) SBS Transit is a public transport operator providing both bus and rail services. It has established a strong presence in the bus services market with a total fleet of close to 3,000 buses and a 75% market share. As for MRT services, SBS Transit operates the North East Line and Downtown Line, as well as two light rail transit systems, Sengkang and Punggol.
Development of public transport facilities and traffic control measures

Electronic Road Pricing system

2.6 Singapore is the first city in the world to manage road traffic flow by the ERP system. The system was introduced in September 1998 to replace the Singapore Area Licensing Scheme which charged drivers entering downtown. Based on a pay-as-you-use principle, the ERP system charges motorists when they use the priced road at places and at times where and when they may cause congestion. ERP rates differ for different roads and time periods depending on local traffic conditions. This encourages motorists to change their mode of transport, travel route or time of travel.

(a) Operation of Electronic Road Pricing system

2.7 The ERP system consists of gantries located at the roads linking into Singapore's central business district, as well as along the expressways and arterial roads with heavy traffic to discourage usage during peak traffic hours. The gantry system is actually a system of sensors on two gantries, one in front of the other. Cameras are also attached to the gantries to capture the rear license plate numbers of vehicles. There are about 80 ERP gantries in operation, and additional gantries will be installed where serious traffic congestion is occurred in roads like expressways.

Figure 1 – Electronic Road Pricing system in Singapore

Source: Land Transport Authority.

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A case in point is the trip taken from Woodlands New Town (a suburban town in northern Singapore) to Raffles Place (located in the downtown area) via the central business district. It costs about S$15 (HK$93) during peak hours, compared with about S$2 (HK$12.4) during lunch time.
2.8 A device known as an in-vehicle unit ("IU") is affixed on the lower right corner of the front windscreen within sight of the driver, in which a stored-value card, known as the CashCard, is inserted for payment of the road usage charges (see Figure 2). It is mandatory for all Singapore-registered vehicles to be fitted with an IU if they wish to use the priced roads.

Figure 2 – Toll collection under Electronic Road Pricing system

![How Does ERP Work?](image)

Source: Land Transport Authority.

2.9 When a vehicle equipped with an IU passes under an ERP gantry, a road usage charge is deducted from the CashCard in the IU. Sensors installed on the gantries communicate with the IU via a dedicated short-range communication system, and the deducted amount is displayed to the driver on an LCD screen of the IU.

2.10 The ERP system operates from Monday to Friday between 7:30 a.m. to 7 p.m. for the central business district areas, and 7:30 a.m. to 9:30 a.m. for the other ERP-pricing roads. ERP is not in operation on Saturdays, Sundays and public holidays.
(b) Effectiveness of the system and future development

2.11 According to the Ministry of Transport\(^5\), the ERP system has been effective in managing traffic congestion by maintaining traffic flows within an optimal speed range. However, the ERP system cannot operate in silo and has to work with other measures such as increasing and optimizing road capacity, and encouraging motorists to shift to public transport to maintain a smooth-flowing road network.

2.12 In recent years, LTA has been testing the use of the global positioning system ("GPS") in its ERP system. Not only will a GPS-based ERP overcome the inflexibility of installing physical gantries, but it will also make distance-based congestion charging possible with the computation based on the actual length of congested roads used by motorists. Nevertheless, LTA has yet to set out the timetable for the implementation of the next generation ERP system.

Intelligent transport systems

2.13 LTA has made use of ITS as a traffic control measure to maximize road network efficiency capacity, as well as monitoring and managing traffic flow. The ITS infrastructure spans over 161 km of expressways and road tunnels in Singapore. Key components within the ITS network include:

(a) Intelligent Transport Systems Centre which monitors traffic with an array of ITS and deploys ground recovery crew to assist motorists who are in need. Real-time traffic advisory information are also provided to motorists through electronic message signs;

(b) i-Transport which provides an integrated platform that centralizes the management of all ITS including traffic signal control, traffic monitoring, incident management, tunnel and highway monitoring and provision of real-time traffic advisory information;

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\(^5\) See Ministry of Transport (2014).
(c) Expressway Monitoring and Advisory System which monitors traffic along expressways and alerts motorists of traffic incidents;

(d) Junction Electronic Eyes which is a system of surveillance cameras that monitor the traffic condition at major road junctions;

(e) Your Speed Sign Displays which show the real time speed of vehicles and alert motorists that they are speeding;

(f) Green Link Determining System which monitors, adjusts and optimizes green time in an intelligent and adaptive manner to ensure smooth traffic flow along main roads in response to changing traffic conditions;

(g) e-TrafficScan which uses taxis equipped with GPS as probes on the road network to provide motorists with information on the traffic conditions;

(h) Parking Guidance System which provides real-time information on parking spaces availability of shopping malls at major shopping areas to reduce circulation of traffic in these areas; and

(i) Green Man which extends road crossing time for both the elderly and pedestrians with disabilities to cross the road.6

Integrated transport hubs and bus hubs

2.14 Under the Land Transport Master Plan 2013, LTA is committed to providing more and better connections for commuters by building more integrated transport hubs where air-conditioned bus interchanges and rail stations are co-located with retail and commercial activities. The provision of integrated transport hubs allows transfers to be done more comfortably and provide added convenience as commuters can do some shopping before transferring to their connecting mass rapid transit ("MRT") or bus.

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6 This is done by tapping the senior citizen concession smart card or Green Man smart card on the reader mounted above the standard push button on the traffic light pole. Once the card reader verifies that it is a valid card, the system will extend road crossing time accordingly.
2.15 Six integrated transport hubs are currently built, which are located at Boon Lay, Ang Mo Kio, Clementi, Sengkang, Serangoon and Toa Payoh. Seven more will be provided at Bedok, Bukit Panjang, Hougang, Joo Koon, Jurong East, Marina South and Yishun in tandem with re-development in the respective areas over the next 10 years.

2.16 In addition, LTA has developed bus hubs to create more waiting and boarding space for commuter comfort and reduce the average time each bus needs to dwell at the bus stops. These bus hubs are installed with real-time bus arrival/departure information panels to help passengers better manage their travel time. A total of 18 bus hubs had been completed as at June 2013, and 20 more will be provided.

**Cycling facilities**

2.17 Singapore is working towards becoming a bike-friendly city. In recent years, LTA has provided bicycle racks at MRT stations to cater to parking needs of cyclists. At end-2012, a total of 1 500 bicycle racks at 10 MRT stations had been installed. LTA also formulated the *National Cycling Plan* in 2012 which aims at, among other things, providing dedicated cycle tracks to facilitate intra-district cycling and connectivity to major transport nodes such as MRT stations and bus interchanges.

2.18 In a further effort to help cyclists safely travel to a variety of destinations, LTA has set out the following policy initiatives in the *Land Transport Master Plan* to expand the existing cycling networks through:

(a) extending the cycling path networks to additional public housing estates;

(b) adding 90 km more of cycling paths to bring the total cycling path network to around 190 km by 2020; and

(c) installing more racks to secure up to 3 000 bicycles at more than 30 MRT stations by the end of 2014.

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7 For instance, the Boon Lay integrated transport hub consists of a MRT Station, a bus interchange holding up to 60 buses with 31 boarding/alighting berths, and Jurong Point Shopping Mall housing over 450 stores. This project is estimated to benefit some 150 000 commuters daily and those staying in the nearby areas.
Intelligent route information system

2.19 IRIS was launched by SBS Transit in 2007 as a free travel information service for its passengers. At present, SBS Transit offers two IRIS applications to help commuters better plan their journeys: the IRIS Journey Planner and the IRIS NextBus.

2.20 The IRIS Journey Planner helps passengers plan the best way to get to the destination by providing travel solutions on SBS Transit bus, MRT and/or light rail transit, based on the shortest walking distance or shortest travelling time. As for the IRIS NextBus, it offers estimated next bus arrival time on a real-time basis. In so doing, passengers benefit from the convenience of knowing how many minutes away the bus is from the bus stop. IRIS NextBus claims to provide an accuracy of +3 minutes and −3 minutes.

2.21 All SBS Transit buses are equipped with in-house developed Automatic Vehicle Management System tracking device. Their exact locations can be tracked on a real-time basis and together with relevant route conditions/patterns, IRIS NextBus can provide the estimated next bus arrival time. When experiencing intermittent loss of GPS signals, which do happen from time to time, bus real time locations cannot be obtained and bus schedule information is utilized instead to estimate the next bus arrival time.

2.22 Both the IRIS Journey Planner and the IRIS NextBus are available on a number of mobile devices via short messaging service, General Package Radio Service and Web Access Protocol sites. Smartphone users can also download IRIS iPhone app and IRIS Android app for accessing to the services.

2.23 According to SBS Transit, it has received favourable response for its IRIS applications against the background of widespread proliferation of smart phones. In 2012, the IRIS NextBus application received an average of three million queries for next bus arrival time per day, more than doubled the number of daily enquiries received in 2011. Motivated by the popularity of its IRIS applications, SBS Transit is working with the government on a trial project to provide commuters with bus loading information in addition to next bus arrival time.

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8 The estimated arrival time for the next bus and subsequent bus can be found out by selecting the desired route number, travel direction and bus stop or simply the bus stop number.

9 It is a packet-based mobile data communication technology that enables data to be transmitted to users of Global System for Mobile Communications ("GSM") mobile phones.
Appendix

Overview of the public transport strategy in Singapore

1.1 Singapore is one of the most densely populated countries in the world, with a total land area of 687 sq km and a population size of about 5.4 million. Given the land constraint, a good public transport system is essential to enhance the movement of commuters.

1.2 An important objective of the public transport strategy adopted by the Land Transport Authority ("LTA") is to make the public transport a choice mode, or a viable alternative to the car. This is fulfilled by providing a quality public transport system to support the growth of travel demand in future, which includes expanding the rail network and improving the quality of bus services.

2. Rail system

2.1 In Singapore, the mass rapid transit ("MRT") system is operated by two operators SMRT Trains and SBS Transit, as well as several light rail transit lines operated by these two companies. LTA plans to increase the length of the rail network by 55% over the next decade from 178 km in 2012 to the targeted length of 278 km at the cost of S$60 billion (HK$372 billion). With the increase in rail density, commuters in the central area may access a rail transit station within 400 m, or five minutes' walk on average.

3. Bus services

3.1 Buses form a significant part of public transportation in Singapore, with about 3.5 million rides taken per day on average. The public bus services are provided by SBS Transit and SMRT Buses. To boost the bus capacity and bus service levels, LTA has decided to partner with the public transport operators ("PTOs") through funding their purchase of 550 buses. Together with the 250 buses that the PTOs promise to add to their fleet, an additional 800 new buses will come on stream over the next few years.
References


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