

Electronic Road Pricing Pilot Scheme in Central and its Adjacent Areas

Public Engagement Document



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Table of Contents

	Page No.
Executive Summary	ES-1
Chapter 1 Worsening Road Traffic Congestion	1
Chapter 2 An ERP Pilot Scheme in Central and its Adjacent Areas	11
Chapter 3 Basic ERP Elements and Overseas Experience	19
Chapter 4 Planning for our ERP Pilot Scheme	41
Chapter 5 Way Forward	59
Chapter 6 Ways of Providing Your Views	63
Appendices	i
Abbreviations	xi

Executive Summary

Introduction

1. Road traffic congestion is deteriorating in Hong Kong. It undermines our city's mobility, connectivity and livability. The economy, air quality as well as image of Hong Kong as a world-class metropolis are also adversely affected.
2. To step up the Government's effort to tackle road traffic congestion, the Secretary for Transport and Housing invited the Transport Advisory Committee ("TAC") in 2014 to conduct a study to identify the factors contributing to road traffic congestion in Hong Kong and to put forward practicable recommendations to the Government to tackle the problem. One of the recommendations made by the TAC is the early planning for an Electronic Road Pricing ("ERP") pilot scheme. In view of the particularly congested traffic situation of the central business district in Central and its adjacent areas, the Government proposes to implement, as part of the blueprint to alleviate road traffic congestion and as a follow-up to the TAC's recommendations, an ERP pilot scheme in the areas.

Worsening Road Traffic Congestion

3. The deteriorating road traffic congestion in Hong Kong can be accounted for by a host of reasons, most notably the continuous growth of vehicle fleet which results in more intense competition in the use of road space. There is a general decline in regional car journey speeds across Hong Kong (see **Figure 1.1** in **Chapter 1**). On some major traffic corridors, cars only travel at around 10 km/hour during peak hours, a speed that is not much faster than an adult's average walking speed of 4 to 5 km/hour (see **Table 2.1** in **Chapter 2**).

4. The Government adopts a three-pronged approach in tackling road traffic congestion, namely improving transport infrastructure, expanding and improving the public transport system, and managing road use. On improving transport infrastructure, the Government continues to pursue improvements which include expansion of the railway network, improvements to the road infrastructure under various highway and development programmes, as well as facilitation of non-vehicular means of commuting such as building hillside escalators and improving pedestrian facilities. Nonetheless, road transport infrastructure expansion are limited in view of the physical, spatial and social constraints brought by the intensifying urban development in Hong Kong, the demand for a quality living environment and the stricter air quality requirement that capital works projects are required to meet.
5. With regard to public transport, Hong Kong has one of the most efficient public transport systems in the world. The Government has been constantly monitoring the needs of passengers for public transport services and actively working with public transport operators to optimise the efficiency of their services (e.g. through bus route rationalisation). The Government has also commenced a two-year Public Transport Strategy Study to examine the respective roles and positioning of public transport modes other than the heavy rail.
6. To better manage the use of roads so as to maximise the efficiency of the use of the limited road space, the Government has employed different measures to discourage the ownership as well as the use of vehicles to tackle the fast growing vehicle fleet. General traffic management measures and the use of information technology for dissemination of travel information to road users are also put in place to manage road use.

7. Despite the efforts described above, road traffic condition is worsening in recent years. Having considered TAC's recommendations and overseas experience, the Government proposes to start planning for an ERP pilot scheme in Central and its adjacent areas. The experience gained from the pilot scheme will enable us to consider whether ERP should be implemented in other parts of Hong Kong which are facing similar chronic congestion problems. ERP is an effective measure to deal with road traffic congestion that occurs in a specific area at specific times. For territory-wide worsening traffic conditions, the Government will continue to adopt a multi-pronged approach.

What is ERP?

8. ERP is a traffic management tool to tackle localised road traffic congestion. It aims to rationalise vehicular flows in targeted areas where severe traffic congestion occurs almost daily. It has been successfully implemented in Singapore, London (United Kingdom) and Gothenburg (Sweden).
9. ERP is based on the "user pays" principle and, in this sense, could be said to be a relatively fair mechanism. Motorists are required to pay the charges only when they use the roads in the charging area during the specified times. It will not affect motorists who do not travel to the designated districts. The implementation of ERP can enhance traffic mobility and improve business operations and efficiency in the charging area. It can also bring about economic and social benefits to the community.

10. In the past, the Government has conducted three studies on the use of ERP in Hong Kong. The Government did not take forward the implementation of ERP in the past mainly due to changes in economic situation, privacy concern and the lack of community consensus at the time of the past studies. With the developments mentioned below, it is now an opportune moment to start planning an ERP pilot scheme in Central and its adjacent areas (“ the Central District ERP Pilot Scheme”) -

(a) **Severe traffic congestion in Central and its adjacent areas**

Severe traffic congestion occurs almost daily in Central and its adjacent areas. The slow traffic speeds results in long traffic queues and sometimes gridlocks in the surrounding road networks.

(b) **Mature ERP technology**

Over the last two decades, ERP has been successfully implemented in a number of overseas cities and has been proven to be a useful tool to tackle localised traffic congestion. With the advancement in technology, past concerns (such as privacy concerns) can, to a large extent, be addressed now.

(c) **Availability of alternative route and mode of transport**

The Central – Wan Chai Bypass, when commissioned, will provide a free-of-charge alternative route to allow motorists whose origins and destinations are not in Central and its adjacent areas to make a detour around the charging area. Moreover, Central and its adjacent areas are well served by a variety of public transport modes.

More details are given in **Chapter 2**.

Basic ERP Elements

11. While ERP schemes have been successfully implemented in overseas cities, the concept of ERP remains a novel one for many road users in Hong Kong and there is not yet a consensus over its use. The following explanation of the basic elements of ERP will facilitate better understanding of how an ERP scheme operates and the discussion of the Central District ERP Pilot Scheme. More details are given in **Chapter 3**.

(A) Charging area

12. “Charging area” is the area covered by an ERP scheme. This area is usually, but not limited to, the central business district of a city where severe traffic congestion occurs almost daily.

(B) Charging mechanism

13. There are two common types of charging mechanism, namely cordon-based mechanism and area-based mechanism. A ***cordon-based*** charging mechanism charges a vehicle each time when the vehicle passes through a charging point during the charging period. The charging points are located along the boundary of the charging areas. Under an ***area-based*** charging mechanism, a vehicle is charged, typically at a daily rate, for entering or using the roads in the charging area during the charging period, regardless of the duration, distance and number of entries the vehicle makes.

(C) Charging period

14. “Charging period” refers to the time period during which vehicles will be charged, and normally corresponds to the period lasting from the morning peak hours to the evening peak hours on weekdays.

(D) Charging level

15. “Charging level” is the amount to be charged on motorists for using the roads in the charging area during the charging period. A major consideration in setting the charging level is whether it will be effective in reducing the traffic volume in the charging area to an acceptable level.

(E) Exemption and concession

16. All vehicles using the roads in a charging area contribute to road traffic congestion. Thus, it seems fair for all vehicle users to pay the congestion charge under the “user pays” principle. Nonetheless, there are arguments that certain types of vehicles should be exempted or provided concession on different grounds. In deciding whether and what types of exemptions / concessions should be made available, it is important to take into account a host of factors, including the implications for controlling traffic volume in the charging area, the administrative cost of an ERP scheme and public views, etc.

(F) Technology

17. There are two commonly used technologies for ERP, namely “Automatic Number Plate Recognition” (“ANPR”) and “Dedicated Short-range Radio Communication” (“DSRC”). **ANPR** technology uses cameras to capture the images of the licence number plates of vehicles passing through ERP gantries / poles on which the cameras are mounted. **DSRC** technology requires vehicles to pre-install an in-vehicle unit (“IVU”) for information exchange with the equipment mounted on ERP gantry / pole using wireless communication, and ERP charges will be immediately deducted from the pre-payment / credit cards inserted in the IVU.
18. Regardless of whether ANPR technology or DSRC technology is used, installation of roadside hardware for detection of vehicles entering / exiting / being used within the charging area, as well as for enforcement purposes, will be required. The number of roadside gantries / poles required depends on the size of charging area, the charging mechanism and technology employed.

Overseas Experiences

(A) Singapore

19. The Singapore ERP Scheme (“The Singapore Scheme”) was implemented in 1998, using a cordon-based charging mechanism. The charging area covers about 8 km². Additional charging points are located at major expressways outside the cordoned charging area.
20. The Singapore Scheme levies charges on weekdays except public holidays from 7:00 a.m. to 8:00 p.m. Charging is also implemented on Saturdays at certain ERP gantries along busy roads. The level of charge varies according to the location, time of passing, and vehicle type. A 5-minute transition period between two charging periods is introduced if the difference in ERP charges is more than SGD 1 (about HKD 5.5) and motorists are charged the average of the “before” and “after” charges to discourage motorists from speeding up or slowing down near a charging point when charges are about to change. Only emergency vehicles are exempted from ERP charging in the Singapore Scheme. No concession is given to any other type of vehicles.
21. The Singapore Scheme uses DSRC technology. All vehicles are required to install an IVU for instantaneous payment when passing through an ERP gantry. The ERP payment is made via an anonymous pre-payment card or credit card inserted into the IVU. Should a vehicle fail to pay ERP charge at the ERP gantry due to, for example, invalid or insufficient value in the pre-payment card, enforcement cameras will be automatically activated to capture the rear licence plate of the violating vehicle. An additional administrative charge of SGD 10 (about HKD 55) will be added to the ERP charge. If the vehicle owner does not settle the payment within two weeks, he / she will receive a penalty notice of SGD 70 (about HKD 390) which has to be paid within 28 days after the notice is issued or the outstanding case will be brought before the court.

22. After the first year of operation, the traffic volume entering the charging area during morning peak hours reduced by 16%, and the corresponding average travelling speed increased by 26%. The Singapore Government reviews the traffic speeds of the concerned roads quarterly to determine if the ERP charge should be adjusted upward or downward to maintain effectiveness of the scheme.

(B) London

23. London commissioned its London Congestion Charging Scheme (“The London Scheme”) in 2003. Using an area-based charging mechanism, the London Scheme covers the central business district and its surrounding neighbourhoods, spanning 21 km².
24. The London Scheme charges motorists at a daily flat rate of GBP 11.5 (about HKD 140) for driving into the charging area between 7:00 a.m. and 6:00 p.m. on weekdays except public holidays and the period between 25 December and 1 January. Congestion charge must be paid before midnight of the following charging day after the day of travel, or on a monthly basis for users who have opened a pre-registered account. There are a number of vehicle types or usages which are exempted from payment or may enjoy concession upon registration.
25. The London Scheme adopts the ANPR technology. Cameras mounted on ERP poles located at the entrances, exits and within the charging zone will capture images of the licence number plates of all vehicles. The licence numbers of the captured vehicles will then be processed and cross-checked against payment records. Any outstanding payment not settled by the deadline will result in penalty to the registered vehicle owner.
26. The average speed during the charging period in the charging area increased by 27%, and the traffic volume during the charging period dropped by 16% over the same period one year after the implementation of the London Scheme. To maintain the effectiveness of the scheme, the charging rate has been increased three times since 2003.

(C) Gothenburg

27. The Gothenburg Congestion Tax Scheme (“The Gothenburg Scheme”), commissioned in 2013, uses a cordon-based charging mechanism and covers the city centre area of about 12 km² as well as some charging points located at major roads outside the cordoned charging area.
28. The charging periods of the Gothenburg Scheme are from 6:00 a.m. to 6:29 p.m. on weekdays, except public holidays and the day before and during the whole month of July. All vehicles are charged at the same rate at all charging locations, but the rate varies according to the time of day. While the charge is on a “per pass” basis, if a vehicle passes through several charging points within 60 minutes, it will only be charged once at the highest rate applicable to the charging points passed. The total daily charge for a vehicle is capped at SEK 60 (about HKD 55). Charges will be tallied and generated in a monthly bill, which will be sent to the registered owner of the vehicle for settlement.
29. Exemption in the Gothenburg Scheme is only granted to emergency vehicles, diplomatic registered vehicles, military vehicles, buses over 14 tonnes and motor cycles. No concession is offered. It uses ANPR technology. Images of all vehicles going in and out of the charging area are photographed by cameras at the gantries / poles. ERP gantries are also equipped with necessary DSRC technology to instantly charge foreign-registered vehicles (e.g. some vehicles from other countries of Europe) equipped with IVUs.
30. After the first year of operation of the Gothenburg Scheme, traffic volume through charging points has decreased by 15% for the morning peak hours, and the average traffic speed has increased by 20%. To maintain the effectiveness of the scheme, the charging level has been increased once since the Scheme’s inception in January 2013.
31. The key elements of the Singapore Scheme, the London Scheme and the Gothenburg Scheme are summarised in **Table 3.2** in **Chapter 3**.

Pointers for Hong Kong's Pilot Scheme

32. There are a few pointers which we can distil from overseas ERP schemes -
- (a) ERP charging area is usually set in the central business districts where road traffic congestion problem is severe;
 - (b) ERP charging period is normally set to cover the working hours on weekdays, except public holidays;
 - (c) charging level must be high enough to bring about a change in motorists' travel behaviours in the charging areas, reviewed regularly and adjusted if necessary to maintain its effectiveness;
 - (d) under a cordon-based charging mechanism, the charging level can be adjusted to cater for different degrees of congestion occurring at different times and locations, while an area-based approach with daily rate is simple to operate but does not allow charging flexibility;
 - (e) exemptions from ERP charges and / or concessions may be considered for certain types of vehicles, but will inevitably add to the complexity and operation costs of an ERP scheme as well as reduce its effectiveness;
 - (f) penalties / additional charges should be in place to ensure charges are paid promptly;
 - (g) ANPR and DSRC are proven ERP technologies with their own advantages and disadvantages. ANPR technology does not require any installation of IVU but has to capture images of all licence plates; while DSRC technology requires installation of IVU but allows anonymous payment. Images of licence plates are captured only when payment is not made; and
 - (h) gantries / poles need to be installed at roadside or on pavement to mount ERP charging facilities or cameras to capture images of vehicles for processing ERP charges and / or enforcement actions.

Planning for Central District ERP Pilot Scheme

33. There are various possible options for each element of the Central District ERP Pilot Scheme. More details are in **Chapter 4**. The Government has an open mind and would like to invite the public's views on these options.

(A) Charging area

34. When drawing up the exact boundary of the Central District ERP Pilot Scheme, the Government will take into account various factors, such as the level of traffic congestion, public views, technological requirements and physical constraints (e.g. the availability of road space for the erection of ERP gantries / poles). A more exact boundary will be developed under a feasibility study at the next stage for discussion by the public.

(B) Charging mechanism

35. The area-based charging mechanism and cordon-based charging mechanism each has its respective merits and shortcomings. Some may consider an area based charging mechanism with a daily rate inequitable as it disregards the distance and duration that vehicles have travelled within the area during the charging period of a day. Vehicles that have travelled a short distance and for a short duration are charged at the same rate as vehicles that have travelled extensively in the charging area. It also does not allow for charging different rates according to different degrees of congestion during different times of the day. A daily rate may also generate unnecessary trips to and within the charging area. This is because after a motorist has made the first trip to / in the charging area and paid the charge, there will be no additional costs for subsequent trips on the same day. Installation of additional roadside infrastructure is also required in the charging area for charging vehicles which travel solely within the charging area. This may pose a difficulty in Central and its adjacent areas where the local roads and footpaths are narrow with limited spare space.

36. Under a cordon-based charging mechanism, a vehicle is charged every time it crosses a charging point located along the boundary (the “cordon”) of the charging area during the charging period. The ERP charge for a trip will depend on how many charging point(s) and which charging point(s) a vehicle has passed. This mechanism allows ERP charging level to be varied according to time of day, location and travel direction, and may be considered more in line with the “user pays” principle.
37. On the other hand, a cordon-based charging mechanism may induce undesirable travel behaviours. Some motorists may decide to stay or circulate in the charging area and leave only after the ERP charges are lowered. To encourage drivers to leave the charging area without unnecessary circulation, vehicles could be charged once only even if it passes through several charging points within a certain period of time. Another way to deter unnecessary traffic circulation within a charging area is to set up a number of cordoned areas within the charging area so that a vehicle passing between the different cordoned charging areas will be subject to multiple ERP charges.

(C) Charging period

38. The charging period should cover the periods when traffic in Central and its adjacent areas is busy and congested. On a weekly basis, the traffic flow in Central and its adjacent areas is very high throughout weekdays and Saturdays, while it is significantly lower on Sundays. On a 24-hour basis, there is a high level of traffic on weekdays from 7:00 a.m. to 8:00 p.m. and on Saturdays from 8:00 a.m. to 8:00 p.m. Therefore it seems reasonable to set a charging period from 7:00 a.m. to 8:00 p.m. from Mondays to Fridays and from 8:00 a.m. to 8:00 p.m. on Saturdays, excluding public holidays for the Central District ERP Pilot Scheme.

(D) Charging level

39. The ERP charge must be set at a level which could induce motorists to consider adjusting their travel behaviour. In setting the most appropriate charging level, it is necessary to take into account a host of factors, including motorists’ behaviour, traffic flow variation, charging mechanism, vehicle types to be charged or exempted (if any) and public views.

40. There are three different charging approaches -
- (a) **A unified charge for all vehicle types**
Vehicles of different types and sizes are charged at the same level.
 - (b) **Differential charges based on vehicle sizes**
Each vehicle type is charged differently according to the road space it occupies. For example, a private car is charged less than a bus.
 - (c) **Differential charges based on a vehicle's carrying capacity**
Vehicles are charged differently according to their carrying capacity. A vehicle having a low carrying capacity (e.g. private car) will be charged more than one with a higher capacity (e.g. franchised bus).
41. Separately, if a cordon-based charging mechanism is to be used, it is possible to charge motorists according to traffic demands (including travel direction). The charge is higher for road sections, time periods and traffic direction with higher vehicular usage. The need for transition periods to bridge over periods of different ERP charges should also be considered.
42. Apart from the normal charge(s), motorists will need to pay penalties if they fail to make timely payments. The penalty level for the Central District ERP Pilot Scheme will be examined at the next stage.

(E) Exemption and concession

43. All vehicles using the roads inside a charging area contribute to traffic congestion. It should be noted that the more exemptions or concessions given, the less effective an ERP scheme is. As a result, much higher charges will have to be set for those types of vehicles not exempted / given concession. The Government will undertake a detailed study on whether and to what type of vehicles should exemptions or concessions be given and develop more concrete options for discussion with the public at the next stage. The study will take into account a number of factors, including the views received from this engagement exercise, consideration of fairness and effectiveness of the scheme.

(F) Technology

44. Both ANPR and DSRC can be used under an area-based or cordon-based charging mechanism. A key difference between the ANPR and DSRC technologies is whether a pre-installed IVU is required. An ERP scheme using ANPR technology does not require such an installation as it captures the images of licence number plates of all vehicles in the charging area during the charging period. However, capturing images may raise concern over privacy, and accuracy of information shown in the captured images needs to be verified by labour-intensive manual checking.
45. An ERP scheme using DSRC technology requires installation of IVUs in all vehicles entering the charging area to enable the pre-payment / credit card inserted in the IVU to make automatic payment. Its simplicity and instantaneous payment technology is particularly suitable for cordon-based charging mechanism. IVUs can also be used to pay tunnel tolls and parking charges.

(G) Privacy concerns

46. Inadequate protection of privacy was the primary public concern when the first ERP study was conducted in Hong Kong in 1980s. In the jurisdictions where ERP is implemented now, with the advancement in technology over the years and more established privacy-protection laws, privacy issues have, to a large extent, been addressed.
47. Nonetheless, in implementing ERP in Hong Kong, there may still be lingering concerns over protection of privacy and concerns over the problems that have not arisen overseas. To address these concerns, privacy issues relating to the Central District ERP Pilot Scheme will be thoroughly examined in consultation with the Office of the Privacy Commissioner for Personal Data.

(H) Effectiveness

48. There is a need to establish some quantitative indicators (e.g. reduction of traffic volume within the charging area during the charging period and the corresponding increase of average car speed) for evaluation of the effectiveness of the Central District ERP Pilot Scheme. The evaluation results will provide useful information for the community and the Government to consider whether and how ERP schemes should be put in place to address localised traffic congestion in other parts of Hong Kong.
49. The effectiveness of an ERP scheme could be weakened when there is a change in travel pattern, or if motorists get used to the ERP charge, or when the effect of the charge has been eroded by inflation or increase in household income. There is therefore a need to have a transparent, objective and regular mechanism to monitor and adjust the ERP charging level.

(I) Complementary measures

50. Overseas experience shows that appropriate complementary measures would be instrumental in achieving success for an ERP scheme. The Government will explore appropriate complementary measures which could encourage and facilitate drivers or passengers to make better use of public transport, or to travel to the charging area during non-peak hours.
51. Some specific questions on the above issues pertinent to the planning of the Central District ERP Pilot Scheme are set out in **Chapter 4** and **Appendix 4**. Views on other relevant aspects of the subject are also welcome.

Way Forward

52. This public engagement exercise is the first important step to engage the public and stakeholders to work out a practicable pilot scheme. After collecting the views through this exercise, the following steps will be taken (details are set out in **Chapter 5**) -

- (a) **Feasibility study**
We will appoint a consultant to develop feasible options for the Central District ERP Pilot Scheme.
- (b) **Public engagement**
A second public engagement exercise with feasible options developed by the feasibility study will be launched.
- (c) **Legislation for the pilot scheme**
We will seek the enactment of a new piece of legislation on the ERP pilot scheme by the Legislative Council.
- (d) **Funding approval**
After the enactment of the governing legislation, we will seek funding from the Legislative Council to carry out the detailed design, procure the systems and put in place the infrastructure required.
- (e) **Programme rollout**
With funding approved, we will carry out detailed design for the system and the engineering works, and consult local districts on roadside hardware installation. Test runs will be conducted before actual implementation.

53. While we share the public's aspiration to have an early solution to tackle the traffic congestion problem in Central and its adjacent areas, we expect that some lead time will be required from planning to commission of the ERP system, given the complexities involved. As such, it is all the more important to commence the community discussion now on how to take forward the Central District ERP Pilot Scheme.

Your views

54. Your views are valuable in taking forward the planning of the Central District ERP Pilot Scheme and making it a success. Please let us know your views latest by **18 March 2016**.

1

Worsening Road Traffic Congestion



Chapter 1

Worsening Road Traffic Congestion

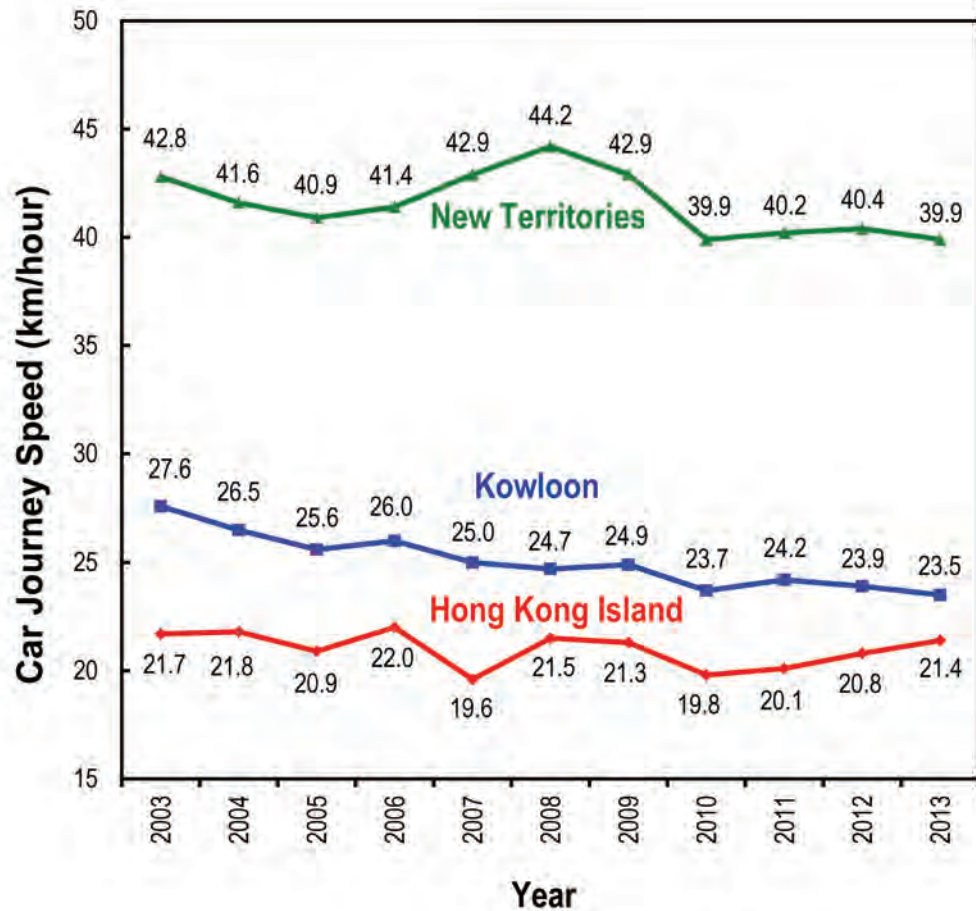
1.1 Overview

- 1.1.1 This Chapter describes the worsening traffic conditions in Hong Kong, explains how they are affecting us, and outlines the host of measures being pursued by the Government to tackle the problem, including the recommendations made by the Transport Advisory Committee (“TAC”) in December 2014. In view of the particularly congested traffic situation of the central business district in Central and its adjacent areas, the Government proposes to implement, as part of the blueprint to alleviate road traffic congestion and as a follow-up to the TAC’s recommendations, an Electronic Road Pricing (“ERP”) pilot scheme in the areas.

1.2 Current road traffic conditions

- 1.2.1 Road traffic congestion is deteriorating in Hong Kong. The deterioration can be accounted for by a host of reasons, most notably the continuous growth of vehicle fleet which results in more intense competition in the use of road space. **Figure 1.1** shows the trend of average car journey speeds on Hong Kong Island, Kowloon and the New Territories during the morning peak hours on weekdays over the last decade. The car journey speed on Hong Kong Island is the lowest (averaging at around 20 km/hour), indicating more serious road traffic congestion. There is also a general decline in the car journey speeds in Kowloon and the New Territories.

Figure 1.1 – Average car journey speeds during morning peak hours on weekdays



Note: The 2014 car journey speeds on Hong Kong Island, Kowloon and the New Territories are not shown since they were affected by the Occupy Movement in 2014.

1.2.2 At the local level, the average speeds on some major traffic corridors such as Des Voeux Road West and Chater Road on Hong Kong Island, and along Chatham Road North and Waterloo Road in Kowloon are even lower. Cars are only travelling at around 10 km/hour during morning or evening peak hours, a speed that is not much faster than an adult’s average walking speed of 4 to 5 km/hour (see **Table 2.1** in Chapter 2 on car journey speeds on some road sections in Central and its adjacent areas).

- 1.2.3 Road traffic congestion is not only a matter of wasting travelling time of road users. It undermines our city's mobility, connectivity and livability. The economy, air quality as well as image of Hong Kong as a world-class metropolis are also adversely affected.

1.3 Measures to ease traffic congestion

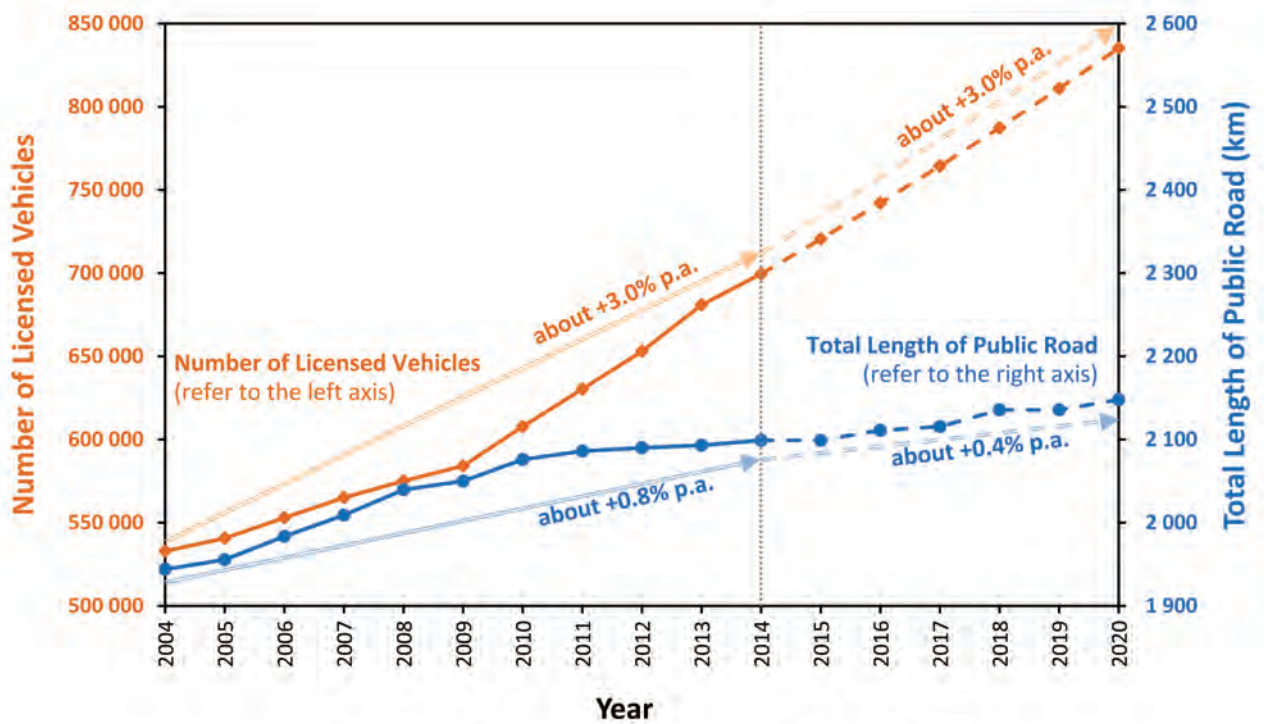
- 1.3.1 The Government adopts a three-pronged approach in tackling road traffic congestion, namely -

- (a) improving transport infrastructure;
- (b) expanding and improving the public transport system; and
- (c) managing road use.

- 1.3.2 The Government's transport policy is underpinned by public transport services with railway as its backbone. On transport infrastructure, the Government continues to pursue improvements as appropriate and where resources permits. These include expansion of the railway network, improvements to the road infrastructure under various highway and development programmes, as well as facilitation of non-vehicular means of commuting such as building hillside escalators and improving pedestrian facilities. In September 2014, the Government announced the new Railway Development Strategy, providing a planning framework for the future expansion of Hong Kong's railway network up to 2031. Over the years, a number of major roads have been built (or are being built), such as the widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling - Stages 1 and 2, the reconstruction and improvement of Tuen Mun Road, the Central - Wan Chai Bypass and Island Eastern Corridor Link, the Tuen Mun - Chek Lap Kok Link. Others, such as the Central Kowloon Route, the Tseung Kwan O - Lam Tin Tunnel, the Cross Bay Link, and the Tuen Mun Western Bypass, are under active planning.

1.3.3 Nonetheless, there is limited scope for road transport infrastructure expansion in view of the physical, spatial and social constraints brought by the intensifying urban development in Hong Kong, the demand for a quality living environment and the stricter air quality requirement that capital works projects are required to meet. Over the coming few years, the expansion of the road network is expected to slow down from about 0.8% per annum to about 0.4% per annum which could in no way sustain our vehicle fleet that has been increasing at an average of about 3% per year for the past 10 years (see paragraph 1.3.5 and **Figure 1.2** below on the vehicle growth).

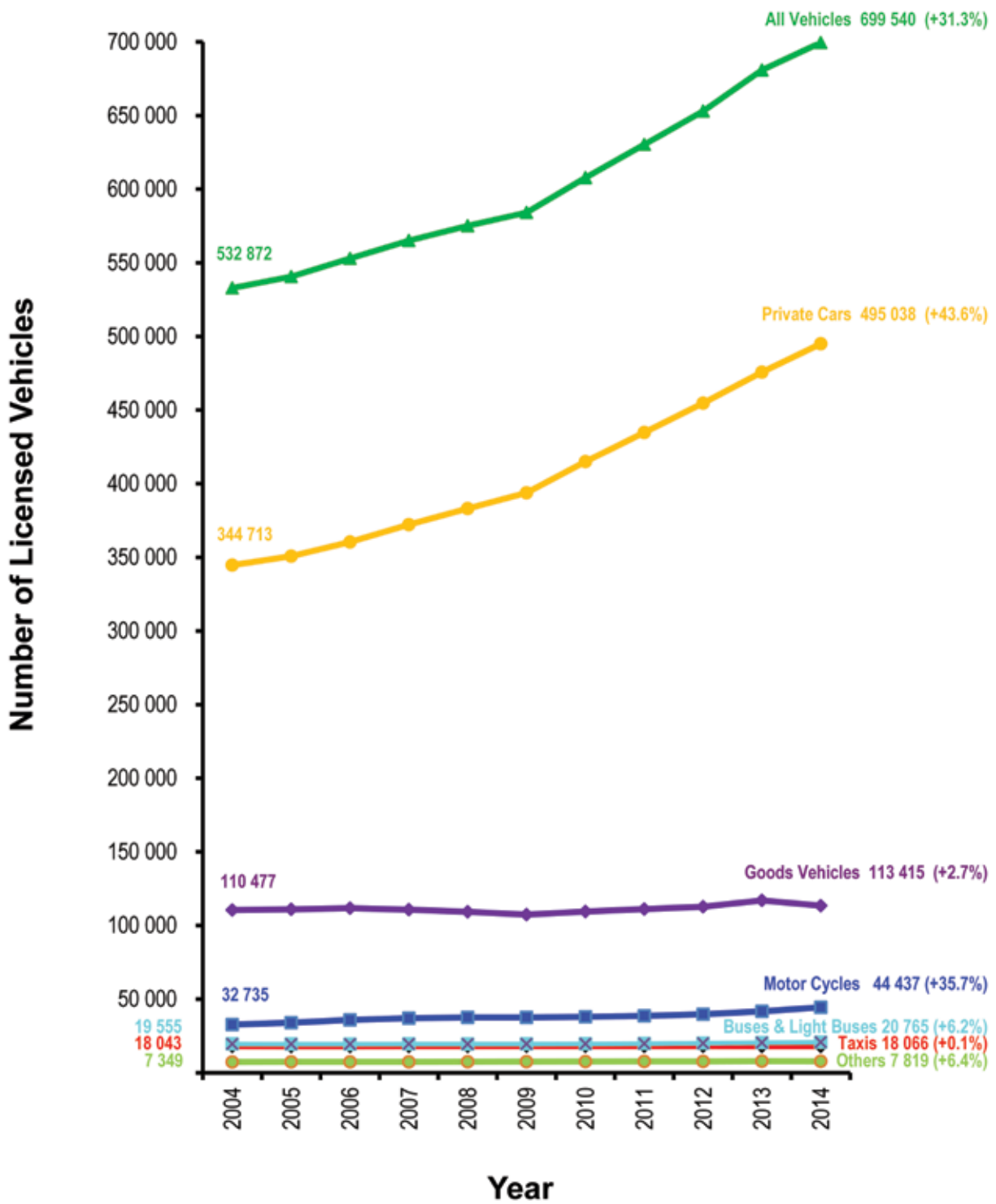
Figure 1.2 – Comparison between growth rates of vehicles and road length



- 1.3.4 Regarding public transport, Hong Kong has one of the most efficient public transport systems in the world¹. About 90% of the daily passenger boardings or 12 million passenger trips per day are made on the public transport system. The Government has been constantly monitoring the needs of passengers for public transport services and actively working with the public transport operators to optimise the efficiency of their services. For instance, the Government and the franchised bus companies have been actively pursuing bus route rationalisation to enhance network efficiency and ease road traffic congestion. In tandem with the further expansion of heavy rail, the Government has commenced a two-year Public Transport Strategy Study to examine the respective roles and positioning of public transport modes other than the heavy rail, with the objective of ensuring their long-term sustainable development while affording the public efficient and accessible services with reasonable modal choices.
- 1.3.5 Another important aspect of the Government's work in alleviating road traffic congestion is to better manage the use of roads to maximise the efficiency of the use of the limited road space. This is particularly important in view of the fast growing vehicle fleet. The number of total licensed vehicles increased by 31% from about 533 000 in 2004 to about 700 000 in 2014. **Figure 1.3** shows the vehicle fleet size by vehicle type during the period.

1. Hong Kong's public transport was ranked first among 84 cities in an international survey published in 2014 (Source: *The Future of Urban Mobility*, a report published in April 2014 by Arthur D. Little, a management consultancy).

Figure 1.3 – Licensed vehicle fleet size (2004 – 2014)



1.3.6 Over the years, the Government has employed different measures to discourage the ownership of vehicles, in particular private cars (e.g. raising first registration tax and annual licence fees) as well as measures to discourage the use of vehicles on the road (e.g. the levy of fuel tax and tunnel / road toll charges). General traffic management measures are also put in place to manage road use, such as imposing restriction zones to prohibit kerbside activities and fine-tuning traffic signal plans at signalised junctions to increase junction capacities. The Government also encourages the use of information technology for better dissemination of travel information, allowing the public to make informed decisions. For example, Speed Map Panel Systems can provide motorists with real-time traffic information, which can facilitate them to select a faster driving route by avoiding areas experiencing road traffic congestion.

1.4 Current challenges

1.4.1 Despite the Government's efforts described in section 1.3 above, road traffic condition has been worsening in recent years. To step up the Government's effort to tackle road traffic congestion, the Secretary for Transport and Housing invited the TAC in early 2014 to conduct a study to identify the factors contributing to road traffic congestion in Hong Kong and to put forward practicable recommendations to the Government to tackle the problem. The TAC submitted a study report ² in December 2014 to the Government and recommended a total of 12 short to long-term measures to tackle road traffic congestion. TAC's recommendations cover different types of measures, including car ownership restraint measures (e.g. raising first registration tax and annual licence fees); car usage restraint measures (e.g. increasing meter parking charges); enforcement (e.g. restoring deterrent effect of fixed penalty for congestion-related offences); and education and publicity, etc. The 12 recommendations made by the TAC are set out in **Appendix 1**.

2. The TAC report can be downloaded at the following link:
http://www.thb.gov.hk/eng/boards/transport/land/Full_Eng_C_cover.pdf

- 1.4.2 The Government agrees in principle with TAC's recommendations. We will take them forward in phases having regard to various factors including public sentiment and stakeholder views, availability of resources, as well as latest technology and overseas experience. Details of the Government's response to the TAC report were presented to the Legislative Council Panel on Transport in May 2015³.
- 1.4.3 One of the recommendations made by the TAC is that the Government should commence the early planning of an ERP pilot scheme. The TAC considers that a very effective way to tackle congestion in a particularly congested area is to put in place an ERP scheme. It nonetheless reckons that the concept of ERP remains a novel one for many road users in Hong Kong and that there is not yet a consensus over its use. The TAC recommends that the Government should engage the public as soon as possible on the planning of an ERP pilot scheme to alleviate traffic congestion at particularly congested areas, recognising that it would take longer time to conduct detailed planning for the implementation of the scheme.
- 1.4.4 Having considered TAC's recommendations and overseas experience, we agree that an ERP pilot scheme should be pursued to alleviate the road traffic conditions in Hong Kong's central business district – Central and its adjacent areas. The experience gained from the ERP pilot scheme will enable us to consider whether ERP should be implemented in other parts of Hong Kong which are facing similar chronic congestion problems. ERP is an effective measure to deal with road traffic congestion that occurs in a specific area at specific times. For territory-wide worsening traffic conditions, the Government will continue to adopt a multi-pronged approach.
- 1.4.5 This document serves to provide the public with information on what an ERP scheme is, why Hong Kong needs it, and how it has been successfully implemented in a number of overseas cities. Most importantly, this document invites the views of the public on the planning parameters of an ERP pilot scheme in Central and its adjacent areas. The views and comments collected will be an important reference for the Government in taking forward the proposed pilot scheme.

3. The paper issued by the Transport and Housing Bureau to the Legislative Council Panel on Transport can be viewed at the following link:
<http://www.legco.gov.hk/yr14-15/english/panels/tp/papers/tp20150512cb4-922-4-e.pdf>

2

An ERP Pilot Scheme in Central and its Adjacent Areas



Chapter 2

An ERP Pilot Scheme in Central and its Adjacent Areas

2.1 Overview

2.1.1 This Chapter briefly explains what ERP is and why it is now an opportune time for Hong Kong to start planning an ERP pilot scheme in Central and its adjacent areas (hereafter referred to as “the Central District ERP Pilot Scheme”).

2.2 What is ERP?

2.2.1 ERP is a traffic management tool to tackle localised road traffic congestion. It aims to rationalise vehicular flows in targeted areas during traffic congestion periods by levying appropriate charges on vehicles using the roads in the areas. To ensure smooth and uninterrupted traffic flow, electronic payment method, in lieu of stop-and-pay manual method, is used.

2.2.2 The objective of an ERP scheme is to provide a disincentive to vehicle users so that they will use their vehicles less in making trips to the charging area in peak hours and switch to public transport, and / or make their trips to the charging area in non-peak hours.

2.2.3 ERP is based on the “user pays” principle and, in this sense, could be said to be a relatively fair mechanism. Motorists are required to pay the charges only when they use the roads in the charging area during the specified times. Compared to other territory-wide measures to discourage the ownership or use of vehicles (for example, increase in first registration tax), motorists who do not travel to the designated districts (and hence do not contribute to localised traffic congestion) will not be affected.

2.2.4 From the community's point of view, through the use of ERP in areas with serious road congestion problem, the traffic flow in the areas could be improved and the operational efficiencies of commercial, business and social activities enhanced, bringing about economic and social benefits to the community as a whole.

2.2.5 ERP has been successfully implemented in a number of overseas cities such as Singapore, London (United Kingdom) and Gothenburg (Sweden) over the past two decades, and has been proved to be an effective tool in alleviating traffic congestion in targeted areas.

2.3 **An opportune time to start planning the Central District ERP Pilot Scheme**

Past studies on ERP in Hong Kong

2.3.1 In the past, the Government has conducted three studies on the use of ERP in Hong Kong. These studies were completed in 1985, 2001 and 2009 respectively. They examined various issues concerning ERP, including transport planning, charging mechanism, technology and public acceptability. A summary of the studies is at **Appendix 2**.

2.3.2 The community had three key recurring concerns over ERP in these past studies -

(a) **Privacy**

When the subject was first introduced to the community in the 1980s, many expressed concern over the possible intrusion into privacy, as the technology proposed at that time had to record the date and time of every vehicle's crossing of charging points.

(b) **Fairness**

Motorists were concerned that since there was no free-of-charge alternative route to bypass the charging area, they were "forced" to enter the charging area and therefore had to pay the ERP charge, even when their origins and destinations were not within the charging area.

(c) **Effectiveness**

Some questioned the effectiveness of ERP in the long run since motorists might be reluctant to change their travel patterns, and some would grow accustomed to the charges and revert to their old travel habits.

Now - An opportune moment

2.3.3 The Government did not take forward the implementation of ERP in the past mainly due to changes in economic situation, privacy concern and the lack of community consensus at the time of the past studies. However, conditions are now ripe for us to start planning the Central District ERP Pilot Scheme due to the developments set out in the paragraphs below.

(A) Road traffic congestion in Central and its adjacent areas

2.3.4 As mentioned in Chapter 1, the recorded traffic speeds of some roads in Hong Kong were as low as around 10 km/hour during peak hours on weekdays in the past few years. This is not much faster than the average walking speed of an adult of 4 to 5 km/hour. The situation is particularly worse in Central and its adjacent areas, our strategic central business district. **Table 2.1** shows the car journey speeds of certain road sections in Central and its adjacent areas.

2.3.5 The excessive number of vehicles competing for use of road space in the area (including loading and unloading activities) gives rise to traffic congestion, resulting in long traffic queues and sometimes gridlocks in the surrounding road networks. Consequently, a lot of time which could otherwise be productively spent at work or in pursuit of drivers and passengers' own interest is spent waiting in long vehicle queues on the road. Traffic congestion also results in stop-and-go traffic which increases air pollution as fuel consumption increases with the constant starting and braking.

Table 2.1 – Car journey speeds on some road sections in Central and its adjacent areas

Road Sections	Car Journey Speed during Morning Peak on Weekdays (km/hour)				
	2009	2010	2011	2012	2013
Cleverly Street (from Connaught Road Central to Des Voeux Road Central)	7.2	9.5	3.8	5.3	6.1
Hillier Street (from Wing Lok Street to Connaught Road Central)	7.2	5.7	7.8	7.3	5.4
Connaught Road Central Flyover (from Morrison Street to Jubilee Street)	7.9	10.3	9.0	10.0	9.5
Des Voeux Road Central (Eastbound) (from Cleverly Street to Pedder Street)	8.0	9.5	8.9	10.0	12.5
Connaught Road Central (Eastbound) (from Morrison Street to Rumsey Street)	8.6	13.5	15.3	12.9	14.0
Chater Road (from Pedder Street to Murray Road)	9.2	10.3	8.3	9.3	10.2
Lambeth Walk (from Queensway to Connaught Road Central)	11.3	11.1	14.9	12.7	13.0
Harcourt Road (Eastbound) (from Murray Road to Cotton Tree Drive)	15.6	18.1	11.4	14.7	18.3
Des Voeux Road Central (Westbound) (from Jubilee Street to Wing Wo Street)	18.1	17.1	14.0	17.6	14.0
Connaught Road Central (Westbound) (from Murray Road to Morrison Street)	18.5	15.9	15.6	15.5	17.0

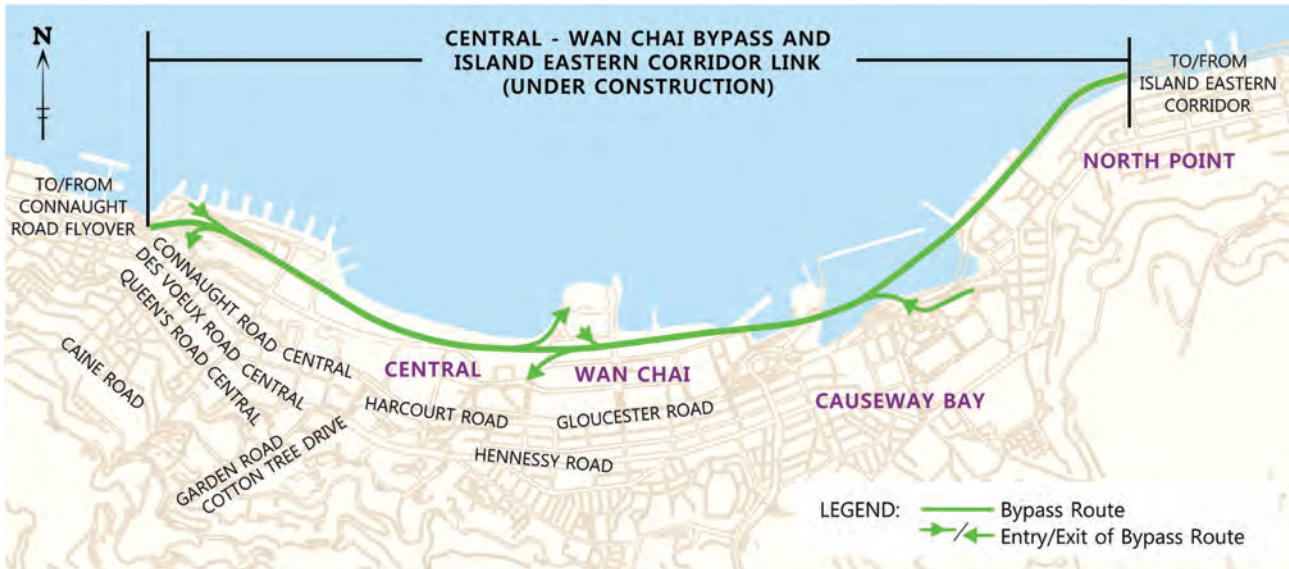
(B) Mature ERP technology

- 2.3.6 Over the last two decades, ERP has been successfully implemented in a number of overseas cities and it has been proven to be a useful tool to tackle localised traffic congestion. For example, in London, the average speed during the charging hours in the charging area one year after the ERP scheme was introduced increased by 27% when compared with that before, and traffic volume during the charging hours decreased by 16% over the same period. For the Singapore ERP scheme, after the first year of implementation, the traffic volume entering the charging area during the morning peak period reduced by 16%, and the corresponding average travelling speed increased by 26%. The relevant authorities of overseas ERP schemes have adjusted the charging level to maintain the desirable level of traffic flow in the charging areas (see Chapter 3).
- 2.3.7 With the advancement in technology, past concerns (such as privacy concerns) can, to a large extent, be addressed now. For example, under the Singapore ERP scheme, a motorist can instantly pay ERP charges via an anonymous pre-payment card. Personal data such as vehicle licence plate numbers and the time and location of entry into the charging area will not be collected unless a vehicle fails to make payment.

(C) Availability of alternative route and mode of transport

- 2.3.8 One key consideration in determining whether ERP is a suitable solution for the congestion problem is whether a free-of-charge alternative route is available to allow motorists to bypass the charging area. When commissioned, the Central - Wan Chai Bypass will allow motorists whose origins and destinations are not in Central or its adjacent areas to make a detour around the charging area (see **Figure 2.1**). Hence, an ERP scheme could be devised so that only motorists who travel to the charging area and contribute to local congestion will be required to pay.

Figure 2.1 – An illustration of Central - Wan Chai Bypass



2.3.9 Apart from the availability of an alternative route, Central and its adjacent areas are well served by public transport, including the Mass Transit Railway (“MTR”) services (the Island Line, the Tsuen Wan Line, the Tung Chung Line and the Airport Express), about 150 franchised bus routes, about 20 public light bus routes and 6 tram routes. Public transport accessibility to Central and its adjacent areas will be further enhanced upon the commissioning of the South Island Line (East) and the Shatin to Central Link. Hence, private vehicle drivers and passengers have convenient options to access Central and its adjacent areas by a variety of different public transport modes.

2.3.10 In its Report on Study of Road Traffic Congestion in Hong Kong published in December 2014, the TAC also agreed that given the importance of the Central District as our central business district and the severity of its road traffic congestion, the Central District should be a suitable location for implementing an ERP pilot scheme.

- 2.3.11 While overseas experience has demonstrated that the use of ERP could effectively tackle localised traffic congestion, ERP remains a novel concept to most of the general public of Hong Kong. The Government therefore proposes to start planning the Central District ERP Pilot Scheme to test out the implementation of ERP scheme in Hong Kong. Some quantitative indicators (e.g. traffic volume and speeds) for evaluation of the pilot scheme would be put in place. The results of the evaluation will provide useful information for the community and the Government to fine-tune the pilot scheme and consider whether, and if so, how other ERP schemes should be put in place to address localised traffic congestion in other parts of Hong Kong (see paragraph 4.2.40 in Chapter 4).
- 2.3.12 To facilitate better understanding of how an ERP scheme will work in Hong Kong, the next Chapter explains some basic elements of an ERP scheme and the implementation of ERP schemes in Singapore, London and Gothenburg.

3

Basic ERP Elements and Overseas Experience



Chapter 3

Basic ERP Elements and Overseas Experience

3.1 Overview

3.1.1 Over the past two decades, ERP has been successfully implemented as a congestion management tool in a number of overseas cities such as Singapore, London (United Kingdom) and Gothenburg (Sweden) ¹. This Chapter gives an account of these schemes. Whilst these overseas schemes vary in terms of charging philosophy and technology and operate under different social contexts, they have some common basic elements. The experience of these overseas schemes provides a number of useful pointers from which that Hong Kong can learn.

3.2 Basic elements of an ERP scheme

(A) Charging area

3.2.1 “Charging area” is the area covered by an ERP scheme. This area is usually, but not limited to, the central business district of a city where severe traffic congestion occurs almost daily. For an ERP scheme to achieve the desired effect, the charging area should preferably be well served by public transport. It is also desirable that there is a free-of-charge alternative route allowing motorists to bypass the charging area.

1. Other cities include Stockholm (Sweden), Milan (Italy) and Durham (United Kingdom).

(B) Charging mechanism

3.2.2 There are two common types of charging mechanism, namely cordon-based mechanism and area-based mechanism. A **cordon-based** charging mechanism charges a vehicle each time when the vehicle passes through a charging point during the charging period (see paragraph 3.2.4 below for charging period). The charging points are located along the boundary (the “cordon”) of the charging area. The cordon-based charging mechanism allows the charging level of each charging point to vary based on time, location, and travel direction, in order to cater for different degrees of traffic congestion.

3.2.3 Under an **area-based** charging mechanism, a vehicle is charged, typically at a daily rate, for entering the charging area during the charging period, regardless of the duration, distance and number of entries the vehicle makes. Vehicles which only use the roads within the charging area and do not enter or leave the area are also charged. Such a “daily approach” is relatively simple to operate. Nonetheless, since a daily rate is charged, it does not have the flexibility to vary the charging level at different times or at different locations. Some motorists may also consider it unfair if they only drive in the charging area for a short period of time. In addition to using a “daily approach” under an area-based charging mechanism, technology using satellites to track a vehicle may theoretically allow charging a vehicle by a “distance approach” (i.e. the distance travelled in the charging area) or a “time approach” (i.e. the time spent in the charging area)². However, the satellite technology is not yet mature for ERP application and there may possibly be a concern over privacy.

(C) Charging period

3.2.4 “Charging period” refers to the time period during which vehicles will be charged. Normally it corresponds to the period lasting from the morning peak hours to the evening peak hours on weekdays. However, the exact charging period depends on local traffic congestion patterns. For example, charging is also implemented on Saturdays at a number of charging points along busy roads in Singapore.

2. The application of technology using global positioning system called “Global Navigation Satellite System” (“GNSS”) into ERP is emerging. GNSS uses the location(s) of a vehicle in the charging area and the corresponding time to determine the ERP charge. Apart from possible privacy concerns (i.e. the vehicle being tracked), the urban landscape with tall buildings, bridges and trees, and signal reflections in Hong Kong may create a difficult environment for GNSS to be accurate in determining the charge. The Singapore Government aims at implementing ERP using GNSS in 2020.

(D) Charging level

- 3.2.5 “Charging level” is the amount to be charged on motorists for using the roads in the charging area during the charging period. A major consideration in setting the charging level is whether it will be effective in reducing the traffic volume in the charging area to an acceptable level. A cordon-based ERP system allows the charging level to be varied during the charging period in a day and by location, while an area-based ERP system adopting the “daily approach” charges only a daily rate throughout the charging period.
- 3.2.6 Under both the cordon-based approach and the area-based approach, to avoid the charge, some motorists may speed up / slow down to enter into / leave the charging area when the charging period is about to start or end. Under a cordon-based approach, there may be similar behaviour when a time period with higher charging level is about to begin or end. To discourage such behaviour which could endanger road safety, there could be a transition period (see paragraph 3.3.4 below for the operation of the transition period under the ERP scheme in Singapore) to change the charging levels progressively.

(E) Exemption and concession

- 3.2.7 All vehicles using the roads in a charging area contribute to road traffic congestion. Thus, it seems fair for all vehicle users to pay the congestion charge under the “user pays” principle. Nonetheless, there are arguments that certain types of vehicles should be exempted or provided concession on different grounds.
- 3.2.8 Emergency vehicles such as ambulances and fire engines are exempted from ERP charges under the ERP schemes in Singapore, London and Gothenburg. Whether other types of vehicles (such as buses or vehicles used by disabled persons) are given exemption or concessions differ vastly amongst these cities (see section 3.3 below). In deciding whether and what types of exemptions / concessions should be made available, it is important to take into account a host of factors, including the implications for controlling traffic volume in the charging area, the administrative cost of an ERP scheme and public views, etc.

(F) Technology

- 3.2.9 There are two commonly used technologies for ERP, namely “Automatic Number Plate Recognition” (“ANPR”) and “Dedicated Short-range Radio Communication” (“DSRC”). **ANPR** technology uses cameras to capture the images of the licence number plates of vehicles passing through ERP gantries / poles on which the cameras are mounted. The captured images are then processed to obtain vehicle licence numbers for cross-checking against the records of payment received or billing the vehicle owners afterwards. Vehicles are not required to install any ERP device on board.
- 3.2.10 For ERP schemes using **DSRC** technology, vehicles are required to pre-install an in-vehicle unit (“IVU”) for information exchange between the vehicle and the equipment mounted on ERP gantry / pole using wireless communication. ERP charges will be immediately deducted from the pre-payment / credit cards inserted into the IVU when the vehicle passes through an ERP gantry / pole. The use of anonymous pre-payment card in the IVU will provide a greater degree of privacy. Only vehicles which fail to make payment at the charging point will be photographed.
- 3.2.11 Regardless of whether ANPR technology or DSRC technology is used, installation of roadside hardware for detection of vehicles entering / exiting / being used within the charging area, as well as for enforcement purposes, will be required. The number of roadside gantries / poles required depends on the size of charging area, the charging mechanism and technology employed.

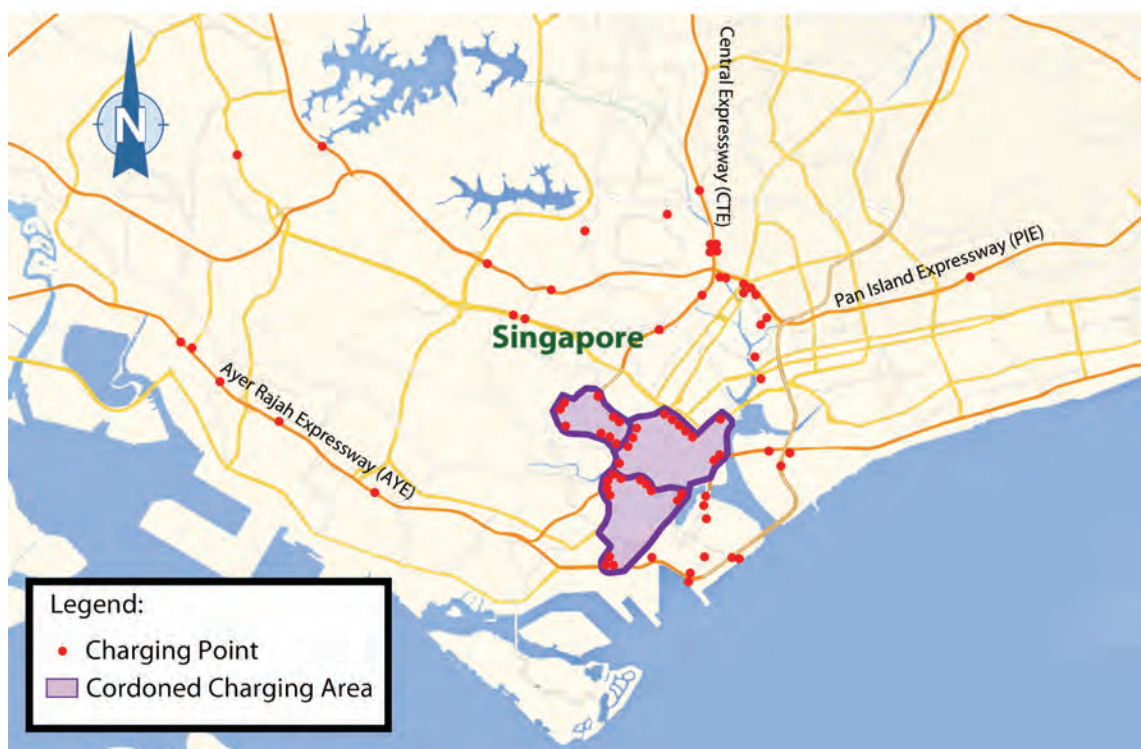
3.3 Overseas Experience

(A) Singapore

Charging location and mechanism

3.3.1 Singapore is the first city to implement ERP. Commissioned in 1998, the Singapore ERP Scheme (“The Singapore Scheme”) has the primary objective of congestion management. The Singapore Scheme is cordon-based. The cordoned charging area covers about 8 km², which is about 80% of the size of Wan Chai District in Hong Kong or about the size of 42 Victoria Parks. There are 48 additional charging points located at major expressways outside the cordoned charging area, and motorists are charged if their vehicles are driven through these charging points irrespective of whether they subsequently enter the cordoned charging area (see **Figure 3.1**).

Figure 3.1 – The cordoned charging area and charging points in the Singapore Scheme



Charging period and level

3.3.2 The Singapore Scheme, with a total of 77 charging points, operates from 7:00 a.m. to 8:00 p.m. on weekdays, except public holidays. Charging is also implemented on Saturdays at a number of ERP gantries along busy roads such as the major shopping street, the Orchard Road. Vehicles are charged instantaneously every time they pass through ERP gantries installed at the charging points during the charging period. **Figures 3.2A** and **3.2B** show a typical ERP gantry and the charging information shown on the ERP gantry in the Singapore Scheme.

Figure 3.2A – A typical ERP gantry



Figure 3.2B – Charging information shown at the top of a ERP gantry



3.3.3 The Singapore Scheme charges its motorists according to the location, time of passing, and vehicle type. ERP charges during peak hours are higher than those during non-peak hours. The charges at different locations (e.g. Marina Bay and Orchard Road) are also different. The ERP charge also varies by vehicle type, with larger vehicles being charged higher rates. **Table 3.1** sets out the range of ERP charges (per charging point basis) for different types of vehicles.

Table 3.1 – Range of ERP charges³ (per charging point basis) for different types of vehicles in the Singapore Scheme

Passenger cars, taxis and light goods vehicles	Motor cycles	Heavy goods vehicles and small buses	Very heavy goods vehicles and large buses
SGD 0.5 - 6 (about HKD 3 - 33)	SGD 0.25 - 3 (about HKD 1.5 - 16.5)	SGD 0.75 - 9 (about HKD 4.5 - 50)	SGD 1 - 12 (about HKD 5.5 - 66.5)

3. The ERP rates are reviewed quarterly. The quote rates are effective from 2 November 2015 to 31 January 2016.

- 3.3.4 To discourage motorists from speeding up or slowing down their vehicles near a charging point when the charges are about to change, a 5-minute transition period between two charging periods is introduced if the difference in the ERP charge is more than SGD 1 (about HKD 5.5⁴). During this transition period, the charge is the average of the “before” and “after” charges. As an illustration, the ERP charge for private cars entering the Bugis - Marina Centre area from 5:30 p.m. to 6:00 p.m. on weekdays is SGD 1.5 (about HKD 8.5), but that for the next charging period (i.e. 6:00 p.m. to 6:55 p.m.) is SGD 3 (about HKD 16.5). Since the difference in charge is over SGD 1, a transition period from 6:00 p.m. to 6:05 p.m. is introduced. Vehicles entering the charging area during the 5-minute transition period are charged SGD 2.3 (about HKD 12.5) (i.e. average of SGD 1.5 and SGD 3).
- 3.3.5 If motorists fail to pay ERP charge when they pass through the ERP gantries during the charging period (e.g. having invalid or insufficient value on pre-payment card), an additional administrative charge of SGD 10 (about HKD 55) will be added to the ERP charge incurred. The vehicle owner will have to settle the payment within two weeks; otherwise the owner will receive a penalty notice of SGD 70 (about HKD 390), which has to be paid within 28 days after the notice is issued, or the outstanding case will be brought before the court.

Exemption and concession

- 3.3.6 Only emergency vehicles are exempted from ERP charging in the Singapore Scheme; these include ambulances, fire engines, police vehicles, motor cycles used by the Singapore Civil Defence Force for providing emergency ambulance services, and any vehicle being towed by another vehicle. No concession is given to any other types of vehicles.

4. To facilitate easy reference, we have used the exchange rate as at 31 October 2015 throughout this document.

Technology

- 3.3.7 The Singapore Scheme uses DSRC technology. All vehicles are required to install an IVU for instantaneous ERP payment when passing through an ERP gantry. Each type of vehicle has a specific type of IVU that allows ERP gantries to recognise the vehicle type and charge the corresponding rates accordingly. The ERP payment is made via a pre-payment card (similar to Hong Kong's Octopus Card) or a credit card inserted into the IVU. A picture of an IVU is shown in **Figure 3.3**.

Figure 3.3 – An IVU installed in a vehicle in Singapore



- 3.3.8 Vehicles having made ERP payment will not be photographed. Should a vehicle fail to pay ERP charge at the gantry, enforcement cameras will be automatically activated to capture the rear licence plate of the violating vehicle. The registered owner of the vehicle will be notified of the outstanding charges and the administrative fee imposed.

- 3.3.9 The Singapore Government is developing a new generation of ERP using GNSS (see footnote 2 in this Chapter). This new system may overcome the constraints of physical ERP gantries and may have the scope to allow for distance-based and / or time-based charging.

Effectiveness

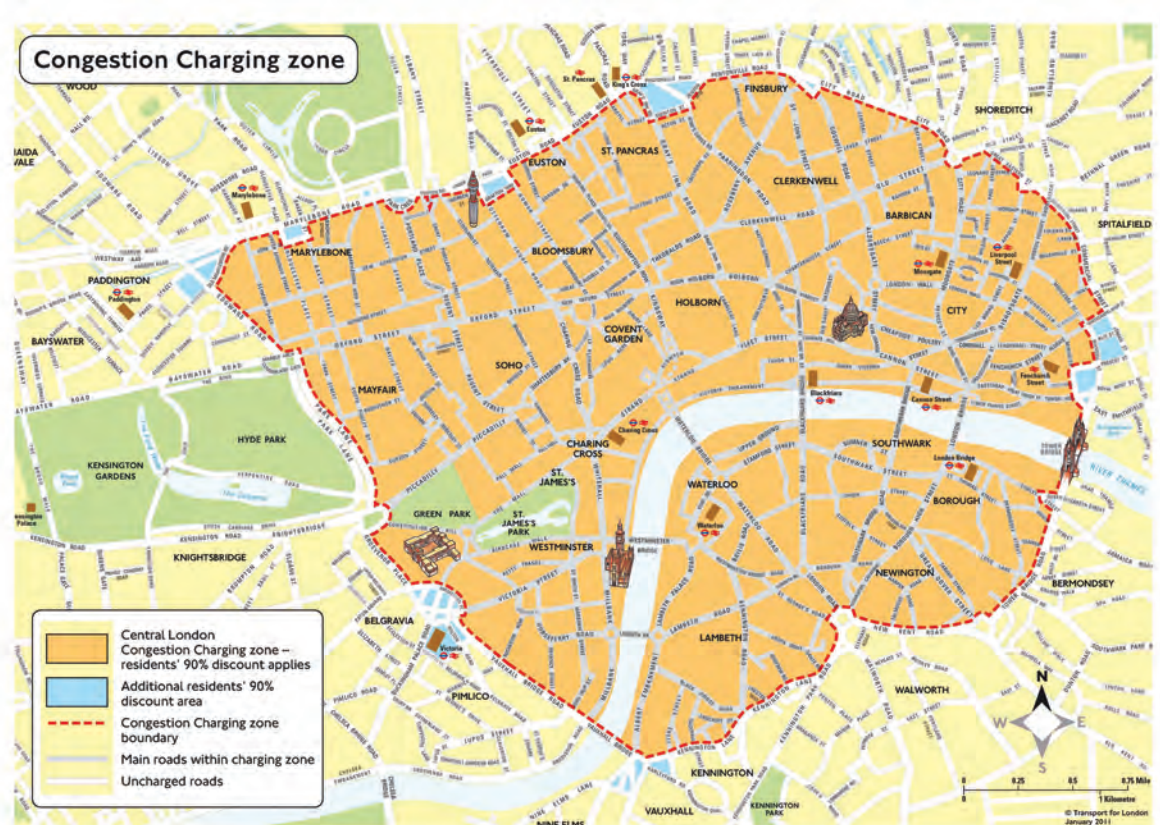
- 3.3.10 The Singapore Scheme has achieved its objective of congestion management. After the first year of operation, the traffic volume entering the charging area during the morning peak hours reduced by 16%, and the corresponding average travelling speed increased by 26%.
- 3.3.11 To maintain the effectiveness of the scheme (which is assessed on the basis of an optimal speed range of 20 to 30 km/hour on major roads in the cordoned charging area and 45 to 65 km/hour on expressways), the Singapore Government reviews the traffic speeds of the concerned roads quarterly to determine if the ERP charge should be adjusted upward or downward.

(B) London, United Kingdom

Charging location and mechanism

- 3.3.12 The London Congestion Charging Scheme (“The London Scheme”) was introduced in central London in 2003. Apart from road traffic congestion management, the London Scheme has a second objective of raising revenue for investment in London’s transport infrastructure and public transport services. Using an area-based charging mechanism, the London Scheme covers the central business district and its surrounding neighbourhoods, spanning 21 km², an area about the combined size of Central and Western District and the Wan Chai District or the size of 110 Victoria Parks. The charging area of the London Scheme is illustrated in **Figure 3.4**.

Figure 3.4 – Charging Area of the London Scheme



Source: Transport for London

Charging period and level

3.3.13 With an area-based charging mechanism, a motorist pays a daily flat rate of GBP 11.5 (about HKD 140) for driving a vehicle within the charging area between 7:00 a.m. and 6:00 p.m. on weekdays, except public holidays and the period between 25 December and 1 January (both dates inclusive). Congestion charge must be paid before midnight of the following charging day after the day of travel, or penalty charges will be applied⁵. Payment can be made online, by mobile apps, by phone, by post or on a monthly basis for frequent users who have opened a pre-registered account.

5. The payment will be increased from GBP 11.5 (about HKD 140) per day to GBP 14.0 (about HKD 170) per day if payment is made after midnight of the day of travel and up to midnight of the following charging day after the day of travel.

Exemption and concession

- 3.3.14 Similar to the Singapore Scheme, the London Scheme exempts emergency service vehicles from paying congestion charges. In addition, vehicles used by disabled persons, taxis and private hire vehicles, and certain vehicles registered in the European Economic Area member states are also exempted from the payment.
- 3.3.15 Different from the Singapore Scheme, the London Scheme provides concessions (90% discount) to residents living within the charging area on application. If motorists decide to register with an auto-pay payment method, they will also be eligible for discounts (i.e. GBP 1 (about HKD 12) per day).
- 3.3.16 A list of the types of vehicles with exemptions or concessions under the London Scheme is at **Appendix 3**.

Technology

- 3.3.17 The London Scheme adopts the ANPR technology. Installation of IVU is not required. Cameras on ERP poles, as shown in **Figure 3.5**, located at the entrances, exits, and within the charging zone will capture images of the licence number plates of all vehicles. The licence numbers of the captured vehicles will then be processed and cross-checked against the records of payment received until midnight of the following charging day after the day of travel. Any outstanding payment not settled by the deadline will result in penalty to the registered vehicle owner.

Figure 3.5 – ERP pole and cameras in the London Scheme



Effectiveness

- 3.3.18** The London Scheme has achieved its objectives of congestion management and raising revenue for investment on transport infrastructure and public transport services. The average speed during the charging period in the charging area increased by 27%, from 13.6 km/hour in 2002 (pre-charging) to 17.3 km/hour in 2003 (post-charging), and the traffic volume during the charging period dropped by 16% over the same period. The London Scheme generated revenue of GBP 1.2 billion (about HKD 15 billion) from 2003 to 2013 for investment into transport infrastructure and public transport services in London.
- 3.3.19** To maintain the effectiveness of the scheme, the charging rate ⁶ of the London Scheme has been increased three times, from GBP 5 (about HKD 60) initially in February 2003, to GBP 8 (about HKD 95) in July 2005 and to GBP 10 (about HKD 120) in January 2011, and more recently to GBP 11.5 (about HKD 140) in June 2014.

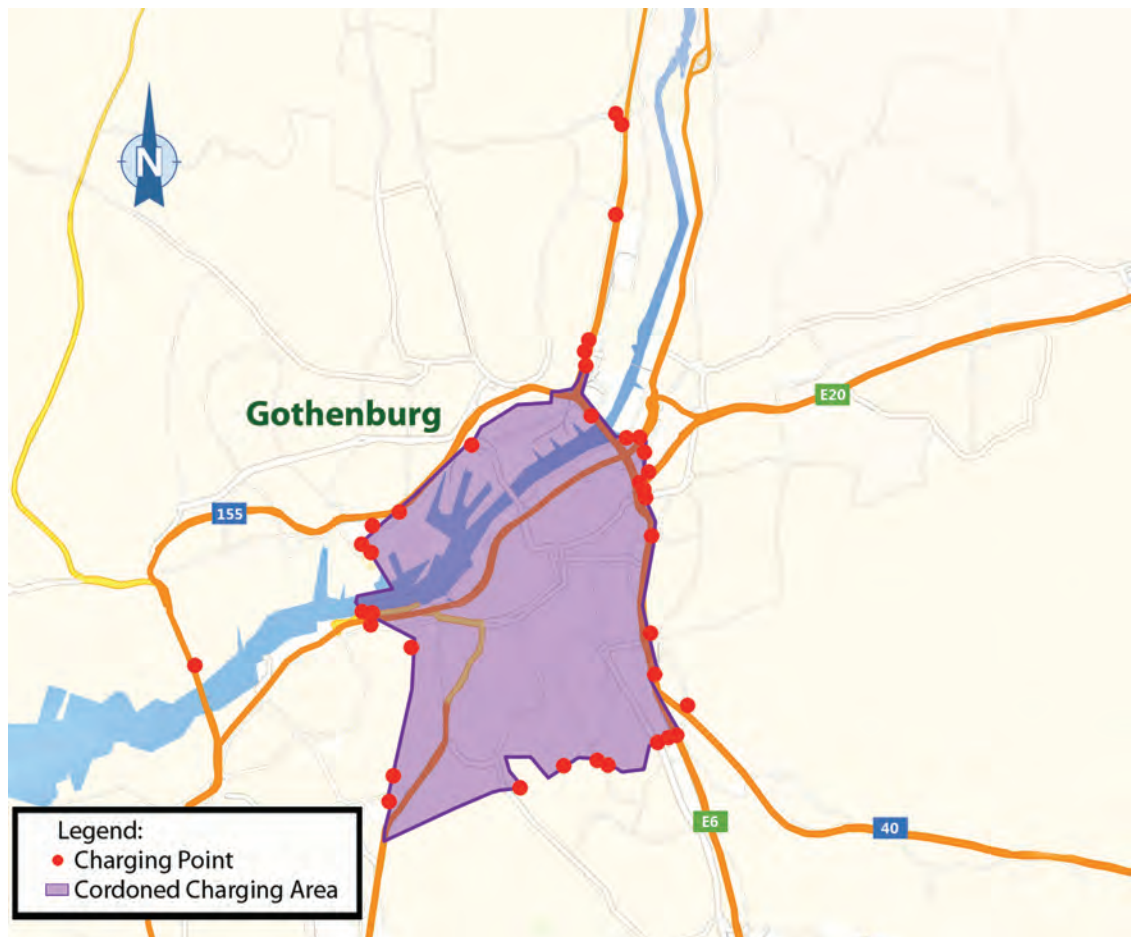
6. This refers to the undiscounted charging rate paid by midnight of the day of travel or before.

(C) Gothenburg, Sweden

Charging location and mechanism

- 3.3.20 Two congestion charging schemes were introduced in Sweden since 2007, first in Stockholm as a pilot scheme, and then in 2013 in Gothenburg. The Gothenburg Congestion Tax Scheme (“the Gothenburg Scheme”) has three objectives, namely congestion management, financing transport infrastructure and services, and improving the environment.
- 3.3.21 Similar to the Singapore Scheme, the Gothenburg Scheme uses a cordon-based charging mechanism. Covering about 12km² (which is about the size of Central and Western District or the size of 63 Victoria Parks), the Gothenburg Scheme covers the city centre, as well as some charging points located at major roads outside the cordoned charging area. There are currently 36 charging points. **Figure 3.6** shows the cordoned charging area and the additional charging points in the Gothenburg Scheme.

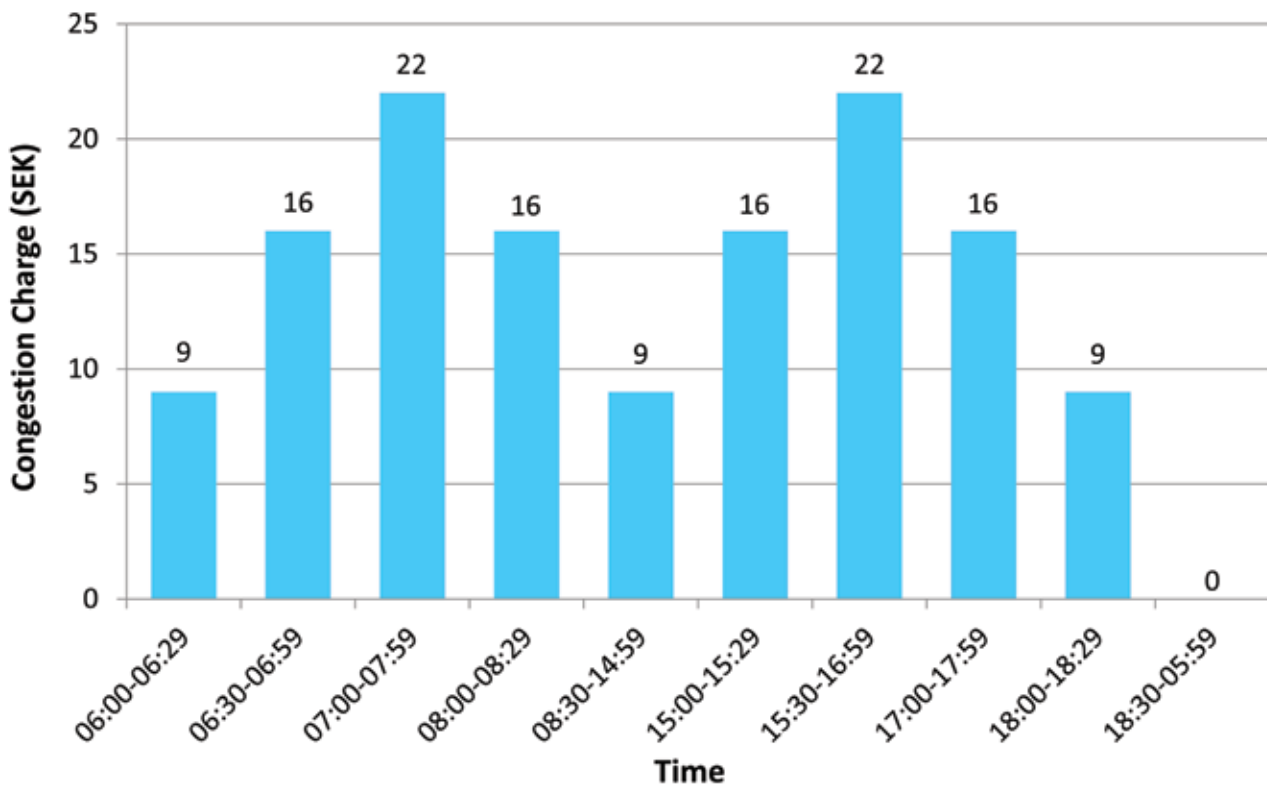
Figure 3.6 - The cordoned charging area and additional charging points in the Gothenburg Scheme



Charging period and level

- 3.3.22 The charging periods of the Gothenburg Scheme are from 6:00 a.m. to 6:29 p.m. from Monday to Friday, except public holidays and the day before and the whole month of July.
- 3.3.23 All vehicles are charged at the same rate at all charging locations, but the rate varies according to the time of day. While the charge is on a “per pass” basis, if a vehicle passes through several charging points within 60 minutes, it will only be charged once at the highest rate applicable to the charging points passed. In addition, the total daily charge for a vehicle is capped at SEK 60 (about HKD 55). **Figure 3.7** shows the different charges according to the time of day of the Gothenburg Scheme. Charges will be tallied and generated in a monthly bill, which will be sent to the registered owner of the vehicle for settlement.
- 3.3.24 An additional fee of SEK 500 (about HKD 455) will be imposed if congestion charge is not received on time (i.e. one month after the payment slip has been sent out).

Figure 3.7 – Charges of the Gothenburg Scheme



Exemption and concession

- 3.3.25 Emergency vehicles, diplomatic registered vehicles, military vehicles, buses over 14 tonnes and motor cycles are exempted from the Gothenburg Scheme. No concession is offered.

Technology

- 3.3.26 The Gothenburg Scheme uses ANPR technology. Images of all vehicles going in and out of the charging area are photographed by cameras at the gantries / poles. IVU is not required. However, ERP gantries in Gothenburg are equipped with necessary DSRC technology to instantly charge foreign-registered vehicles equipped with IVUs⁷. **Figure 3.8** illustrates the ERP gantry design in Gothenburg, which is relatively less bulky than that in the Singapore Scheme.

7. Some vehicles registered in other countries of Europe are equipped with IVUs for ERP and / or road tolling in their own countries. The DSRC provision on the ERP gantries allows the flexibility to collect ERP payment when these vehicles travel in Gothenburg. The Swedish Transport Agency also appoints a company to be responsible for issuing ERP invoices and collecting the related payment from owners of foreign-registered vehicles that are not equipped with IVUs.

Figure 3.8 – Roadside ERP gantry in the Gothenburg Scheme



Effectiveness

- 3.3.27 The traffic volume through charging points has decreased by 15% for the morning peak hours, and the average traffic speed has increased by 20% after the first year of operation of the Gothenburg Scheme. Journey times for buses are shorter, and patronage of buses has increased by about 10%. To maintain the effectiveness of the scheme, the charging level has been increased once since the Scheme's inception in January 2013 from SEK 8 to 18 (about HKD 7 to 16) to the current level of SEK 9 to 22 (about HKD 8 to 20) in January 2015 (i.e. two years after implementation).

3.4 Summary of overseas schemes

3.4.1 **Table 3.2** below summarises the key elements of the three overseas ERP schemes.

Table 3.2 – Key elements of three overseas ERP schemes

	Singapore	London	Gothenburg
a) Implementation Year	1998	2003	2013
b) Scheme Objectives	Congestion Management	<ul style="list-style-type: none"> • Congestion Management • Raising revenue for investment on transport infrastructure and public transport services 	<ul style="list-style-type: none"> • Congestion Management • Raising revenue for financing transport infrastructure and public transport services • Improving environment
c) Charging Mechanism	Cordon-based	Area-based	Cordon-based
d) Charging Period	Weekdays (and Saturdays for some charging points) 7:00 a.m. - 8:00 p.m.	Weekdays 7:00 a.m. - 6:00 p.m.	Weekdays 6:00 a.m. - 6:29 p.m.
e) Charging Level	SGD 0.5 to 12 (about HKD 3 to 66.5) [Charge for different types of vehicles passing one charging point]	GBP 11.5 (about HKD 140) [Charge for all types of vehicles each day]	SEK 9 to 22 (about HKD 8 to 20) [Charge for all types of vehicles, passing one charging point , and capped at SEK 60 (about HKD 55) per day]
f) Exemption and Concession	<ul style="list-style-type: none"> • Only emergency vehicles are exempted • No concession offered 	Both exemption and concession are available. Detailed in Appendix 3	<ul style="list-style-type: none"> • Emergency vehicles, diplomatic registered vehicles, military vehicles, buses over 14 tonnes and motor cycles are exempted • No concession offered
g) Technology	DSRC	ANPR	Mainly ANPR
h) In-vehicle Unit Installation Required	Yes	No	No
i) Payment Method	Instant payment through pre-payment card / credit card	<ul style="list-style-type: none"> • Pay in advance or before midnight of the following charging day after the day of travel • Auto-pay with monthly bill 	Monthly bill
j) Enforcement Method	Photographs of vehicle licence plate taken for violating vehicles	Photographs of vehicle licence plate taken for all vehicles	Photographs of vehicle licence plate taken for all vehicles
k) Penalty Charge / Additional Fee	Yes	Yes	Yes
l) Initial Reduction of Traffic	16%	16%	15%

3.5 Pointers for Hong Kong's pilot scheme

3.5.1 There are a few pointers which we can distil from the above overseas schemes -

- (a) ERP charging area is usually set in the central business districts where road traffic congestion problem is severe;
- (b) ERP charging period is normally set to cover the working hours on weekdays, except public holidays;
- (c) Charging level must be:
 - (i) high enough to bring about a change in motorists' travel behaviours in the charging areas; and
 - (ii) reviewed regularly and adjusted if necessary to maintain its effectiveness.
- (d) Under a cordon-based charging mechanism, the charging level can be adjusted to cater for different degrees of congestion occurring at different times and locations, while an area-based approach with daily rate is simple to operate but does not allow charging flexibility;
- (e) Exemptions from ERP charges and / or concessions may be considered for certain types of vehicles, but will inevitably add to the complexity and operation costs of an ERP scheme as well as reduce its effectiveness;
- (f) Penalties / additional charges should be in place to ensure charges are paid promptly;
- (g) ANPR and DSRC are proven ERP technologies with their own advantages and disadvantages -
 - (i) ANPR technology does not require any installation of IVU but has to capture images of all licence plates; and
 - (ii) DSRC technology requires installation of IVU but allows anonymous payment. Images of licence plates are captured only when payment is not made.

- (h) Gantries / poles need to be installed at roadside or on pavement to mount ERP charging facilities or cameras to capture images of vehicles for processing ERP charges and / or enforcement actions.

3.5.2 In the next Chapter, we will discuss the planning parameters of our Central District ERP Pilot Scheme in the light of the lessons learnt from the overseas experience.

4

Planning for our ERP Pilot Scheme

Use Public Transport
使用公共交通工具



User Pays
用者自付



Chapter 4

Planning for our ERP Pilot Scheme

4.1 Overview

4.1.1 This Chapter presents the basic elements for planning the Central District ERP Pilot Scheme. There are various possible options for each element. The Government has an open mind and would like to invite the public's views on these options. After collating the public views, we will develop more detailed options for discussion at the next stage.

4.2 Central District ERP Pilot Scheme

4.2.1 Chapter 3 explains the basic elements of an ERP scheme and demonstrates how these elements work in overseas ERP schemes. The basic elements include charging area, charging mechanism, charging period, charging level, exemption / concession and the technology employed (see paragraphs 3.2.1 to 3.2.11 in Chapter 3). We will set out below the options of these elements as well as some pertinent issues in planning for the Central District ERP Pilot Scheme.

(A) Charging area

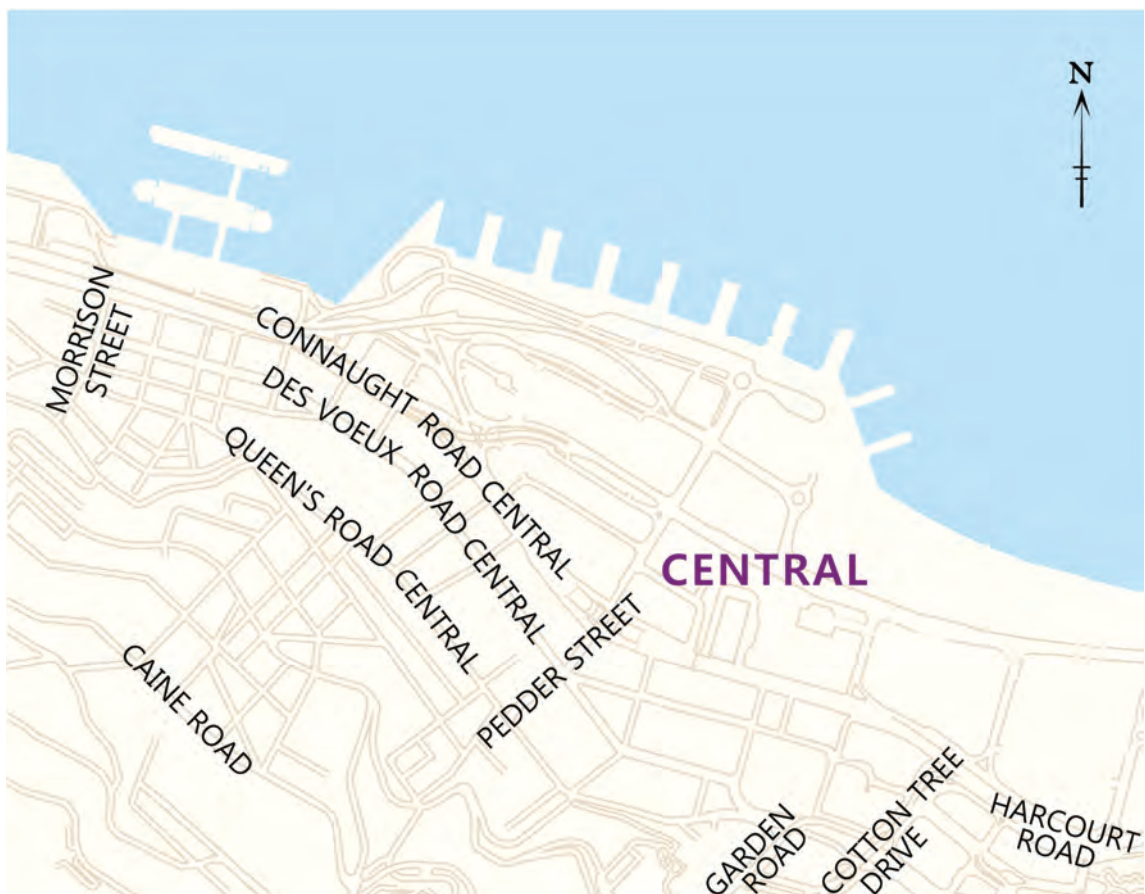
4.2.2 As explained in Chapter 2 (see paragraphs 2.3.3 to 2.3.11), it is an opportune time now to start planning the Central District ERP Pilot Scheme. To briefly recapitulate, Central and its adjacent areas are considered suitable for launching a pilot scheme based on the following considerations -

- (a) Central and its adjacent areas are the central business district of Hong Kong and are strategically important. Yet, the road traffic conditions in these areas are far from satisfactory. In some road sections in the areas during the morning peak hours on weekdays, the traffic speed is as slow as about 10 km/hour (see **Table 2.1** in Chapter 2) which is not much faster than the average walking speed of an adult of about 4 to 5 km/hour;

- (b) Central and its adjacent areas are well served by a variety of public transport modes, including four MTR lines, about 150 franchised bus routes, about 20 public light bus routes and six tram routes. Motorists therefore have ample choices of alternative transport modes to reach Central and its adjacent areas; and
- (c) the Central – Wan Chai Bypass, when commissioned, will provide a free-of-charge alternative route to bypass the charging area for motorists whose origins and destinations are not in Central or its adjacent areas.

4.2.3 In its report published in December 2014, the TAC also considered that Central District could be a suitable location for an ERP pilot scheme.

Figure 4.1 – Central and its adjacent area



4.2.4 **Figure 4.1** shows Central and its adjacent areas within which we will map out the charging area for the Central District ERP Pilot Scheme. As the main objective of an ERP scheme is to alleviate localised traffic congestion, the charging area should be confined to where severe traffic congestion occurs almost daily. When drawing up the exact boundary, the Government will take into account various factors, such as the level of traffic congestion, public views, technological requirements and physical constraints (e.g. the availability of road space for the erection of ERP gantries / poles). A more exact boundary will be developed under a feasibility study (see paragraph 5.2.1 in Chapter 5) at the next stage for discussion by the public.

Your Views

Q1

Do you have any views on how the boundary of the Central District ERP Pilot Scheme should be drawn up, and what are your reasons?

Q2

Do you think some neighbouring areas of Central, say some parts of Admiralty or Sheung Wan, should be covered in the Central District ERP Pilot Scheme? If so, which area(s)?

(B) Charging mechanism

4.2.5 There are two commonly used charging mechanism, namely area-based mechanism and cordon-based mechanism. An **area-based** charging mechanism with a daily rate, such as the London Scheme, is simple and could be easily understood by motorists. Motorists are only required to pay once per day and could enter and re-enter the charging area without having to make further payment on the same day. There is only one rate regardless of the distance or duration a motorist travels within the charging area. In London, the undiscounted ERP charge is GBP 11.5 (about HKD 140) a day.

- 4.2.6 Some may consider charging a daily rate inequitable as it disregards the distance and duration that vehicles have travelled within the area during the charging period of a day. Vehicles that have travelled a short distance and for a short duration are charged at the same rate as vehicles that have travelled extensively in the charging area. It also does not allow for charging different rates according to different degrees of congestion during different times of the day. For example, during the morning peak hours, the traffic in one direction may be very congested while that for the opposite direction is only mildly congested and it is the reverse for the evening peak. An area-based charging mechanism with a daily rate will charge all motorists entering the charging area the same rate regardless of the condition of the road traffic at the time individual motorists enter the charging area.
- 4.2.7 A daily rate may also generate unnecessary trips to and within the charging area. This is because after a motorist has made the first trip to / in the charging area and paid the charge, there will be no additional costs for subsequent trips on the same day.
- 4.2.8 Under an area-based charging mechanism, vehicles which travel solely within the charging area (i.e. not entering or leaving the area) will also be subject to ERP charge. Installation of additional roadside infrastructure (i.e. ERP gantries / poles) is therefore required inside the charging area for detecting and charging such vehicles. This may pose a difficulty in Central and its adjacent areas where the local roads and footpaths are narrow with limited spare space for such installation.
- 4.2.9 Some advocate charging vehicles on the basis of distance travelled (i.e. the “distance approach”) or the time spent in the charging area (i.e. the “time approach”) to make an area-based charging mechanism more equitable. As explained in Chapter 3 (see paragraph 3.2.3), the relevant technology (i.e. GNSS) is not yet mature in ERP application at this stage. The Government will keep in view the latest development of ERP technology.

- 4.2.10 Under a **cordon-based** charging mechanism, a vehicle is charged every time it crosses a charging point located along the boundary (the “cordon”) of the charging area during the charging period. The ERP charge for a trip will depend on how many charging point(s) and which charging point(s) a vehicle has passed. If a vehicle travels extensively into and out of the charging area during the charging period on a single day, it will cross a number of charging points and will be subject to multiple charges. Both the Singapore Scheme and the Gothenburg Scheme use the cordon-based charging mechanism.
- 4.2.11 This mechanism allows ERP charging level to be varied according to time of day, location and travel direction. Compared with the area-based approach with a daily rate, some may consider cordon-based approach more in line with the “user pays” principle.
- 4.2.12 On the other hand, a cordon-based charging mechanism may induce undesirable travel behaviours. Some motorists may decide to stay or even circulate in the charging area and leave only after the ERP charges at charging points located along the boundary of the charging area are lowered. To encourage drivers to leave the charging area without unnecessary circulation, vehicles could be charged once only even if they pass through several charging points provided that they pass these charging points within a certain period of time. For example, in the Gothenburg Scheme, vehicles are charged once (at the highest rates among the charging points passed) if they pass through multiple charging points within a 60-minute window. Another way to deter unnecessary traffic circulation within a charging area is to set up a number of cordoned areas within the charging area so that a vehicle passing between the different cordoned areas will be subject to multiple ERP charges. In the Singapore Scheme, there are three cordoned charging areas, namely Bugis - Marina Centre, Shenton Way - Chinatown and Orchard.

Your Views

Q3

Do you prefer an area-based or cordon-based charging mechanism for the Central District ERP Pilot Scheme? Why?

(C) Charging period

- 4.2.13 The main objective of the Central District ERP Pilot Scheme is to reduce the traffic using the roads in Central and its adjacent areas to alleviate localised traffic congestion. Hence, the charging period should cover the periods when traffic in Central and its adjacent areas is busy and congested.
- 4.2.14 **Figure 4.2** shows that, on a weekly basis, the traffic flow in Central and its adjacent areas is very high throughout weekdays and Saturdays, while it is significantly lower on Sundays. On a 24-hour basis, **Figure 4.3** shows the traffic on weekdays remaining at a high level from 7:00 a.m. to 8:00 p.m. and on Saturdays from 8:00 a.m. to 8:00 p.m. It gradually drops from 8:00 p.m. to the lowest point at around 4:00 a.m. the next day on both weekdays and Saturdays.

Figure 4.2 – Daily variations of traffic flow going in and out of Central and its adjacent areas

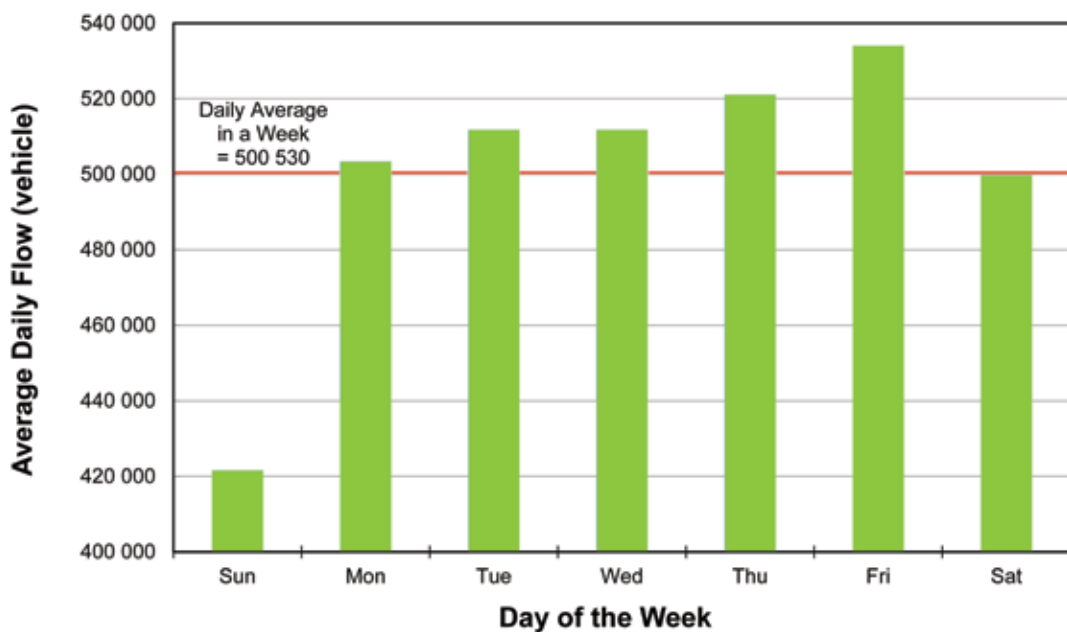
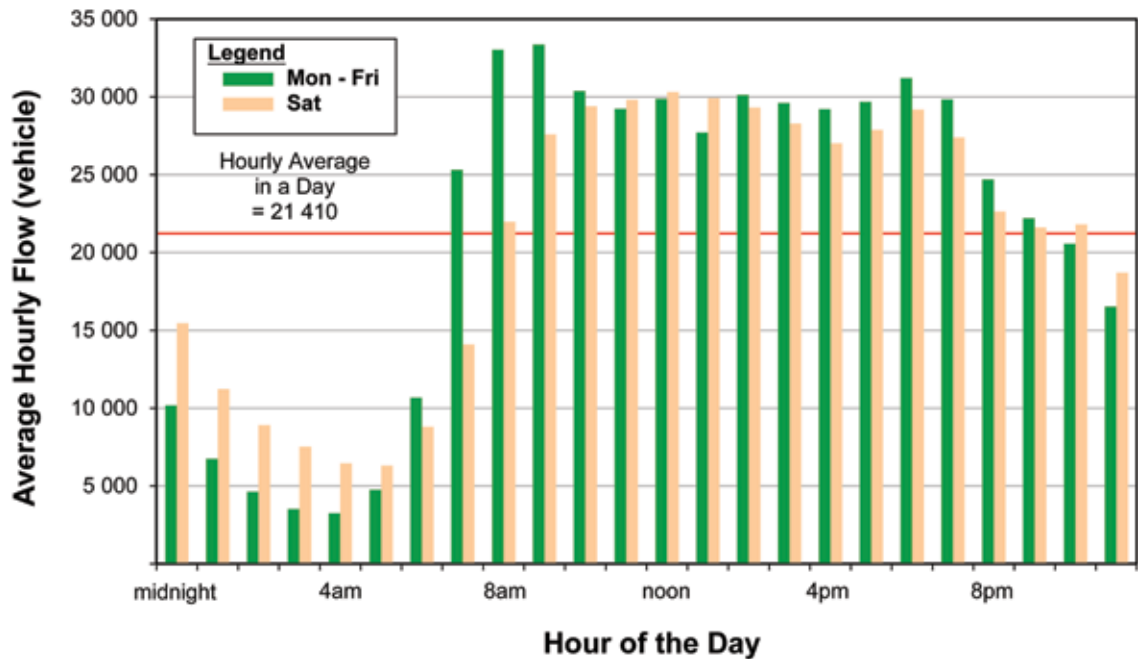


Figure 4.3 – Hourly variations of traffic flow going in and out of Central and its adjacent areas



4.2.15 With the above information, it seems reasonable to set a charging period from 7:00 a.m. to 8:00 p.m. from Mondays to Fridays and from 8:00 a.m. to 8:00 p.m. on Saturdays, excluding Sundays and public holidays for the Central District ERP Pilot Scheme.

Your Views

Q4

Do you agree that ERP charges for the Central District ERP Pilot Scheme should be imposed throughout the hours in a day when the traffic flow is high in the charging area?

Q5

Do you agree that Sundays and public holidays should be excluded from the ERP charges for the Central District ERP Pilot Scheme? Do you have any other views on the charging period?

(D) Charging level

4.2.16 The ERP charge must be set at a level which could induce motorists to consider adjusting their travel behaviour. In setting the most appropriate charging level, it is necessary to take into account a host of factors including motorists' behaviour, traffic flow variation, charging mechanism, vehicle types to be charged or exempted (if any) and public views. After collating the views of our community on the basic elements of the Central District ERP Pilot Scheme, we will develop more concrete options of the charging level for discussion with the public at the next stage.

4.2.17 For reference, the London Scheme charges a daily rate of GBP 11.5 (about HKD 140). The Singapore Scheme uses a cordon-based mechanism and there are different charges for different travel routes. For example, if a private car travels during the morning peak from the Woodlands New Town (a typical suburb) to Raffles Place (city centre), it will pass through three charging points and has to pay SGD 9.5¹ (about HKD 53) one way. If another private car travels during the same hour but from Tampines to Orchard Road, it will pass through four charging points and has to pay SGD 8.5 (about HKD 47) one way (see **Figure 4.4** on these two routes).

Figure 4.4 – Charges under two different routes in the Singapore Scheme



1. The rates are effective from 2 November 2015 to 31 January 2016.

4.2.18 Since different cities have different living standards and travel patterns, it may not be very useful to directly compare the charges of overseas ERP schemes. We could instead focus the discussion on the following different charging approaches -

(a) **A unified charge for all vehicle types**

Vehicles of different types and sizes are charged at the same level. The London Scheme and Gothenburg Scheme have adopted this charging approach.

(b) **Differential charges based on vehicle sizes**

Each vehicle type is charged differently according to the road space it occupies. For example, a private car is charged less than a bus. The Singapore Scheme has adopted this charging approach.

(c) **Differential charges based on a vehicle's carrying capacity**

Vehicles are charged differently according to their carrying capacity (i.e. the maximum number of passengers that can be carried on board). A vehicle having a low carrying capacity (e.g. private car) will be charged more than one with a higher capacity (e.g. franchised bus) on grounds that a private car does not make good use of the limited road space as it is not an efficient carrier. We understand that this approach has not yet been adopted in any overseas ERP schemes.

4.2.19 Separately, if a cordon-based charging mechanism is to be used, it is possible to charge motorists according to the travel direction, reflecting the difference in traffic demands during morning and evening peaks. A maximum charge within a certain period of time may be considered in order to discourage motorists from circulating within the cordoned charging area (see paragraph 4.2.12 above). The need for transition periods to bridge over periods of different ERP charges, as in the case of the Singapore Scheme (see paragraph 3.3.4 in Chapter 3), could also be considered to avoid motorists rushing through or slowing down before reaching a charging point to minimise or avoid ERP charge.

4.2.20 Apart from the normal charge(s), motorists will need to pay penalties if they fail to make timely payments. As observed from overseas experience, the penalty is usually set at a fairly high level to achieve a strong deterrent effect ². The penalty level for the Central District ERP Pilot Scheme will be examined at the next stage.

Your Views

Q6

Which charging approach do you prefer for the Central District ERP Pilot Scheme – a unified charge for all vehicles, differential charges based on vehicle sizes (i.e. larger vehicles to be charged more), or differential charges based on a vehicle's carrying capacity (i.e. vehicles with higher carrying capacities to be charged at lower levels)?

Q7

Do you have any suggestion on the range of ERP charge which you believe could induce motorists to adjust their travel behaviour when (a) ERP charge is levied on a per day basis; or (b) ERP charge is levied on a per pass basis (charging at each and every charging point)?

(E) Exemption and concession

4.2.21 All vehicles using the roads inside a charging area will contribute to traffic congestion. Arguably, it is fair for all motorists to pay congestion charge under the “user pays” principle. Nonetheless, there are views that certain types of vehicles or usage of vehicles should be exempted or given concession.

4.2.22 All the three overseas ERP schemes implemented in Singapore, London and Gothenburg (see Chapter 3) grant exemption for emergency vehicles (e.g. fire engines, ambulances and police vehicles). Given the unique nature of an emergency vehicle, the exemption is easily understandable.

2. Minimum penalty charge in Singapore is SGD 70 (about HKD 390), while London is GBP 65 (about HKD 780), and Gothenburg is at SEK 500 (about HKD 455).

- 4.2.23 As regards the arrangements for exemption / concession for vehicle types / usage other than emergency vehicles, they vary in the three overseas schemes. The Singapore Scheme does not provide for exemption or concession for any other types of vehicles (see paragraph 3.3.6 in Chapter 3) while the London Scheme has a long list of vehicle types entitled to various exemptions and concessions (see **Appendix 3**). Under the Gothenburg Scheme, only diplomatic registered vehicles, military vehicles, buses over 14 tonnes and motor cycles are exempted, and there is no concession given (see paragraph 3.3.25 in Chapter 3).
- 4.2.24 It should be noted that the more exemptions or concessions given, especially to those types of vehicles with high usage in the charging area, the less effective an ERP scheme is. As a result, much higher charges will have to be set for those types of vehicles not exempted / given concession.
- 4.2.25 There are suggestions that franchised buses, taxis, goods vehicles or residents living in the charging areas should be given exemption / concession. In the London and Gothenburg Schemes, buses ³ are exempted from ERP charges. In the London Scheme, licensed taxis and private hire vehicles are granted full concession (which in effect is an exemption) while residents living within the zone can apply for concessions (90% discount) for one of their private vehicles. The Singapore Scheme and the Gothenburg Scheme do not have such an arrangement for taxis or residents living in the charging area.
- 4.2.26 As regards goods vehicles, they are not given any exemption / concession in the three overseas ERP schemes. To minimise the impact of the implementation of the ERP Scheme on goods vehicle operators, the Singapore Government made a special arrangement to phase in the full ERP charges on goods vehicles over four years. It could be argued that the introduction of ERP charges may provide the logistics industry with an incentive to conduct delivery services outside the charging period, and hence minimise the loading and unloading activities within the charging area during busy hours. This will certainly help alleviate traffic congestion in Central and its adjacent areas during the charging period.

3. Buses registered in European Economic Area member states in the London Scheme and buses over 14 tonnes in the Gothenburg Scheme are exempted from ERP charges.

4.2.27 In sum, whether and what exemption / concession is provided in the Central District ERP Pilot Scheme will have a bearing on the effectiveness of the scheme as well as the charges to be levied on vehicle types not exempted / given concession. The Government will undertake a detailed study to develop more concrete options for discussion with the public at the next stage. The study will take into account a number of factors, including the views received from this engagement exercise, consideration of fairness and effectiveness of the scheme.

Your Views

Q8

Do you support providing exemption / concession to vehicles other than emergency vehicles for the Central District ERP Pilot Scheme? If so, what are the type(s) of vehicles and why do you choose them?

(F) Technology

- 4.2.28 There are currently two mature ERP technologies, namely ANPR and DSRC (see paragraphs 3.2.9 to 3.2.11 in Chapter 3). Both technologies could be used under an area-based or cordon-based charging mechanism.
- 4.2.29 A key difference between the ANPR and DSRC technologies is whether a pre-installed IVU is required. An ERP scheme using **ANPR** technology does not require such an installation as it captures the images of licence number plates of all vehicles in the charging area during the charging period.
- 4.2.30 ANPR technology provides convenience to occasional motorists who do not use the roads in the charging area frequently and have no IVU installed. With ANPR technology, ERP charges could be paid monthly, or settled within a prescribed deadline.

- 4.2.31 However, capturing licence number plate images may raise concern over privacy. The accuracy of the information shown in the captured images also needs to be verified by labour-intensive manual checking. This is because a clear captured image of licence number plate relies on having good visibility of the car plate, and the image not being obscured. The clarity of the captured images could become critical in cases of dispute over ERP charges and prosecuting violating vehicles for non-payment. In the London Scheme, substantial manpower is deployed for manual cross-checking of images at the back office before issuing penalty notices, thus adding significant operation cost to the scheme.
- 4.2.32 An ERP scheme using **DSRC** technology requires installation of IVUs in all vehicles entering the charging area to enable the pre-payment / credit card inserted in the IVU to make automatic payment. To encourage and speed up the installation of IVUs, the Singapore Government provided free fitting of IVUs for all its existing vehicles before the commissioning of its ERP in 1998. Upon the expiry of this free-fitting programme, owners of vehicles have to pay for IVU installation at their own costs.
- 4.2.33 Because of its simplicity and instantaneous payment technology, DSRC technology is particularly suitable for cordon-based charging mechanism where the charging level of each charging point could vary based on time, location and travel direction to cater for different degrees of traffic congestion. If a vehicle passing a charging point is not equipped with an IVU or the payment transaction through the pre-payment / credit card cannot be made successfully, a photograph of the licence number plate of the vehicle will be taken by enforcement cameras for follow-up action.
- 4.2.34 It should be noted that IVUs can also be used to pay tunnel tolls and parking charges. This would certainly facilitate better operation of our tolled tunnels and roads, and car parks.

- 4.2.35 Regarding roadside hardware installation, both ANPR and DSRC technologies require the installation of gantries / poles in the charging area. ERP technology has become more mature over the years and we note that the design of roadside hardware has also improved accordingly. While the gantries in the Singapore Scheme, which was commissioned in 1998, are bulky, the gantries and poles in the Gothenburg Scheme, which was commissioned in 2013, are more compact and take up less road space.
- 4.2.36 The new GNSS (see paragraph 3.2.3 and footnote 2 in Chapter 3) is under development for ERP application. It employs global positioning system via satellites to determine the location of vehicles. GNSS is not yet a mature technology for ERP application. There may also be concern over privacy given that the vehicles are tracked continuously for distance and duration of stay within the charging area. The Government will keep in view the development of this technology for ERP application and remains open on whether it is suitable for use in Hong Kong.

Your Views

Q9

DSRC technology requires the installation of an IVU in each vehicle entering the charging area for ERP payment, while ANPR technology captures the licence number plate of a vehicle every time when it enters / leaves / circulates in the charging area. On the whole, would you say that ANPR or DSRC is a more preferable technology for the Central District ERP Pilot Scheme?

(G) Other pertinent issues

Privacy concerns

- 4.2.37 Inadequate protection of privacy was the primary public concern when the first ERP study was conducted in Hong Kong in 1980s. In the jurisdictions where ERP is implemented now, with the advancement in technology over the years and more established privacy-protection laws, privacy issues have, to a large extent, been addressed.

4.2.38 In the Singapore Scheme, the use of DSRC technology allows instant payment by using pre-payment / credit card inserted in the IVU. Anonymous pre-payment cards are available for purchase without the need to register personal details. In the London Scheme, images of licence number plate of vehicles captured using the ANPR technology will be deleted immediately after cross-checking that there is no outstanding payment. Only licence number plate images with outstanding payment will be retained as evidence for follow-up action. Image records and associated information will be safeguarded and handled by the authorities in accordance with the United Kingdom's Data Protection Act.

4.2.39 Nonetheless, in implementing ERP in Hong Kong, there may still be lingering concerns over whether images of the licence number plates of violating vehicles captured by roadside cameras (in the case of adopting the DSRC technology), or the captured images of all vehicles' licence number plates (in the case of adopting the ANPR technology), will be improperly accessed and misused by unauthorised persons. The Hong Kong public may also have concerns over protection of privacy issues that have not arisen in the jurisdictions we studied. To address these concerns, privacy issues relating to the Central District ERP Pilot Scheme will be thoroughly examined in consultation with the Office of the Privacy Commissioner for Personal Data.

Your Views

Q10

Do you have any concern over the protection of privacy in the Central District ERP Pilot Scheme? What are your concern(s) and how do you think it / they could be addressed?

Effectiveness

- 4.2.40 As the prime objective of the Central District ERP Pilot Scheme is to alleviate localised traffic congestion in Central and its adjacent areas, we consider that there is a need to establish some quantitative indicators for evaluation of its effectiveness. Possible indicators include the reduction of traffic volume within the charging area during the charging period and the corresponding increase of average car speed. The results of the evaluation will also provide useful information for the community and the Government to consider whether and how ERP schemes should be put in place to address localised traffic congestion in other parts of Hong Kong.
- 4.2.41 The effectiveness of an ERP scheme could be weakened when there is a change in travel pattern, or if motorists get used to the ERP charge, or when the effect of the charge has been eroded by inflation or increase in household income. There is therefore a need to have a transparent, objective and regular mechanism to monitor and adjust the ERP charging level.
- 4.2.42 Overseas experience shows that the charging levels have to be adjusted from time to time to maintain the effectiveness of an ERP scheme. In the Singapore Scheme, traffic speeds of the roads covered by ERP are reviewed quarterly to determine if the ERP charges should be adjusted upward or downward. In the London Scheme, the charging level has been raised three times (in 2005, 2011 and 2014) since its initial implementation in 2003. Under the Gothenburg Scheme, the congestion charge has been increased once since its inception in 2013.

Your Views

Q11

What indicators do you think we should use to evaluate the effectiveness of the Central District ERP Pilot Scheme?

Q12

Do you agree that the charging level should be reviewed regularly and adjusted where necessary in order to maintain the effectiveness of the Central District ERP Pilot Scheme?

Complementary measures

- 4.2.43 Overseas experience shows that appropriate complementary measures would be instrumental in achieving success for an ERP scheme. For example, 300 buses were introduced into and around the charging area when the London Scheme was launched in 2003 so that motorists could have an alternative not to drive their cars into the charging area.
- 4.2.44 In planning for the Central District ERP Pilot Scheme, the Government will explore appropriate complementary measures which could encourage and facilitate drivers or passengers to make better use of public transport, or to travel to the charging area during non-peak hours. For example, park-and-ride car parks at or near MTR stations⁴ allow motorists to park their cars and then switch to MTR. According to the guidelines in the Hong Kong Planning Standards and Guidelines, the Government encourages the provision of park-and-ride car parks at suitable locations. In taking forward individual railway projects, as well as urban renewal and new development projects, the Government will consider introducing more park-and-ride facilities at suitable locations. The Government has also requested the MTR Corporation Limited (“MTRCL”) to promote wider use of its existing park-and-ride facilities, and to extend the provision of park-and-ride concessions to certain car parks which are near MTR stations but currently not offering such concessions.

Your Views

Q13

Do you have any suggestions on measures which could complement the implementation of the Central District ERP Pilot Scheme?

- 4.2.45 We would like to hear your views on the basic elements and pertinent issues in building the Central District ERP Pilot Scheme. With your views, we could then take forward the Central District ERP Pilot Scheme following the steps elaborated in the next Chapter.

4. Currently, there are 11 car parks providing park-and-ride service in various districts (including urban and rural areas), providing a total of 3 871 parking spaces. These car parks are located at or near MTR stations, including Sheung Shui Station, Hong Kong Station, Kowloon Station, Tsing Yi Station, Choi Hung Station, Kam Sheung Road Station, Hung Hom Station, Olympic Station, Hang Hau Station, Wu Kai Sha Station and Tuen Mun Station, to facilitate drivers to switch to MTR. Park-and-ride users (i.e. those who park their cars and switch to MTR to travel to their destinations) can enjoy a parking fee discount. Currently, among the aforementioned car parks, seven are managed by the Transport Department and the MTRCL (i.e. those located at or near Sheung Shui Station, Hong Kong Station, Kowloon Station, Tsing Yi Station, Choi Hung Station, Kam Sheung Road Station and Hung Hom Station).

5

Way Forward



Chapter 5

Way Forward

5.1 Overview

5.1.1 This chapter explains the steps to be taken for putting in place the Central District ERP Pilot Scheme.

5.2 Steps ahead

5.2.1 This public engagement exercise is the first important step to engage the public and stakeholders to work out a practicable pilot scheme. After collecting the views through this exercise, the following steps will be taken -

(a) **Feasibility study**

We will appoint a consultant to develop feasible options for the ERP pilot scheme. The consultant will undertake field surveys to collect data for developing transport models to assess possible options. In developing the options, the consultant will take into account the views collected in this public engagement exercise, the latest traffic data, overseas experience, and findings from the past studies on ERP. Based on a further round of public engagement exercise (see item (b) below), the consultant will recommend an ERP pilot scheme option for possible implementation.

- (b) **Public engagement exercise on options of the ERP pilot scheme**
With feasible options developed by the consultant, we will engage the public further to develop the ERP pilot scheme in finer details, for example, the charging level, the exact boundary of the charging area and the operation of the scheme. This is to ensure that the eventual pilot scheme would be acceptable, in principle and in details, to the majority of the community.
- (c) **Legislation for the ERP pilot scheme**
The implementation of the ERP pilot scheme requires proper legal backing. We will seek the enactment of a new piece of legislation on the ERP pilot scheme by the Legislative Council. The legal framework will also be relied upon if ERP is to be rolled out to other particularly congested areas at a later stage.
- (d) **Funding approval**
The cost of the ERP pilot scheme will largely depend on the choice of ERP technology. It is difficult to make an estimation at this stage because the feasible ERP pilot scheme options are still to be developed, and ERP technology is still evolving. After the enactment of the governing legislation (see item (c) above), we will seek funding from the Legislative Council to carry out the detailed design, procure the systems and put in place the infrastructure required.
- (e) **Programme roll out**
With funding approved (see item (d) above), we will carry out detailed design for the system and the engineering works. In addition, field trials may also be conducted to test the ERP technology to be adopted. We will consult the local districts on the installation of roadside hardware (like gantry / pole) for detection of vehicles entering, exiting and being used in the charged area, as well as for enforcement purposes. Test runs will be conducted before the actual implementation.

5.2.2 While we share the public's aspiration to have an early solution to tackle the traffic congestion problem in Central and its adjacent areas, we expect that some lead time will be required to complete the above steps, given the complexities involved. For reference, it took about four years to implement the ERP schemes both for London ¹ and Gothenburg ². Singapore, which is the first city to introduce ERP, took nine years (excluding the time for public engagement) from the start of planning to commission of the ERP system. As such, it is all the more important to commence the community discussion now on how to take forward the Central District ERP Pilot Scheme. Your views are valuable in taking forward the planning of the Central District ERP Pilot Scheme and making it a success.

1. The lead time of the London Scheme was relatively short compared to Singapore because the London Scheme was included in the manifesto made by the Mayor of London during the mayoral election and Londoners who voted for the Mayor were clear that he would implement the scheme. The process of implementation after the election was therefore smooth. Moreover, the Mayor committed at that time to implement the scheme within his four-year term of office, and a relatively simple mechanism was accordingly adopted for implementation.

2. The lead time of the Gothenburg Scheme was relatively short compared to Singapore because the Gothenburg Scheme was similar to the one implemented in Stockholm. The Stockholm's experience has paved the way for a smooth and prompt implementation in Gothenburg.

6

Ways of Providing Your Views

POST



E-MAIL



FAX



WEBSITE



Chapter 6

Ways of Providing Your Views

6.1 Overview

- 6.1.1 We look forward to hearing your views. We have recapitulated in **Appendix 4** the questions raised in Chapter 4 for your easy reference. Views on other relevant aspects of the subject are also welcome.

6.2 Details

- 6.2.1 Please send in your views through the following means -

Website: www.erphk.hk

E-mail: info@erphk.hk

Fax: 2802 2673

Post: Transport Department
Room 3926, 39/F, Immigration Tower
7 Gloucester Road
Wan Chai, Hong Kong

- 6.2.2 Your views will help lay the foundation for the Central District ERP Pilot Scheme. Please let us know your view latest by **18 March 2016**.

- 6.2.3 If you have any enquiries, please contact us on 2804 2600.
(Our telephone hotline is handled by “1823”)

Notes:

1. It is optional for any member of the public to supply his / her personal data in providing views on this public engagement document. Any personal data provided with a submission may be transferred to the relevant Government bureaux and departments and their authorised agents for purposes directly related to this public engagement exercise. The relevant Government bureaux and departments and their authorised agents receiving the data are bound by such purposes in their subsequent use of such data.
2. The names and views of individuals and organisations which put forth submissions in response to this public engagement document (“senders”) may be published for public viewing after the public engagement exercise. The Government may, either in discussion with others (whether privately or publicly), or in any subsequent report, attribute comments submitted in response to this public engagement document.
3. To safeguard senders’ privacy, we will remove senders’ relevant data (if provided), such as residential / return addresses, email addresses, identity card numbers, telephone numbers, facsimile numbers and signatures, where provided, if we publish their submissions.
4. We will respect the wishes of senders to remain anonymous and / or keep the views confidential in part or in whole. If the senders request anonymity in the submissions, their names will be removed if their views are published. If the senders request confidentiality of their views, their submissions will not be published.
5. If the senders do not request anonymity or confidentiality in the submissions, it will be assumed that the senders can be named and the views can be published in their entirety.

6. Any sender providing personal data to the Transport Department in the submission will have rights of access and correction with respect to such personal data. Requests for data access and correction of personal data should be made in writing to -

Post: Access to Information Officer
Transport Department Headquarters
41/F, Immigration Tower
7 Gloucester Road
Wan Chai
Hong Kong

Fax : 2804 2652*

E-mail: tdenq@td.gov.hk*

* Our fax hotline and e-mail box are handled by "1823".

Appendices

Page No.

Appendix 1	Recommendations made by TAC in its Report on Study of Road Traffic Congestion in Hong Kong	ii
Appendix 2	Summary of Past ERP Studies in Hong Kong	iii
Appendix 3	Types of Vehicles Exempted or Given Concessions under the London Congestion Charging Scheme	vii
Appendix 4	Summary of Specific Questions Raised	ix

Appendix 1

Recommendations made by TAC in its Report on Study of Road Traffic Congestion in Hong Kong

Control of private car fleet

1. Raise First Registration Tax and Annual Licence Fees for private cars
2. Tighten up standards for Environment-Friendly Petrol Private Cars ¹
3. Raise “fuel levy” for diesel private cars

Efficient use of limited road space

4. Start planning for a congestion charging pilot scheme
5. Increase meter parking charges

Stringent penalty and enforcement of traffic offences

6. Step up education and publicity
7. Restore deterrent effect of fixed penalty for congestion-related offences
8. Strengthen enforcement action
9. Make more use of information technology in enforcement

Long-term measures

10. Review parking policy and disseminate real-time information on parking vacancies
11. Encourage on-street loading and unloading outside off-peak hours
12. Provide more park-and-ride facilities

1. The Environmental Protection Department already terminated the tax incentive scheme for Environment-Friendly Petrol Private Cars on 1 April 2015 on grounds that the emission control technology of petrol private cars has advanced to such a mature stage that further emission reduction is limited.

Appendix 2

Summary of Past ERP Studies in Hong Kong

1. The Government conducted three studies on the use of ERP to address road traffic congestion in the past. Due to changes in economic situation at the time of the studies, privacy concerns and the lack of community consensus, ERP was not taken forward then. The following paragraphs briefly summarise the objectives and key findings of each study.

1st Study: Hong Kong ERP Pilot Scheme (1983-1985)

2. In 1983, the Government announced its intention to introduce ERP system in the territory to tackle road congestion problem in the urban areas and commissioned a study to design and conduct a pilot scheme in Central.
3. The pilot scheme was conducted from July 1983 to March 1985, with about 2 500 vehicles voluntarily joining the scheme for test running but without actual charging. The pilot scheme employed a technology where an electronic plate with a unique identification code was mounted underneath each volunteer vehicle. When a vehicle passed through a charging point, its identification code was transmitted to the control centre via a roadside computer. A mock monthly bill was then generated. Roadside Closed Circuit Television enforcement cameras were also installed to take pictures of vehicles with faulty or tampered electronic plate automatically.
4. The pilot scheme concluded that ERP was feasible on technical, administrative and legal grounds. However, there was general public concern regarding the system's possible intrusion into privacy. The general public also considered that the traffic conditions at that time were satisfactory after the introduction of a basket of fiscal measures ² in 1982 to discourage car ownership and usage as well as the opening of the MTR Island Line in 1985.

2. The fiscal measures included doubling of First Registration Tax, trebling of Annual Licence Fee and doubling of fuel tax.

2nd Study : Feasibility Study on ERP (1997-2001)

5. There was a sharp increase in the number of private vehicles in the early 1990s, which prompted the community's discussion on how to control car growth and address traffic congestion. In 1995, the Government decided that ERP should be further explored as a means to reduce congestion.
6. The feasibility study was commissioned with the objectives of examining the practicability of implementing an ERP system in Hong Kong and assessing the need for such a system to meet transport objectives.
7. The main findings of this study were -
 - (a) ERP was not warranted on traffic management grounds before 2006 for Hong Kong Island and 2011 for Kowloon at the earliest if the growth of the private vehicle fleet was no more than 3% per year;
 - (b) both ERP technologies, namely the DSRC and GNSS could be adopted for a possible ERP scheme in Hong Kong. However, DSRC technology would be a more mature technology and GNSS is still at the development stage; and
 - (c) ERP could only work where there was a high level of consensus in the community.

3rd Study: Congestion Charging Transport Model – Feasibility Study (2006-2009)

8. The main objective of this study was to develop a computer-based transport model for the analysis of congestion charging. This model was to facilitate the assessment of various ERP schemes and strategies for relieving traffic congestion in Hong Kong. Different charging scenarios were investigated using the transport model to evaluate the potential impacts in the study area from traffic, social, economic and environmental perspectives.

9. The key findings of this study were -
 - (a) ERP could make a significant contribution to managing traffic, bringing broad transport benefits and supporting sustainable development;

 - (b) ERP would alleviate localised road traffic congestion and secure an efficient operating environment for public transport and commercial vehicles;

 - (c) the preferred approach to ERP scheme would be in form of a cordon-based charging mechanism around the commercial areas on Hong Kong Island. There may not be much scope to offer concessions as the road network in the commercial areas remained busy throughout the working day. Vehicles crossing the cordon would be charged both directions to maximise its effectiveness, but the option to charge by travel direction to reflect the different traffic demands could still be considered. It was also suggested to levy the charge on Saturdays when the traffic was heavy throughout the day, particularly during lunch time;

 - (d) the “user pays” approach should be adopted with all vehicles to be charged (except emergency vehicles). Differential charges could be levied based on vehicle size;

- (e) DSRC technology would be the preferred option for Hong Kong, while the development of other technologies should be closely monitored. The use of an anonymous payment card under the DSRC technology would ensure privacy of motorists who make valid payments;
- (f) an ERP scheme could be implemented equitably and effectively with the availability of a free-of-charge alternative route for motorists to bypass the charging area; and
- (g) community consensus would need to be reached before implementation of an ERP scheme.

Appendix 3

Types of Vehicles Exempted or Given Concessions under the London Congestion Charging Scheme

- I. **Exemptions** (vehicles are exempted from ERP charges and there is no need for application or registration)
 1. Two-wheeled motorbikes (and side cars) and mopeds
 2. Emergency service vehicles, such as ambulances and fire engines
 3. National Health Service vehicles
 4. Vehicles with “disabled” taxation class
 5. Taxi and private hire vehicles
 6. Buses registered in European Economic Area member states
 7. Any vehicles under the armed forces
 8. Certain operational vehicles used by local authorities in the charging area
 9. Certain vehicles used by Her Majesty’s Coastguard and Port Authorities
 10. Certain vehicles used by Royal Parks Agency

II. Concessions (vehicles have to pay the registration cost and renew annually in order to benefit from a discount)

1. Residents – 90% discount
2. Blue Badge holders in the European Economic Area – 100% discount (i.e. no need to pay)
3. Breakdown vehicles operated by organisations in the European Economic Area – 100% discount (i.e. no need to pay)
4. Vehicles with nine or more seats – 100% discount (i.e. no need to pay)
5. Cars or vans with ultra low emission – 100% discount (i.e. no need to pay)
6. Motor tricycles – 100% discount (i.e. no need to pay)
7. Roadside recovery vehicles – 100% discount (i.e. no need to pay)

Appendix 4

Summary of Specific Questions Raised

We would like to hear your views on the various elements in building the Central District ERP Pilot Scheme. The specific questions raised in Chapter 4 are recapitulated below for your easy reference. Other views are certainly welcome.

Charging area

- Q 1 Do you have any views on how the boundary of the Central District ERP Pilot Scheme should be drawn up, and what are your reasons?
- Q 2 Do you think some neighbouring areas of Central, say some parts of Admiralty or Sheung Wan, should be covered in the Central District ERP Pilot Scheme? If so, which area(s)?

Charging mechanism

- Q 3 Do you prefer an area-based or cordon-based charging mechanism for the Central District ERP Pilot Scheme? Why?

Charging period

- Q 4 Do you agree that ERP charges for the Central District ERP Pilot Scheme should be imposed throughout the hours in a day when the traffic flow is high in the charging area?
- Q 5 Do you agree that Sundays and public holidays should be excluded from the ERP charges for the Central District ERP Pilot Scheme? Do you have any other views on the charging period?

Charging level

- Q 6 Which charging approach do you prefer for the Central District ERP Pilot Scheme – a unified charge for all vehicles, differential charges based on vehicle sizes (i.e. larger vehicles to be charged more), or differential charges based on a vehicle's carrying capacity (i.e. vehicles with higher carrying capacities to be charged at lower levels)?

- Q 7 Do you have any suggestion on the range of ERP charge which you believe could induce motorists to adjust their travel behaviour when (a) ERP charge is levied on a per day basis; or (b) ERP charge is levied on a per pass basis (charging at each and every charging point)?

Exemption / Concession

- Q 8 Do you support providing exemption / concession to vehicles other than emergency vehicles for the Central District ERP Pilot Scheme? If so, what are the type(s) of vehicles and why do you choose them?

Technology

- Q 9 DSRC technology requires the installation of an IVU in each vehicle entering the charging area for ERP payment, while ANPR technology captures the licence number plate of a vehicle every time when it enters / leaves / circulates in the charging area. On the whole, would you say that ANPR or DSRC is a more preferable technology for the Central District ERP Pilot Scheme?

Privacy concern

- Q 10 Do you have any concern over the protection of privacy in the Central District ERP Pilot Scheme? What are your concern(s) and how do you think it / they could be addressed?

Effectiveness

- Q 11 What indicators do you think we should use to evaluate the effectiveness of the Central District ERP Pilot Scheme?
- Q 12 Do you agree that the charging level should be reviewed regularly and adjusted where necessary in order to maintain the effectiveness of the Central District ERP Pilot Scheme?

Complementary measures

- Q 13 Do you have any suggestions on measures which could complement the implementation of the Central District ERP Pilot Scheme?

Abbreviations

ANPR	Automatic Number Plate Recognition
Central District ERP Pilot Scheme	ERP Pilot Scheme in Central and its adjacent areas
DSRC	Dedicated Short-range Radio Communication
ERP	Electronic Road Pricing
GNSS	Global Navigation Satellite System
IVU	In-vehicle Unit
MTR	Mass Transit Railway
MTRCL	MTR Corporate Limited
TAC	Transport Advisory Committee
The Gothenburg Scheme	The Gothenburg Congestion Tax Scheme
The London Scheme	The London Congestion Charging Scheme
The Singapore Scheme	The Singapore ERP Scheme



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