

**For discussion on
17 November 2017**

Legislative Council Panel on Transport

Preliminary Findings of the Toll Rationalisation Study of Three Road Harbour Crossings and Three Land Tunnels between Kowloon and Sha Tin

Purpose

This paper briefs Members on the preliminary findings of the Government's study on the rationalisation of traffic distribution among the three road harbour crossings ("RHCs") (*viz.* Cross Harbour Tunnel ("CHT"), Eastern Harbour Crossing ("EHC") and Western Harbour Crossing ("WHC")) and the three land tunnels between Kowloon and Sha Tin ("three land tunnels") (*viz.* Lion Rock Tunnel ("LRT"), Tate's Cairn Tunnel ("TCT") and Eagle's Nest and Sha Tin Heights Tunnel ("Route 8K")). It also proposes the next steps for the study. The geographical locations and tolls of the tunnels concerned are at **Annexes 1 and 2** respectively.

Tunnel Traffic Conditions

2. Among the three RHCs, the weekday morning peak-hour traffic demands for CHT and EHC have already significantly exceeded their respective design capacities by 77% and 38% respectively, causing long traffic queues on their connecting roads. Currently, weekday morning peak-hour traffic demand for WHC is about 90% of its design capacity. In theory, WHC should have room to absorb traffic diverted from CHT and EHC. However, because of congestion on its connecting roads in Central and Sheung Wan, the spare capacity of WHC is constrained and could not be released for diverted traffic until the Central-Wan Chai Bypass ("CWB")¹ is commissioned around end 2018 / early 2019 when the traffic conditions on certain connecting roads are improved. Regarding the three land tunnels, the weekday morning peak-hour traffic demands for LRT and TCT have also exceeded their respective design

¹ CWB will provide an expressway for east-west traffic in Central and Wan Chai to divert the traffic from the existing trunk roads including Connaught Road Central, Harcourt Road and Gloucester Road, and alleviate the existing traffic congestion around Wan Chai North and the Central District of Hong Kong Island.

capacities by 35%² and 38%, resulting in long traffic queues on their connecting roads. While Route 8K is not congested during peak hours, the congestion on Tai Po Road (Sha Tin Section) is constraining the traffic flow to the tunnel. The design capacities and the existing weekday peak-hour traffic conditions (including traffic demands, times for crossing the tunnel³ and traffic queue lengths) are tabulated at **Annex 3**.

3. With improved traffic conditions on its connecting roads, the traffic demand for WHC is expected to increase. Assuming that the existing tolls remain unchanged, and with a continuous growth of the vehicle fleet size, we anticipate that by 2021, the overall weekday morning peak-hour traffic demands (southbound) and evening peak-hour traffic demands (northbound) for the six tunnels will exceed their total design capacity. However, when compared to CHT and EHC, the traffic demand for WHC is anticipated to exceed its design capacity only slightly⁴. Hence, there should be still room to absorb traffic diverted from CHT and EHC.

4. Apart from looking into rationalising traffic distribution through appropriate increases and decreases of tolls of various tunnels, the Government is adopting a multi-pronged approach in tackling road traffic congestion, including commissioning within this year a feasibility study for the Electronic Road Pricing Pilot Scheme in Central and its adjacent areas. The Government will also continue to pursue progressively the series of short-, medium- and long-term measures recommended by the Transport Advisory Committee on easing the problem of road traffic congestion (see **Annex 4** for details), including measures to control the overall growth of vehicle fleet size.

² The weekday evening peak-hour traffic demand for LRT exceeded its capacity by 46%.

³ Refers to the time required to travel from the end of traffic queue to the exit portal of a tunnel.

⁴ Congestion on the connecting roads of WHC is expected to ease with the commissioning of CWB, increasing the traffic demand for WHC with a peak-hour volume to capacity (“v/c”) ratio of slightly higher than 1.0 but below 1.1. V/c ratio is an indicator reflecting the traffic situation during peak hours. A v/c ratio below 1.0 means the situation is acceptable. A v/c ratio above 1.0 indicates the onset of mild congestion. The congestion is manageable if the v/c ratio is between 1.0 and 1.2. A v/c ratio above 1.2 means the congestion is becoming serious.

Toll Rationalisation Study

5. When the Eastern Harbour Crossing Legislation (Amendment) Bill 2015 was passed in May 2016, the Government undertook that after the takeover of EHC, it would commence as soon as possible a study on the overall strategy and feasible options for the rationalisation of traffic distribution among the three RHCs and submit toll adjustment proposals to the Legislative Council (“LegCo”) Panel on Transport (“the Panel”) within the 2017-18 legislative session. According to an assessment by the Transport Department (“TD”), at present, about 15% of the cross-harbour road traffic also uses one of the three land tunnels⁵. Owing to the geographical locations of the tunnels, there is a natural “pairing effect” on the use of the three RHCs and the three land tunnels. For example, the majority of the cross-harbour road traffic coming through LRT prefers CHT over EHC or WHC. Similar tendencies are also observed in the eastern areas (pairing TCT and EHC), and in the western areas (pairing Route 8K and WHC). Noting this pairing effect, TD has commenced a study on the rationalisation of traffic distribution of the three RHCs and the three land tunnels in a holistic manner (“toll rationalisation study”). The aim of the study is to **formulate various proposals to influence the choice of motorists through raising and lowering the tolls of different tunnels in order to rationalise traffic distribution among the six tunnels.**

6. The consultant engaged by TD is developing a transport model for traffic forecasting under different tolling scenarios. This transport model simulates motorists’ choice of tunnels based on the starting points and destinations of journeys, travel times and costs (including tunnel tolls). The travel characteristics of the population of Hong Kong are also taken into account.

7. The consultant collected data through traffic surveys and used big data (real-time car journey time) to supplement traffic survey results to calibrate the transport model. The transport model simulates motorists’ choices of tunnels under scenarios of different toll levels. The consultant has completed traffic queue surveys, and used a smartphone route guidance application to assess real-time journey times. The collected data will be applied to calibrate the travel times for crossing each tunnel as simulated in the transport model. The consultant will continue to fine-tune the transport model to further improve its accuracy. The model will be used for assessing the effects on traffic conditions under different tolling scenarios. Such assessments should provide an objective basis for the formulation of toll adjustment proposals.

⁵ The daily traffic volume that uses both RHCs and land tunnels is about 40 000 for weekdays.

Previous Toll Adjustment Suggestions from the Community

8. There were a number of suggestions raised by the community in the past, including but not limited to the following -

- (a) lower EHC tolls to align with CHT tolls;
- (b) unify the tolls of the three land tunnels by lowering TCT tolls to align with LRT and Route 8K tolls;
- (c) unify the tolls of three RHCs by raising CHT tolls and lowering WHC tolls to align with those of EHC;
- (d) unify the tolls of three RHCs by raising CHT tolls and lowering WHC and EHC tolls; and
- (e) lower the tolls of all six tunnels.

9. According to preliminary assessments using the transport model, the consultant considers that toll adjustment suggestions (a) to (e) above will not be conducive to improving the traffic conditions at tunnels which are already over-utilised during peak hours (i.e. CHT, EHC, LRT and TCT). Overall speaking, compared to the scenario whereby the tolls remain unchanged, it is expected that by 2021, the overall time required to cross the tunnels would be further lengthened under toll adjustment suggestions (a) to (e). Some two million daily tunnel users on weekdays will be affected, incurring substantial social costs. Those suggestions are not considered to be in the public interest. The conclusions from the preliminary assessments are set out in **Annex 5**.

10. There are also suggestions on measures that could remove toll booths, such as completely waiving tunnel tolls, adding Autotoll lanes or mandating electronic tolling, on the premise that those measures could ease congestions at toll booths caused by the need to collect toll payment. We must stress that the root cause for congestion at tunnels is traffic volume significantly exceeding the design capacity of the tunnel tube. As a result, the two or three lanes in the tunnel tube cannot cope with traffic flow funnelling in from multiple lanes of connecting roads. Since the suggestions to **remove toll booths will not increase the capacities of tunnel tubes or divert traffic away from a tunnel**, they would not help alleviate traffic congestion at the tunnels.

Operation and Tolls of WHC

11. Pursuant to the Build-Operate-Transfer (“BOT”) franchise agreement, WHC is currently owned and operated by a private company (i.e. the WHC franchisee) and will revert to Government ownership in August 2023 upon expiry of the BOT franchise. According to the Western Harbour Crossing Ordinance (Cap. 436), before the expiry of the franchise, the WHC franchisee is entitled to increase the statutory tolls for a number of times without the need to seek the Government’s approval. The WHC franchisee is currently providing concessions for all classes of vehicles so that the actual tolls are lower than the statutory tolls. The WHC franchisee may adjust the actual tolls at any time having regard to its business considerations. The Government will discuss with the WHC franchisee the possibility of better utilising the capacity of the tunnel by **providing appropriate subsidisation from the public coffers** so that the actual tolls payable by motorists using WHC can be lowered. Any subsidisation arrangement and amount need to be agreed by the WHC franchisee. At this stage, we **do not preclude the possibility that an agreement could not be reached with the WHC franchisee.**

Proposed Framework for Practicable Toll Adjustment Options

12. As the preliminary findings of the toll rationalisation study indicate that the toll previous adjustment suggestions are not to the overall benefits of the community, we consider that the next steps of the study should be to formulate practicable options. We propose to **explore and develop with LegCo and other stakeholders specific toll adjustment options under the following framework which could meet public aspirations** and achieve traffic rationalisation among the tunnels.

(i) Toll adjustment proposals should not cover individual tunnels only

13. With the pairing effect described in paragraph 5 above, the traffic volume of the three RHCs will affect the usage of the three land tunnels, and vice versa. Therefore, toll adjustment proposals should **cover all the six tunnels in a holistic manner**, and make the best use of the spare capacities of WHC and Route 8K. In the event that an agreement could not be reached with the WHC franchisee on the lowering of WHC tolls through subsidisation, the toll adjustment proposals should cover the remaining five tunnels.

(ii) Tunnels should not be toll-free

14. Generally speaking, tolls or fees of Government tolled tunnels / roads are determined in line with the “cost-recovery” and “user-pays” principles. In determining the toll or fee levels, the Government will take into account a series of factors, including traffic management, costs of the provision of the relevant tunnels / roads (including the capital costs spent), the toll of alternative routes and public affordability and acceptability, etc.

15. If all or some of the six tunnels were made toll-free, significant additional traffic demand could be induced. This could over-stress the tunnels and cause serious traffic congestion on the respective connecting roads. The areas in the vicinity of the connecting roads could be affected. There could also be large-scale grid-locks, resulting in enormous social costs and affecting the economy, public transport passengers as well as residents in the vicinity of the tunnels and their connecting roads. Therefore, the six tunnels cannot be made toll-free.

(iii) Toll of CHT and LRT should be suitably increased

16. CHT and LRT are centrally located with the best connectivity, while charging the lowest tolls among the three RHCs and three land tunnels respectively. In fact, the tolls of CHT and LRT have not been adjusted since 1999. The weekday morning peak-hour traffic demand of CHT and LRT are 4 600 vehicles and 3 500 vehicles respectively, far exceeding their design capacities and causing severe traffic congestion at the two tunnels. There is hence already no room for toll reduction at CHT and LRT.

17. To effectively divert the traffic of CHT and LRT without inducing additional traffic demand, it is necessary to suitably increase the tolls of CHT and LRT, while reducing the tolls of their alternative tunnels at the same time.

(iv) Toll adjustments should focus primarily on private cars, taxis and motorcycles

18. The Government’s transport policy is public transport-oriented with railway as the backbone. Currently, some 12 million passenger trips (or over 90% of the total passenger trips) are made on public transport services every day. Compared to public transport, private cars, motorcycles and taxis are more personalised transport modes, but they contribute to about 73% of the total

tunnel traffic volume⁶. Meanwhile, over the past decade, the average combined annual growth rate of motorcycles and private cars amounted to about 4%. It will hence be more effective to achieve traffic rationalisation if toll adjustments could focus on these types of vehicles. Furthermore, there are public transport modes which may serve as viable alternatives to the majority of users crossing the six tunnels with motorcycles, private cars and taxis. Some may argue that motorcycles should be considered separately since they do not occupy much road space. However, we must point out that, when crossing a tunnel, a motorcycle occupies space on a traffic lane and hence also consumes the capacity of the tunnel tube.

19. On the other hand, goods vehicles contribute to only 19% of the total tunnel traffic. Increasing tolls on goods vehicles would in turn increase goods transportation costs, thus having an adverse impact on the logistics industry. The additional goods transportation costs may eventually be passed onto end-users, hence affecting the community as a whole.

(v) Tolls on fixed route public transport should not be increased

20. Public transport services basically operate on fixed routes⁷ in accordance with operational needs and the choice of tunnels will not be affected by the adjustment of tunnel tolls. Increasing tolls on this type of vehicles will also not result in re-distribution of their traffic among the tunnels. We therefore do not propose to increase tunnel tolls for fixed route public transport vehicles.

(vi) Differential toll levels at different periods may be explored

21. Traffic congestion at the tunnels is much more serious at peak hours than non-peak hours of the day. There is therefore a greater need for traffic rationalisation through toll adjustment at peak hours than non-peak hours. However, charging different toll levels at different time periods on weekdays may cause some motorists to speed up or slow down on purpose near the time of change of toll levels to avoid paying higher tolls. As the traffic volume is higher on weekdays, this may result in operational issues at the tunnels and may even have an adverse impact on the safety of other tunnel users. We hence do not propose to pursue this proposal at this stage. However,

⁶ According to TD's traffic census statistics, in 2016 the traffic volumes of private cars, motorcycles and taxis accounted for 51%, 3% and 20% respectively (i.e. a total of 73%) of the total tunnel traffic volume.

⁷ Except red minibuses which only account for a very small proportion of the total tunnel traffic volume.

if there is consensus in the community, it may be more practicable to consider conducting trials of charging different toll levels on Sundays and public holidays when the traffic volume is lower. In the longer term, we may consider introducing incremental changes to toll levels within a period between peak and non-peak hours when electronic toll collection is fully implemented in future, so as to address the safety issues arising from motorists speeding up or slowing down on purpose near the time of change of toll levels.

(vii) Toll adjustment mechanisms may be explored

22. In the long run, it will be necessary to adjust tunnel tolls on a regular basis to maintain the effects of rationalising traffic distribution among the six tunnels. An effective and fair toll adjustment mechanism should be based on objective parameters such as changes in the traffic flow of the tunnels concerned and/or average time for crossing the tunnels. Any automatic toll adjustment mechanism would need to be effected by way of legislative amendments.

Next Step

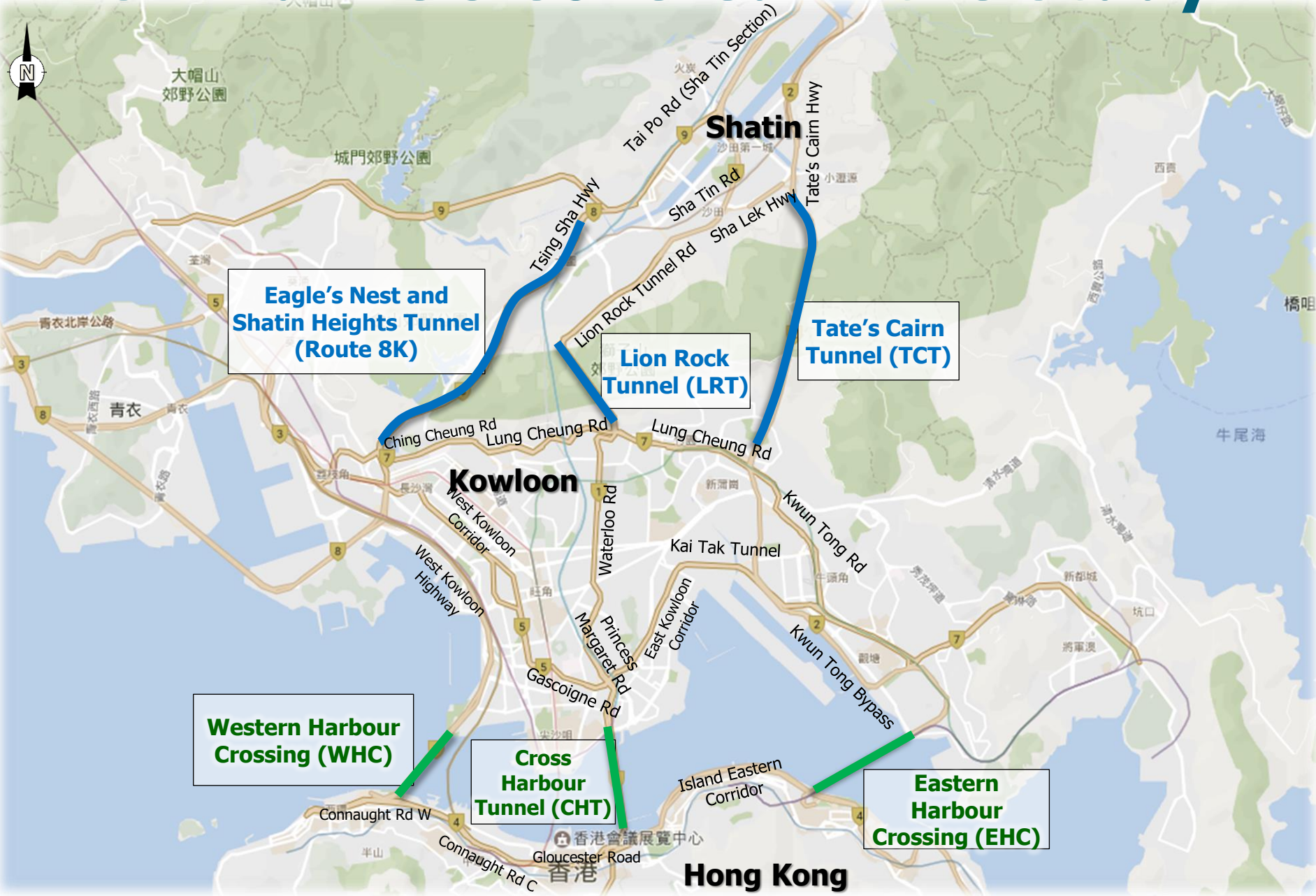
23. Taking into account the views of Members and other stakeholders on the proposed framework as well as the preliminary outcome of discussion with WHC franchisee on subsidisation arrangements, we will formulate different toll adjustment options and further assess the impact of the proposals on tunnel traffic and the community as a whole. We will further consult Members on the specific toll adjustment proposals within this legislative session. If there is community consensus, we will implement toll adjustments for Government tunnels through legislative amendments.

Advice sought

24. Members are invited to note the preliminary findings on the toll rationalisation study and express views on the framework set out in paragraphs 12 to 22 above.

**Transport and Housing Bureau
Transport Department
November 2017**

Six Tunnels Covered in the Study



Existing Toll Levels of the Six Tunnels

Vehicle Type	EHC	CHT	WHC		TCT	LRT	Route 8K
			Statutory Toll	Actual Toll			
Motorcycle	\$13	\$8	\$130	\$25	\$15	\$8	\$8
Private car	\$25	\$20	\$225	\$65	\$20		
Taxi			\$225	\$60			
Public light bus	\$38	\$10	\$270	\$75	\$23		
Private light bus					\$24		
Light goods vehicle			\$15	\$320			
Medium goods vehicle	\$50	\$20	\$490	\$100	\$28		
Heavy goods vehicle	\$75	\$30	\$680	\$130			
Public and private single-decked bus	\$50	\$10	\$270	\$120	\$32		
Public and private double-decked bus	\$75	\$15	\$400	\$170	\$35		

Existing Traffic Conditions at the Six Tunnels

(a) Traffic Demand (Peak-hour and daily)

Traffic Demand (No. of vehicles)	EHC	CHT	WHC	Three RHCs Total	TCT	LRT	Route 8K	Three Land Tunnels Total
Tunnel design capacity (per hour, one-way)	2,600	2,600	4,200	9,400	2,600	2,600	4,700	9,900
Weekday AM southbound traffic demand * (hourly average)	3,600 [138%]	4,600 [177%]	3,800 [90%]	12,000 [128%]	3,600 [138%]	3,500 [135%]	3,700 [79%]	10,800 [109%]
Weekday PM northbound traffic demand * (hourly average)	3,600 [138%]	4,400 [169%]	3,600 [86%]	11,600 [123%]	3,200 [123%]	3,800 [146%]	3,000 [64%]	10,000 [101%]
Tunnel design capacity (per day, two-way)	78,500	78,500	118,000	275,000	78,500	78,500	118,000	275,000
Daily traffic demand (per day, two-way)	76,100 [97%]	116,300 [148%]	68,000 [58%]	260,400 [95%]	58,900 [75%]	93,700 [119%]	54,800 [46%]	207,400 [75%]

* Including traffic flow across tunnel and average traffic queue

[] Figures in brackets denote % of tunnel capacity

(b) Average Peak-hour Traffic Queue and Journey Time
















Average length of traffic queue and time for crossing the tunnel #	EHC	CHT	WHC	TCT	LRT	Route 8K
AM Peak (Southbound)	1.3 km	2.9 km	No observable queue	1.9 km	1.8 km	No observable queue
	14 minutes	31 minutes	3 minutes	26 minutes	17 minutes	5 minutes
PM Peak (Northbound)	1.0 km	3.0 km	No observable queue	1.2 km	1.5 km	No observable queue
	14 minutes	36 minutes	3 minutes	14 minutes	13 minutes	5 minutes

Time required to travel from the end of traffic queue to the exit portal of the tunnel

**The 12 Measures on Road Traffic Congestion
Recommended by the Transport Advisory Committee**

Measures	Proposed Timeframe
I. Short, Medium-term measures	
<i>Managing the Private Car (“PC”) Fleet Size</i>	
1. Raise PC’s First Registration Tax and Annual Licence Fee	Short-term
2. Tighten up standards for environment-friendly petrol PCs	Short-term
3. Raise “fuel levy” for diesel PCs	Short-term
<i>Efficient Use of Limited Road Space</i>	
4. Start planning for a congestion charging pilot scheme	Medium-term
5. Increase meter parking charges	Short-term
<i>Stringent penalty and enforcement of traffic offences</i>	
6. Enhance publicity and education	Short-term
7. Restore deterrent effect of fixed penalty for congestion-related offences	Short-term
8. Strengthen enforcement action	Short-term
9. Make more use of information technology in enforcement	Medium to Long-term
II. Long-term measures	
10. Review parking policy and disseminate real-time information on parking vacancies	Long-term
11. Encourage on-street loading and unloading outside peak hours	Long-term
12. Provide more park-and-ride facilities	Long-term

Previous Toll Adjustment Suggestions from the Community

Toll Adjustment						Forecast peak-hour traffic conditions
EHC	CHT	WHC	TCT	LRT	R8K	
<u>Lower EHC tolls to align with CHT tolls</u>						
	—	—	—	—	—	<ul style="list-style-type: none"> Traffic queues at EHC and TCT will be lengthened Traffic queues at CHT will not be diverted to other road harbour crossings (“RHCs”)
(Aligning with CHT tolls)						
<u>Unify the tolls of the three land tunnels (lower TCT tolls to align with LRT / Route 8K tolls)</u>						
—	—	—		—	—	<ul style="list-style-type: none"> Traffic queues at TCT will be lengthened Traffic queues at LRT will not be diverted to other land tunnels
(Aligning with LRT / Route 8K tolls)						
<u>Unify the tolls of the three RHCs (raise CHT tolls and lower WHC tolls to align with EHC)</u>						
—			—	—	—	<ul style="list-style-type: none"> Traffic queues at EHC, CHT, LRT and TCT will be lengthened Traffic queues will be formed at WHC Traffic queues at CHT will not be diverted to other RHCs
(Aligning with EHC tolls)						
<u>Unify the tolls of the three RHCs (raise CHT tolls and lower WHC and EHC tolls)</u>						
			—	—	—	<ul style="list-style-type: none"> Traffic queues at CHT, EHC, LRT and TCT will be lengthened Traffic queues will be formed at WHC and Route 8K Traffic queues at CHT will not be diverted to other RHCs
(Unifying the tolls of three RHCs)						
<u>Lower the tolls of all six tunnels</u>						
						<ul style="list-style-type: none"> Traffic queues at CHT, EHC, LRT and TCT will be lengthened Traffic queues will be formed at WHC and R8K Traffic queues at CHT and LRT will not be diverted
Legend:  Decrease in tunnel toll  Increase in tunnel toll — No change in tunnel toll						