Consultancy Study on Rationalising the Utilisation of Road Harbour Crossings (RHCs)

Executive Summary of the Final Report

Objective of the Study

1. The principal objective of the Consultancy is to provide advice to the Government on possible options to achieve a better distribution of traffic amongst the three road harbour crossings (RHCs), taking into account, inter alia, the capacity of the connecting road networks and with the least financial burden to public expenditure or Government spending.

Study Method

2. In carrying out the Study, the existing problems at the RHCs were first analysed through data collection and traffic surveys. A transport model was then developed from the previous Third Comprehensive Transport Study (CTS-3) Transport Model and validated for the purpose of this Study. By deploying the transport model, the ideal, tolerable and congested traffic levels of each RHC, taking into account the capacity of their connecting roads, were then estimated.

3. The toll scenarios that may achieve a better distribution of traffic amongst the three RHCs are identified (better toll scenarios), and the feasibility, complexity and pros and cons of the various possible options that may effect the better toll scenarios are evaluated from legal, organisational and financial perspectives, and the feasible implementation options are recommended.

Existing Problem

4. The Cross Harbour Tunnel (CHT) is the most heavily utilised crossing amongst the three RHCs, and congestion at CHT is a long standing problem. CHT has a clear natural advantage given its central location and connectivity. CHT enjoys the best connecting road systems compared to the other two RHCs and hence higher practical capacity levels. This advantage is reinforced by the significantly lower tolls that apply to CHT over the years[1]. During peak hours (which may last from 8 am to at least

[1] CHT's tolls were adjusted upward three times in the past 38 years. The last time that CHT's tolls adjusted upward was in 1999 with only motorcycles and private cars affected.

8 pm), extensive queues are commonly observed at the CHT connecting roads on both sides of the entrances.

5. On the other hand, the motorists using Western Harbour Crossing (WHC) usually experience congestion which is caused, not by the tunnel itself, but by the capacity limitation and physical layout of the connecting road networks. Major bottlenecks during peak periods include the Connaught Road Central/Pedder intersection and the Connaught Road West Flyover where congestion can be very serious with formation of traffic queues blocking the non-cross-harbour-related through traffic.

6. The traffic at CHT (limited by the tunnel capacity) is at congested level[2]. Traffic at WHC (limited by its connecting roads) is at tolerable level[3]. There is not much scope for WHC to take up extra cross-harbour traffic at present because of the constraints of its connecting roads (WHC's capacity will be significantly improved by some 70% upon the completion of the Central-Wanchai Bypass (CWB) in 2017). Eastern Harbour Crossing (EHC) traffic is at ideal level[4], and should have some scope to take up extra traffic from CHT.

7. According to its original design, the connecting roads of WHC included the CWB. With the opening of CWB in 2017[5], it is expected the traffic condition along the corridor of Connaught Road West-Connaught Road Central-Harcourt Road will improve significantly. Queues from Pedder Street Underpass will no longer exist, and there will be a dedicated, additional expressway bringing traffic from WHC southbound exit away from the central areas of the Hong Kong Island, providing substantial relief to the congestion at WHC's connecting roads. WHC will be able to accommodate much more traffic by that time.

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[2] Congested traffic level refers to the level of daily traffic throughput at a particular RHC where queues will be formed and the queues will block through traffic unrelated to cross-harbour movements.

[3] Tolerable traffic level refers to the level of daily traffic throughput at a particular RHC where queues will be formed but the queues will not block the non-cross-harbour-related through traffic.

[4] Ideal traffic level refers to the level of daily traffic throughput at a particular RHC where no queues will be formed.

[5] CWB was first planned in late 1980's, but its implementation was delayed and gazetted in 2007 due to the judicial review and other cases related to the reclamation in Central.

Ideal, Tolerable and Congested Traffic Levels

8. Traffic projections show that if the tolls remain unchanged, CHT will continue to experience traffic congestion in the next two decades. WHC will experience some traffic congestion until the opening of CWB in 2017. Estimates on the ranges of ideal, tolerable and congested traffic levels for the RHCs are set out below:-

RHC	*Timeframe*	*Ideal*	*Tolerable*	*Congested*	*Weekday traffic (per day)*[6]
CHT	Existing	< 110K	110 – 115K	> 115K	122K
EHC	Existing	< 75K	75 – 80K	> 80K	68K
	Route 6 in use (2016)#	< 80K	80 – 85K	> 85K	
WHC	Existing	< 47K	47 – 52K	> 52K	51K
	P2 Road in use (2011)	< 50K	50 – 55K	> 55K	
	CWB in use (2017)#	< 85K	85 – 90K	> 90K	

Based on planning assumptions

Testing of Toll Scenarios

9. Toll adjustment is necessary to achieving a better traffic distribution amongst the three RHCs. A large number of toll scenarios with varying assumptions on which RHC's tolls may be adjusted have been tested using transport modelling. The consultants have also tested variants of different toll structures for CHT, i.e. to keep the present toll structure unchanged, and to modify it to make it closer to its original toll structure or the EHC toll structure, etc (see paragraph 17 below for details).

10. In identifying better toll scenarios, the following two criteria[7] are used: (i) achieve at least 40% of queue reduction at CHT, and (ii) lower or maintain the traffic levels of RHCs to or at the tolerable traffic level.

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[6] Existing traffic conditions refer to the traffic conditions at the beginning of the study period, i.e. at the end of 2008. The updated annual average weekday traffic throughput at CHT, EHC and WHC in 2009 is 122,000, 68,000 and 52,000 respectively.

[7] Additional performance indicators are also used to validate that the better toll scenarios will indeed bring traffic benefits without creating problems or worsen traffic conditions elsewhere, including travel time through CHT, cross-harbour point-to-point journey time, average travel speed in selected districts, assessment of impact on critical junctions and major strategic connecting roads etc.

Toll Scenarios That Cannot Achieve Effective Traffic Re-distribution

11. Equalised tolls scenarios (e.g. with private car toll at $25 in 2011, tolls for other vehicle types are set at the weighted average of their current tolls) and low toll scenarios (with private car tolls at CHT, EHC and WHC at $20, $15 and $30 in 2011 respectively, tolls for other vehicle types are adjusted proportionally) have been tested. They will divert much traffic from CHT to WHC, adding a lot of extra traffic to WHC causing severe and immediate congestion at WHC and the Central and increasing the overall cross-harbour traffic. They do not work. Some examples of the toll scenarios that cannot achieve effective traffic re-distribution are shown in Part II of **Annex**.

12. In particular, the consultants' tests on these toll scenarios show that there are a number of prerequisites or observations relevant to rationalising cross-harbour traffic –

- The extent to which EHC and WHC tolls can be reduced is limited by the capacities of their connecting roads. Adjusting downward WHC toll before 2017 to attract extra cross-habour traffic will cause further congestion at WHC and its connecting roads;

- Equalised toll scenarios would not work as they would result in immediate congestion at WHC connecting roads due to increased traffic flow;

- Low toll scenarios at the three RHCs do not work as they would induce more cross-harbour traffic causing queuing and access problems at tunnel exits;

- Tolls are more effective in rationalising cross-harbour traffic if CHT adopts the EHC's toll structure; and

- Tolls on three RHCs need to be adjusted overtime to maintain the desirable traffic conditions.

Better Toll Scenarios

13. Having tested different toll scenarios, the consultants find that certain toll scenarios work better, and may achieve the criteria mentioned in paragraph 10 above in all or most of the modelling years. These are summarized in Part III of Annex. Most of these better toll scenarios involve upward adjustments to CHT tolls and/or corresponding downward adjustments to

the tolls of the other crossings (primarily EHC). Some of them[8] also involve modifying the toll structure of CHT to make it closer to its original toll structure or that of the EHC. The consultants have examined the possible options which could enable the implementation of better toll scenarios. Toll scenarios which only involve adjustments to CHT tolls[9] may be implemented on their own, i.e. do not have to be combined with any implementation options. If other toll scenarios are to be implemented, they need to be combined with the use of an implementation option. The costs to Government vary to a large extent depending on which toll scenario and implementation option to adopt but generally speaking, the financial implication involved in buy-back or franchise extension will be significantly higher than the rebate or concession option.

14. For example, one of the better toll scenarios (Scenario C2) is to modify both the CHT and EHC toll structures to halfway between the current CHT and EHC toll structures, and adjust upward CHT toll by $5 to $25 for private cars (and introduce proportional increases for other types of vehicles under the modified toll structure) and adjust downward EHC toll by $5 to $20 for private cars (and introduce proportional decreases for other types of vehicles under the modified toll structure), queues at CHT may reduce by over 70%. Another better toll scenario example (Scenario C1) is to adjust tolls at CHT upward by $5 for private cars (and introduce proportional increases for other types of vehicles), and adjust downward the tolls at EHC also by $5 for private cars (and introduce proportional decreases for other types of vehicles), queues at CHT may reduce by about 50%.

15. In addition, compared to maintaining the existing tolls at the RHCs, all the better toll scenarios would generate positive economic benefits to the society as a whole (mainly in terms of savings in travel time and vehicle operating costs such as fuel costs and depreciation of vehicle), ranging between $0.4 and $0.6 billion per annum.

16. Although it is more effective if the CHT toll structure can be modified, even partially, towards that of EHC (such as under Scenario C2), the impact on commercial vehicles will be more significant.

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[8] Examples are toll scenarios A2, A3, B2, B3, C2 and C3 set out in Part III of Annex to the Executive Summary. The modified structures are referred to as '0.5s' and 's' structures in Annex to the Executive Summary. The former comprises toll scenarios A2, B2 and C2; the latter comprises A3, B3, and C3.

[9] Toll scenarios in Group A, i.e. A1, A2 and A3 in Part III of Annex to the Executive Summary refer.

Toll Structure

17. From a purely resource management perspective, the toll on a vehicle class should depend on the amount of resources consumed (e.g. tunnel space and tunnel maintenance cost). This generally means that larger vehicles that consume a larger amount of tunnel resources are subject to higher tolls compared to smaller vehicles that consume fewer resources. In most international toll facilities, tolls are related to vehicle types following this principle[10].

18. In Hong Kong's case, CHT's toll structure currently does not follow the above resource management based principle. In fact, such a principle was observed for CHT when it was first opened to traffic in 1972. The toll structure has however been altered three times over the years, resulting in the current structure where tolls of different vehicle classes are no longer proportional to the resources they consume. The changes over the years are set out in the following table –

	Initial (1972)	**1984**	**1992**	**Now (since 1999)**
Car	$5	$10	$10	$20
Taxi	$5 (1)	$10 (1)	$10 (1)	$10 (0.5)
Light Goods Vehicle (LGV)	$10 (2)	$15 (1.5)	$15 (1.5)	$15 (0.75)
Heavy Goods Vehicle (HGV)	$20 (4)	$25 (2.5)	$30 (3)	$30 (1.5)

( ) toll ratio to car

19. The toll structures of EHC and WHC on the other hand follow more closely the resource management based principle. The current toll structure at CHT, coupled with a lower level of tolls, means there are substantial differences between CHT tolls and tolls of the other crossings especially for larger vehicles. The existing tolls of the three RHCs for certain vehicle types are set out in the following table –

[10] The European Commission in setting rules for toll structures states that the principle "takes better account of the principles of fair and efficient pricing in transport by providing for greater differentiation of tolls and charges in line with costs associated with the road use". The Severn Crossing in the UK LGV (less than 3.5 tons) tolls are double car tolls and HGV (greater than 3.5 tons) are triple car tolls. On the Hudson Crossings between New York and New Jersey, three-axle trucks are charged three times car tolls and four-axle trucks four times.

	CHT	**EHC**	**WHC**
Car	$20	$25	$50
Taxi	$10 (0.5)	$25 (1)	$45 (0.9)
LGV	$15 (0.75)	$38 (1.52)	$60 (1.2)
HGV	$30 (1.5)	$75 (3.0)	$115 (2.3)

( ) toll ratio to car

Evaluation of Implementation Options

20. All possible options that may help the Government gain control over the toll adjustment mechanism of EHC and WHC, such that the better toll scenarios may be effected were examined for their effectiveness and feasibility from legal, organisational and financial perspectives. It needs to be stressed that whichever implementation options to adopt, they need to be combined with a toll adjustment (such as adopting one of the better toll scenarios) to have any effect.

21. Implementation options such as sell CHT to WHC/EHC franchisees, buy-back EHC/WHC, franchise extension, restrict the use of CHT, increase CHT tolls, peak hour surcharge, concession to franchisees and toll rebates to EHC/WHC users have all been examined. Sell CHT to WHC/EHC and peak hour surcharge are considered ineffective in relieving the congestion at CHT. Restrict the use of CHT or increase CHT tolls as a standalone measure may not be considered appropriate or acceptable by the community.

22. Buy-back and franchise extension will involve huge capital outlay or loss in revenue for the Government, which amount to subsidy to EHC and WHC users by public funds. Besides, for the options to work, the Government and the relevant tunnel companies will need to address and agree on certain fundamental parameters, including forecasts of traffic flow and revenue in future, valuation of the assets of the RHCs, expected returns, the toll level and adjustment mechanism in future etc. These issues are highly contentious as they involve subjectivity and assumptions. The franchisees will likely demand premium in exchange for their agreement to franchise extension or buy-back. The negotiations are inevitably extremely difficult and complex, and likely to be protracted. Buy-back EHC/WHC and franchise extension will involve changes to the organisational and management structures of the RHCs.

23. Toll scenario testing further suggests that even if the negotiations on buy-back or franchise extension are successful, low toll scenarios could not be implemented, as they would cause immediate congestion at WHC and even all RHCs as overall cross-harbour traffic increases with the adoption of low tolls.

24. Common ownership, in addition to having some of the difficulties with buy-back and franchise extension, is indeed the most complex option from an organisational and management point of view. It would be extremely difficult to establish a corporate governance structure for the commonly owned entity through which the Government could secure an effective control over the appropriate toll levels for the three RHCs while at the same time balance the commercial interests of other shareholders. If EHC and WHC franchisees were asked not to adjust upward the tolls of EHC and WHC, compensation in form of higher-than-reasonable shareholding and hence toll revenue share might be required.

25. The more feasible implementation options are to provide rebate to tunnel users[11] (increase CHT tolls and provide rebate to EHC and/or WHC users) and provide concession to franchisees[12] (provide concession to New Hong Kong Tunnel Company Limited (NHKTCL) and/or Western Harbour Tunnel Company Limited (WHTCL) in exchange for toll reduction at EHC and/or WHC), especially for the period from now to 2017. Concessions to franchisees (concession option) and toll rebates to EHC/WHC users (rebate option) do not involve any change to the organisational or management structures of the RHCs, but agreements with EHC/WHC franchisees are required. Under these two options, certain parameters have to be agreed upon with the franchisees but the parameters involved would be less contentious comparatively, and they are much more flexible than the options of common ownership, buy-back and franchise extension. They may be implemented within a relatively short period of time. And if these implementation options are adopted to implement the better toll scenarios, it is possible that CHT queues may be reduced by 50% or more. The

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[11] Under the rebate option, the Government may consider increasing the CHT toll and provide a corresponding rebate in the EHC/WHC toll to EHC/WHC users, and implementing the rebate through the EHC/WHC franchisee. The rebate will be provided to EHC/WHC users direct, and the Government will reimburse the EHC/WHC franchisee the rebate provided to EHC/WHC users on basis of actual traffic flow. Agreement of the EHC/WHC franchisee on not to adjust its tolls during the rebate period will be required.

[12] Under the concession option, the Government may consider increasing the CHT toll and reducing the tolls at EHC/WHC. The Government will need to negotiate and reach an agreement with the respective franchisee to lower the tolls at EHC/WHC in exchange for monetary compensation to cover expected loss of profit arising from toll reductions. Agreement needs to be reached on some contentious and subjective parameters and assumptions including traffic projections, expected returns and toll levels.

financial implication to Government of implementing the rebate option varies[13], depending on the better toll scenario to adopt. If toll scenario C1 is to be adopted using the rebate option, for instance, the implication is in the region of tens of millions dollars per annum (estimated cost of about $25 million for the year of 2011).

26. As WHC is severely constrained by its connecting roads, there is little scope to adjust downward its toll level to attract additional traffic flow before the completion of the CWB in 2017 (most of the better toll scenarios involve adjusting upward the toll level of CHT and adjusting downward the toll level of EHC).

27. The ownership of EHC will be returned by EHC's franchisee, NHKTCL, to the Government in 2016, so there seems to be little advantage in buying back EHC (as the negotiations will involve highly contentious and subjective parameters and assumptions including traffic projections, financial projections and expected returns and hence, they are expected to be extremely difficult, complex and protracted), and the Government will be in a stronger position in dealing with WHC's franchisee, WHTCL, after the return of the ownership of EHC.

28. Although the negotiation with NHKTCL and WHTCL on the extension of franchises would be less difficult and complex than the buy-back option in terms of legal, management and organizational arrangements, it is expected that it would be extremely difficult for the Government to reach commercial agreement with the franchisees on the period of extension and new toll levels, because the negotiations will involve highly contentious and subjective parameters and assumptions as in the case of buy-back, e.g. toll levels, the projected traffic flows, adjustment mechanism in future, and financial returns for the extended period. Therefore the case for negotiating with NHKTCL is not a strong one, and the Government will be in a stronger position by postponing the negotiation with WHTCL to 2016, failing other options.

29. Under the concession to WHTCL and NHKTCL option or the concession option, for instance, the Government would increase the CHT toll and request the EHC franchisee to provide a corresponding reduction in EHC toll. The Government would need to negotiate and reach an agreement with the franchisee to lower the tolls by providing financial compensation to cover expected loss of profits arising from toll reductions. Agreement with the franchisee needs to be reached on some contentious and subjective

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[13] The annual financial implication to Government of implementing the rebate option using toll scenarios in Group B and Group C as set out in Part III of Annex ranges from a revenue of $280 million to a cost of $25 million per annum.

parameters and assumptions including traffic projections and expected returns.

30. Under the rebate option, for instance, the Government would increase the CHT toll and provide a corresponding rebate in the EHC toll to EHC users through the EHC franchisee. The rebate will be provided to EHC users direct. The Government will reimburse the EHC/WHC franchisee the rebate provided to EHC/WHC users on basis of actual traffic flow. Agreement of the EHC franchisee on not to adjust its tolls during the rebate period will be required. Compared with buy-back and franchise extension, both the concession option and the rebate option are more flexible as the magnitude and period may be adjusted, and may be implemented within a short period of time.

Recommendations

31. Having considered all the implementation options, the consultants recommends the following measures -

(i) Short to Intermediate Term (2010 – 2013)

- Discuss with the franchisees the implementation option to increase CHT tolls and provide toll rebate to EHC and/or WHC users, i.e. the rebate option.

- Conduct a trial run on the rebate option to test the travel behaviour of RHC users adopting any of the better toll scenarios.

(ii) Intermediate Term (2013 – 2017)

- Continue with Short to Medium Term solution, i.e. the rebate option adopting the better toll scenario that has been tested and produces desirable traffic impact.

- Towards the end of EHC franchise in August 2016, negotiate with WHTCL regarding the implementation of the concession option. At that time, the Government will have a stronger hand in the negotiations with WHTCL. Additionally, the CWB will open to traffic in 2017 whereupon more traffic can be diverted from the CHT to WHC without causing unacceptable traffic problems on the connecting road network, especially along the Connaught Road Central corridor.

(iii) Long Term (2018 – 2023)

- Implement the package of concession or rebate options and implement desirable toll scenario if successfully negotiated with WHTCL.

- Failing that, consider the implementation options of extension of franchise or buy-back.

(iv) Long Term – after 2023

- Implement any of the better toll scenarios, as control of all three RHCs will have been reverted to the Government by that time.

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ANNEX TO EXECUTIVE SUMMARY

Introduction

There are three Parts in this Annex. Part I shows the toll scenario for the Base Case (i.e. existing tolls are maintained). Part II shows examples of the scenarios that cannot achieve effective traffic re-distribution. Part III shows the better toll scenarios.

The better toll scenarios are divided into three groups according to different assumptions, as follows –

- Group A - only Cross Harbour Tunnel (CHT) tolls may be adjusted.

- Group B - tolls of all three tunnels may be adjusted.

- Group C - tolls of CHT and Eastern Harbour Crossing (EHC) may be adjusted.

Each group of scenarios can be further divided into three types according to the relationship between tolls for different vehicle types at the same tunnel (i.e. the toll structure). These are –

- "non-s" type, which retains the current relationships between the tolls for private cars and other vehicle types at each tunnel. The scenarios A1, B1 and C1 are "non-s" type.

- "0.5s" type, which adjusts the toll structure of CHT and/or EHC to halfway between their existing toll structures. Tolls for CHT and EHC under scenarios A2, B2 and C2 belong to "0.5 s" type.

- "s" type, which modifies the current relationships between the tolls for private cars and other vehicle types at CHT to that of EHC. Tolls for CHT under scenarios A3, B3 and C3 belong to "s" type.

Under both "0.5s" and "s" type scenarios, tolls for vehicle types other than private cars will be adjusted more than the percentage change in private car tolls. The following table lists out the toll levels as well as the ratio to car tolls of the various vehicle types at CHT under three types of toll structures: the existing toll structure, "0.5s" structure and "s" structure.

Toll Ratio of all Vehicle Types to Private Car at CHT

Toll Structure	Non-s		0.5s		s	
Vehicle types*	Existing CHT toll structure		Mid-way toll structure at CHT and/or EHC, formulated as a half-way structure between the existing CHT and EHC toll structures		CHT toll structure modified to the existing EHC toll structure	
	Ratio to Car Toll	Toll Levels	Ratio to car toll	Toll Levels	Ratio to car toll	Toll Levels
Car	1.00	$20	1.00	$20	1.00	$20
Taxi	0.50	$10	0.75	$15	1.00	$20
Motorcycle	0.40	$8	0.46	$9	0.52	$10
PLB	0.50	$10	1.01	$20	1.52	$30
LGV	0.75	$15	1.14	$23	1.52	$30
MGV	1.00	$20	1.50	$30	2.00	$40
HGV	1.50	$30	2.25	$45	3.00	$60
Extra Axle	0.50	$10	0.75	$15	1.00	$20
SD	0.50	$10	1.25	$25	2.00	$40
DD	0.75	$15	1.88	$38	3.00	$60

** Vehicle types: Car; Taxi; Motorcycle; PLB - public and private light buses; LGV - light goods vehicles; MGV – medium goods vehicles; HGV – heavy goods vehicles; Extra Axle - each additional axle in excess of two; SD – single decked buses; DD – double decked buses.*

Part I: Tolls for Base Case under each modelling year (i.e. existing tolls are maintained):

Base Case Scenario

Base Case	Toll levels for private car toll ($)			Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC	
2011	20	25	50	**251**
2016	20	25	50	**261**
2021	20	25	50	**281**
2026	20	25	50	**302**

2011 Toll levels ($) for Selected Vehicle Types under Base Case Scenario

Vehicle types	CHT	EHC	WHC
Car	20	25	50
Taxi	10	25	45
LGV	15	38	60
HGV	30	75	115
DD	15	75	128

Part II: Examples of toll scenarios that cannot achieve effective traffic re-distribution and their traffic analysis under each modelling year:

Equalised tolls

	Toll levels for private car toll ($)			% Change of WHC Traffic	% Change of Total Cross Harbour Traffic	
	CHT	EHC	WHC			
2011	25	25	25	+69%	+8%	Ideal Traffic Level Tolerable Traffic Level Congested Traffic Level
2016	30	30	30	+79%	+11%	
2021	35	35	35	+106%	+20%	

Note: private car toll set at $25 in 2011, tolls for other vehicle types are set at the weighted average of their current tolls.

Low toll option (i.e. tolls at EHC and WHC are reduced)

	Toll levels for private car toll ($)			% Change of WHC Traffic	% Change of Total Cross Harbour Traffic	
	CHT	EHC	WHC			
2011	20	15	30	+48%	+9%	Ideal Traffic Level Tolerable Traffic Level Congested Traffic Level
2016	25	20	35	+58%	+12%	
2021	30	25	40	+85%	+19%	

Note: private car tolls at CHT, EHC & WHC are set at $20, $15 and $30 in 2011 respectively, tolls for other vehicle types are adjusted proportionally.

Only adjust toll once

	Toll levels for private car toll ($)			% Change of WHC Traffic	% Change of Total Cross Harbour Traffic	
	CHT	EHC	WHC			
2011	25	20	50	+5%	+4%	Ideal Traffic Level Tolerable Traffic Level Congested Traffic Level
2016	25	20	50	+20%	+9%	
2021	25	20	50	+48%	+17%	

Part III: Toll assumptions and traffic analysis for the better scenarios under each modelling year:

Traffic Analysis of Toll Scenario A1

Toll Scenario A1	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	30	25	50	-63%	**249**
2016	40	25	50	-75%	**261**
2021	40	25	50	-63%	**282**
2026	60	45	70	-63%	**283**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario A1

Vehicle types	CHT	EHC	WHC
Car	30	25	50
Taxi	15	25	45
LGV	23	38	60
HGV	45	75	115
DD	23	75	128

Traffic Analysis of Toll Scenario A2

Toll Scenario A2	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	25(0.5s)	25	50	-67%	**243**
2016	30(0.5s)	25	50	-79%	**256**
2021	35(0.5s)	20(0.5s)	50	-77%	**281**
2026	45(0.5s)	40(0.5s)	60	-79%	**285**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario A2

Vehicle types	CHT	EHC	WHC
Car	25	25	50
Taxi	19	25	45
LGV	28	38	60
HGV	56	75	115
DD	47	75	128

Traffic Analysis of Toll Scenario A3

Toll Scenario A3	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	20s	25	50	-67%	**244**
2016	25s	25	50	-82%	**253**
2021	30s	25	50	-87%	**274**
2026	40s	35	60	-92%	**282**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario A3

Vehicle types	CHT	EHC	WHC
Car	20	25	50
Taxi	20	25	45
LGV	30	38	60
HGV	60	75	115
DD	60	75	128

Traffic Analysis of Toll Scenario B1#

Toll Scenario B1	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	25	20	50	-52%	**250**
2016	35	20	50	-64%	**265**
2021	40	25	50	-63%	**282**
2026	60	45	70	-63%	**283**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario B1

Vehicle types	CHT	EHC	WHC
Car	25	20	50
Taxi	13	20	45
LGV	19	30	60
HGV	38	60	115
DD	19	60	128

Traffic Analysis of Toll Scenario B2#

Toll Scenario B2	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	25(0.5s)	20(0.5s)	50	-77%	**248**
2016	30(0.5s)	20(0.5s)	50	-77%	**260**
2021	35(0.5s)	20(0.5s)	45	-77%	**284**
2026	45(0.5s)	40(0.5s)	60	-79%	**285**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario B2

Vehicle types	CHT	EHC	WHC
Car	25	20	50
Taxi	19	15	45
LGV	28	23	60
HGV	56	45	115
DD	47	38	128

Traffic Analysis of Toll Scenario B3#

Toll Scenario B3	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	20s	20	50	-77%	**245**
2016	25s	20	50	-86%	**257**
2021	30s	20	40	-94%	**281**
2026	40s	35	60	-92%	**282**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario B3

Vehicle types	CHT	EHC	WHC
Car	20	20	50
Taxi	20	20	45
LGV	30	30	60
HGV	60	60	115
DD	60	60	128

Under toll scenarios in Group B (which assume that the Government may control tolls at all three tunnels), it is not desirable to lower tolls at WHC before the opening of the Central-Wanchai Bypass in 2017 because WHC's capacity is limited by its connecting road networks. Reducing the tolls at WHC before then will divert much traffic from CHT to WHC, causing severe and immediate congestion at WHC.

Traffic Analysis of Toll Scenario C1

Toll Scenario C1	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	25	20	50	-52%	**250**
2016	35	20	50	-64%	**265**
2021	40	25	50	-63%	**282**
2026	60	45	70	-63%	**283**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario C1

Vehicle types	CHT	EHC	WHC
Car	25	20	50
Taxi	13	20	45
LGV	19	30	60
HGV	38	60	115
DD	19	60	128

Traffic Analysis of Toll Scenario C2

Toll Scenario C2	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	25(0.5s)	20(0.5s)	50	-77%	**248**
2016	30(0.5s)	20(0.5s)	50	-77%	**260**
2021	35(0.5s)	20(0.5s)	50	-77%	**281**
2026	45(0.5s)	40(0.5s)	60	-79%	**285**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario C2

Vehicle types	CHT	EHC	WHC
Car	25	20	50
Taxi	19	15	45
LGV	28	23	60
HGV	56	45	115
DD	47	38	128

Traffic Analysis of Toll Scenario C3

Toll Scenario C3	Toll levels for private car toll ($)			CHT Queue Reduction (Compared with base year)	Daily Cross Harbour Traffic Flows (in '000)
	CHT	EHC	WHC		
2011	20s	20	50	-77%	**245**
2016	25s	20	50	-86%	**257**
2021	30s	25	50	-87%	**274**
2026	40s	35	60	-92%	**282**

2011 Toll levels ($) for Selected Vehicle Types under Toll Scenario C3

Vehicle types	CHT	EHC	WHC
Car	20	20	50
Taxi	20	20	45
LGV	30	30	60
HGV	60	60	115
DD	60	60	128