

Consultancy Study on Rationalising the Utilisation of Road Harbour Crossings

Consultancy Study Findings

9 November 2010

Meeting of the Panel on Transport of the Legislative Council

Public Consultation on Consultancy Report

- The Government maintains an open-mind on all proposals which may improve distribution of cross-harbour traffic
- We understand that the public may have varying views on the consultants' recommendations
- We will conduct a three-month public consultation exercise on the consultants' recommendations
- Before deciding on the way forward, we would listen to and carefully consider views from the public and relevant stakeholders including Legislative Council Members, the Transport Advisory Committee, the transport trade, road users, and members of the public

Study Objective

- *Identify possible options to achieve the optimum level and distribution of traffic for the three road harbour crossings, namely Cross Harbour Tunnel ("CHT"), Eastern Harbour Crossing ("EHC") and Western Harbour Crossing ("WHC"), taking into account, inter alia, their locations and the capacity of the connecting road networks, and with the least financial burden to public expenditure*

Current Situation and Constraints (1)

CHT (Government owned)

- Central location and best connectivity
- Limited by its capacity
- Low toll levels, not following the resources management principle
- CHT has a flat peak traffic profile between 7:30am -10pm on weekdays
- Queues are formed at the two accesses of the tunnel most of the time

Current Situation and Constraints (2)

WHC (franchise up to August 2023)

- Mainly serves the traffic in the west; traffic on the west expected to grow continuously
- Sufficient capacity in the tunnel itself but limited by its Central-bound exit roads; connecting roads to Tsim Sha Tsui are also under constraint
- Congestion during peak period due to weaving problem on Connaught Rd West Flyover, Connaught Rd Central Underpass bottlenecks (near Pedder St.) and insufficient capacity at junction of Lin Cheung Road and Jordan Road in Jordan
- CWB to be opened in 2017 could help to significantly improve capacity of WHC and its connecting roads by 70%; other improvement schemes (incl. Lin Cheung Road - Austin Road Tunnel) will be implemented at connecting roads to Tsim Sha Tsui
- Limited capacity to absorb traffic from CHT before 2017

WHC Weaving Location – Connaught Rd West Flyover

WHC Constraints

Short-term improvement measures

- To extend the merging distance for near-side lane traffic by shortening the solid white line between the near-side lane and the middle-lane at Connaught Road West Flyover east bound near Shun Tak Centre (from 280m to 160m) in order to minimize the possibility of traffic tailing back to WHC entrance
- To separate the existing two traffic lanes by using double white lines at Connaught Road Central east bound near Man Kat Street; to provide one additional lane at Eastern Street North to assure smoother traffic to Central and Admiralty and increase the traffic flow
- With the extension of P2 Road (which is currently named Lung Wo Road) to Fenwick Pier Street in late 2011, traffic from WHC to Central, Admiralty and Wan Chai can make use of Harcourt Road via P2 Road to Central and Admiralty

Long-term improvement measures

- Traffic can be relieved in a longer term upon the opening of Central-Wanchai Bypass in 2017 (originally in 2001)
- It is expected that the queues at Connaught Road Central Underpass and the Connaught Road West Flyover east bound bottleneck can be relieved and WHC capacity can be increased significantly by 70%

Ideal/Tolerable/Congested Traffic Levels

Based on past experiences and detailed analysis of the present traffic conditions at the three RHCs, the traffic levels for each tunnel may be defined into the three levels below –

- **Ideal** – the level of daily traffic throughput at a particular RHC where no queues will be formed
- **Tolerable** – the level of daily traffic throughput at a particular RHC where queues will be formed but will not block through traffic unrelated to cross harbour movements
- **Congested** – 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

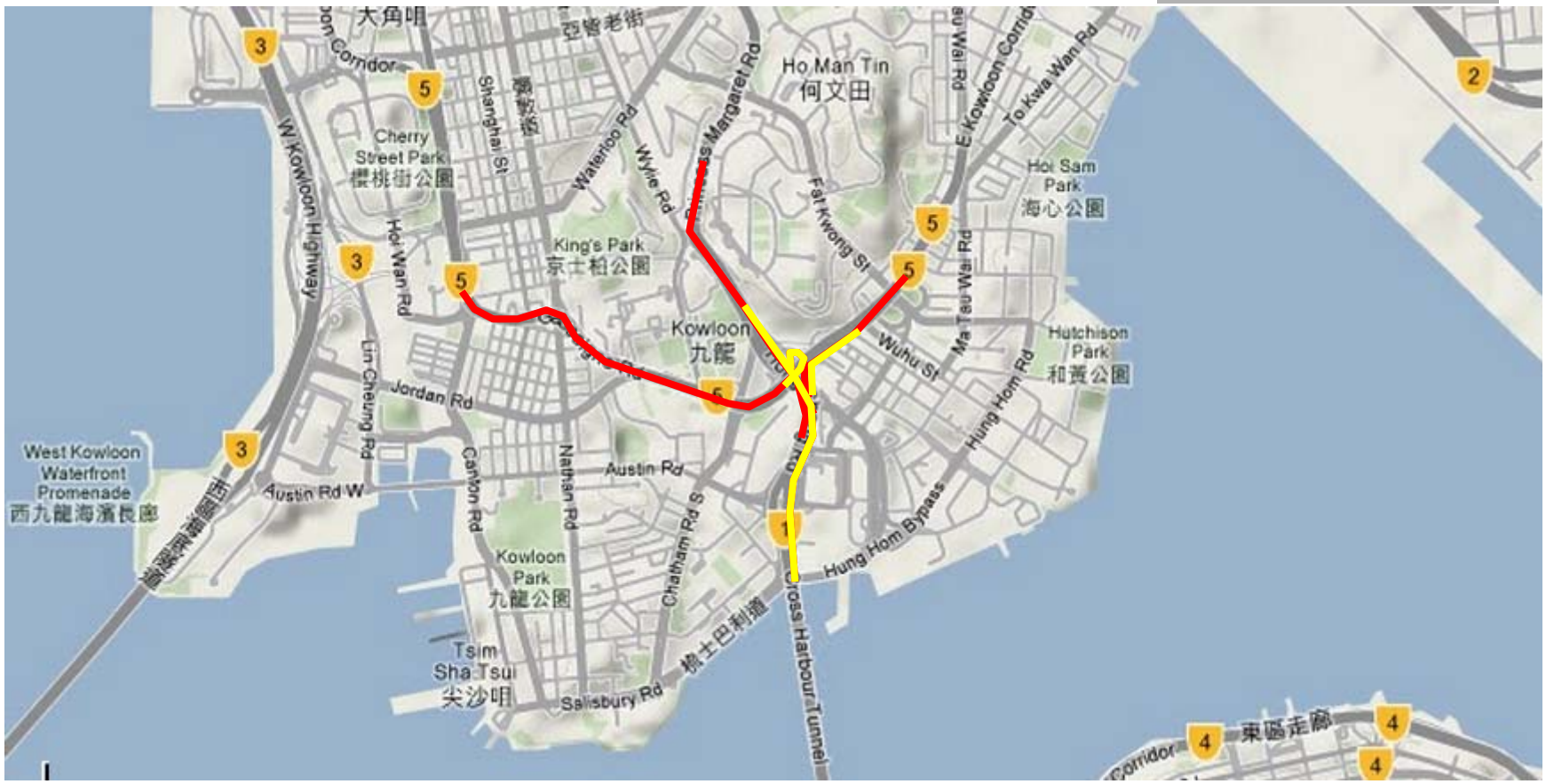
Existing and Ideal Utilisation

	Timeframe	Ideal	Tolerable	Congested	Weekday (Mon-Fri) traffic daily average#
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**
	Rd P2 in use (2011)	< 50K	50 – 55K	> 55K	
	CWB in use (2017)*	< 85K	85 – 90K	> 90K	

 # indicates the data at the beginning of the study period (i.e. Dec 2008); the traffic throughput in 2009 was comparable

** based on planning assumptions*

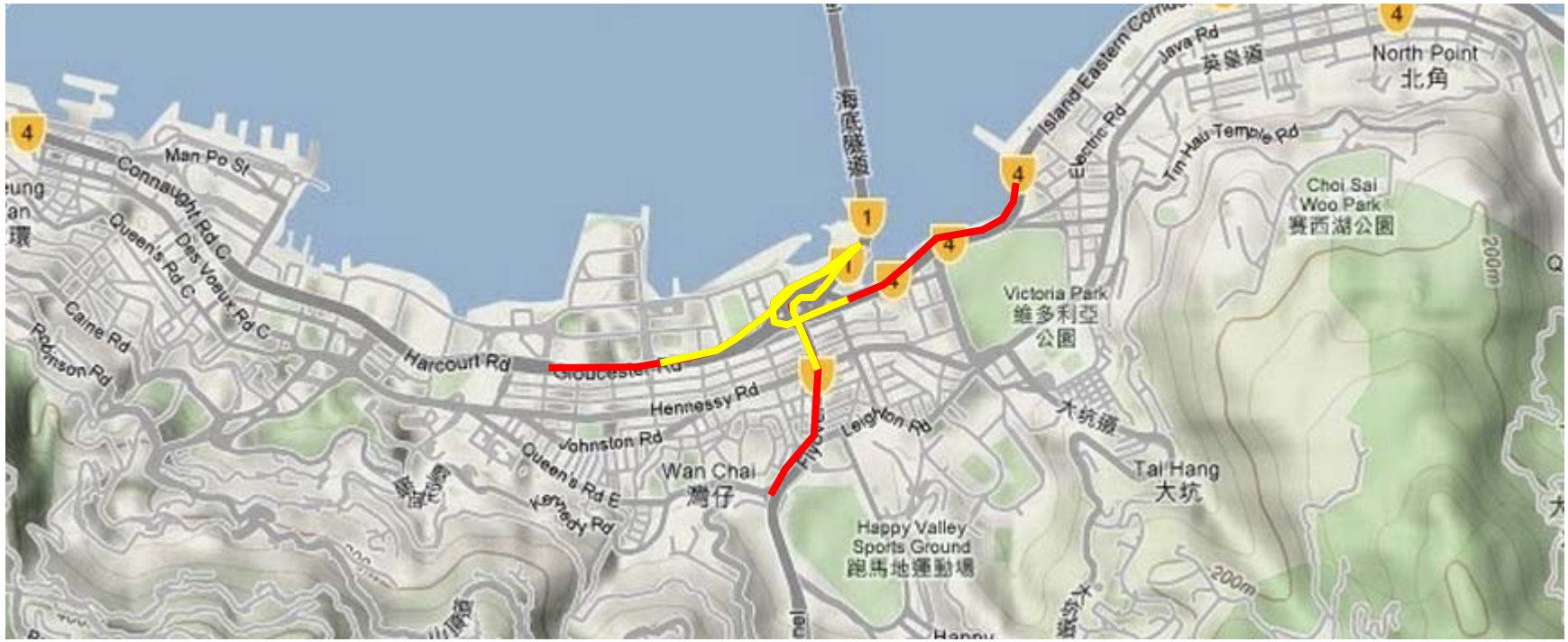
CHT Observed and Tolerable Queue after Improvement (1)



Legend:

- Observed Queue
- Tolerable Queue

CHT Observed and Tolerable Queue after Improvement (2)



Legend:

- Observed Queue
- Tolerable Queue

Forecasts Using Transport Model

- Developed and validated by this study using:
  - Land Use Forecasts
  - Highway and Public Transport Plans
  - Cost and Growth Parameters
  - Flow and Queue Surveys

Toll Scenarios That Cannot Achieve Effective Traffic Re-distribution - Example (1)

Equalized Toll

- Equalized toll scenario for all vehicle types at the three RHCs is not feasible and will lead to heavy congestion at WHC and its connecting roads immediately as WHC traffic will increase by 69% (87,000 veh/day)
- Example: Traffic analysis of the option of equalizing the toll for private cars at $25 and tolls for all other vehicle types being set to the weighted average of the current tolls for all RHCs -

Equalised Tolls					
	CHT	EHC	WHC	Traffic (WHC)	Total Cross Harbour Traffic
2011	25	25	25	69%	+8%
2016	30	30	30	79%	+11%
2021	35	35	35	106%	+20%

Toll Scenarios That Cannot Achieve Effective Traffic Re-distribution - Example (2)

Low Toll Option

- Low toll option for all three RHCs would also increase the total cross-harbour traffic and cause severe congested traffic conditions at WHC and other RHCs. WHC traffic will increase by 48% (76,000 veh/day)
- Example: Traffic analysis of private car tolls at CHT, EHC & WHC being set at $20, $15 and $30 respectively, with tolls for other vehicle types being adjusted proportionally -

Low Toll Option					
	CHT	EHC	WHC	Traffic (WHC)	Total Cross Harbour Traffic
2011	20	15	30	+48%	+9%
2016	25	20	35	+58%	+12%
2021	30	25	40	+85%	+19%

Better Toll Scenarios – Group A

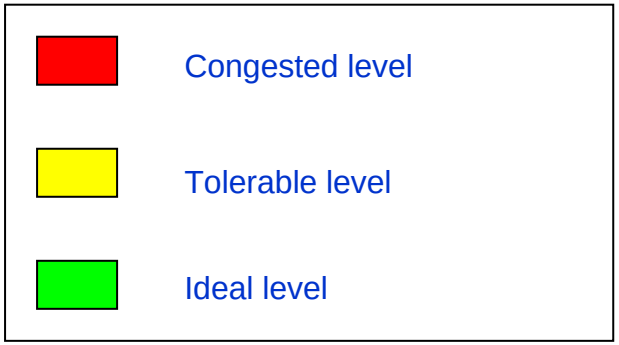
(only change tolls of CHT)

A-1	CHT	EHC	WHC	CHT queue
2011	30	25	50	-63%
2016	40	25	50	-75%
2021	40	25	50	-63%
2026	60	45	70	-63%

A-2	CHT	EHC	WHC	CHT queue
2011	25(0.5s)	25	50	-67%
2016	30(0.5s)	25	50	-79%
2021	35(0.5s)	20(0.5s)	50	-77%
2026	45(0.5s)	40(0.5s)	60	-79%

A-3	CHT	EHC	WHC	CHT queue
2011	20s	25	50	-67%
2016	25s	25	50	-82%
2021	30s	25	50	-87%
2026	40s	35	60	-92%

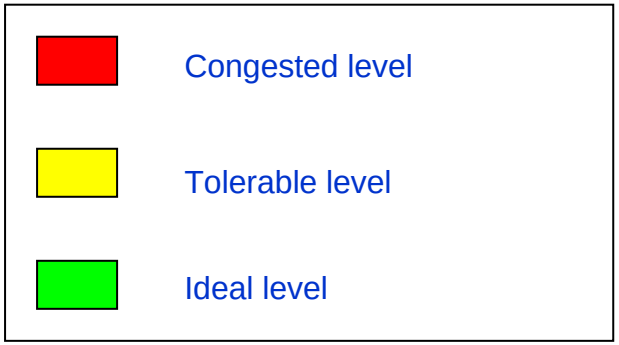
Maintain existing tolls	CHT	EHC	WHC
2011	20	25	50
2016	20	25	50
2021	20	25	50
2026	20	25	50



Better Toll Scenarios – Group B
(change tolls of all three RHCs)

B-1	CHT	EHC	WHC	CHT queue
2011	25	20	50	-52%
2016	35	20	50	-64%
2021	40	25	50	-63%
2026	60	45	70	-63%
B-2	CHT	EHC	WHC	CHT queue
2011	25(0.5s)	20(0.5s)	50	-77%
2016	30(0.5s)	20(0.5s)	50	-77%
2021	35(0.5s)	20(0.5s)	45	-77%
2026	45(0.5s)	40(0.5s)	60	-79%
B-3	CHT	EHC	WHC	CHT queue
2011	20s	20	50	-77%
2016	25s	20	50	-86%
2021	30s	20	40	-94%
2026	40s	35	60	-92%

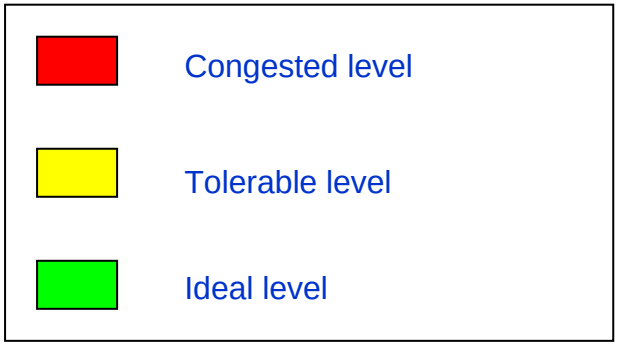
Maintain existing tolls	CHT	EHC	WHC
2011	20	25	50
2016	20	25	50
2021	20	25	50
2026	20	25	50



Better Toll Scenarios – Group C
(only change tolls of CHT & EHC)

C-1	CHT	EHC	WHC	CHT queue
2011	25	20	50	-52%
2016	35	20	50	-64%
2021	40	25	50	-63%
2026	60	45	70	-63%
C-2	CHT	EHC	WHC	CHT queue
2011	25(0.5s)	20(0.5s)	50	-77%
2016	30(0.5s)	20(0.5s)	50	-77%
2021	35(0.5s)	20(0.5s)	50	-77%
2026	45(0.5s)	40(0.5s)	60	-79%
C-3	CHT	EHC	WHC	CHT queue
2011	20s	20	50	-77%
2016	25s	20	50	-86%
2021	30s	25	50	-87%
2026	40s	35	60	-92%

Maintain existing tolls	CHT	EHC	WHC
2011	20	25	50
2016	20	25	50
2021	20	25	50
2026	20	25	50



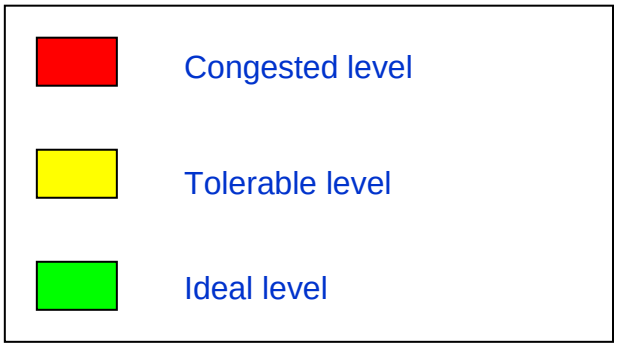
Example of Better Toll Scenario (C1- change tolls of CHT and EHC, but maintain CHT existing toll structure)

C-1	CHT	EHC	WHC	CHT Queue
2011	25	20	50	-52%
2016	35	20	50	-64%
2021	40	25	50	-63%
2026	60	45	70	-63%

Note: The above refers to private car tolls; tolls for other vehicle types will be adjusted proportionally

Maintain existing tolls	CHT	EHC	WHC
2011	20	25	50
2016	20	25	50
2021	20	25	50
2026	20	25	50

- Private car toll of CHT will be increased from $20 to $25 and that of EHC will be reduced from $25 to $20, while tolls for other vehicle types will be adjusted proportionally. Queue at CHT is expected to be reduced by 52-64%



Queue Reduction under Toll Scenario C1

Total queue length at CHT during peak period[1] (including the 6 connecting roads on either side of the harbour)	Equivalent number of vehicles[2] (assuming average length of vehicle is 10 m) (in vehicle)	Queue Length Reduction in %	Peak Period Queue Length Reduction	Peak Period Traffic Flow Reduction (in vehicle)	Average Daily Traffic Flow Reduction (in vehicle)
13.0 km	1,300	52%	6.8 km	680 (16% of daily traffic flow)	4,300

(1): From 7:00 am – 9:00 am (queue calculated based on equivalent single lane configuration)
(2): After taking into account the lengths of larger and smaller vehicles and the space between a vehicle and the one in front

Toll Structure

Current toll structure for some vehicle types at the three RHCs:

	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**)	$115 (**2.3**)

() toll ratio to car

- *Some international toll facilities adopt a resource management based principle in setting the tolls for individual vehicle classes, depending on the amount of resources they consumed (e.g. tunnel space and tunnel maintenance cost). Hence, larger vehicles that consume a larger amount of tunnel resources are subject to higher tolls compared to smaller vehicles that consume fewer such resources. The toll structure of EHC follows more closely this principle*
- *Currently, there is significant difference between the tolls of CHT and EHC, especially for larger vehicles*

Implementation Options for Better Toll Scenarios

- Apart from conducting traffic analysis, the consultancy study also analysed from the financial, organisational and legal perspectives as well as the implication to public expenditure the feasibility of a range of options to implement the better toll scenarios, including –
  - Toll-related options (e.g. increase CHT tolls, peak hour surcharge at CHT, variable toll adjustment mechanism, toll rebate to EHC/WHC users, etc.)
  - Franchise-related options (e.g. buy-back EHC/WHC, common ownership, extension of franchise of EHC/WHC, etc.)
  - Other options (e.g. building a fourth RHC, restricting use of CHT, etc.)

Evaluation of Implementation Options (1)

Peak hour surcharge at CHT

- Traffic flow at CHT consistently at high level for most of the day, i.e. from 7:30 am to 10 pm. Implementing peak hour surcharge will only extend the congestion to other periods (e.g. queues may be formed before 7 am; or possibly extended to until after midnight), unable to relieve the congestion
- Similar to a toll increase if applicable for most of the day
- Relatively high level of surcharge required to divert traffic effectively
- Traffic flow and safety issues during transitional periods – international experience shows that cars may speed through the toll plaza or slow down (even stopping to wait)
- Cannot achieve the desired effect if EHC/WHC franchisees increase their tolls

⇨ Not a feasible option

Evaluation of Implementation Options (2)

Building a fourth RHC

- Existing connecting road networks could not cope with the additional traffic flow brought about by a fourth RHC
- Difficult to acquire suitable land for the ingress/egress and connecting roads of the new tunnel
- There is still surplus capacity for the existing three RHCs on their own, but constrained by the capacity of the connecting roads and undesirable traffic distribution
- Huge capital outlay for the Government, long planning and construction periods, unable to relieve the congestion at CHT in the short to medium term

Restricting use of CHT (e.g. vehicle class or plate no.)

- Significant impact on all tunnel users (especially for the transport trade)
- Vehicles may be forced to travel longer distance to use EHC/WHC, causing congestion elsewhere
- Less equitable to tunnel users with only one car
- Enforcement problem; effectiveness will decrease overtime

⇨ Not a feasible option

Evaluation of Implementation Options (3)

Increase CHT Tolls only

Pros:

- Negotiation with franchisees not needed
- No public expenditure required

Cons:

- Relatively high toll increases required to make an impact
- Change of toll structure, if adopted at the same time, will impact heavily on commercial vehicles
- Obtaining public support could be a challenge
- Cannot achieve the desirable effect if EHC/WHC franchisees increase their tolls in response to the CHT toll increase

⇨ Not recommended to implement on its own, but may be combined with other implementation options

Evaluation of Implementation Options (4)

Buy-back EHC/WHC

Pros:

- Give the Government some control over tolls

Cons:

- Involve major changes to organisational and management structures, legal and contractual issues
- Huge capital outlay for the Government
- Negotiations complicated, difficult and time-consuming
  - Difficult to reach consensus with franchisees on contentious issues including asset valuation of the tunnels, traffic and revenue forecasts and expected returns
  - Franchisees may demand premiums significantly higher than fair market price
- Extent to which WHC tolls can be reduced is limited by the capacities of its connecting roads
- Little benefit in buying-back EHC before the expiry of its franchise (2016)

⇨ Not practicable in short to medium term, may consider pursuing in the long term combined with better toll scenarios

Evaluation of Implementation Options (5)

Common Ownership

Pros:

- Give the Government some control over tolls

Cons:

- Substantial restructuring of organisational and management structures
- Negotiations most complicated, difficult and time-consuming, difficult to reach consensus with franchisees on contentious issues including asset valuation of the tunnels, traffic and revenue forecasts and expected returns
- Not attractive to franchisees if they are asked to give up toll setting autonomy, unless compensated unreasonably high shareholding
- Extent to which WHC tolls can be reduced is limited by the capacities of its connecting roads
- Little benefit in buying-back EHC before the expiry of its franchise (2016)

⇨ Not recommended to implement

Evaluation of Implementation Options (6)

Extension of EHC/WHC franchise in exchange for lower tolls

Pros:

- No impact on existing organisational structures of RHCs
- No public expenditure required

Cons:

- Loss of tunnel revenue for Government
- Negotiations difficult and time-consuming
  - Difficult to reach consensus with franchisees on contentious issues including traffic and revenue forecasts and expected returns
  - Extension period asked by franchisee may be longer than the Government expected due to the use of different assumptions
- Extent to which WHC tolls can be reduced is limited by the capacities of its connecting roads

⇨ Not practicable in short to medium term, may consider pursuing in the long term combining with better toll scenarios

Evaluation of Implementation Options (7)

Concession to franchisees

- Implement lower tolls at EHC/WHC, and increase CHT tolls correspondingly. The Government provides monetary compensation to franchisees to cover expected loss of profit arising from toll reductions

Pros:

- No restructuring required
- Period and magnitude of concessions flexible
- Additional revenue generated from CHT toll increase helps ease the financial burden of the Government

Cons:

- Negotiations with franchisees still involve traffic/financial assessment
  - Some difficulties in determining the magnitude of concessions due to differences in traffic and revenue forecasts adopted by the Government and franchisees
  - Agreement of franchisees not to increase tolls during the concession period required
- Additional compensation for not increasing tolls may be sought by franchisees
- May involve public expenditure

⇨ May consider pursuing combining with better toll scenarios in the intermediate to long term

Evaluation of Implementation Options (8)

Rebate to tunnel users

- Provide rebate to EHC/WHC users to lower EHC/WHC tolls, and increase CHT tolls correspondingly. 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

Pros:

- No restructuring required
- Period and magnitude of rebate most flexible
- Additional revenue generated from CHT toll increase helps ease the financial burden of the Government
- Negotiations with franchisees relatively more objective, as involve fewer assumptions and calculation of toll differences are on basis of actual traffic flow
- May conduct trial run to test the travel behaviour of RHC users

Cons:

- Negotiations and agreement with franchisees not to increase tolls during the rebate period are still required
- May involve public expenditure

⇨ May consider pursuing combining with better toll scenarios

Implementation Option: Concession vs. Rebate

	Concession	Rebate
To Users	• Users of CHT pay higher tolls, users of other RHCs pay lower tolls • Pay same level of tolls under the two options	• Users of CHT pay higher tolls, users of other RHCs receive toll rebate from the Government. The rebate is received through the franchisees in the form of reduction in tolls • Pay same levels of toll under the two options
To the Government	• Pay franchisees difference between expected profit arising from the original tolls and from the reduced tolls, in exchange for the agreement of franchisees to reduce tolls	• Provide rebate to other tunnel users through the franchisees • Pay franchisees the rebate calculated on basis of actual traffic flow on reimbursement basis
To Franchisees	• Receive from the Government difference between expected profit arising from original tolls and from the reduced tolls • Receive lower toll from users	• Assist the Government to provide toll rebate to users by receiving lower toll • Receive from the Government the rebate calculated on basis of actual traffic flow on reimbursement basis

Financial Implications of Rebate to the Government

- Financial implications to the Government in 2011 of implementing the better toll scenarios through “toll rebate” –

	(Million per annum; positive figures represent revenue, negative represent expenditure)
B-1	-25
B-2	+181
B-3	+280
C-1	-25
C-2	+181
C-3	+280

Note: All Group A toll scenarios do not involve rebate to tunnel users as they only assume adjustment to CHT tolls

Economic Benefits

- All better toll scenarios will bring about positive economic benefits, including –
  - Savings in travel costs (e.g. vehicle maintenance costs, fuel costs)
  - Savings in travel time
- Better toll scenarios may bring about economic benefits ranging from **$0.4 billion to $0.6 billion** per year
- Better toll scenarios may also bring about environmental benefits in terms of reduction in emissions and reduction in fuel consumption, etc.

Key Issues

1. According to the findings of the consultancy study, toll adjustment is one of the requisite considerations in achieving better traffic distribution among the three RHCs. The basic principle is to make upward toll adjustment for the congested RHC(s) and downward toll adjustment for the RHC(s) that still have spare capacity.

2. When judging whether an RHC can accommodate the smooth passage of additional traffic flow, instead of focusing on the capacity of the tunnel passage alone, the capacity of its connecting roads at the tunnel exits have to be taken into consideration. Whether there is any room for EHC or WHC to take up extra traffic should be determined on this basis.

Key Issues

3. A number of combinations of toll adjustments (including adjusting the tolls of CHT only, adjusting the tolls of all three RHCs, and adjusting the tolls of CHT and EHC), which should be able to achieve better traffic distribution among the three RHCs and reduce the queues at CHT by at least 50% have been set out. Among these combinations, the option of adjusting the tolls of CHT and EHC appears to be preferable in the short to intermediate term.

4. The combinations of toll adjustment include certain combinations which involve the re-adoption of a resource management based toll structure at CHT in setting the tolls for different vehicle classes. This will better facilitate traffic re-distribution among the three RHCs. Such fine-tuning means the toll adjustment for vehicle classes other than private cars (e.g. commercial vehicles) will be proportionally higher, and they will have to bear higher costs for crossing the harbour, though they will benefit from savings in travel time due to smoother tunnel traffic.

Key Issues

5. A better traffic distribution among the three RHCs and how the tolls of individual RHCs should be set in a complementary manner will require a combination of implementation options or methods, e.g. the Government to provide toll rebate to tunnel users or concession to franchisees, franchise extension or buy-back.

6. Buy-back or franchise extension is considered worth pursuing, failing other options, after 2017 (by then the Central-Wanchai Bypass will have been completed and EHC transferred to the Government).

7. In the short to intermediate term, may consider options for which agreement can be easier to reach with the franchisees and less public expenditure may be incurred, such as toll rebate or concession to franchisees. These options involve negotiation with franchisees and reaching an agreement with them.

Consultancy Study on Rationalising the Utilisation of Road Harbour Crossings

- Questions / Views -