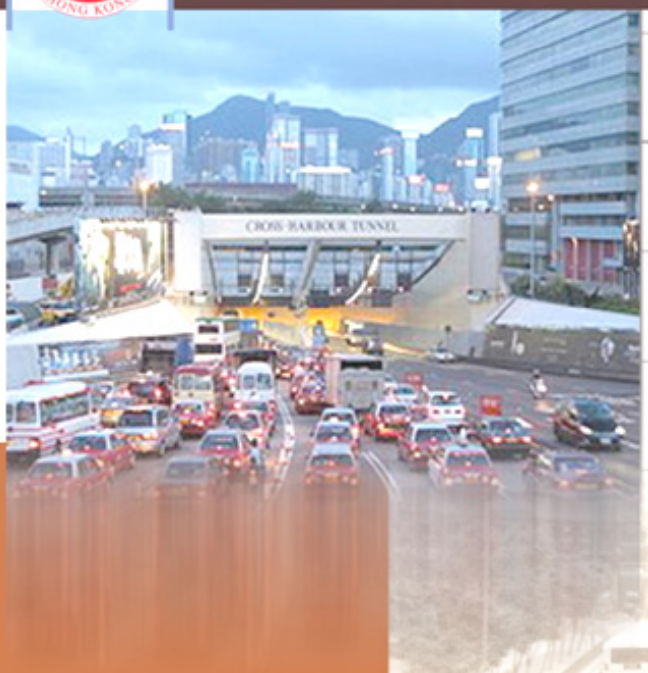
Transport and Housing Bureau
The Government of the Hong Kong SAR



FINAL REPORT

Consultancy Services for Providing Expert Advice on Rationalising the Utilization of Road Harbour Crossings

September 2010

ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES

In Association with

ERNST & YOUNG

Deacons 的近律師行

CONSULTANCY SERVICES FOR PROVIDING EXPERT ADVICE ON RATIONALISING THE UTILISATION OF ROAD HARBOUR CROSSINGS

FINAL REPORT

September 2010

WILBUR SMITH ASSOCIATES LIMITED

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure **Title** **Page**

LIST OF APPENDICES

Title

Abbreviations

ALS	Area Licensing Scheme
Authority	For the purposes of the RT Ordinance, the Commissioner for Transport
Base Date	31 December 2008
Base Year	Year 2008
BOT	Build-Operate-Transfer
BTO	Build-Transfer-Operate
Business Interruption Event	A Business Interruption Event will occur if: (i) HKSAR Government certifies in any Facilities Operation Report that any Tolled Facility operated below its Operational Capacity on 90 or more Relevant Days in any period of 180 consecutive days ending on the Collection Date immediately before the Facilities Operation Report Date on which such FOR is delivered (which 180-day period shall be the "BIE Affected Period" for such Business Interruption Event); and/or (ii) HKSAR Government certifies in any FOR that any Operator has failed to remit to HKSAR Government any amount actually payable (after the conclusion of any applicable dispute resolution procedures set out in the relevant MOM Agreement) under the relevant MOM Agreement for any reason (including, without limitation, failure by the operator of the Autotoll system to remit such amount to the relevant Operator) and HKSAR Government falls to recover such amount prior to the last day of Collection Period in which such amount was payable (which Collection Period shall be the "BIE Affected Period" for such Business Interruption Event); and (iii) The Net Toll Revenues for the relevant BIE Affected Period, when compared against BIE Reference Revenue Amount, have fallen by the BIE Specified Amount or more
CBD	Central Business District
CHT	The Cross Harbour Tunnel
CHHL	The Cross-Harbour (Holdings) Ltd.
CITIC	CITIC Pacific Ltd.
Collection Period	The period starting on, and including, one Collection Period End Date (or, in the case of the first Collection Period, 1 May 2004) and ending on, but excluding, the next following Collection Period End Date
Collection Period End Date	The first day of March, June, September and December of each year after the Issue Date
CPTC	California Private Transportation Company
CTS-3	Third Comprehensive Transport Study
CWB	Central-Wan Chai Bypass
DD	Public and private double-decked buses
Direct Payment Event	A Business Interruption Event, a Toll Adjustment Event or an Operator Services Event
Direct Payment(s)	The additional payment(s) (before any adjustment) that HKSAR Government is obliged to make to the TRB Account on Direct Payment Date(s)
Downward Toll Adjustment	The reduction of the toll level for any Tolled Facility
EHC	The Eastern Harbour Crossing
EHC Ordinance	The Eastern Harbour Crossing Ordinance (Cap. 215)
EHC Project Agreement	The agreement between NHKTCL and the Government in relation to the operation of the EHC
ETC	Electronic Toll Collection

E&Y	Ernst & Young Transactions Limited
Extra Axle	Each additional axle in excess of two
Facilities Operation Report or FOR	A report in the form set out in Schedule 3 (Form of Facilities Operation Report) of the TRB Subscription Agreement and to be delivered by HKSAR Government on each Facilities Operation Report Date in accordance with Clause 13 (Facilities Operation Reports) of the TRB Subscription Agreement
Fund	The WHC Toll Stability Fund established pursuant to section 37 of the WHC Ordinance
Fyxx	Financial year ended 31 August 20xx for CHT Financial year ended 31 December 20xx for NHKTC Financial year ended 31 July 20xx for WHC FY refers to financial year and the financial year end of CHT, NHKTC and WHC is different
GDP	Gross Domestic Product
GFC	Global Finance Crisis
GIS	Geographical Information System
Gross Toll Revenue	With respect to any Tolled Facility for any specified period, the aggregate during such period of: (a) The Tolls collected in respect of such Tolled Facility prior to any deduction which the Operator of such Tolled Facility is entitled to make under the relevant MOM Agreement; (b) Other amounts paid by the Operator to Government under such MOM Agreement; and (c) Any amounts paid to Government under any Operator Credit Facility in respect of such Tolled Facility.
GV	Goods vehicle
Hedge Provider	Any person (in its capacity as swap counterparty) who enters into a Swap Agreement and either a Credit Support Deed or a Credit Support Annex with the Issuer and accedes to the Transaction Administration Agreement and the Deed of Charge, as contemplated in Clause 16 (Swap Arrangements) of the TRB Subscription Agreement
HGV	Heavy goods vehicles, special purpose vehicle (other than an articulated vehicle) of a permitted gross vehicle weight exceeding 24 tonnes
HK$	Hong Kong dollar, the currency of Hong Kong
HKSAR Government, or the Government	The Government of Hong Kong Special Administrative Region
Interpretation Ordinance	The Interpretation and General Clauses Ordinance (Cap. 1)
IRR	Internal Rate of Return
Issue Date	7 May 2004, the date Toll Revenue Bond was issued.
Issuer	Hong Kong Link 2004 Limited, a limited liability company incorporated in Hong Kong and whose registered office is at 12/F, West Wing, Central Government Offices, Central, Hong Kong
ITS	Intelligent Transport System
LegCo	the Legislative Council of the Hong Kong SAR
LGV	Light goods vehicles, special purpose vehicle of a permitted gross vehicle weight not exceeding 5.5 tonnes
MOM	Management, Operation and Maintenance
MC	Motor cycles, motor tricycles
MGV	Medium goods vehicles, special purpose vehicle (other than an articulated vehicle) of a permitted gross vehicle weight exceeding 5.5 tonnes but not exceeding 24 tonnes

MOM Agreement	With respect to any Tolled Facility, the management-operation-maintenance agreement under which the Operator of such Tolled Facility was appointed
Net Toll Revenues	The sum of: (a) the Tolls from the operation of each Tolled Facility other than the Lantau Link less operating fees and expenses payable pursuant to the relevant MOM Agreements to the Operators of such Tolled Facilities; plus (b) the amount by which the Tolls from the operation of the Lantau Link less fees and expenses (excluding amounts in respect of the cost of Non-Scheduled Maintenance Works) payable pursuant to the relevant MOM Agreement on account of the Lantau Link exceeds HK$20,000,000 in any financial year (or, in the case of the first year after the Issue Date, the period from 1 May 2004 to 31 March 2005); plus (c) all amounts received by HKSAR Government under the Operator Credit Facilities; plus (d) all insurance proceeds received by HKSAR Government under any policy taken out pursuant to the MOM Agreements; minus (e) an amount in respect of certain historic maintenance costs of the Tsing Ma Control Area equal to, in the first 12 months after the Issue Date, HK$2,200,000 each month; in the second 12 months after the Issue Date, HK$3,300,000 each month and, in the third 12 months after the Issue Date, HK$3,700,000 each month. and, in relation to any Toll Revenue Deposit Date, means the Net Toll Revenues to be deposited by HKSAR Government in the Collection Account on such Toll Revenue Deposit Date pursuant to Clause 14.2.2 of the TRB Subscription Agreement
NEWCO	New Company
NHKTCL	The New Hong Kong Tunnel Company Limited, being the franchisee of the EHC
NOPAT	Net operating profit after tax
OCTA	Orange County Transportation Authority
Operator	With respect to any Tolled Facility, the entity appointed by HKSAR Government to provide management, operation and maintenance services in respect of such Tolled Facility, including, without limitation, the collection of Tolls, and, for the avoidance of doubt, this definition shall include any department or combination of departments of HKSAR Government which may be appointed to manage, operate and maintain such Tolled Facility in circumstances where the fees, costs or expenses of such department or combination of departments may be deducted from the Gross Toll Revenue of such Tolled Facility
Operator Services Event	An Operator Services Event will occur if: (i) The amount properly deducted from the Gross Toll Revenue by the Operator of the relevant Tolled Facility under its MOM Agreement (other than, in the case of the MOM Agreement for the Lantau Link, in respect of the costs of Non-Scheduled Maintenance Works) increases by more than 20% in any period of three consecutive months or, in the case of the Tsing Ma Control Area, twelve consecutive moths (the "OSE Affected Period") following the MOM Agreement Amendment Date by comparison with the three months or, as the case may be, twelve month period corresponding to the OSE Affected Period in the year immediately prior to the MOM Agreement Amendment Date; and (ii) HKSAR Government certifies that, having regard to the substance and effect of the entire agreement, the new or amended MOM Agreement contains terms which: (a) Make more onerous the scope of the maintenance and servicing works for which the Operator is responsible; (b) Make more onerous the standard to which the Operator is required to

	perform its services (other than as a result of changes to applicable standards of care which are imposed by any law or regulation applying to the Operators or the Tolled Facilities); or (c) Increase the cost of the method by which the Operator is required or permitted to perform its obligations under the MOM Agreement; and (iii) The Net Toll Revenues for the relevant OSE Affected Period, when compared against the OSE Reference Revenue Amount, have fallen by the OSE Specified Amount or more
PLB	Public and private light buses
Principal Accumulation Account	The interest-bearing HK dollar denominated account (account name Hong Kong Link 2004 Limited – Principal Accumulation Account) in the name of the Issuer at the Account Bank and/or such other HK dollar denominated account as the Trustee may approve as a replacement for or in addition to such account
Principal Paying Agent	The Hongkong and Shanghai Banking Corporation Limited at its Specified Office or, if applicable, any successor paying agent which shall be appointed as principal paying agent pursuant to the provisions of the Agency Agreement and notice of whose appointment has been given to the Holders pursuant to the Conditions
Project Agreements	The WHC Project Agreement and the EHC Project Agreement
Prospectus	The prospectus published in relation to the Issuer and the Retail Bonds on 19 April 2004
R&D Department	Research and Development Department
Reference Agent	The Hongkong and Shanghai Banking Corporation Limited at its Specified Office or such other reference agent for the Notes and the Retail Bonds as may from time to time be appointed by the Issuer pursuant to the Agency Agreement and notice of whose appointment has been given to the Holders in accordance with the Conditions
Retail Bonds	The Tranche A Retail Bonds, the Tranche B Retail Bonds and the Tranche C Retail Bonds and "Retail Bond" means any of them
Road Harbour Crossing, RHC	Either or all of the CHT, WHC and/or EHC
RT Ordinance	The Road Tunnels (Government) Ordinance (Cap. 368)
RT Regulations	The Road Tunnels (Government) Regulations (Cap. 368 sub. leg. A)
SCC	State Corporation Commission of the Virginia State Government in USA
SD	Public and private single-decked buses
Secretary	The Secretary for Transport and Housing (for and on behalf of the Government)
SPB	Special purpose buses
Swap Agreement	Any 1992 ISDA Master Agreement and schedule thereto and a confirmation detailing an interest rate transaction entered into as contemplated in Clause 16 (Swap Arrangements) of the TRB Subscription Agreement
TA Report	A report in the form set out in of the Second Schedule (Form of TA Report) to the Transaction Administration Agreement and to be delivered by the Transaction Administrator in respect of each Collection Period pursuant to Clause 6.5 (TA Reports) of the Transaction Administration Agreement
TAC	Transport Advisory Committee
TAE Affected Period	The meaning set out in Clause 10.1 (Toll Adjustment Events) of the TRB Subscription Agreement: A Toll Adjustment Event will occur if, in any period of three consecutive months following a Downward Toll Adjustment or any period of six consecutive months following an Upward Toll Adjustment

TAE Reference Revenue Amount	With respect to any Toll Adjustment Event, the sum of the Net Toll Revenues and any Direct Payment Amounts received during the three or, as the case may be, six month period corresponding to the TAE Affected Period in the year immediately preceding the relevant Toll adjustment, provided that no TAE Direct Payment Amount made in respect of any TAE Affected Period occurring after the first anniversary of such Toll Adjustment Event, shall exceed the amount of any TAE Direct Payment Amount made in respect of the corresponding three or, as the case may be, six month period in the first year after such Toll adjustment
TBTA	Triborough Bridge and Tunnel Authority
Toll Adjustment	An Upward Toll Adjustment or, as the context may require, a Downward Toll Adjustment
Toll Adjustment Event	A Toll Adjustment Event will occur if, in a TAE Affected Period: (i) the Gross Toll Revenue for the Tolled Facility affected by the relevant Toll Adjustment falls by 10% or more by comparison with the equivalent period in the year before the relevant Toll Adjustment; and (ii) the Net Toll Revenues for the relevant TAE Affected Period, when compared against the TAE Reference Revenue Amount, have fallen by the TAE Specified Amount or more.
Toll Revenue Bond, or TRB	The HK$6,000,000,000 variable rate Toll Revenue Bond to be issued by HKSAR Government on the Issue Date
Tolled Facilities	Tolled Facilities (each a "Tolled Facility") comprise: The Cross-Harbour Tunnel, the Shing Mun Tunnels, the Tseung Kwan O Tunnel, the Aberdeen Tunnel, the Lion Rock Tunnel, and the Lantau Link
Tolls	With respect to each Tolled Facility, all revenues (including auto-tolls received using the Autotoll system; fees and charges stipulated under the Road Tunnels (Government) Ordinance (Cap. 368) or, as the case may be, the Tsing Ma Control Area Ordinance (Cap. 498); the proceeds of the sale of pre-paid tickets; advertising revenues; and any damages payable by the Operators under the MOM Agreement for such Tolled Facility, but excluding any statutory fines or financial penalties; taxes; water charges or levies under the Waterworks Ordinance (Cap. 102) or any other charges or levies (other than tolls) imposed by statute and any amount which is reimbursable by HKSAR Government to the relevant Operator under the relevant MOM Agreement for such Tolled Facility in respect of amounts which such Operator has previously over-paid to HKSAR Government and any amounts calculated by HKSAR Government as having been over-paid to the Collection Account following reconciliation of the amounts remitted by the Operator to HKSAR Government against the amounts transferred by HKSAR Government into the Collection Account) received by HKSAR Government, the Relevant Operator or HKSAR Government's agents from the operation of such Tolled Facility
TPEDM	Territorial Population and Employment Data Matrices
Transaction Administration Agreement	The transaction administration agreement dated on or about 7 May 2004 between HKSAR Government, the Issuer, the Transaction Administrator, the Trustee, the Principal Paying Agent, the Reference Agent and each Hedge Provider (upon its accession to such deed of charge as contemplated in Clause 16 (Swap Arrangements) of the TRB Subscription Agreement)
Transaction Administrator	The Hongkong and Shanghai Banking Corporation Limited, acting in its capacity as transaction administrator, and includes any successor, permitted assign or replacement therefore in that capacity pursuant to the terms of the Transaction Administrator Agreement
Transport Planning Team, or WSA	Wilbur Smith Associates Ltd

TRB Account	The interest bearing HK dollar denominated account (account name Hong Kong Link 2004 Limited – TRB Account) in the name of the Issuer at the Account Bank and/or such other HK dollar denominated account as the Trustee may approve as a replacement for or in addition to such account
TRB Interest Amount	With respect to any TRB Interest Period, an amount equal to the product of Principal Amount Outstanding of the Toll Revenue Bond on the first day of such TRB Interest Period multiplied by the TRB Interest Rate for such TRB Interest Period, rounding the result to the nearest cent (half a cent being rounded upwards).
TRB Maturity Date	The TRB Payment Date falling in May 2016
TRB Payment Date	The second Business Day before each Note Payment Date
TRB Subscription Agreement	The subscription agreement in respect of the Toll Revenue Bond made between HKSAR Government, the Issuer, the Trustee and the Transaction Administrator on or about 7 May 2004
Trust Deed	The trust deed to be dated on or about 7 May 2004 entered into by the Issuer and the Trustee
Trustee, or HSBC	HSBC Trustee (Hong Kong) Limited in its capacity as trustee under the Trust Deed and the Deed of Charge and, wherever the context so admits, such expression shall include such entity and all other persons from time to time acting in that capacity
Tunnel Entities	Refers to New Hong Kong Tunnel Company Limited and Western Harbour Tunnel Company Limited
Tunnel Ordinances	The RT Ordinance, WHC Ordinance and EHC Ordinance;
Upward Toll Adjustment	The increase of the toll level for any Tolled Facility or the imposition of any tax or levy specifically directed at motorists of tolled roads in Hong Kong generally (including the Tolled Facilities)
Value	Equity Value
Valuation Date	31 December 2008
WHC Project Agreement	The agreement between WHTCL and the Secretary in relation to the operation of the WHC; and
WHC	Western Harbour Crossing
WHC Ordinance	The Western Harbour Crossing Ordinance (Cap. 436)
WHTCL	The Western Harbour Tunnel Company Limited, being the franchisee of the WHC
XH	Cross Harbour

1 BACKGROUND AND INTRODUCTION

1.1 Background

1.1.1 At present, there are three road harbour crossings ("RHCs") in Hong Kong. They are the Cross Harbour Tunnel ("CHT"), Eastern Harbour Crossing ("EHC") and Western Harbour Crossing ("WHC"). Initially awarded and operated as a "Build, Operate and Transfer" project, the ownership of the CHT was transferred to the Government upon the expiry of the franchise in September 1999. The New Hong Kong Tunnel Company Limited ("NHKTCL") is granted a 30-year franchise to operate EHC until August 2016. The Western Harbour Tunnel Company Limited ("WHTCL") is granted a 30-year franchise to operate WHC until August 2023.

1.1.2 The three RHCs connect Hong Kong with Kowloon Peninsula at the following points:

- The CHT connects Wan Chai/Causeway Bay with Hung Hum
- The EHC connects Quarry Bay with Yau Tong
- The WHC connects Sheung Wan with Jordan

1.1.3 Due to the differences in their locations, connectivity and toll levels, the distribution of traffic among the three road harbour crossings has been undesirable. CHT has a clear natural advantage over the other two crossings given its central location and connectivity, which means shorter journeys, convenience and lower fuel costs for its users. This advantage is reinforced by the significantly lower toll that applies to CHT over the years.

1.1.4 Consequently, the CHT is the most heavily utilised of all three road harbour crossings, with an all-day throughput of about 122,000 vehicles[1] which greatly exceeds its design capacity of 78,500 vehicles / day. The CHT and the approach roads leading to it are congested for a good part of the day. It is considered desirable in traffic terms to divert some of the CHT traffic to the other two crossings.

1.2 Introduction

1.2.1 Against this background, the Government of Hong Kong Special Administrative Region (the Government) appointed Wilbur Smith Associates Limited (WSA) together with its financial and legal sub-consultants, Ernst & Young (E&Y) and Deacons, to provide "Consultancy Services for Providing Expert Advice on Rationalising the Utilisation of Road Harbour Crossings" in November 2008.

1.2.2 The principal objective of the Consultancy is to provide advice to the Government by identifying possible options to achieve a better traffic distribution among the 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.

[1] The CHT is well connected with primary road distributors to the east, west and central on both entrances

1.2.3 Toll adjustments are envisaged to be a prerequisite to redistribution of traffic among the three RHCs and appropriate toll scenarios required will be identified in the first place. The second important task of this Consultancy Study is to provide a comprehensive analysis of the possible implementation options to ensure that the traffic benefits to the public could be materialised.

1.2.4 The overall scope and major tasks of the Consultancy are shown in Table 1-1.

Table 1-1 Consultancy Scope and Tasks

Consultancy Scope	Descriptions
(a)	➢ Develop and maintain a validated transport model to produce traffic forecasts and conduct sensitivity tests for all road harbour crossings, as well as for their respective connecting roads, under different toll scenarios and toll adjustment mechanisms. ➢ Conduct traffic forecasts and analyse the traffic situation over time, taking into account, among other things, the availability of any new transport infrastructure, such as Central-Wan Chai Bypass ("CWB") and Sha Tin to Central Link. ➢ Produce traffic forecasts up to 2040 or otherwise to be advised by the Government. The tasks to be performed should include the following: - To carry out traffic surveys at the adjacent roads leading to and from CHT, WHC and EHC; - To review and assess the existing traffic conditions at CHT, WHC and EHC, as well as their connecting roads; - To develop and validate a transport model to produce simulated traffic and transport demand matching satisfactorily the observed traffic conditions for the base year 2008. - To apply the validated transport model to produce traffic forecasts for the design years 2011, 2016, 2021, 2026 and 2031. For the purpose of evaluating the revenue generated from different options, produce traffic projections for CHT, WHC and EHC for the intervening years between 2011 and 2031 by interpolating the traffic forecasts from the transport model, and for those beyond 2031 by extrapolation; and - To assess the traffic impact on the adjacent roads leading to and from CHT, WHC and EHC under different toll scenarios and toll adjustment mechanisms.
(b)	➢ Examine the revenue implications of different toll scenarios and toll adjustment mechanisms.
(c)	➢ Advise on the better toll regime for each of the implementation options, taking into account the tolerable level of traffic at the respective crossings and their connecting roads (which may vary over time due to the availability of new transport infrastructures, such as the

Consultancy Scope	Descriptions
	CWB and Sha Tin to Central Link), to ensure that the financial and traffic benefits to the public are maximised while also making commercial sense to the franchisees of EHC and WHC. ➢ Advise on the timing for implementation. ➢ The better toll regime should comprise an adjustment mechanism specifying the magnitude and timing for any further toll variations that may be required to cater for the changing traffic situations and needs.
(d)	➢ Develop and maintain a financial model to evaluate the financial implications of different implementation options, including the financial implications of the 2004 Securitisation of the Government tolled tunnels (including CHT) and bridge revenues, such as the likelihood, size and duration of any direct payments by the Government to meet shortfall in toll revenues be reduced as a result of any "Business Interruption Events", "Toll Adjustment Events" or "Operator Services Events", each as defined or referred to in the Prospectus for the Securitization dated 19 April 2004.
(e)	➢ Value CHT, EHC and WHC as separate entities and their respective assets under different toll scenarios and implementation options.
(f)	➢ Advise on the better management and organizational structure of any new entity that may need to be set up in order to implement the relevant toll scenarios.
(g)	➢ Identify the legal constraints on or obstacles to the implementation of the relevant measures under the existing enabling Ordinances for the three crossings, project agreements between Government and the franchisees of EHC and WHC, etc.
(h)	➢ Research into and advise on international experiences in relation to the Consultancy.

1.3 Report Structure

1.3.1 Following this introductory chapter, the Final Report is structured as follows:

- Chapter 2 –includes an overview of the methodology adopted in identifying and assessing the possible solutions
- Chapter 3 – identifies the existing problem of undesirable traffic distribution among the three RHCs and discusses the implications of the previous suggestion on rationalising the utilisation of road harbour crossings.

- Chapter 4 –recapitulate the results of traffic forecasts and traffic impact on the adjacent roads leading to and from CHT, WHC and EHC under different toll scenarios and toll adjustment mechanisms

- Chapter 5 - identifies the legal constraints on/obstacles to the implementation of the better toll scenarios and implementation options under the existing enabling Ordinances for the three crossings, project agreements between Government and franchisees of EHC and WHC etc. and, where appropriate, provides suggestions for the better management and organisational structures of the new entities that would be required in order to implement the relevant toll scenarios.

- Chapter 6 – provides the financial analysis on the valuation of the EHC and WHC as of 31 December 2008 (the "Valuation Date") based on the traffic and revenue results obtained from the traffic model under the better toll scenarios.

- Chapter 7 – presents our assessment of the performance of the better toll scenarios, and evaluation of the feasibility of the implementation options available to the Government.

2 STUDY METHODOLOGY

2.1 Overview of methodology

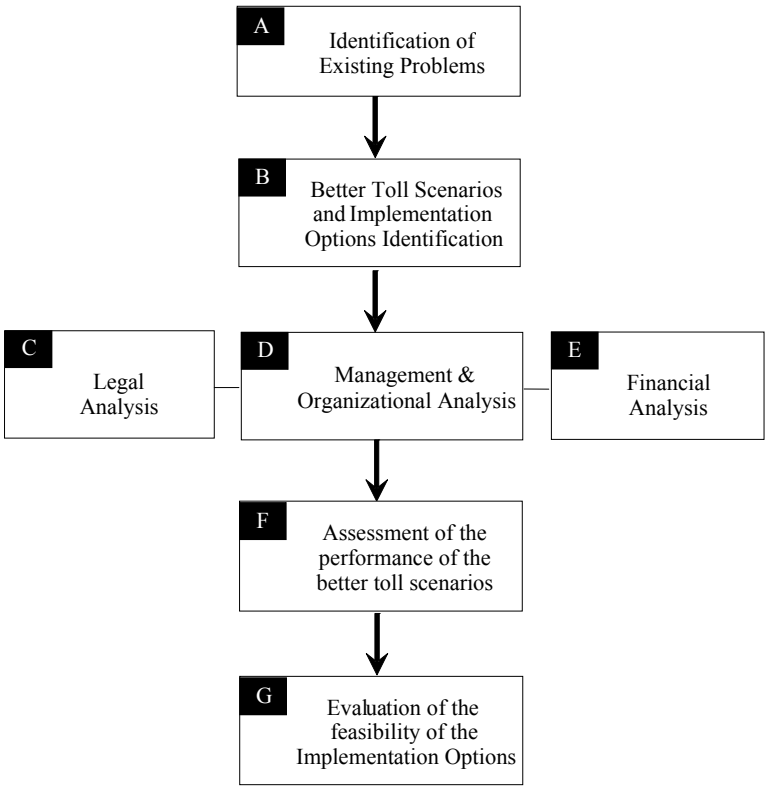
2.1.1 The methodology developed for this study is driven largely by the objective of identifying and assessing possible solutions to address the problem of undesirable traffic distribution across the three RHCs.

2.1.2 Although it is believed that, from traffic demand management's perspective, adjusting the tolls at the respective crossings is expected to be an effective means to achieve a better distribution of traffic across the three RHCs, with the tunnels currently owned by three different parties in both the public and private sectors, and that the EHC and WHC are governed by the tunnel ordinances, in order to identify possible solutions that can address the traffic problems and more importantly be implementable in practice, our methodology covers analysis on traffic, financial, management and organisation, and legal, which are the relevant factors that are essential to be considered when identifying effective solutions to achieve a better traffic result.

2.1.3 This section provides an overview of the methodology adopted in this report to identify and assess possible solutions which may help address the current problem of undesirable traffic distribution among the three RHCs. It also illustrates how each of the individual components of the study and their outcomes are inter-related to each other.

2.1.4 The methodology is divided into seven stages, as illustrated in Figure 2-1.

Figure 2-1 Overview of Study Methodology



2.2 7-stage Study Methodology

2.2.1 Stage A – Identification of Existing Problems

Stage A aims to identify the existing traffic problems at the RHCs. Most of this is around the collection of relevant data and carry out traffic count/queue surveys at the three RHCs and their vicinity area, followed by analysing the causes of the existing problems.

2.2.2 Stage B – Better Toll Scenarios and Implementation Options Identification

Based on the outcomes from Stage A, a set of preliminary toll-related scenarios has been identified, and traffic analysis have been undertaken to examine the traffic impacts under the different toll scenarios. Stage B involves the update of the CTS-3 Traffic model, toll scenario testing and identification of the better toll scenarios.

2.2.2.1 In order to implement the better toll scenarios, we have provided a basis in giving advice and assisting the Government in making decision on the possible implementation options available to the Government regarding CHT and the Tunnel Entities, including:

- Increase CHT tolls
- Peak hour surcharge at CHT
- Restrict use of CHT
- Sell CHT to WHC/EHC franchisees
- Buy-back EHC and/or WHC
- Extension of EHC and/or WHC franchises
- Provision of concessions to EHC and/or WHC franchises
- Forming a common ownership of CHT, EHC and/or WHC
- Increase CHT tolls and rebate to EHC and WHC users

2.2.2.2 At this stage, a set of proposals with different combinations of better toll scenarios and implementation options available to Government regarding CHT and the Tunnel Entities will be developed for further analysis.

2.2.3 Stage C – Legal Analysis

2.2.3.1 Stage C is to identify the legal constraints on / obstacles to the implementation of the different proposals, under the existing enabling Ordinances for the three RHCs, project agreements between the Government and the franchisees of EHC and WHC.

2.2.4 Stage D – Management & Organisational Analysis

2.2.4.1 At Stage D, the key success factors based on the measures of the various proposals will be defined, and the corresponding impact on management and organizational structure will be assessed. The high-level management and organizational structure of the new entities will be devised, if considered necessary to be set up in order to implement the various proposals.

2.2.5 Stage E – Financial Analysis

2.2.5.1 In order to examine the financial implications of the better toll scenarios under the different implementation options, financial models are developed to:

- Value CHT, EHC and WHC as separate entities and their respective assets under different measures and circumstances for the better toll scenarios
- Evaluate the financial implications of the different toll scenarios

2.2.5.2 The financial analysis will provide a basis in deciding on the possible implementation options available to the Government regarding CHT and the Tunnel Entities.

2.2.6 Stage F – Assessment of the performance of the better toll scenarios

2.2.6.1 In order to assess the performance of the better toll scenarios, the benefits and/or disbenefits of different better toll scenarios to the overall traffic conditions will be compared and evaluated against the objectives and goals of each of these toll scenarios.

- Extent to which the proposal achieves a more desirable level of traffic (i.e. at least within tolerable level) at the three tunnels
- Effectiveness to improve overall traffic conditions
- The level of financial burden to public expenditure or Government spending required to implement such proposals
- Certainty of outcome
- Ease of implementation (from legal, management and operational perspectives)

2.2.7 Stage G – Evaluation of the feasibility of the implementation options

2.2.7.1 The better toll scenarios identified can only be implemented if they combine with the implementation options available to the Government, in order to form meaningful proposals. Detailed analysis of the implementation options, including legal, management and organisational structure and financial implication of implementing each of the option will be conducted. The pros and cons of each implementation option will be considered and studied carefully.

2.2.7.2 Finally, the level of difficulty and implementability of each of the implementation options will be evaluated. The feasibility of these implementation options will be explored.

3 IDENTIFICATION OF EXISTING PROBLEMS

3.1 Existing[2] Problems

3.1.1 The undesirable distribution of traffic among the three RHCs, and the congestion at CHT is a long standing problem.

3.1.2 The CHT is the most heavily utilized of all three RHCs. There are congestions at both ends of the tunnel and vehicles have to line up for their turn to go into the tunnel for a good part of the day. During peak periods, extensive queues are commonly observed at the CHT connecting roads on both sides of the entrances, e.g. Canal Road Flyover, Gloucester Road Eastbound and Victoria Park Road/Island Eastern Corridor on the Hong Kong Island side; and Chatham Road North, Princess Margaret Road and Gascoigne Road/Chatham Road South on the Kowloon side. The average queue lengths observed at the beginning of the study at the CHT entrances during peak periods are illustrated graphically in Figure 3-1 below:

Figure 3-1 Observed average queue length

[2] "Existing" refers to the condition at the beginning of the study period, i.e. at the end of 2008. The same word which appears throughout Chapter 3 carries the same meaning.

3.1.3 The motorists using EHC and WHC usually experience congestion which is caused, not by the tunnels themselves, but by the capacity limitation and physical layout of the wider road networks.

3.1.4 For example, during the morning peak period, it is not unusual for EHC users to experience congestion which is usually caused by its approach roads, e.g. Kwun Tong Bypass near Lei Yue Mun Interchange, which forms a bottleneck. Also, the tunnel leaving traffic on the Hong Kong Island sometimes experience minor congestion along Island Eastern Corridor.

3.1.5 As for WHC users leaving the tunnel on the Hong Kong Island and travelling towards Central District, they often experience worse traffic conditions compared to those experienced by EHC users. During peak periods, congestion is always present at the eastbound corridor along Connaught Road West, Connaught Road Central and Harcourt Road. In particular, the Connaught Road Central/Pedder Street intersection is considered to be a major bottleneck in the area and queues are often observed at the Pedder Street Underpass.

3.1.6 On weekdays, the queue caused by traffic along this corridor extends back to Connaught Road West Flyover where traffic leaving WHC merges with traffic from Kennedy Town to Central District and it would occupy the nearside lane of Connaught Road West Flyover. Among this traffic, those heading towards Central (exclude Central North), Admiralty and Wan Chai have to merge from the nearside lane into the mainstream traffic originated from the Island Western area, prior to entering into Pedder Street Underpass. The traffic lanes at the merging point are effectively reduced from 3 lanes to 2 lanes, thus creates a bottleneck at Connaught Road West Flyover and constraining the throughput of WHC. WHC traffic is blocked and queuing back to a point near Sun Yat Sen Memorial Park is not uncommon.

3.1.7 Therefore, the capabilities of the tunnels in accommodating cross harbour traffic are not merely dependent on the tunnel design capacities. The capacities of the road networks connecting the three crossings should also be considered and taken into account. Otherwise there is a risk that, although a better distribution of cross harbour traffic through the tunnels can be achieved, worse congestions are however created at some of the connecting roads of the tunnels.

3.2 Implications of the existing traffic conditions[3] on ideal traffic levels across the three RHCs

3.2.1 When considering the existing traffic conditions at the three RHCs and their existing traffic throughput together, there are some important implications on the ideal traffic levels across the three tunnels that can be identified.

Table 3-1 Existing Traffic Throughput

Tunnel	Existing traffic throughput[4] (weekday traffic, veh/day)	Existing traffic conditions
CHT	122,000	➢ Severe congestion at entrances and approach roads on both sides of the tunnel for most part of the day.
EHC	68,000	➢ Good traffic condition within tunnel. During the morning peak period, EHC users experience congestion which is usually caused by its approach roads e.g. Kwun Tong Bypass near Kai Tin Road / Lei Yue Mun Road Roundabout, which forms a bottleneck.

[3] 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.

[4] Rounding to the nearest thousand.

Tunnel	Existing traffic throughput[4] (weekday traffic, veh/day)	Existing traffic conditions
		➢ The tunnel leaving traffic on the Hong Kong Island sometimes experience minor congestion along Island Eastern Corridor.
WHC	51,000	➢ Good traffic condition within tunnel and at tunnel's immediate approaches. ➢ During peak periods, WHC users leaving the tunnel on the Hong Kong Island usually experience severe congestion along Connaught Road West – Harcourt Road Corridor, caused by overloading of this corridor. On some days where traffic condition is worse than usual, queue is formed at Connaught Road West Flyover where WHC traffic merges with traffic from Kennedy Town.

3.2.2 Table 3-1 above relates the traffic throughput across the three tunnels to the traffic conditions at the tunnels and their vicinities.

3.2.3 There are on average 241,000 cross harbour vehicular trips per day, with CHT carrying the bulk of cross harbour traffic (51%), followed by EHC (28%) and WHC (21%). The problem of undesirable traffic distribution across the three tunnels is a serious issue. The severe congestion at CHT is costing the Hong Kong economy, and diverting some traffic from CHT to the other two tunnels will achieve greater economic efficiency and bring convenience to motorists.

3.3 Diversion of traffic from CHT to EHC and WHC

3.3.1 If the tunnels were isolated and not part of the wider road network, an ideal traffic condition would be considered as: the traffic level at each of the tunnels is comfortably below their respective design capacities and that the distribution of the cross harbour traffic is based on the relative design capacity of the tunnels.

3.3.2 In reality, the three tunnels are part of the wider road network. Therefore, in addition to their design capacities the ideal traffic levels going through them are also constrained by the capacities of their connecting roads. This is a very important point to note, and can be elaborated further by referencing the information presented in Table 3-1.

3.3.3 Given that the designed daily capacities of the CHT, EHC and WHC are 78,500, 78,500 and 118,000 vehicles respectively, only CHT is operating over its design capacity by 43,500 vehicle trips. It may seem that the current problem of congestion at CHT could simply be solved by diverting traffic to EHC and WHC, each of which has a spare capacity of around 10,500 vehicles/day and 67,000 vehicles/day respectively. However, as pointed out earlier, the eastbound corridor along Connaught Road West- Connaught Road Central-Harcourt Road

is already very congested during peak hours, and queues sometimes form on Connaught Road West Flyover where WHC users merge with the traffic from Kennedy Town. If more cross harbour trips are diverted to WHC, the congestion along this corridor will only accentuate. Taking this into consideration, the number of cross harbour vehicle trips that can realistically be accommodated by WHC and its connecting roads at present is in fact much less than the WHC's design capacity. On the other hand, from past experiences, EHC can accommodate up to 80,000 vehicle trips per day without causing too many problems on its connecting roads.

3.3.4 This implies that, whilst it is feasible to divert some cross harbour trips from CHT to EHC, there is not much scope for WHC to take up extra cross harbour trips at present because of the constraints of its connecting roads.

3.3.5 This implication also suggests that it will be extremely difficult to bring the daily cross harbour trips through CHT down to its design capacity of 78,500.

3.3.6 However, this does not mean that the problems of undesirable traffic distribution at the three RHCs and the congestion at CHT cannot be addressed at all. By diverting some cross harbour vehicle trips from CHT to EHC, and a small number of cross harbour vehicle trips from CHT to WHC, the severe congestion at CHT should be alleviated to a visible extent without creating severe traffic problems on the road network elsewhere.

3.3.7 Based on past experiences, detailed analysis of the existing traffic conditions at the three RHCs and their vicinities, the ranges of traffic throughput for each of the tunnels are defined under three levels: Ideal, Tolerable and Congested.

- Ideal traffic level refers to the level of daily traffic throughput at a particular RHC where no queues will be formed
- Tolerable traffic level refers to the level of daily traffic throughput at a particular RHC where queues will be formed but the queues are tolerable, i.e. they will not block the non-cross-harbour-related through traffic.
- 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 the non-cross-harbour-related, through traffic.

3.3.8 Using these definitions as the basis, the Ideal/Tolerable/Congested traffic levels (vehicles/day) under existing restraints for each of the three RHCs are set out in Table 3-2.

Table 3-2 Ideal/Tolerable/Congested Traffic Levels (vehicles/day) Under Existing Restraints

Tunnel	Ideal traffic levels	Tolerable traffic levels	Congested traffic levels
CHT	< 110k	110k – 115k	> 115k
EHC	< 75k	75k – 80k	> 80k
WHC	< 47k	47k – 52k	> 52k

3.3.9 The Ideal /Tolerable/Congested traffic levels of the three tunnels are not fixed over time, but will vary when transport infrastructure is improved in the vicinity of the tunnels.

3.3.10 Upon the extension of Road P2 to Fenwick Pier Street in late 2011, there will be an alternative route for WHC traffic to access Central (excluding Central North), Admiralty and Wan Chai (excluding Wan Chai North) by keeping traveling along the nearside lane of Connaught Road West Flyover to Road P2 and turning back to Harcourt Road (ground level) via Edinburgh Place. However, this alternative route is longer in distance and less direct, and will still be blocked by the merging traffic on Connaught Road West Flyover. Hence the benefit to increasing WHC throughput will not be significant.

3.3.11 With the opening of CWB in 2017, it is expected that the traffic condition along the eastbound corridor of Connaught Road West-Connaught Road Central-Harcourt Road will improve. In particular, the lane discipline on Connaught Road West Flyover would be changed. WHC traffic no longer needs to weave to the middle or fast lane. Traffic coming from Hill Road/Shing Sai Road and Connaught Road West would have to weave to the nearside lane to gain access to Central and Admiralty via Road P2. The ground level condition of Connaught Road and Pedder Street Underpass would be improved. Hence, some Hill Road/Shing Sai Road and Connaught Road West traffic may choose to use ground level road instead of Connaught Road West Flyover. The number of cross harbour trips accommodated by WHC and its connecting roads can be increased significantly.

3.3.12 Upon the opening of Route 6 in 2016, the bottleneck at Kai Tin Road / Lei Yue Mun Road Roundabout that governs the throughput of existing traffic using the EHC will be alleviated, which would provide extra accesses to the EHC tunnel portal from T2 Road and Tseung Kwan O-Lam Tin Tunnel of Route 6. This would relieve the pressure at the area of Kai Tin Road / Lei Yue Mun Road Roundabout and will also serve as an alternative route for the existing Tseung Kwan O Tunnel. Table 3-3 summarises the Ideal/Tolerable/Congested traffic levels of EHC and WHC, given the major changes in transport infrastructure in their vicinity.

Table 3-3 Ideal/Tolerable/Congested traffic levels of EHC and WHC, given the major changes in transport infrastructure in their vicinities

Tunnel	Network assumptions	Ideal traffic levels	Tolerable traffic levels	Congested traffic levels
EHC	After the opening of Route 6 in 2016*	< 80k	80k – 85k	> 85k
WHC	After the opening of Road P2 in late 2011	< 50k	50k – 55k	> 55k
	After the opening of CWB in 2017*	< 85k	85k – 90k	> 90k

* based on planning assumptions

3.3.13 In addition to using tolerable traffic levels as the benchmark for traffic diversion, the queues at the entrance to CHT are also used as a benchmark.

3.3.14 Queue length is highly visible and is also one of the major factors which are relevant to users' perception of the level of service at the road harbour crossings. Therefore the queues building up at the entrance to CHT are also used as a benchmark. The queues are measured in metres and from the tunnel entrance where queues start to build up.

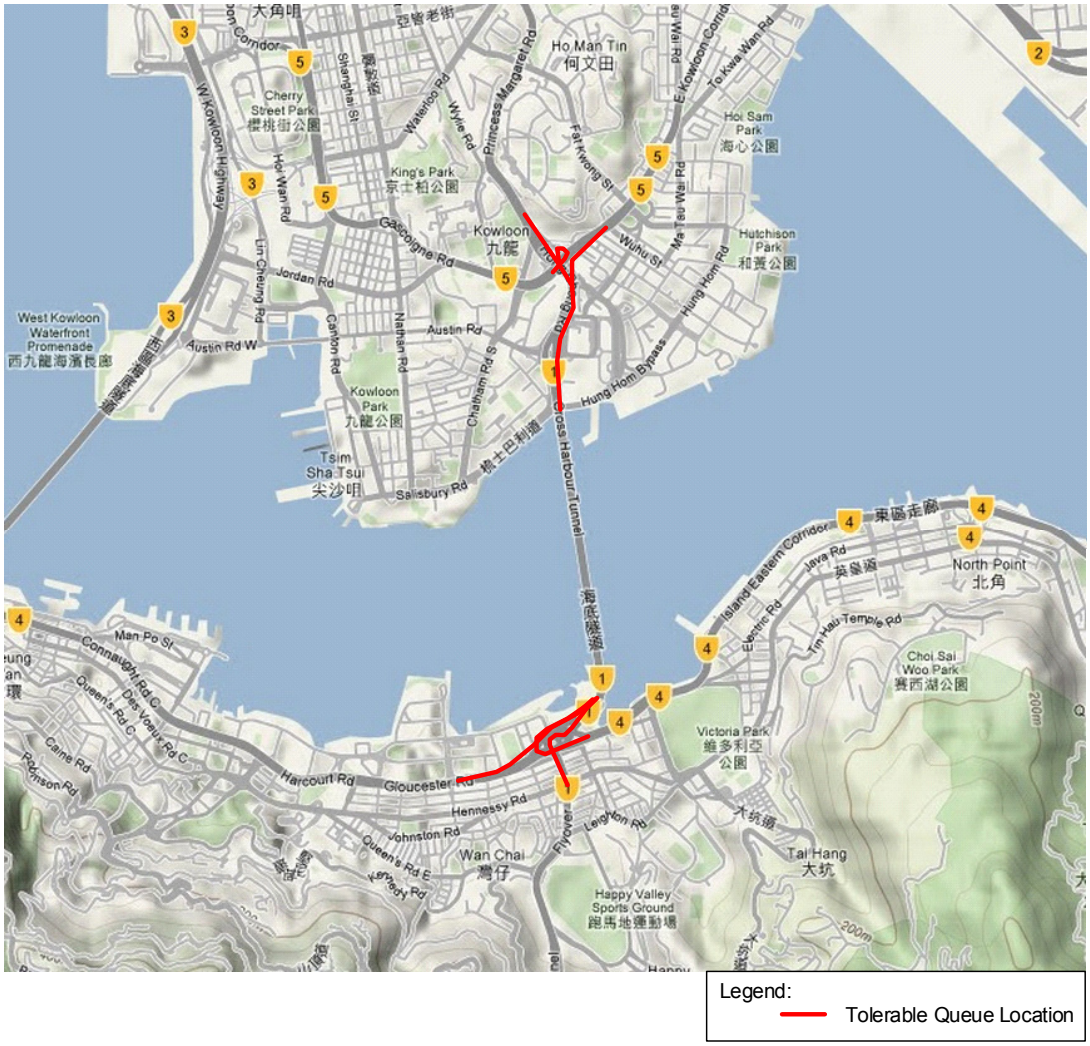
3.3.15 Table 3-4 shows the locations where the tolerable queues would end on the Hong Kong and Kowloon sides of CHT respectively. This corresponds to a 40% reduction in queue length approximately during peak periods.

Table 3-4 Summary of tolerable queue locations

Direction	Location
CHT – From Hong Kong to Kowloon	Gloucester Road eastbound – near China Resources Building
	Gloucester Road westbound – Percival Street
	Canal Road – Russell Street
CHT – From Kowloon to Hong Kong	Chatham Road North – Wuhu Street
	Gascoigne Road – Chatham Road North near its upramp to Hong Chong Road
	Princess Margaret Road – King's Park Sports Ground

3.3.16 Figure 3-2 shows the tolerable queue location.

Figure 3-2 Tolerable Queue Locations



3.3.17 Combining the two benchmarks, namely traffic level and queue length, the traffic condition at CHT could be considered as "tolerable" if the queue length at the two entrances can be reduced by about 40% and the traffic level can be controlled within the range of 110k – 115k. The traffic condition at CHT can be considered as "ideal" if the queue length at the two entrances can be eliminated and at the same time achieve a daily traffic level below 110k.

3.3.18 On the other hand, as queues have yet to form at the entrances of EHC and WHC, queue length cannot be used as a benchmark for these two tunnels. Therefore it is aimed to achieve the traffic levels as set out in Table 3-2 for these two tunnels without creating sustained congestion for them.

3.4 Analysis of Previous Suggestions

3.4.1 The undesirable distribution of traffic among the three road harbour crossings has long been a hot subject of debate in public forums, including the Legislative Council (LegCo) Panel on Transport, Transport Advisory Committee (TAC), newspapers and the academia. Toll adjustment at the respective road harbour crossings and with road network improvements, would be effective to achieve a better distribution of traffic without causing impact to other through traffic. However, the toll adjustment mechanisms are established in their respective governing legislation and form part of the agreements between the Government and the franchisees concerned, which should be respected and followed and can be changed only by mutual agreement of the Government and the franchisees. It follows that the commercial interests of EHC and/or WHC must be taken into account to gain their support on toll adjustments. Toll adjustments may also have an impact on the Government's revenue from the CHT. Therefore, the Government needs to consider the overall traffic, financial, organizational and legal implications before any public debate on the issue.

3.4.2 The Government has raised 12 possible measures in 2005 to address the above problem. These may be grouped into "Toll-Related" Measures, "Franchise-Related" Measures and Other Measures, and are summarised in Table 3-5.

Table 3-5 Previous Suggestions

Category	Measures
Category 1 – Toll-related measures	1A: Overall increase in CHT tolls
	1B: Peak Hour Surcharge at CHT
	1C: Surcharge at CHT with Rebate for Use at WHC/ EHC
	1D: Variable Toll Adjustment System at CHT
	1E: Toll increase at CHT & Toll reduction at WHC/EHC
Category 2 – Franchise-related measures	2A: Buying out the Franchises of WHC/EHC
	2B: Selling CHT to the Franchisees of WHC/EHC
	2C: Common Ownership for CHT, WHC and EHC
	2D: Extension of Franchises of WHC and EHC
Category 3 – Other measures	3A – Building a Fourth Road Harbour Crossing or Expanding the Capacity of CHT
	3B: Restricting the Use of CHT
	3C: Enhancement of Ferry Services

3.4.3 The consulting team has considered the feasibility of these possible measures that were discussed at LegCo as set out in the above table, as well as other measures related to the RHCs, including restricting vehicles with "odd/even" registration numbers on alternate days, car pooling and rebate by the Government at WHC/EHC using coupons. Considerations and expert insights on these measures are summarised in the rest of this section.

Category 1 – Toll-Related Measures

3.4.4 Overall Increase in CHT tolls

Whilst upward adjustments in CHT toll would be effective in diverting traffic to WHC and EHC, and there are some supporters for this option, there could be considerable objection from the existing CHT users. The increase in CHT toll is likely to trigger simultaneous toll increases at EHC and WHC. As such, increasing CHT toll in a bid to shift traffic to EHC and WHC might not produce desirable diversion results. Although this option in its present form would unlikely be the better option of the public at large, for the purpose of this study, it is important to examine the extent to which CHT tolls need to be increased in order to address the existing traffic problems.

3.4.5 Peak Hour Surcharge at CHT

It has been suggested that a peak hour surcharge could be used to alleviate some of the problems at the CHT. Normally a peak hour surcharge operates by moving the traffic from the peak hours to a later or earlier time when there is available capacity. However this is not applicable to the CHT as there is only available spare capacity before 7:30am and after at least 10:00pm. The daily profile of traffic passing through the CHT is shown in Figure 3-3.

Figure 3-3 Daily Traffic Profile at CHT

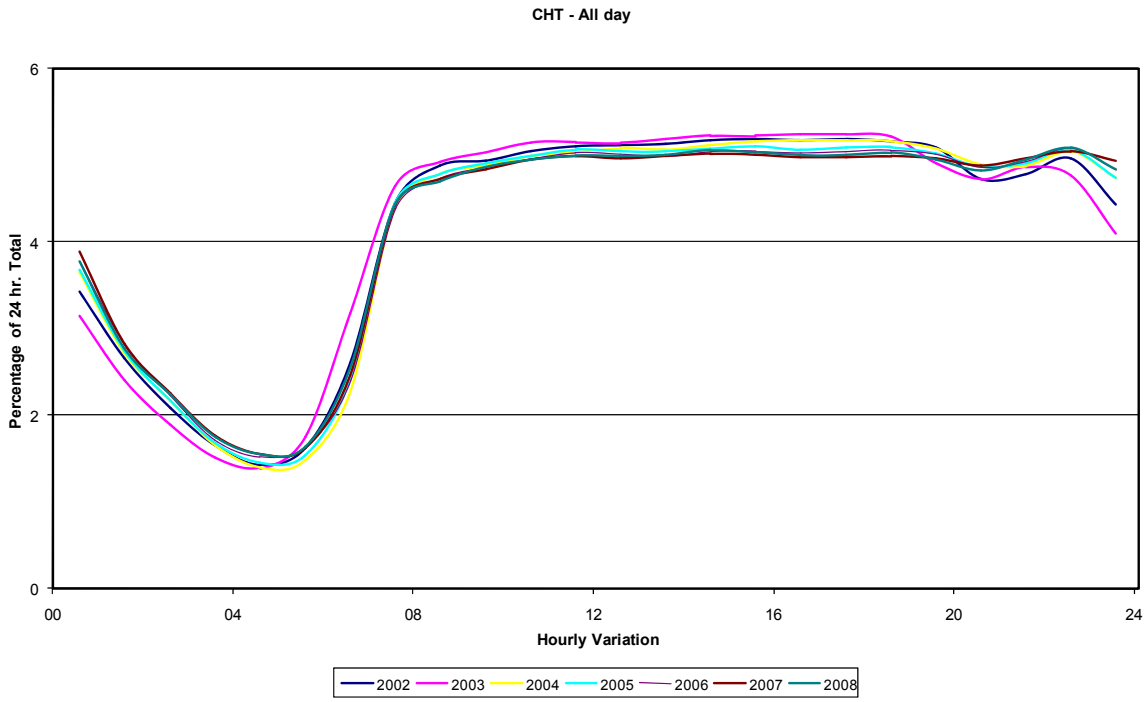


Figure 3-4 Daily Traffic Profile at EHC

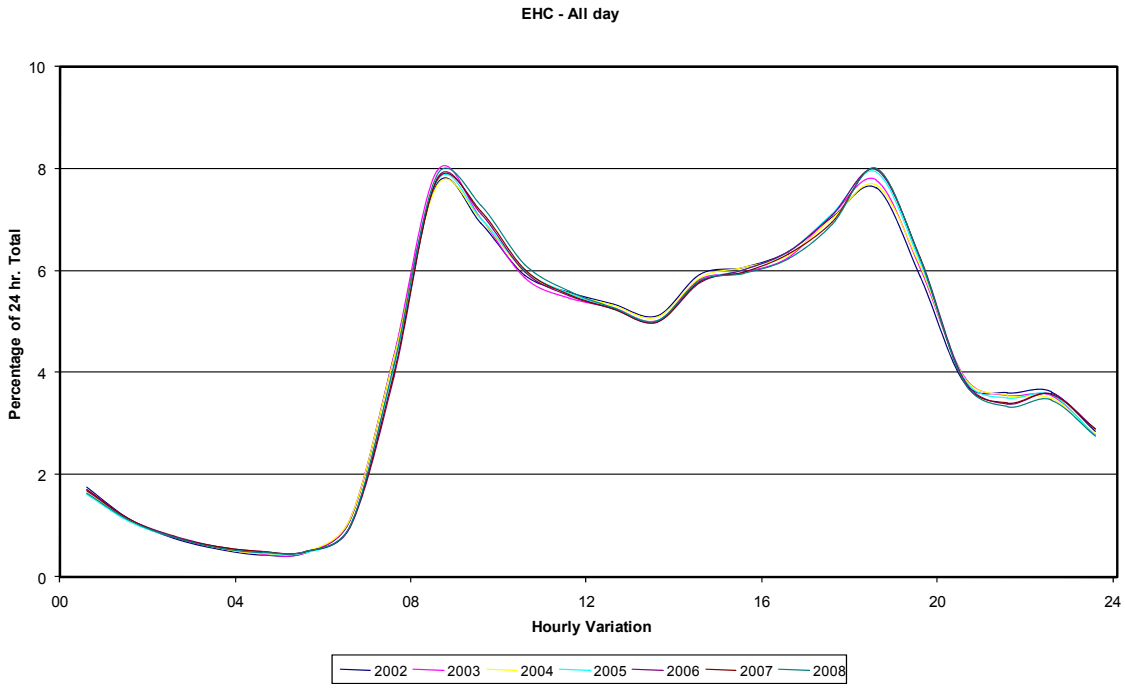
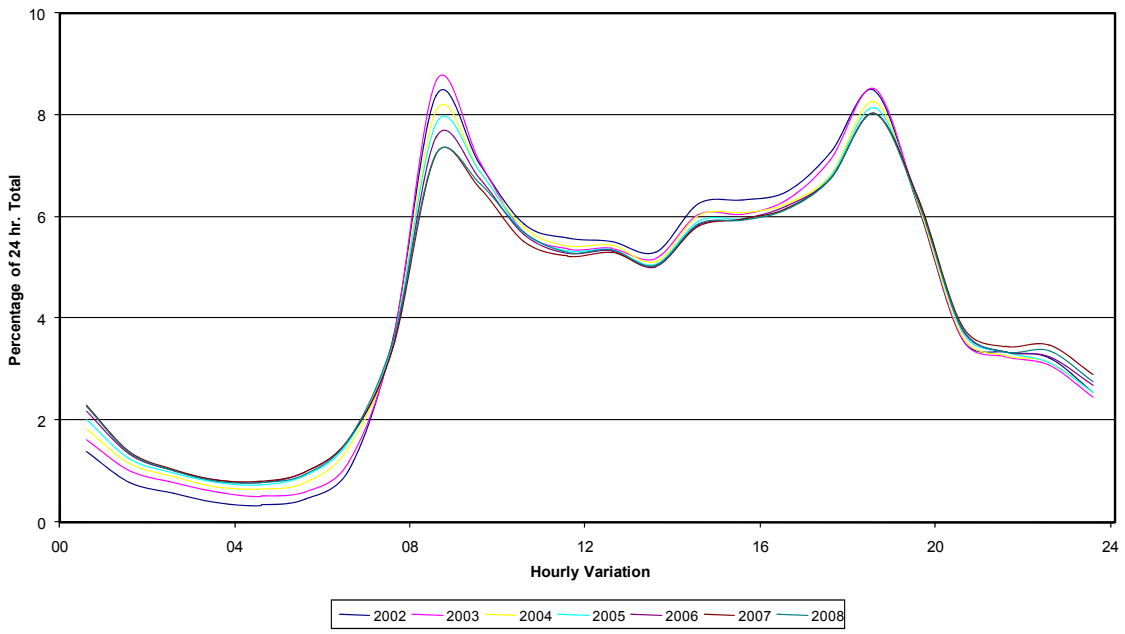


Figure 3-5 Daily Traffic Profile at WHC



Any shifting of traffic within that period will only affect the timing of the maximum queue. The actual peaks in the demand of CHT are between 8:30am and 5:00pm, so a considerable, probably unrealistic, time-shift would be required. In order to cover the whole period when the CHT is operating at capacity (most part of the day), the surcharge would have to cover at least the period from 7:00am to 8:00pm and be a toll increase in all but name.

It has also been suggested that to compensate for a peak hour surcharge the tolls could be reduced or eliminated during the night-time hours. This would shift very few person-related movements as people usually do not want or need to travel in those hours. Goods movements switching out of the day time could bring about toll savings, but would almost certainly attract extra costs in paying the vehicle crew and requiring personnel present at the origin and destination. Overall, this measure would have a negligible effect.

In addition, there would be shifts from the CHT to the WHC and EHC, which could be beneficial. However, it is likely that these shifts would only be substantial if the surcharge is large enough to make the other two tunnels competitive in price. For cars it would only require a $5 increase to equal the EHC, but for taxis $15 would be needed and for medium goods vehicles it would be $30. If the other two tunnels raise their tolls, either in response to this measure or for other reasons, then the differential would be greater still.

As shown in the Figure 3-3 to Figure 3-5, the hourly profiles of WHC and EHC are similar to the typical urban road traffic pattern with two obvious peak periods in a day. This typical pattern usually represents that there are spare capacity within the tunnel of WHC and EHC especially during off peak period. However, the Peak Hour Surcharge at CHT would not help much on shifting the traffic from CHT to the WHC and EHC during peak periods. This is due to the fact that WHC and EHC users currently experience congestion at the connecting roads of the tunnels, especially WHC users.

The behaviour of drivers at the start and end of the surcharge period must be considered from road safety perspective. When the Area Licensing Scheme (ALS) – essentially a toll on entering the CBD during the morning peak - was introduced in Singapore in 1975 drivers were observed to travel at high speeds immediately before the start of the period to avoid the surcharge and to stop on the road waiting for the period to end. Such behaviour on the approaches to the CHT would lead to great problems, and maybe cause more congestion than had been alleviated. Although under a progressive increase / decrease surcharge system, the number of the stop and waiting drivers is expected to be slightly lower, the queuing problem due to the bunching effect during transitional periods would still remain, apart from the safety issues and enforcement problem.

3.4.6 Surcharge at CHT with Rebate offered to CHT Users for Use at WHC/EHC

This option combines an upward adjustment with coupons issued to affected CHT users for toll reduction at WHC/EHC.

This option has the advantage of being flexible as both the magnitude and period of this rebate can be adjusted. It would have no impact on existing franchise agreements or the WHC and EHC Ordinances. The Government would be able to take actions early in alleviating congestion at the CHT and addressing the problem of unbalanced tolls at the road harbour crossings.

This may be a viable option although it requires certain important pre-conditions for it to work, such as the ability to increase the toll levels of CHT both initially and over the years, and WHC/EHC franchisees agree not to increase their toll levels or better still, lower it to some extent.

The administration and logistical arrangements of this option would have to be worked out with WHC/EHC franchisees, however, it is considered that there are some possible rebate schemes in which this option can be modified and implemented. The scheme can be administered by tunnel companies, through the issuance of cash coupons or with the combined use of Autotoll for Autotoll booths and Octopus at manual booths. Details of these administration methods are covered in Chapter 5 and Chapter 7.

3.4.7 Variable Toll Adjustment System at CHT

This is essentially a flexible toll adjustment mechanism that seeks to adjust the toll of CHT at regular intervals of say, 6-12 months, following a set of agreed indicators like queue lengths, CHT throughput, etc. There are major problems with frequent toll changes as the flows take a considerable time to stabilise. Even relatively short-term decisions, such as the choice of which tunnel to choose for a particular journey, need enough time for the users to grow accustomed to the time it takes to use the tunnels under the new traffic conditions, and will oscillate for some months. Longer term decisions, particularly for commercial vehicles, about which destinations to serve from which origins, and even the locations of depots, are made over much longer periods. Therefore uncertainty about future toll regimes is undesirable for users.

The testing has shown that changing tolls on the CHT alone results in problems on the WHC access roads, and therefore this policy would need agreement with the WHC operator to act in a complementary way, which may be difficult to obtain. In addition, it would be necessary that the EHC did not raise tolls to negate the effects of any toll increases on the CHT and WHC.

Therefore it is considered that this option should not be further pursued at the present time, though it may be re-examined at a time when Government has control of all the three tunnels. Even then a longer period of stability than 6-12 months will probably be desirable.

3.4.8 Toll Increase at CHT & Toll Reduction at WHC/EHC by offering financial incentives to tunnel companies

This option should be a more effective way to improve the traffic distribution and reduce congestion at CHT than simply adjusting tolls at CHT upwards. However, the commercial interest of the WHC/EHC franchisees would be affected by this option and their agreements must be obtained before it can be implemented. They are unlikely to accept this measure unless they are offered sufficient financial incentives, such as rebate and concessions by the Government, or mutual agreement on a franchise related measure (to be discussed later) is reached.

Given that this could be a more effective way to ease the existing traffic congestion at RHCs, the better toll scenarios will be assessed under this.

3.4.9 Summary of "Toll-Related" Measures

With the reasons given above, it is considered that the feasibility and effectiveness of three of these "Toll-Related" Measures: "Overall Increase in CHT Tolls", "Surcharge at CHT with Rebate offered to CHT Users for Use at WHC/EHC" and "Toll Increase at CHT & Toll Reduction at WHC/EHC by offering financial incentives to tunnel companies", should be further examined in the legal, management and organisation implications section.

Category 2 – Franchise-Related Measures

3.4.10 Government Buying out the Franchisees of WHC/EHC

This option would enable the Government to adjust the toll at the respective road harbour crossings without involving private commercial entities once their franchises have been bought out. This option would involve substantial funding from the public coffer, and it would be difficult to reach agreement with the franchisees on the valuation of the remaining franchises, due to different input assumptions used in the valuation process, such as economic forecasts. As well, in a market economy it is not possible to force the franchisees to sell at a price they see as anything less than very attractive.

Against the above negative factors however, some members of the community have expressed the view that buying out WHC/EHC would enable the Government to have a free hand in adjusting tolls at the respective crossings unencumbered by the franchise agreements, that would best suit the interests of the public as the Government would then become the sole owner of all the three road harbour crossings.

3.4.11 Selling CHT to the Franchises of WHC/EHC

This is the reverse of the first option. It will not help the Government in achieving the goal of better distribution of traffic among the three road harbour crossings by adjusting the toll at the respective road harbour crossings in any way better or easier than the existing arrangement. Under this option, the Government has no control over tolls of and will lose a long-term income stream. As such, this option should not be pursued further.

3.4.12 Forming a Common Ownership for CHT, WHC and EHC

This option aims at addressing the imbalances and unfairness of the existing tolling system at the three road harbour crossings without the need to buy out the franchises of EHC and WHC. The new entity formed by the common ownership would take over the toll collection role, implement a fair and equitable toll system and divide revenue among the operators. This option would involve complex legal, financial and organizational issues, which would require protracted discussion with the franchisees. Like the first option under this category, it is required that agreements to be reached between the Government and the franchisees of EHC and WHC.

3.4.13 Extending the Franchise of WHC and EHC

The last "Franchise-Related" option is to "compensate" the franchisees for their loss in revenue resultant from downward toll adjustments. However, it would be necessary to work out carefully the duration of the franchise extension so as to ensure fairness to the franchisees, the tunnel users and the Government.

3.4.14 Summary of "Franchise-Related" Measures

The option of selling CHT to the franchisees of WHC/EHC should not be further pursued. The other three "Franchise-Related" options require considerable time to negotiate with the franchisees and the results are by no means certain. The financial and legal implications of the options are further examined.

Category 3 – Other Measures

3.4.15 Building a Fourth Road Harbour Crossing or Expanding the Capacity of CHT

This option was being proposed to increase the overall cross harbour capacity and divert the traffic from the existing Road Harbour Crossings. However, the constraints of this option are as follows:

- Various technical issues will need to be examined such as huge capital costs, difficult land acquisition for the ingress/egress and connecting roads, and protracted procedures under the Public Reclamation and Foreshore Seabed Ordinances and long construction period. Therefore, this option would not help alleviate the traffic problem in the short to medium term;
- Overall there is still surplus capacity for the existing three Road Harbour Crossings. In fact, there is spare capacity at WHC (subject to improvement of its connecting road networks after the opening of the CWB in 2017) and EHC to accommodate cross-harbour traffic whereas it is the undesirable traffic distribution among the three RHCs that gives rise to the congestion of CHT;
- The selection of location for the new harbour crossing would be a major concern considering that the capacity of EHC and WHC is limited by their connecting roads rather than their own capacity. Also, the existing connecting road network may not have much spare capacity to accommodate additional traffic as a result of the fourth harbour crossing.

Therefore, this option would unlikely be a feasible or viable short or medium term solution to the present problem. As such, it should not be further pursued.

3.4.16 Restricting the use of CHT

This option envisages restricting the use of CHT to certain classes of vehicles. If implemented on a long term basis, it could cause major enforcement problems, meet with strong objections from motor trades and transport unions as well as possible under-utilisation of a valuable public asset and hence shortfall of Government revenue. Moreover, some vehicles may be forced to travel longer distance to use other tunnels and cause congestion elsewhere. This option should not be considered further unless it can be shown that all other measures would fail to address the present problem.

Another way of restricting the use of CHT is to impose restrictions based on "odd-even" registration numbers on alternate days, whereby private cars (and/or some other vehicle types such as motorcycles, taxis and goods vehicles) would be banned from entering the tunnel on alternate days depending on whether their registration plates end in odd or even number. This demand management policy aims at limiting the number of vehicles that can use the road network (or the tunnel in this case) in any one day by admitting only a percentage of the vehicle fleet by legislative and administrative means. It has been used and implemented in other cities in the past, most recently in Beijing for two months just prior to and during the Olympic Game in the summer of 2008. This demand management measure proved to be very effective for improving traffic flow for the event. It was estimated by the authority that, together with other measures to promote public transport, motorised traffic in Beijing city centre was reduced by up to 70% during the period it was implemented.

However, this policy may be seen as less equitable than some others, as households with only one car would be restricted more than multi-vehicle owning households. Single-vehicle owning households would have to either pay more to use the other two tunnels on alternate days or travel by other modes which may be less accessible to them. As such, popularity of this policy would likely be fairly low. For instance, when this temporary measure was implemented in Beijing last year, those motorists affected by the restriction were compensated by not having to pay road or vehicle taxes for three months, thus costing the Beijing Municipal Government about 1.3 billion yuans. Additionally, based on experience in other cities like Mexico City the effectiveness of this kind of policy generally declines over a longer period of time as travelers would figure out ways to get around the restriction, e.g. by owning a second car.

Experience learned from other cities that have implemented this measure is that there are extensive administrative (which vehicle to be exempted and under what circumstances) and enforcement difficulties associated with schemes which operate on a long term basis. In the case of the CHT, the restriction would have to start at approach road junctions at a fair distance away from the tunnel itself thereby affecting non-tunnel traffic as well. There seems to be no point in applying the scheme to buses, PLBs and special purpose buses. Taxi and goods vehicle associations would strongly oppose the scheme. If taxis are exempted, some car owners would switch to taxis on non-usage days for their vehicle such that there would be little gain to relieving tunnel congestion. For goods vehicles, the scheme would have more impact on operators with a single vehicle than large fleet operators. If goods vehicles are exempted, it may encourage the ownership and usage of light vans as a substitute for cars.

In view of the administrative and enforcement problems mentioned above, this measure would be fraught with difficulties and unlikely to be acceptable to the general public.

3.4.17 Enhancement of Ferry Services

This would likely be an inefficient and expensive option as a very large fleet of ferries would be required to supplement the capacity of the CHT. Furthermore, there are problems of finding sufficient space in the urban area to build vehicular ferry piers and concourses required for this option.

3.4.18 Car pooling

Private cars and taxis are inefficient users of road space because of their low occupancy. Car or Taxi pooling schemes aim at reducing the number of persons driving their cars or taxis crossing the harbour. Instead they form car or taxi pools whereby several drivers or taxi passengers who travel more or less along the same route are matched together so that only one of them needs to drive or only one taxi is used. This is usually arranged for the journey to work, possibly on a rotation basis, thereby increasing the passenger occupancy. If implemented successfully, it would have the following potential advantages:

- The number of cars and taxis using the tunnels is reduced, especially during the AM peak and PM peak periods, thus reducing congestion;
- Participants would be able to save fuel and parking costs or taxi fares; and
- Reduction in emission from cars and taxis.

Different types of share riding programs exist in other cities like London New York and San Francisco. Some are privately organized by large firms with no Government assistance, some are Government sponsored programs and yet other is private schemes with technical and financial assistance from Government.

Different from western cities, in Hong Kong those who choose to drive to work daily normally belong to the higher income groups or are business proprietors. Many of them use their cars regularly for multi-purpose trips such as social, personal and recreational activities after work. Besides, there would be no reduction to the number of cars using the tunnels if a car driver share his/her ride with an employee who formerly travels by public transport.

Also in Hong Kong, as in many other cities, different income groups tend to live in different neighbourhoods. It would not be convenient or likely to be acceptable for drivers to go out of their way to pick up their fellow employees. The alternative of providing ride sharing car parks or taxi stands on the approaches to the tunnels would also be unpopular and give rise to enforcement difficulties, not to mention that such sites are extremely difficult to find and taxi fare sharing is illegal in Hong Kong[5]. Car pooling based on certain occupancy would be easier to enforce, but it may be too restrictive and attract public objections. Car pools would not be successful unless the participants work in the same area so that the maximum distance from the destination car park to the work place does not exceed about 200 metres, depending on the topography.

Given the wide distribution of origins and destination of private vehicle trips or taxi trips, this will be difficult to enforce in practice if the scheme is compulsory. Any car pooling scheme must be voluntary, in which case it would not be effective in reducing congestion at the CHT.

[5] See ROAD TRAFFIC (PUBLIC SERVICE VEHICLES) REGULATIONS - REGULATION 37 - Obligations of taxi driver

3.4.19 Summary of Other Measures

None of the Other Options mentioned above are promising or feasible, and should be either rejected outright or not considered further unless it can be shown that the "Franchise-Related" or "Toll-related" measures would fail to address the present problem. At the very least, they should not form the better options and therefore would not be considered further in this report.

3.4.20 The following Toll-related measures and Franchise-Related options are further studied in this report. It is considered that all the "Franchise-Related" measures must be combined with certain toll adjustments (such as the better toll scenarios identified) as without toll adjustment, the traffic congestion at CHT will not be eased.

- Option 1: Increase CHT tolls
- Option 2: Buy-back EHC and/or WHC
- Option 3: Forming a common ownership of CHT, EHC and/or WHC
- Option 4: Extension of EHC and/or WHC franchises
- Option 5: Provision of concessions to EHC and/or WHC franchisees
- Option 6: Increase CHT tolls and rebate to EHC and/or WHC users

Detailed analysis of these six implementation options, including legal, management and organisational structure and financial implication, as well as the feasibility of each of the options is included in Chapter 5 to 7.

3.5 Toll Structures of the Three RHCs and Composition of RHC traffic

3.5.1 As illustrated from the above analysis of the 12 measures considered by the Government in 2005 and other measures that have been suggested by the members of the public, there is no single measure that stands out as 'the obvious right way forward' and all of them have their own pros and cons which need to be considered and studied carefully.

3.5.2 As a matter of fact, CHT has a clear natural advantage with its central location and connectivity, this advantage is reinforced by the significantly lower toll level that applies to CHT over the years. While the locations of the tunnels are fixed parameters which cannot be changed, it is necessary to examine the toll levels and toll structure of the three RHCs and identify the appropriate toll scenarios that can help address the existing traffic problem effectively.

3.5.3 Specifically, in identifying the possible solutions to the existing traffic problems, it is necessary to look into closely how the toll relationships between vehicle types have contributed to today's traffic problems.

3.5.4 In resources management terms the toll on a vehicle class should depend on the amount of the resources, in this case tunnel space and tunnel maintenance cost, which the vehicle class consumes. The amount of road space that a vehicle uses is not only dependent on the physical size of the vehicle, but also on its acceleration and braking characteristics. Thus a goods vehicle will usually not be able to accelerate as fast as a car and so a gap is created, and cannot brake so effectively and must leave a larger gap. Heavier vehicles do a disproportionate amount of damage to the road surface within the tunnel and are responsible for the large majority of the maintenance needs. Similarly larger engines create more fumes and thus contribute heavily to ventilation needs.

3.5.5 These criteria were observed in drawing up the original CHT toll structure for the opening in 1972. However since that time the CHT toll structure has been altered over the years, as shown in Table 3-6. The addition of the Passage Tax in 1984 (a restraint measure in the years before the opening of the EHC) consisted of a flat HK$5 increase for cars, taxis and goods vehicles, but no increase for buses, intended to cause a shift towards buses. This changes the ratios because the base car tolls, has been doubled, but the other vehicle type tolls go up by a smaller proportion. It is assumed that a flat increase was considered politically easier to implement at the time, and it is recognized that there may be social reasons for deviating from purely resource management based toll structures.

Table 3-6 Change of CHT Toll Structure

Type of Vehicles	CHT Toll Structure					
	Year 1972	Ratio to Car Toll	Year 1984	Ratio to Car Toll	Year 1999	Ratio to Car Toll
Car	5	1.00	10	1.00	20	1.00
Taxi	5	1.00	10	1.00	10	0.50
PLB	8	1.60	10	1.00	10	0.50
LGV	10	2.00	15	1.50	15	0.75
MGV	15	3.00	20	2.00	20	1.00
HGV	20	4.00	25	2.50	30	1.50
SD	10	2.00	10	1.00	10	0.50

Note: CHT toll was also altered in 1992 when only HGV toll was increased from $25 to $30, tolls for other vehicle types remained unchanged.

3.5.6 The later doubling of tolls for private cars at the CHT brings its toll structure further away from the resource management principle, a medium goods vehicle now pays the same as a car, and a single-decker bus pays half of a car.

3.5.7 In comparison the EHC and WHC toll structures are very similar to the original CHT structure, as shown in Table 3-7. Although the CHT is the lowest price tunnel for cars it is only $5 less than the EHC. However, for other vehicle types the differential is much greater - $15 for taxi, $28 for PLB, $23 for LGV, $30 for MGV and $40 for single-decker bus. The differences against the WHC are greater still.

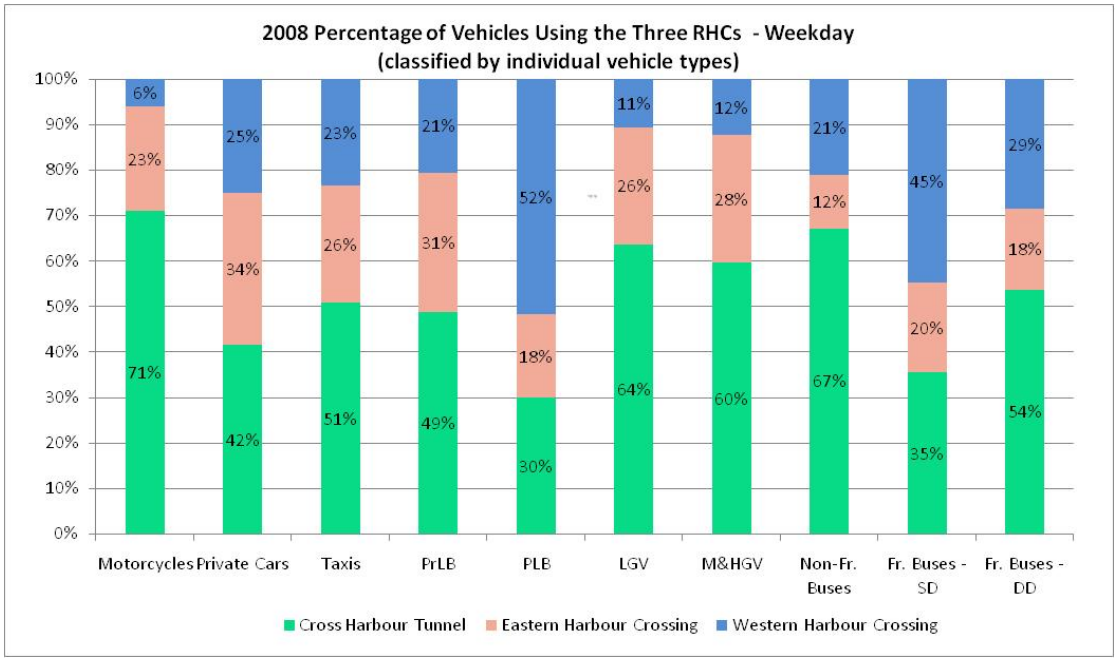
Table 3-7 2010 Toll Structures at CHT, EHC and WHC

Types of Vehicles	2010 Toll Structures					
	CHT	Ratio to Car Toll	EHC	Ratio to Car Toll	WHC	Ratio to Car Toll
Car	20	-	25	-	50	-
Taxi	10	0.50	25	1.00	45	0.90
PLB	10	0.50	38	1.52	60	1.20
LGV	15	0.75	38	1.52	60	1.20
MGV	20	1.00	50	2.00	85	1.70
HGV	30	1.50	75	3.00	115	2.30
SD	10	0.50	50	2.00	90	1.80

3.5.8 These differentials give a large incentive to vehicles which are not time-critical to use the CHT. Examples include residential buses from the NWNT to Hong Kong Island which use the WHC during the morning peak heading southbound for the speed, but return empty through the CHT, thereby saving $80. It is a similar situation for empty goods vehicles, empty minibuses and empty taxis.

3.5.9 Figure 3-6 below show that, because of the altered toll structure at CHT, the majority of goods vehicles, private light buses and taxi drivers would opt to use CHT to cross the harbour.

Figure 3-6 Daily % of Vehicles Using the Three Road Harbour Crossings (classified by individual vehicle types)



3.5.10 Accordingly, for the toll scenarios analysed in this study there are three different toll structures adopted for the CHT and/or EHC:

1. The same toll structure as currently adopted for CHT.

2. Formulated as a halfway between the existing CHT and EHC toll structure.

3. In some measures the relativities for the CHT are set to the current relativities for EHC.

4 TRAFFIC ANALYSIS

4.1 Introduction

4.1.1 This Chapter presents the details of the results of our traffic analysis. Specifically, it sets out how the "better toll scenarios" are identified, and the traffic impacts achieved under each of these better toll scenarios.

4.2 Toll structures

"s" toll structure and "0.5s" toll structure

4.2.1 From a purely resource management's perspective, the toll on a vehicle class should depend on the amount of resources (e.g. tunnel space and tunnel cost) consumed on the road network.

4.2.2 The European Commission in setting rules for toll structures states that "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". In general such a principle is supported for Hong Kong's Road Harbour Crossings. In almost all international tolled facilities tolls are related to vehicle types following this principle. For example, for 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.

4.2.3 In Hong Kong taxis are equivalent to cars in terms of the resources that they consume in passing through any of the Cross Harbour Tunnels. They take up the same amount of road space. There is no transport reason for charging them a lower toll. Goods vehicles and buses take up more road space than cars or taxis. They are larger in sizes by about 50 percent and generally have poorer acceleration and braking characteristics and so require larger gaps, consuming yet more of the available space. In terms of damage to the road surfaces, and therefore maintenance needs, heavy vehicles are largely responsible. It was estimated in the Trucking Industry Study that buses were responsible for 59 percent of the damage and that goods vehicles for 40 percent, with the remaining 1 percent being done by cars, taxis and PLBs.

4.2.4 In addition, in CTS-3 the contribution of different vehicle types to emissions, and therefore tunnel ventilation needs, showed that, per vehicle, LGVs contributed 1.5 times cars, HGVs 4.5 times and double-decked buses 6.9 times.

4.2.5 In conclusion, the toll structure currently adopted by the EHC is supported as being a reasonable representation of the relative resources consumed by each vehicle type.

4.2.6 The existing toll structures of the three tunnels are vastly different, with the toll structure at CHT deviating the most from the resource management principle. The Year 2010 toll structures of the three RHCs are shown in Table 4-1 below:

Table 4-1 Year 2010 Toll Structure

Vehicle types	Year 2010 Toll Structures (shown in ratio to car toll)		
	CHT	EHC	WHC
Car	1.00	1.00	1.00
Taxi	0.50	1.00	0.90
Motorcycle	0.40	0.52	0.46
PLB	0.50	1.52	1.20
LGV	0.75	1.52	1.20
MGV	1.00	2.00	1.70
HGV	1.50	3.00	2.30
Extra Axle	0.50	1.00	0.60
SD	0.50	2.00	1.80
DD	0.75	3.00	2.56

4.2.7 To identify the better toll scenarios, the effectiveness of changing the toll structure at the tunnels is examined in order to achieve better traffic distribution across the three RHCs, apart from adjusting the overall toll levels alone.

4.2.8 Hereunder the concepts of a full modification of CHT toll structure (s) and a halfway modification (0.5s) are introduced.

"s" structure

4.2.9 As discussed earlier, when examining the different toll structure for the three RHCs, it is identified that the toll structure at EHC is most in line with resource management's perspective. Therefore, one possible way to achieve better traffic distribution across the three RHCs would be to align the CHT toll structure with that of EHC. This is called "s" structure for CHT toll scenarios. Table 4-2 illustrates the changes in toll levels for each vehicle type user at CHT based on the existing car toll, if the toll structure at CHT is modified to "s" structure.

Table 4-2 Changes in toll levels for each vehicle type user at CHT with "s" structure

Vehicle types	CHT's existing toll structure		CHT with "s" structure	
	Ratio to Car Toll	Toll levels	Ratio to car toll	Toll levels
Car	1.00	20	1.00	20
Taxi	0.50	10	1.00	20
Motorcycle	0.40	8	0.52	10
PLB	0.50	10	1.52	30
LGV	0.75	15	1.52	30
MGV	1.00	20	2.00	40
HGV	1.50	30	3.00	60
Extra Axle	0.50	10	1.00	20
SD	0.50	10	2.00	40
DD	0.75	15	3.00	60

"0.5s" structure

4.2.10 From purely resource management perspective modifying the toll structure at CHT to "s" structure would be the most reasonable and effective way. However, as shown in the above table, this change would hit some CHT user groups harder than the others, e.g. apart from the car users who would be paying the same level of tolls, all other CHT user groups would need to pay more – varying from a 25% increase for motorcycle to a 300% increase for double-decker buses.

4.2.11 Taking into account public acceptability in setting the tolls, the feasibility of modifying the CHT toll structure to "0.5s" structure, as shown in Table 4-3 is also examined.

Table 4-3 Changes in toll levels for each vehicle type user at CHT with "0.5s" structure

Vehicle types	CHT's existing toll structure (Ratio to car toll)	EHC's existing toll structure i.e. "s" structure (Ratio to car toll)	"0.5s" structure (Ratio to car toll)
Car	1.00	1.00	1.00
Taxi	0.50	1.00	0.75
Motorcycle	0.40	0.52	0.46
PLB	0.50	1.52	1.01
LGV	0.75	1.52	1.14
MGV	1.00	2.00	1.50
HGV	1.50	3.00	2.25
Extra Axle	0.50	1.00	0.75
SD	0.50	2.00	1.25
DD	0.75	3.00	1.88

4.2.12 "0.5s" structure refers to a new toll structure, which is halfway between the toll structure at CHT and EHC. Compared to the "s" toll structure, "0.5s" toll structure also involves toll increases for all vehicle types (except car) but to a lesser extent (from a 25% increase for motorcycle to 138% to double-decker buses). The following table compares the toll levels of the different vehicle types at CHT under three different toll structures: the existing toll structure, "s" structure and "0.5s" structure. Table 4-4 illustrates how the "0.5s" structure is derived.

Table 4-4 Comparison of the Three Toll Structures at CHT

Vehicle types	Under existing toll structure	Under "s" structure	Under "0.5s" structure
Car	20	20	20
Taxi	10	20	15
Motorcycle	8	10	9
PLB	10	30	20
LGV	15	30	23
MGV	20	40	30
HGV	30	60	45
Extra Axle	10	20	15
SD	10	40	25
DD	15	60	38

4.3 Identification of Preliminary Toll Scenarios

4.3.1 To achieve the objectives to of this study, a set of preliminary toll-related scenarios have been identified to be tested in this study. These toll-related scenarios can be categorized into four groups:

- Group A – Existing situation: Franchises of EHC and WHC remain unchanged, Government can set tolls for CHT from now and EHC after 2016
- Group B – Government have complete freedom in setting toll levels of the three RHCs now
- Group C – Government can set tolls for CHT and EHC now
- Group D – Government can set tolls for CHT and WHC now

4.3.2 It should be recognised that whether the Government can set tolls for EHC and WHC will also very much depend on the time horizon. Table 4-5 illustrates the period of time when toll-related scenarios from each of these groups could be applied.

Table 4-5 Time Horizon when Government can effect toll changes

Time Horizon	Government can secure agreement with franchisees on not to change their tolls	Government can effect a change in toll levels by negotiation with franchisees (e.g. buy-back, concession, extending franchise periods)
Between now and 2016/2017[i]	Group A OR Combination of Group A and Government's rebate to EHC and WHC users	Group B (if Government can effect toll level changes at both EHC and WHC) Group C (if Government can effect toll level changes at EHC only) Group D (if Government can effect toll level changes at WHC only)
Between 2016/2017 and 2023[ii]	Group C	Group B (negotiation with WHC required)
From 2023 onwards	Group B	Group B

Notes: i. The franchise of EHC will end in August 2016. The Central-Wan Chai Bypass is tentatively scheduled to be opened in 2017.
ii. The franchise of WHC will end in August 2023.

4.3.3 Specifically, the current toll regimes for the three tunnels are known, but their future changes are clearly not. In order to achieve a better distribution of traffic across the three RHCs, and to explore how such improved traffic conditions can be sustainable in the long term, for each modelling year the toll levels at the three RHCs that are required to achieve such sustainable improved traffic conditions (e.g. by increasing the toll levels in real terms) have been examined.

4.4 Toll Scenarios Evaluations

4.4.1 Comprehensive evaluations were undertaken to select the more desirable and viable toll scenarios and their related toll adjustment mechanisms using the transport model. The transport model was developed from the Third Comprehensive Transport Study (CTS-3) Transport Model and validated by the updated data for performing the traffic forecast and analysis for this study. The future traffic forecast assumptions data were collected from different Government departments. They include: (i) the planning data, such as population, households, resident workers, employment etc. which were provided by Planning Department; (ii) the economic data, such as GDP Growth, which were obtained from the Government Economist; (iii) the future transport facilities usage data, such as the number of cross boundary traffic, airport usage and toll assumptions for other toll facilities, which were supplied by Transport Department; (iv) the transport infrastructure development data, such as highway network assumptions and rail network assumptions, which were supplied by Highways Department.

4.4.2 Extensive number of toll scenarios have been developed and sieved, initially based purely on their traffic results. It was found that some performed well in the earlier years, but needed modifications in later years, these were refined. Eventually some of these could not be made to meet traffic objectives with any reasonable toll levels, and these were abandoned. The better scenarios were continually refined so as to meet traffic objectives and give the best traffic results, subject to other criteria including the least financial burden to public expenditure or Government spending.

4.4.3 In particular, tests on these preliminary toll scenarios confirm that there are a number of prerequisites and observations relevant to rationalise cross harbour traffic. These are:

- The extent to which EHC and WHC tolls can be reduced is limited by the capacities of their connecting roads
- Equalised toll scenarios and equalised car toll scenarios are not desirable as they would result in immediate congestion at WHC connecting roads
- Low toll options at the three RHCs are not feasible, as they would induce more cross harbour traffic causing queuing and access problems
- Tolls are more effective in rationalising cross harbour traffic if CHT adopts the EHC's toll structure
- The change of toll structure, if adopted, will impact heavily on taxis and commercial vehicles. Therefore obtaining public support could be a challenge.
- Tolls on three RHCs need to be adjusted overtime to maintain the desirable traffic conditions

4.4.4 Consequently, not all of the tested scenarios would be considered further here because they performed not as good with respect to the traffic criteria over the forecasting period (i.e. in achieving ideal level of traffic). Additionally, it is important to bear in mind that the objective of developing the better toll scenarios was to present as many different ways of meeting the traffic objectives as possible, but also to ensure that they were sufficiently distinct from each other to provide new information.

4.5 Better Toll Scenarios – Selection Criteria

4.5.1 The selection of toll scenarios is mainly based on their performance of forecast traffic flows and queue lengths at CHT based on the criteria set out in Section 0. Toll scenarios are selected only if the following criteria are met:

- Traffic ranges across the tunnels are within the tolerable traffic levels in most of the modelling years
- Achieves at least 40% of queue reduction at CHT

4.5.2 For reference purpose, the toll scenario which would achieve the ideal traffic levels (i.e. the 'ideal' toll scenario) and some other toll scenarios which would fail to achieve the tolerable traffic levels are set out below.

4.6 Base Case Scenario

4.6.1 Before presenting the analysis for the better toll scenarios, Table 4-6 shows the traffic analysis for the Base Case under the modelling years of 2011, 2016, 2021 and 2026 to give an idea on what will be the traffic situation if we do nothing on the toll levels.

4.6.2 The result shows that without toll adjustment, CHT will continue to experience traffic congestion for all modelling years. WHC will experience traffic congestion until the opening of CWB and will be congested again in year 2026. EHC traffic will be at ideal or tolerable level until year 2021 and it will experience congested traffic level after 2026. After 2026, all RHC tunnels will be congested if the toll level will remain at current situation.

Table 4-6 Base Case Scenario

Base Case	Toll levels for private car toll (HK$)			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**

4.7 The 'Ideal' toll scenario

4.7.1 Using an iterative approach to toll scenario testing, the 'ideal' toll scenario which would achieve the ideal traffic levels defined in Table 3-2 has been identified and is shown in Table 4-7.

Table 4-7 'Ideal' Toll Scenario – Toll Levels in Year 2011

Vehicle Types	CHT	EHC	WHC
Car	$35	$25	$55
Taxi	$35	$25	$50
MC	$18	$13	$25
PLB	$53	$38	$66
LGV	$53	$38	$66
MGV	$70	$50	$94
HGV	$105	$75	$127
Extra Axle	$35	$25	$33
SD	$70	$50	$99
DD	$105	$75	$141

4.7.2 The 'ideal' toll scenario involves drastic changes to both the toll levels and toll structure at CHT. In particular, it involves an increase in toll for private car at CHT from $20 to $35 and a change of the toll structure to the 's' structure. Table 4-8 shows the "ideal" toll scenario for private car toll in different modelling years.

Table 4-8 'Ideal' Toll Scenario

Ideal Toll Scenario	Toll levels for private car toll (HK$)		
	CHT	EHC	WHC
2011	**35s**	**25**	**55**
2016	**45s**	**30**	**60**
2021	**50s**	**30**	**60**
2026	**55s**	**45**	**70**

Notes: 35s – Toll on private car increase to $35 and the toll structure changes to "s" structure.

4.7.3 Taking the public acceptability in consideration, it is believed that the 'ideal' scenario, albeit achieve the best traffic outcome, would be extremely difficult to be implemented in practice and for this reason it has not been selected as one of the better toll scenarios.

4.8 The Failed Cases Examples

4.8.1 Among those tested toll scenarios that failed to pass the traffic criteria, some of them are commonly suggested by the public in the past. They are selected and presented here to illustrate why they are not one of the better toll scenarios. These failed cases examples include:

- Increase CHT private car toll only
- Equalised tolls (with private car toll at $25)
- Low toll option
- Initial toll adjustment only

4.8.2 Increase CHT private car toll only

Table 4-9 summarises the traffic analysis result of increasing CHT private car toll only.

Table 4-9 Toll Scenario for Increasing CHT Private Car Toll Only

Increase CHT private car toll only	Toll levels for private car toll (HK$)			% change of WHC traffic (compared with base year)	% change of total cross harbour traffic (compared with base year)
	CHT	EHC	WHC		
2011	40c	25	50	28%	6%
2016	45c	30	55	38%	9%
2021	50c	35	60	66%	17%

Remark: 40c = Toll on private car increases to $40. Tolls on other vehicle types remain unchanged

- This toll scenario involves increasing the toll for private car at CHT only (from $20 to $40). The traffic results confirm that while increasing the tolls for private car at CHT can help achieve a reduction in the queue at CHT, WHC will experience a 28% increase in traffic which will cause severe traffic problem. The queue building up from WHC southbound will end up in the tunnel itself and even back to the tunnel plaza on Kowloon side. The congestion problem may occur not only within the WHC area but also extend to CBD area, i.e. Central and Admiralty district. The Island northern road network of Connaught Road, Harcourt Road, Gloucester Road will be more congested than the situation now.
- The results has demonstrated that the current toll structure at CHT – the relatively low tolls for other vehicle classes is one of the major causes for the congestion at CHT. Therefore raising only the car tolls at CHT will not be an effective solution to improve the traffic conditions in the long term.

4.8.3 *Equalised tolls with private cars toll at $25*

Table 4-10 summarises the traffic analysis result of the equalised toll with private cars toll at $25.

Table 4-10 Toll Scenario for Equalised Tolls with Private Car Toll at $25

Equalised tolls with private cars at $25	Toll levels for private car toll (HK$)			% change of WHC traffic (compared with base year)	% change of total cross harbour traffic (compared with base year)
	CHT	EHC	WHC		
2011	25e	25e	25e	69%	8%
2016	30e	30e	30e	79%	11%
2021	35e	35e	35e	106%	20%

Remark: e = Tolls for all tunnels are set to the weighted average of the current tolls for all vehicle types

- Many believe that by equalising the tolls of the three RHCs could solve the current congestion problem at CHT. The analysis shows that, although the traffic conditions at CHT could be hugely improved under an equalised toll scenario, the traffic conditions at WHC would be significantly worsened (69% increase in traffic). Due to the fact that WHC's capacity is constrained by its connecting road network it does not have much spare capacity to accommodate the shifted traffic under an equalised toll scenario.

4.8.4 *Low Toll Option*

Table 4-11 summarises the traffic analysis result of low toll option at the three RHCs.

Table 4-11 Toll Scenario for Low Toll Option at the three RHCs

Low Toll Option	Toll levels for private car toll (HK$)			% change of WHC traffic (compared with base year)	% change of total cross harbour traffic (compared with base year)
	CHT	EHC	WHC		
2011	20	15	30	48%	9%
2016	25	20	35	58%	12%
2021	30	25	40	85%	19%

- This toll scenario represents a situation where the tolls of EHC and WHC are reduced (e.g. for car, tolls are reduced to $15 and to $30 at EHC and WHC respectively). While this toll scenario would achieve queue reduction at CHT, it would again cause severe congested traffic conditions at WHC (48% increase in traffic in year 2011) in all the years concerned.

4.8.5 *Initial toll adjustment only*

Table 4-12 summarises the traffic analysis result of the initial toll adjustment only.

Table 4-12 Toll Scenario for Initial toll adjustment only

Initial toll adjustment only	Toll levels for private car toll (HK$)			% change of WHC traffic (compared with base year)	% change of total cross harbour traffic (compared with base year)
	CHT	EHC	WHC		
2011	25	20	50	5%	4%
2016	25	20	50	20%	9%
2021	25	20	50	48%	17%

Ideal Traffic Level
Tolerable Traffic Level
Congested Traffic Level

- This toll scenario presents the case when adjustments are being made to the tolls at the three RHCs in the initial year only, and that overtime the tolls are assumed to increase by inflation (with no further increase in tolls in real term). Traffic analysis shows that under this toll scenario, traffic at CHT would quickly build up again after the initial toll adjustment and that traffic congestion would occur at CHT from 2016 onwards.

4.9 The Nine Better Toll Scenarios

4.9.1 Based on the selection criteria, Table 4-13 summarises the nine remaining toll scenarios – the "better toll scenarios". The detailed toll tables for the above better toll scenarios in 2011 are set out in Appendix B.

4.9.2 The nine toll scenarios represent a three by three matrix with each element having its own characteristics. The first dimension of the matrix defines the relationship between tolls for different vehicle types at the same tunnel. These are:

- "s" type, which has the same relationship between car tolls and other vehicle type tolls for all tunnels. This is considered to have the best economic characteristics, but will lead to very high toll increases for the vehicle types that currently have relatively low tolls at the CHT, particularly taxis and goods vehicles.

- "non-s" type, which retains the current relationships between the tolls for cars and other vehicle types at each tunnel. This leads to the smallest increases in tolls for taxis and goods vehicles at the CHT, and may be the most socially acceptable. However, it induces those vehicle types to continue to use the CHT in a way which is likely to be economically sub-optimal.

- "0.5s" type, which is a compromise solution half way between the "s" and "non-s" types. It will be intermediate in economic terms but, if deemed to be socially acceptable, would be superior to the "non-s" types.

The second dimension of the matrix is defined by:

- Group A assumes that the Government will increase CHT tolls only
- Group B assumes that the Government has control over tolls of all the three tunnels
- Group C assumes that the Government has control over tolls of CHT and EHC only

Under the Group D assumption, Government can set tolls for CHT and WHC now. The ownership of EHC will revert to the Government in 2016, and it is probably not practical to obtain control over WHC much before that date. Therefore the differences in the toll setting under the toll scenarios that are proposed for Group B and Group D will actually be the same from 2016 onwards. In the period up to 2016 in the Base Case the only crossing with spare capacity is EHC. The only way to make use of that capacity would be to raise tolls on CHT above the levels of EHC and also raise WHC tolls to relieve congestion on its access roads. It would be extremely difficult to justify obtaining control of WHC and then raising both CHT and WHC tolls. Hence, none of Group D scenario is selected.

4.9.3 These toll scenarios have covered the range of toll relationships on each tunnel and different car toll regimes.

Table 4-13 Better Toll Scenarios

Group	Better Toll Scenarios	Year 2011 Toll Levels for private cars (HK$)		
		CHT	EHC	WHC
A	A1	30	25	50
	A2	25(0.5s)	25	50
	A3	20s	25	50
B	B1	25	20	50
	B2	25(0.5s)	20(0.5s)	50
	B3	20s	20	50
C	C1	25	20	50
	C2	25(0.5s)	20(0.5s)	50
	C3	20s	20	50

The selection of toll scenarios is mainly based on their performance of forecast traffic flows and queue lengths at CHT of the criteria in Section 4.5. It has been analysed that the selected scenarios will not lead to other traffic problems such as increase in cross harbour travel time, reduction in average travel speed, traffic impacts on critical junctions and major strategic roads connecting the tunnels.

4.9.4 It is important to note that the reliability of forecasts must inevitably decline as the time horizon is extended. Input assumptions are less reliable, people's work and travel habits will change, means of transport will change, but cannot be as certain as now. In assessing the better toll scenarios less weight on the more distant forecast years – say beyond 2021 was placed. In addition, by this time horizon, Government would have the chance to reassess the situation as appropriate.

4.10 Traffic Analysis for the Better Toll Scenarios

This section exhibits the summarised results of the analysis for the nine better toll scenarios.

4.10.1 Constraint on Adjusting Toll Levels

4.10.1.1 Whether the Government has 'actual' control over the tolls of the three RHCs depends on the following conditions:

- The toll scenario group that the Government prefers, i.e. Group A, B or C
- Capacity constraint of WHC connecting roads

4.10.1.2 In the process of identifying the nine better toll scenarios, it is determined that for the period from 2011 to 2016, the toll levels for Group B and Group C are identical. After exploration of all possibilities, this implies that even if the Government has the control over WHC under Group B scenario, there is no scope to have any toll reduction at WHC due to the constraint of WHC connecting roads.

4.10.1.3 Table 4-14 shows an example, in which a reduction of WHC toll by $5 in 2011 and 2016 will shift more traffic to WHC (18% and 43% increase in traffic in 2011 and 2016 respectively when comparing with Base year) and congestions will be worsen at some of the WHC connecting roads. The queue building up from WHC southbound will end up in the tunnel itself and even back to the tunnel plaza on Kowloon side. The congestion problem may occur not only within the WHC area but also extend to CBD area, i.e. Central and Admiralty district. Under such situation the central area in Hong Kong Island will experience severe traffic congestion.

Table 4-14 Toll Scenario for WHC Toll Reduction

WHC Toll Reduction	Toll levels for private car toll (HK$)		
	CHT	EHC	WHC
2011	25	20	45
2016	35	20	45
2021	40	25	45

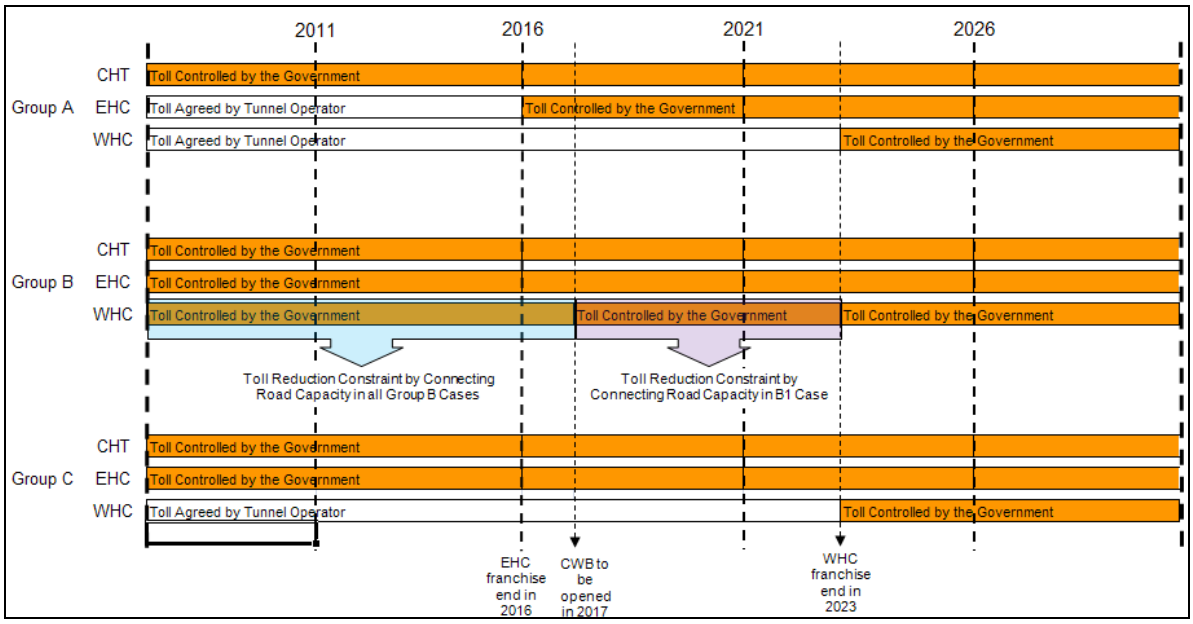
Ideal Traffic Level
Tolerable Traffic Level
Congested Traffic Level

4.10.1.4 As mentioned in the previous Table 4-5, the Government can set tolls for EHC and WHC will depend very much on the time horizon. It could be further translated into Figure 4-1 which describes the situation when the Government should have the control over toll for each RHC under Group A, B and C. It can be summarized that:

- In general, WHC toll cannot be reduced to accommodate more traffic due to the constraint of the capacity of its connecting road from now to 2016, despite the end of EHC franchise.
- With CWB in place in 2017, capacity of WHC will be increased and there is room for the toll reductions at WHC from 2017 to 2023. At this stage, Group A will be basically same as Group C when EHC is in the Government's hand.
- For 2023 or beyond, if there is no alteration to present franchise agreement, all 3 RHCs will be in the Government's hand. Hence same toll scenarios can be adopted for Group A,

B and C.

Figure 4-1 Constraint on Toll Adjustment for Different Groups



4.10.2 Better Toll Scenarios Performance

This section compares the performance of each better toll scenario stated in Table 4-13. It largely concentrates on the years up to 2021, since the forecasts are less secure beyond that and as both the EHC and WHC will have reverted to Government before 2026, they will have much more freedom of action. Indeed, subject to any change of the current franchises, any of the post-2024 toll scenarios can be selected and possibly improved upon.

Group A – Change CHT tolls only

4.10.2.1 Toll Scenario A1

Table 4-15 summarises the traffic analysis result of toll scenario A1.

Table 4-15 Traffic Analysis of Toll Scenario A1

Toll Scenario A1	Toll levels for private car toll (HK$)			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**

Ideal Traffic Level
Tolerable Traffic Level
Congested Traffic Level

- This scenario involves increasing the car toll at CHT from $20 to $30 in 2011, without any changes to the CHT toll structure.
- Under this scenario in 2011, tolerable traffic level at WHC cannot be achieved due to the capacity constraint of its connecting roads, although the volume of overall cross-harbour traffic would be reduced marginally (1%) when compared with the Base Case.
- The traffic results in 2011 indicates that maintaining the same toll structure and adjusting CHT toll alone under this scenario may not be a desirable scenario, although it is already the scenario which has yielded the most desirable results among all tested scenarios under Group A with "non-s" toll structure.
- This toll scenario would achieve more desirable distribution of cross-harbour traffic. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 47%, 29% and 24% respectively. It achieves a reduction of 63% queue at CHT.
- In 2011 and 2016, WHC would be in congested traffic level due to the increasing traffic demand and the limited supply on connecting road capacity. During this period, CHT and EHC could reach the tolerable traffic level. All tunnels could reach the tolerable traffic level in 2021 and 2026 after the opening of CWB in 2017.
- The effectiveness of this toll scenario would be reduced if WHC and/or EHC also increase their tolls.

4.10.2.2 Toll Scenario A2

Table 4-16 summarises the traffic analysis result of toll scenario A2.

Table 4-16 Traffic Analysis of Toll Scenario A2

Toll Scenario A2	Toll levels for private car toll (HK$)			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**

- This scenario involves increasing the car toll at CHT from $20 to $25 in 2011, and a change to the CHT toll structure to a 0.5s structure.
- Under this scenario in 2011, the volume of overall cross-harbour traffic would experience a moderate decrease (about 3%) when compared with the Base Case.
- This toll scenario would achieve a more desirable distribution of cross harbour traffic by switching traffic from CHT to EHC and WHC. It would achieve 67% in queue reduction at CHT. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 48%, 29% and 23% respectively.
- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will experience congestion traffic level

in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

- The effectiveness of this toll scenario would be reduced if WHC and/or EHC also increase their tolls.

4.10.2.3 Toll Scenario A3

Table 4-17 summarises the traffic analysis result of toll scenario A3.

Table 4-17 Traffic Analysis of Toll Scenario A3

Toll Scenario A3	Toll levels for private car toll (HK$)			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**

Ideal Traffic Level
Tolerable Traffic Level
Congested Traffic Level

- This scenario envisages a change of the CHT toll structure to follow the one at EHC, without any upward adjustment of the car toll. Tolls for other vehicle types at the CHT are increased to various degrees with the change in toll structure. It involves keeping car toll at CHT at $20, and changes the toll structure at CHT to the structure same as EHC.

- Under this scenario in 2011, the volume of overall cross-harbour traffic would experience a moderate decrease (3%) when compared with the Base Case.

- Overall, this toll scenario achieves a more desirable distribution of cross harbour traffic by switching traffic from CHT to EHC and WHC. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 49%, 29% and 22% respectively. It would achieve 67% of queue reduction at CHT.

- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will experience congestion traffic level in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

- The effectiveness of this toll scenario would be reduced if WHC and/or EHC also increase their tolls

Group B – Change CHT, EHC and WHC tolls

4.10.2.4 Toll Scenario B1

Table 4-18 summarises the traffic analysis result of toll scenario B1.

Table 4-18 Traffic Analysis of Toll Scenario B1

Toll Scenario B1	Toll levels for private car toll (HK$)			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**

Ideal Traffic Level
Tolerable Traffic Level
Congested Traffic Level

- Toll scenario B1 represents the scenario where the Government has the immediate and complete freedom to set tolls at all the three tunnels. However in short term (i.e. before the opening of CWB), there is no room to reduce the tolls at WHC as the tunnel capacity is constrained by its connecting roads. Therefore, this scenario involves increasing the car toll at CHT from $20 to $25, without any changes to the CHT toll structure. Car tolls are reduced from $ 25 to $ 20 at EHC, with the tolls for all other vehicle types at EHC reduced by the same proportions.
- Under this scenario in 2011, the volume of overall cross-harbour traffic would only experience a very slightly decrease (less than 1%) when compared with the Base Case.
- This toll scenario would also achieve some redistribution of cross-harbour traffic. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 47%, 31% and 22% respectively. It would achieve 52% of queue reduction at CHT.
- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will experience congestion traffic level in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

4.10.2.5 Toll Scenario B2

Table 4-19 summarises the traffic analysis result of toll scenario B2.

Table 4-19 Traffic Analysis of Toll Scenario B2

Toll Scenario B2	Toll levels for private car toll (HK$)			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**

Ideal Traffic Level
Tolerable Traffic Level
Congested Traffic Level

- Similar to B1, in short term (i.e. before the opening of CWB), there is no room to reduce the tolls at WHC as the current traffic condition is constrained by its connecting road. Therefore, this scenario involves increasing the car toll at CHT from $20 to $25, and a change to the CHT toll structure to a 0.5s structure. At the same time, it also involves a

reduction of car toll from $25 to $20 at EHC. The toll structure at EHC will also be changed to a 0.5s structure.

- Under this scenario in 2011, the volume of overall cross-harbour traffic would only experience a very small decrease (about 1%) when compared with the Base Case.

- This toll scenario would also achieve some redistribution of cross-harbour traffic. However, the proportion carried by WHC would be even lower than the existing level. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 47%, 32% and 21% respectively. It would achieve 77% of reduction in queue at CHT.

- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will experience congestion traffic level in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

4.10.2.6 Toll Scenario B3

Table 4-20 summarises the traffic analysis result of toll scenario B3.

Table 4-20 Traffic Analysis of Toll Scenario B3

Toll Scenario B3	Toll levels for private car toll (HK$)			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**

- Toll scenario B3 represents the scenario where the Government has the immediate and complete freedom to set tolls at all the three tunnels. But in short term (i.e. before the opening of CWB), there is no room to reduce the tolls at WHC as the current traffic condition is constrained by its connecting road. Therefore, this scenario involves keeping car toll at CHT at $20, and change the toll structure at CHT to the same structure as EHC. Car tolls are reduced from $25 to $20 at EHC, with the tolls for all other vehicle types at EHC reduced by the same proportions.

- Under this scenario in 2011, the volume of overall cross-harbour traffic would only experience a small decrease (about 2%) when compared with the Base Case.

- This toll scenario would also achieve some redistribution of cross-harbour traffic. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 48%, 31% and 21% respectively. It would achieve 77% of queue reduction at CHT.

- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will experience congestion traffic level in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

Group C – Change CHT and EHC tolls only

4.10.2.7 Toll Scenario C1

Table 4-21 summarises the traffic analysis result of toll scenario C1.

Table 4-21 Traffic Analysis of Toll Scenario C1

Toll Scenario C1	Toll levels for private car toll (HK$)			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**

- Toll scenario C1 represents the scenario where the Government has the immediate and complete freedom to set tolls at the CHT and EHC but not that at WHC. This scenario envisages an immediate upward adjustment of the toll for cars at CHT by 25% (i.e., from $20 to $25). Tolls for other vehicle types at the CHT also increase by the same proportion. Car toll is reduced from $25 to $20 at EHC. Tolls for other vehicle types at EHC are also reduced by the same proportion.
- Under this scenario in 2011, the volume of overall cross-harbour traffic would only decrease marginally (less than 1%) when compared with the Base Case.
- This toll scenario would also achieve some redistribution of cross-harbour traffic by a notable switch of car trips from CHT to EHC and WHC, and goods vehicle trips from CHT and WHC to EHC. It would also achieve a moderate queue reduction of 52% at CHT. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 47%, 31% and 22% respectively.
- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, with the continuously growth in traffic, WHC will experience congestion traffic level in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

4.10.2.8 Toll Scenario C2

Table 4-22 summarises the traffic analysis result of toll scenario C2.

Table 4-22 Traffic Analysis of Toll Scenario C2

Toll Scenario C2	Toll levels for private car toll (HK$)			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**

- Toll scenario C2 represents the scenario where the Government has the immediate and complete freedom to set tolls at the CHT and EHC but not that at WHC. This scenario envisages an immediate upward adjustment of the toll for cars at CHT by 25% (i.e., from $20 to $25), and a change to CHT toll structure to a 0.5s structure. Car toll is reduced from $25 to $20 at EHC, and a change to EHC toll structure to a 0.5s structure is required.
- Under this scenario in 2011, the volume of overall cross-harbour traffic would be reduced marginally (1%) when compared with the Base Case.
- This toll scenario would also achieve some redistribution of cross-harbour traffic. However, the proportion carried by WHC would be even lower than the existing level. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 47%, 32% and 21% respectively. This scenario achieves fairly good queue reduction, with 77% reduction in queue at CHT in 2011.
- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will be congested in 2016. This situation would be improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

4.10.2.9 Toll Scenario C3

Table 4-23 summarises the traffic analysis result of toll scenario C3

Table 4-23 Traffic Analysis of Toll Scenario C3

Toll Scenario C3	Toll levels for private car toll (HK$)			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**

- Toll scenario C3 represents the scenario where the Government has the immediate and complete freedom to set tolls at the CHT and EHC but not that the tolls at WHC. This scenario envisages a change to CHT toll structure to the same structure at EHC, with the car toll stays at $20. Car toll is reduced from $25 to $20 at EHC. Tolls for other vehicle types at EHC are reduced by the same proportion.
- Under this scenario in 2011, the volume of overall cross-harbour traffic would only experience a small reduction (about 2%) when compared with the Base Case.
- This toll scenario would also achieve some redistribution of cross-harbour traffic. Queue reduction of 77% at CHT in 2011 can be achieved. The share of CHT, EHC and WHC will change from 51%, 28% and 21% respectively to 48%, 31% and 21% respectively.
- All tunnels could reach the tolerable traffic level in 2011 with the toll adjustment made. However, when the traffic keeps growing, WHC will be congested in 2016. This situation would be much improved after the opening of CWB in 2017 when the toll levels for all tunnels can be adjusted to achieve the tolerable traffic level.

4.10.3 Economic Evaluation

4.10.3.1 The economic evaluation is used in previous CTS studies and is an approach to measure quantitatively the benefits of certain toll scenarios to the society as a whole including those non-tunnel users.

4.10.3.2 The types of costs considered in the economic evaluation included:

- Perceived costs, the amount that trip makers believe that it costs them to make their trips. For example, it is generally considered that car drivers only perceive fuel, oil and toll costs and do not take into account depreciation of the vehicle caused by the trip-making. However, goods vehicle operators are assumed to perceive all of their costs;

- Financial costs, the total out-of-pocket costs that a trip-maker must eventually bear to make their trips. Items of financial cost include amortised capital costs (a combination of depreciation and interest), annual licence costs, insurance costs, tyre consumption costs, fuel consumption costs, lubricating oil consumption costs, crew wages, spare parts consumption costs and maintenance labour costs; and

- Economic (or resource) costs, the value to the community measuring the real value of the resource. It is normally taken as financial cost net of taxes, duties and subsidies.

4.10.3.3 In essence, in this exercise we are measuring the distortion that tolls cause to the economically best paths for trips. Drivers choose their route according to their perceived costs, which include tolls. If a vehicle travels further than it needs to in order to avoid a high toll, then it will consume real resources, including fuel, drivers' time and vehicle depreciation, which are a cost to the community as a whole.

The routes for vehicles through the road system are calculated using perceived costs which include:

- perceived vehicle operating costs, mainly fuel costs, as it has been found that drivers largely disregard other costs when choosing a route;
- the perceived person time costs for the trip; and
- out-of-pocket expenses, such as tolls.

In general drivers will seek to find routes that minimise the total cost of their journey, defined as the sum of the above elements, and taking into account congestion effects.

Using those routes the model can calculate the actual cost to the whole community using economic, or resource, costs which include:

- economic vehicle operating costs which include elements such as vehicle depreciation, but would exclude the taxation element of the fuel cost, this latter being a transfer payment from the vehicle user to the Government; and

- the economic person time costs, which may be different from the way in which people value their own time.

Tolls are also a transfer payment between one part of the economy of Hong Kong to another part. They are the redistribution of income in the market which does not consume any economic resources. A toll on a route with minimum consumption of economic resources may discourage drivers from choosing that route as the drivers tend to choose a route with a lower perceived cost but a higher resource cost.

The economic costs implied by the routes chosen can be summed over all movements and vehicle types leading to a measure of the distortion caused by the toll system.

4.10.3.4 In the Base Case, the CHT is considerably cheaper than the other tunnels and thus drivers will go out of their way to use the CHT, and at the same time cause congestion – an additional cost. It may be noted that as perceived costs and economic costs are not completely correlated, complete equality of tolls may not lead to the best economic results since usually drivers make their route choices based on perceived costs only.

4.10.3.5 Benefits are compared with Base Case (i.e. positive economic benefit means that the alternative toll scenario generates positive benefits when compared with the Base Case), and economic benefits include savings in travel costs such as fuel costs, maintenance costs etc. and savings in travel time.

4.10.3.6 In general, time benefits for both cars and public transport decrease from the "s" case through the "0.5s" case to the "non-s" case, whereas the reverse is true for taxis. Car routing is almost entirely dependent on travel time and toll, with the perceived cost of travelling playing a very small role. For taxis, on the contrary, the distance related fare is much closer to the full cost of travelling than car perceived cost, and is relatively much more important. This leads taxis, and their passengers, to adopt different routes from cars, with the result that time savings are balanced against real cost savings. The taxis are therefore still ready to adopt slower routes, whereas the cars use the faster routes. Due to the rebalancing between vehicle types, this could lead to the decrease in time benefits gained by taxis from "non-s" to "0.5s" to "s" structure, although the benefits gained are still strongly positive under the better toll scenarios.

4.10.3.7 Overall the "s" case is best for cars, including operating costs, and the "non-s" case is best for taxis. Time benefits are not calculated separately for goods vehicles as the crew costs are included in the vehicle operating costs.

Table 4-24 Summary Result of Annual Benefits (in billion HK$)

Better Toll Scenarios	A-1	B-1	C-1	A-2	B-2	C-2	A-3	B-3	C-3
Economic Benefits	0.38	0.52	0.52	0.41	0.59	0.55	0.43	0.61	0.56

4.10.3.8 Table 4-24 shows the summary result of annual benefits of the nine better scenarios. All the scenarios generate positive economic benefits, ranging between HK$ 0.4 and 0.6 billion per year. In terms of the extent to which economic benefits are generated under the different types of toll structures, it can be seen that the s toll structure group is most effective in generating economic benefits, followed by the 0.5s toll structure group and then the non-S toll structure group. Group B is the best of the three, followed by Group C and Group A.

4.10.3.9 In summary, all of the toll scenarios give good economic benefits and perform much better than the Base Case in serving the needs of Hong Kong people. In general the higher toll options out-perform the lower tolls.

4.10.3.10 Better toll scenarios may also bring about environmental benefits in terms of reduction in emissions in the harbour area. It is known that the repeated starting and stopping of cars and the idling engines in a traffic queue seriously increase the emission of pollution gases especially CO_2. It is always favourable to see the cars moving, even in slow speed, rather than stopping on the road with the engines switched on. Therefore, when considering the environmental benefit, it would be relevant to examine the level of improvement in the queuing situation each of the better toll scenarios can bring about. As the average travel speeds in the queue are about the same in all scenarios, the emissions from this source are proportional to the queue length. The table below shows the reduction in CHT queue in the nine better toll scenarios. The result shows that all nine better toll scenarios could help to reduce more than 50% of the queue. In other words, it means that the pollution gas emission could be significantly reduced under all scenarios.

Table 4-25 CHT Queue Reduction under Each Better Toll Scenarios

Better Toll Scenarios	A-1	B-1	C-1	A-2	B-2	C-2	A-3	B-3	C-3
CHT Queue Reduction in 2011 (Compared with base year)	-63%	-52%	-52%	-67%	-77%	-77%	-67%	-77%	-77%

4.10.4 Summary of Traffic Analysis

4.10.4.1 Summary for Group A

- For all the three toll scenarios in Group A, CHT toll need to be increased overtime to maintain the desirable traffic conditions at all three RHCs.
- This indicates that maintaining the same toll structure and adjusting CHT toll alone under toll scenario A1 are not feasible scenarios in 2011. However, with the change in toll structure for toll scenario A2 and A3, the traffic situation could be improved and the tunnels could achieve tolerable traffic level.
- After the EHC return to the Government in 2016, there will be room for EHC to reduce the car toll by $5 dollars to $20 such that it could relieve the traffic pressure at the other tunnels. While the traffic continues to grow, the car toll level at EHC has to return to $25 under toll scenario A1 and A3 or need to go for $20(0.5s) for toll scenario A-2 in 2021.

4.10.4.2 Summary for Group B

- All three toll scenarios in Group B could achieve tolerable traffic level except the scenarios in 2016, when WHC is under congested level due to the capacity constraint of the connecting roads. The capacity problem would be relieved after the completion of CWB in 2017. Possible toll reduction would be allowed in 2021. The analysis results show that there is room for car toll reduction of $5 and $10 for the scenario B2 and B3 respectively. However, tolls at WHC cannot be reduced under scenario B1 in 2021.

- With the connecting road problems and thus limited WHC capacity, tolls at WHC could not be reduced before the completion of CWB. The analysis results show that toll reduction of $5 at WHC will result in congestion at WHC. The queue building up from WHC southbound will end up in the tunnel itself and even back to the tunnel plaza on Kowloon side. The congestion problem may occur not only within the WHC area but also extend to CBD area, i.e. Central and Admiralty district. The Island northern road network of Connaught Road, Harcourt Road, Gloucester Road will be more congested than the situation now.

4.10.4.3 Summary for Group C

- Nearly all scenarios in Group C could reach tolerable traffic level or better, except the scenarios in 2016, when WHC will reach congested level due to the capacity constraint of the connecting road. The capacity problem will be relieved after the completion of CWB in 2017.

4.10.4.4 Summary for all Groups

- All better toll scenarios selected under the three groups aim to maintain tolerable traffic level except toll scenarios in 2016, when WHC is under congested level due to the capacity constraint of the connecting road. The capacity problem would be resolved when CWB is in place in 2017.

- Toll scenarios in Group A will be basically same as Group C after 2016 when EHC returns to Government at that time.

- Although the main difference between Group B and Group C is the toll control of WHC, take into account the limited WHC tunnel capacity constrained by its connecting roads, WHC car toll has to be kept at $50 in Group B, which is the same as the tolls set in Group C, despite the fact that the Government has control over tolls at all three tunnels under Group B.

- It is important to note that there is no room for toll reduction in B1 even after the completion of CWB in 2017. However, a $5 and $10 car toll reduction would be allowed for B2 (with 0.5s toll structure) and B3 (with s toll structure) respectively. For 2023 and beyond, all tunnels would be returned to the Government and there would be no difference among the three groups.

- For the modelling year 2026, toll scenarios A1, A2 and A3 are all identical to toll scenario B1, B2 and B3 respectively, which are also the same as toll scenarios C1, C2 and C3 since the Government could control all the tunnels at that time. Relatively high toll level for private car would be required under "non-s" (for A1, B1 and C1) toll structure when CHT toll structure is maintained. On the other hand, lower toll level for private car in CHT, EHC and WHC could be maintained with the application of "0.5s" structure (for A2, B2 and C2) and "s" structure (for A3, B3 and C3).

- All of the scenarios show considerable economic benefits over the Base Case, ranging between HK$0.38 billion and HK$0.61 billion every year. In terms of the extent to which economic benefits are generated under different types of toll structures, the s toll structure group is most effective in generating economic benefits, followed by the 0.5s toll structure group and then the non-s toll structure group.

- Group B is the best of the three in terms of achieving the tolerable traffic levels in general, followed by Group C and Group A. All these better toll scenarios bring improvements to the existing cross harbour traffic conditions to some degree, although they affect different user groups to different extents.

- The detailed traffic flow forecast for the above better toll scenarios in 2011 is set out in Appendix C.

5 LEGAL, MANAGEMENT AND ORGANISATION IMPLICATIONS

This section provides the legal, and management and organisational structure implication associated with each of the following implementation options:

- Option 1: Increase CHT tolls
- Option 2: Buy-back EHC and/or WHC
- Option 3: Forming a common ownership of CHT, EHC and/or WHC
- Option 4: Extension of EHC and/or WHC franchises
- Option 5: Provision of concessions to EHC and/or WHC franchisees
- Option 6: Increase CHT tolls and rebate to EHC and/or WHC users

5.1 Option 1: Increase CHT Tolls

5.1.1 This implementation option involves upward adjustments in CHT tolls for implementing toll scenarios under Group A only.

5.1.2 Table 5-1 explains the legal, and management and organisational structure implications of this implementation option.

Table 5-1 Legal, and Management and Organisational Structure Implications for Option 1 – Overall Increase in CHT Tolls

Legal implications
➢ The tolls for the CHT may be increased by the Chief Executive in Council amending the Second Schedule to the RT regulations to reflect the new (i.e. increased) tolls and publishing it in the Gazette. ➢ However, the Chief Executive in Council would need to have the support of LegCo for increasing the CHT tolls and amending the Second Schedule to the RT Regulations because, as subsidiary legislation, it must be laid on the table of LegCo at the next sitting of LegCo after publication in the Gazette (refer section 34(1) of the Interpretation Ordinance, Cap. 1). Where it has been laid on the table, LegCo may pass a resolution requiring that such subsidiary legislation be amended in any manner whatsoever. If any such resolution is passed by LegCo, the subsidiary legislation is deemed to be amended in accordance with the LegCo resolution. Accordingly, while the Chief Executive in Council has the power to amend the Second Schedule, given the ability of LegCo to require amendment to it, Government would need to be satisfied that increases to the CHT tolls (as specified in the amended Second Schedule) would pass the scrutiny of LegCo.
Management and Organisational Structure implications
➢ There will not be any changes to the management and organisational structure of all three RHCs.

5.2 Option 2: Buy-back EHC and/or WHC

5.2.1 This implementation option involves Government negotiating and agreeing with NHKTCL and/or WHTCL, respectively, to buy back their franchise rights, like any other commercial transaction. This could take several forms. The most obvious form is by way of a transfer of shares by all the shareholders of each of NHKTCL and WHTCL to Government. The other form is by Government and each of NHKTCL and WHTCL commercially agreeing to revoke the franchises.

5.2.2 Table 5-2 shows the legal, and management and organisational structure implications of this implementation option.

Table 5-2 Legal, and Management and Organisational Structure Implications for Option 2 – Buy-Back EHC and/or WHC

Legal implications
Buy-back EHC and/or WHC through "Transfer of Shares" ➢ The ownership structures for NHKTCL and WHTCL are detailed below. – Eastern Harbour Crossing – The franchisee of EHC is the New Hong Kong Tunnel Co., Ltd. Its major shareholders are CITIC Pacific Ltd. ("CITIC"), Kumagai International Ltd., Paul Y (New Tunnel) Ltd & Marubeni Hong Kong & South China Ltd, and The Financial Secretary Incorporated which holds 7.5% of EHC. – Western Harbour Crossing – The franchisee of WHC is Western Harbour Tunnel Co., Ltd. Its shareholders are Adwood Company Ltd., and The Cross-Harbour (Holdings) Ltd. ("CHHL"). For Adwood Company Ltd., it is controlled by CITIC Pacific Ltd. and Kerry Properties Ltd. ("Kerry"). ➢ It is extremely likely that the shareholders of both NHKTCL and WHTCL are parties to a shareholders' agreement. The shareholders' agreement would stipulate the terms on which a shareholder may transfer its shares in the company. The terms of a shareholders' agreement are private. However, it is usual that under such agreements a shareholder wishing to transfer its shares (to a third party) must first offer the shares to the other shareholders (being the right of pre-emption). ➢ Accordingly, applying this assumption, in order for either NHKTCL or WHTCL to agree to sell their franchise to Government, all the shareholders must effectively agree to the sale by waiving, or failing to take up, their pre-emption rights. ➢ Obtaining the agreement of all NHKTCL's shareholders and all WHTCL's is therefore a threshold step in Government buying back the EHC and WHC. ➢ Assuming all the shareholders of both NHKTCL and WHTCL accepted Government's offer and agreed to sell, the following legal process would apply: – The terms of the transfer (i.e., the share sale and purchase agreement) would need to be negotiated and agreed;

Legal implications

- All pre-conditions would need to be satisfied, for example, those shareholders who are publicly listed companies would need to satisfy disclosure requirement (where applicable) and obtain shareholder and/or board approval (although it is noted that this is not a process in which Government would be involved) and Government would need to obtain approval from LegCo;

- Completion would take place and associated formalities undertaken, such as payment of stamp duty, registration of the share transfer, novation of existing agreements with NHKTCL/WHTCL to Government (or the termination of existing agreements between NHKTCL/WHTCL and third parties and the formation of new contracts between Government and relevant third parties); and

- The EHC and WHC Ordinances would need to be replaced and the EHC and WHC would be added to the Schedule to the RT Ordinances, as happened with the CHT when the CHT franchise expired in 1999.

Buy-back EHC and/or WHC through "Commercial agreement to revoke the franchises"

- A commercial agreement between Government and NHKTCL and WHTCL, respectively, to revoke the franchises is another way that Government could "buy back" the EHC and WHC.
- This would involve Government obtaining agreement from NHKTCL and WHTCL to "sell" the franchise back to Government, the effect being revocation of the respective franchises. Practically, this would be like NHKTCL and WHTCL agreeing to sell their businesses (i.e., the right to operate and maintain the tunnel, the infrastructure and employees etc). Many of the same legal and commercial issues arise as with the transfer of the shares by the shareholders to Government.
- A transaction of this kind would definitely require majority consent by the directors and/or shareholders (i.e., more than half the directors and/or shareholders holding an aggregate of not less than 51% of the issued voting shares). However, for both NHKTCL and WHTCL, this transaction is likely to constitute the sale of their principal asset. Accordingly, it is likely that the relevant shareholders' agreement will contain a provision that requires a higher majority, for example, a majority of 75%, or even higher, to sell the franchises.
- Instead of a share sale and purchase agreement, there would be a revocation and sale of business agreement and it would be the individual assets and liabilities owned by the companies being transferred rather than the shares in the companies themselves. This would make it a more difficult and complicated process.

Management and Organisational Structure implications

- There will not be any major management and organisational structure implications as tunnels would become Government tunnels under the management of the Transport Department.

5.3 Option 3: Forming a common ownership of CHT, EHC and/or WHC

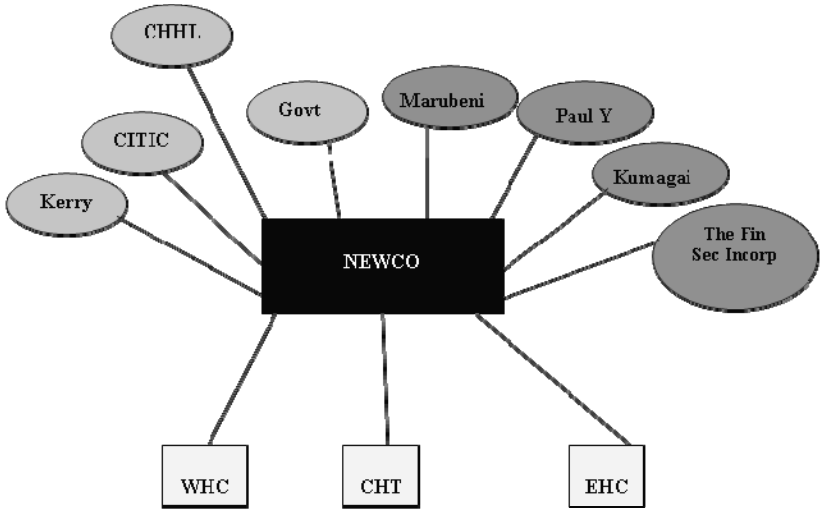
5.3.1 This implementation option involves a new entity formed by the common ownership to take over the toll collection role, implement a fair and equitable toll system and divide revenue among the operators.

5.3.2 There are two ways where a common ownership could be formed. The first is by way of a transfer of the ownerships of CHT, EHC and WHC to a new holding company, which would then own the three tunnels and in which they would all own shares. The second is by Government, NHKTCL and WHTCL agreeing to sell their businesses (in the case of EHC and WHC, in effect, their franchises, the infrastructure and employee etc) to a new company in exchange for shares in the new company.

Table 5-3 Legal, and Management and Organisational Structure Implications for Option 3 –Forming a common ownership of CHT, EHC and/or WHC

Legal implications
Forming a common ownership through "Transfer of Shares" ➢ Forming a common ownership by way of transfer of all of the shareholders' existing shareholdings would involve creating a new company ("Newco"), Government swapping its 100% ownership of CHT for shares in Newco and the shareholders of NHKTCL and WHTCL agreeing to swap their shares in NHKTCL and WHTCL for shares in Newco, as shown in Figure 5-1 below.

Figure 5-1 Forming a common ownership by way of transfer of shares



Legal implications

- As with the buy-back of the EHC and WHC by Government, all the shareholders of NHKTL and WHTCL must agree to the transfer of their existing shareholdings and the threshold issues will be the size of the shareholding of each shareholder and the price.

- Assuming all the shareholders of both NHKTCL and WHTCL agree to transfer their existing shareholdings, the following legal process would apply:

  - The shareholders of NHKTCL and WHTCL would need to obtain the necessary approvals of their shareholders and/or boards and Government would need to obtain LegCo approval.

  - A new shareholders' agreement governing, amongst other things, the organisation, management and business of Newco, and stipulating the terms on which shares in Newco may be transferred, would need to be negotiated and agreed between all the shareholders. This would also need to address the basis for setting tolls in the future, and most likely, a compensatory mechanism by which the non-government shareholders are compensated if, for political or policy reasons, the toll rates are adjusted so that the shareholders receive a less than commercial return or less than their expected IRR.

  - In addition, there would need to be in place consistent franchise arrangement for each of the CHT, EHC and WHC. This might best be achieved by a single project agreement between Newco and Government providing for a single franchise to operate and maintain all three tunnels for the agreed period. Accordingly, the existing WHC Project Agreement would need to be terminated. Similarly, the EHC and WHC Ordinances would probably need to be repealed, CHT removed from the Schedule to the RT Ordinance, and a new ordinance enacted to cover all three tunnels.

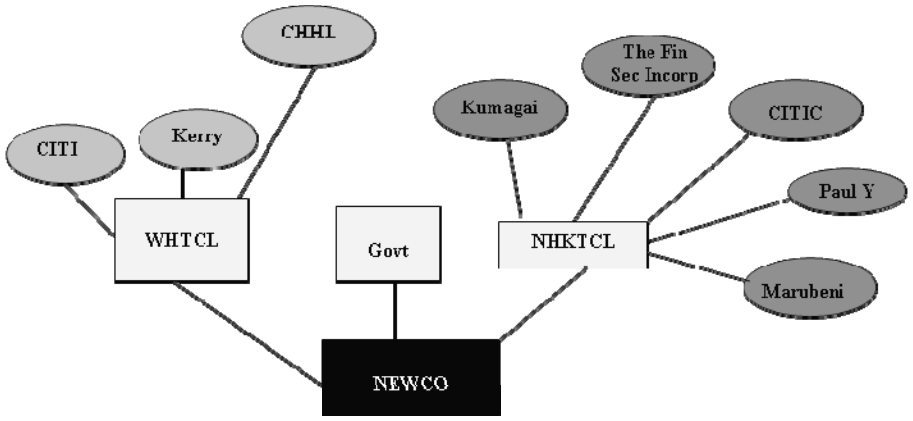
Forming a common ownership through "Sale of Business"

- Forming a common ownership by way of a sale would involve Government, NHKTCL and WHTCL agreeing to sell their businesses (the right to operate and maintain the tunnel, the infrastructure and employees etc) in exchange for shares in Newco, as shown in

- Figure 5-2 below.

Legal implications

Figure 5-2 Forming a common ownership by way of a sale



- Whilst this would result in all three tunnels being held through one company, rather than the three tunnels being held by separate subsidiaries of a holding company owned by the shareholders, much of the same legal and commercial issues arise as with a transfer of existing shares to Newco.
- The shareholders of NHKTCL and WHTCL would need to obtain the necessary approvals of their shareholders and/or boards and Government would need to obtain LegCo approval.
- Instead of a share transfer agreement there would be a sale of business agreement, and it would be the individual assets and liabilities owned by the companies being transferred rather than the shares in the companies themselves. This would make it a more difficult and complicated process, but may allow a degree of restructuring, such as leaving some assets and liabilities with the existing companies and retiring or restructuring debt, which may have a benefit.

Management and Organisational Structure implications

- A new management and organisational structure will need to be redefined.
- An in-depth analysis on the management capability and capacity for the new structure will need to be conducted by the Government before a decision on the right model/structure for the new entity are to be made.
- There are three main models which entail different degrees of integration. These model

Management and Organisational Structure implications
are: - Status-quo organisational structure: this means the organisational structures of the three RHCs stay at their status-quos but define the new mechanism to determine tolls of the RHC in order to distribute the traffic while the three RHCs will operate independently. - *Forming a decentralised-holding company for the three RHCs*: this essentially means to form a holding company for the three RHCs, but decentralise the management and operational of the tunnels. It allows certain level of autonomy for the operations and management of each RHC, but it will standardize the management systems and ensure effective management. - *Forming a centralised-holding company for the three RHC:* this essentially means to form a holding company for the three RHCs, but centralise the various functions of the operations of the tunnels. It involves a full integration of all the RHCs such that there will be common functions. This option will achieve better synergies or cost savings but it requires significant integration efforts. ➢ Additionally, new functions should also be created for specific purposes, e.g. a well established IT Department for effective and advanced management of the new organisation, and a new R&D Department for Traffic & Toll Management.

5.4 Option 4: Extension of EHC and/or WHC franchises

5.4.1 The principle of this implementation option is to "compensate" the franchises for their loss in revenue resultant from downward toll adjustments by extending the franchise periods.

5.4.2 Table 5-4 details the legal, and management and organisational structure implications of this implementation option.

Table 5-4 Legal, and Management and Organisational Structure Implications for Option 4 – Extension of EHC and/or WHC franchises

Legal implications
Extending the EHC franchise period ➢ An extension of the EHC franchise period would need to be agreed between the Government and NHKTCL. ➢ The period of the extension necessary to offset the reduction in the tolls, so as to preserve the return realised by NHKTCL and makes the option a commercially viable offer for NHKTCL. The duration of the extension depends upon the reduction in the

Legal implications
EHC tolls and the other toll scenarios implemented at the CHT and WHC at the same time, as all these would impact upon such things as the traffic flow across the three harbour crossings and the overall volume of cross harbour traffic, which would in turn impact upon the revenue to be realised by NHKTCL. ➢ Consideration for the extent of the toll reduction and the duration of the extension must be applied. ➢ Amendments would need to be made to the EHC Ordinance to reflect the agreement reached between Government and NHKTCL regarding the toll reduction, its duration, extension of the franchise and scope for future toll increases. ➢ Specifically, Section 4(2) of the EHC Ordinance would need to be amended and, given an extension to the franchise period will involve a reduction in the tolls, the Schedule to the EHC Ordinance, which sets out the tolls payable for use of the tunnel, would need to be amended. Whether the mechanism for adjusting the tolls under section 55 would need to be amended will depend on what is agreed between Government and NHKTCL during the negotiation to reduce the tolls and extend the franchise period. ➢ LegCo would need to pass legislation amending the EHC Ordinance to reflect the agreement reached between Government and NHKTCL. Accordingly, Government would need to ensure that it had the support of LegCo in agreeing an extension of the franchise. *Extending the WHC franchise period* ➢ An extension of the WHC franchise period would need to be agreed between the Government and WHTCL. ➢ The period of the extension necessary to offset the reduction in the tolls, so as to preserve the return realised by WHTCL and makes the option a commercially viable offer for WHTCL. The duration of the extension depends upon the reduction in the WHC tolls and the other toll scenarios implemented at the CHT and EHC at the same time, as all these would impact upon such things as the traffic flow across the three harbour crossings and the overall volume of cross harbour traffic, which would in turn impact upon the revenue to be realised by WHTCL. ➢ Under this option, the complex mechanism for increasing the tolls or WHTCL receiving a payment from the Fund in lieu of a toll increase, which is driven by whether WHTCL's net revenue in a particular year falls below a pre-estimated minimum net revenue set out in Schedule 5 to the WHC Ordinance, would logically need to be modified or abolished. This is because such a mechanism would be inconsistent with the new toll regime agreed between Government and WHTCL. ➢ Accordingly, Government would need to agree with WHTCL the extent of the reduction in the tolls, the duration of the toll reduction, the duration of the extension and the ability for WHTCL to increase the tolls down the track and the mechanism for doing

Legal implications
so. ➢ Once agreement is reached, the WHC Project Agreement and the WHC Ordinance (i.e. Section 2(1) definition of "franchise period") would need to be amended. *WHC Ordinance* ➢ The extent of the provisions and schedules to be amended will depend on what is agreed between Government and WHTCL in negotiating an extension to the franchise period. As an extension would necessarily involve a reduction in the tolls, the following would certainly need to be amended: (a) the definition of "franchise period" under section 2(1); and (b) Schedule 1, which sets out the tolls payable for use of the tunnel. ➢ The exact nature and extent of other amendments will depend, for example, on whether or not Government negotiates with WHTCL to modify or abolish the existing pre-estimated net revenue scheme, do away with the anticipated toll increase dates and/or the Toll Stability Fund and, if all or some of these things are modified or abolished, what is agreed will replace them. *WHC Project Agreement* ➢ The definition of "Franchise Period" in clause 1(A) and clause 3 regarding the Franchise Period would need to be amended. Whether Part X, which makes provision for the right of WHTCL to collect tolls and vary the tolls, and Appendix 12, the Toll Adjustment Schedule which makes provision for increasing the tolls in terms similar to Parts IX and X of the WHC Ordinance, would need to be amended would depend on what is agreed between Government and WHTCL in relation to the pre-estimated minimum net revenue scheme as part of the toll reduction and extension of the franchise period negotiations. ➢ In addition, LegCo would need to pass legislation making corresponding amendments to the WHC Ordinance. In doing this, Government would need to be satisfied that the terms of any supplemental agreement would stand up to the scrutiny of LegCo. Government would therefore need to ensure that it had the support of LegCo in agreeing an extension of the franchise.
Management and Organisational Structure implications
➢ No significant management and organisational structure implications.

5.5 Option 5: Provision of concessions to EHC and/or WHC franchisees

5.5.1 This implementation option involves downward adjustment of EHC and/or WHC tolls, with

loss of revenue to franchisees compensated by the Government.

5.5.2 Table 5-5 details the legal, and management and organisational structure implications of this implementation option.

Table 5-5 Legal, and Management and Organisational Structure Implications for Option 5 – Provision of concessions to EHC and/or WHC operators

Legal implications
Provision of concessions to EHC franchisee ➢ Agreement between Government and NHKTCL is required to lower the tolls at EHC. ➢ In view of a 2005 arbitral award finding that a reasonable (but not excessive) remuneration for NHKTCL is an IRR on equity of between 15% and 17% after tax over the life of the franchise, it is possible that any incentive offered by Government to NHKTCL as consideration for NHKTCL agreeing to lower the tolls would need to achieve an IRR of between 15% and 17%, or what can be realistically earned by NHKTCL. ➢ The incentive in relation to the EHC could not comprise a payment from the Fund like WHC (see below for details), since there is no such fund in relation to the EHC. ➢ Due to much simpler mechanism for adjusting the tolls under the EHC Ordinance and the 2005 arbitral award putting a reasonable but not excessive IRR at between 15% and 17%, while amendments would need to be made to the EHC Ordinance to reflect the agreement reached between Government and NHKTCL, the need for significant modification to the toll adjustment mechanism, or its abolition, is less likely than in the case of the WHC and the status quo is less likely to be upset. Provision of concessions to WHC franchisee ➢ Agreement between Government and WHTCL is required to lower the tolls at WHC. ➢ One of the difficulties of obtaining WHTCL's agreement to lower the tolls is the impact this will have on WHTCL's net revenue. This is because under the WHC Ordinance and WHC Project Agreement, if WHTCL's net revenue in a particular year falls below the pre-estimated minimum net revenue for that year, as set out in Schedule 5 to the WHC Ordinance (and Appendix II to Appendix 12 of the WHC Project Agreement), WHTCL is entitled to apply to the Secretary for Transport and Housing to give effect to a toll increase or, if a toll increase is deferred, to receive a payment from the Fund (although it is noted that practically WHTCL does not charge users of the WHC the tolls it is entitled to charge under the WHC Ordinance/WHC Project Agreement). The effect of this mechanism is that Government must be mindful of WHTCL's annual net revenue, and, thereby, its return when negotiating a toll reduction and incentive with WHTCL. ➢ Accordingly, as an incentive to WHTCL to lower the tolls, Government would offer WHTCL a concession. In any event, in order to reach a commercial agreement with WHTCL, the incentive would (probably) need to ensure that WHTCL's projected net revenue in a particular year is achievable, whether or not the toll increase mechanism (which necessarily includes the net revenue scheme) is maintained but suspended,

Legal implications

modified or abolished. At the least, the toll increase mechanism would need to be suspended for the duration of toll reduction and incentive, as the toll reduction/incentive scheme would be inconsistent with the toll increase mechanism, as was the case with the extension of the franchise option.

- Government would therefore need to agree with WHTCL the extent of the reduction in the tolls, the duration of the toll reduction, the duration of the incentive and the ability of WHTCL to increase the tolls down the track and the mechanism for doing so.

- Once agreement is reached between Government and WHTCL, the WHC Project Agreement would need to be amended by a supplemental agreement to reflect the agreement. In addition, LegCo would need to pass legislation amending the WHC Ordinance.

- The amendments to be made to the WHC Ordinance and WHC Project Agreement would depend on what form of incentive/concession is negotiated and agreed between Government and WHTCL in exchange for a reduction in the tolls, the duration of the arrangement and the nature and extent of modifications/amendments to the current toll increase mechanism, as discussed above in relation to extension of the franchise period. In practice, WHTCL charges concessionary tolls which are substantially lower than what are published under Schedule 1 of the WHC Ordinance. Amendment to the Schedule is not necessarily required as a result, provided that agreement between the Government and WHTCL is reached. The relevant parts that might need to be amended include Section 2(1) definitions, Section 33 Tolls, and part IX and X and their associated schedules.

- Regardless of the forms of incentives provided to the franchisee under this option, provision would need to be made for the incentive in an appropriate section of the WHC Ordinance, most likely Part X, which deals with accounts and toll increases. In addition, consequential amendments would need to be made to the toll increase mechanism, and/or the toll stability fund provisions, in Parts IX and X and Schedules 2 to 5 of the WHC Ordinance.

- The WHC Project Agreement would also need to be amended. As for the WHC Ordinance, whether and the extent to which Part X of the WHC Project Agreement, which makes provision for the right of WHTCL to collect tolls and vary the tolls, and Appendix 12, being the Toll adjustment Schedule, which makes provision for increasing the tolls in terms similar to Parts IX and X of the WHC Ordinance, would need to be amended depend on what is agreed between Government and WHTCL in relation to the incentive and the current toll increase mechanism and toll stability fund provisions.

- Furthermore, depending on how the scheme is funded, separate funding allocation or even enabling legislation may be required. The scheme may be funded by funding allocations approved by LegCo. If, however, appropriation was required, separate enabling legislation would be required, which would also need the support of LegCo.

Management and Organisational Structure implications
➢ No significant management and organisational structure implications.

5.6 Option 6: Increase CHT Tolls and rebate to EHC and WHC users

5.6.1 This implementation option involves an increase in tolls for all classes of vehicle at the CHT. In this regard, the same considerations apply as for a straight toll increase, as discussed in Option 1 above.

5.6.2 The other component of this option is a Government rebate to WHC/EHC users. The rebate scheme would be a Government initiative and undertaking and would be administered by either the Transport Department or the tunnel operators or toll collection agents on Government's behalf. It is, in effect, a cash-back by the Government to motorists using the WHC/EHC. Accordingly, with reimbursement from Government the rebate would not affect the levels of the tolls actually collected by either the WHC or EHC.

Table 5-6 Comparison of the concession option (Option 5) and the rebate option (Option 6)

	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

5.6.3 Table 5-7 details the legal, and management and organisational structure implications of this implementation option.

Table 5-7 Legal, and Management and Organisational Structure Implications for Option 6 – Increase CHT Tolls and rebate to EHC and WHC users

Legal implications
Increase CHT tolls ➢ The tolls for the CHT may be increased by the Chief Executive in Council amending the Second Schedule to the RT regulations to reflect the new (i.e. increased) tolls and publishing it in the Gazette. ➢ However, the Chief Executive in Council would need to have the support of LegCo for increasing the CHT tolls and amending the Second Schedule to the RT Regulations because, as subsidiary legislation, it must be laid on the table of LegCo at the next sitting of LegCo after publication in the Gazette (refer section 34(1) of the Interpretation Ordinance, Cap. 1). Where it has been laid on the table, LegCo may pass a resolution requiring that such subsidiary legislation be amended in any manner whatsoever. If any such resolution is passed by LegCo, the subsidiary legislation is deemed to be amended in accordance with the LegCo resolution. Accordingly, while the Chief Executive in Council has the power to amend the Second Schedule, given the ability of LegCo to require amendment to it, Government would need to be satisfied that increases to the CHT tolls (as specified in the amended Second Schedule) would pass the scrutiny of LegCo. Government rebate to EHC and/or WHC users ➢ As EHC and WHC are in private management, to administer a rebate is not straight forward at all. There are three possible forms, with each one having its limitations and drawbacks. Three Methods of Collection ➢ Agreement of WHTCL and NHKTCL not to raise toll levels will be required. Franchisees may charge Government premium for implementing the scheme. ➢ However, consideration would need to be given to how Government would implement this measure from a fiscal point of view, for example, whether the scheme could be funded by funding allocations approved by LegCo or whether separate enabling legislation would be required. ➢ Consideration would also need to be given to the duration of the rebate.

Legal implications
➢ Consideration would need to be given to having one or two collection agents (i.e. Autotoll and/or Octopus) running the scheme simultaneously. *Rebate scheme administered by toll collection agents* ➢ There is nothing in the EHC Ordinance, WHC Ordinance and WHC Project Agreement preventing such a scheme from being implemented and operated by Government. This option therefore would not require any amendment to the WHC Ordinance, WHC Project Agreement or EHC Ordinance. ➢ Since Autotoll administers the auto tolls at WHC and EHC, then Autotoll could administer the rebate scheme at the automatic tolls booths. However, this would be subject to any restriction or condition under an agreement that needs to be reached among the Government, Autotoll and the franchisees. However, this only covers users of Autotoll. ➢ There are difficulties for applying rebate scheme is also applied to manual booths too. One possible way to give the rebate through Octopus, which is not yet available at EHC/WHC. In respect of WHC, the installation of payment by Octopus may also amount to a variation of the Toll Collection System under clause 58 of the WHC Project Agreement, in which case approval of the Commissioner would need to be obtained. In addition, WHTCL and NHKTCL would then each need to enter into an agreement with Octopus to set out the terms of the arrangement and to enable Octopus to install the necessary facilities at the manual toll booths. *Government to issue cash coupons for use at EHC/WHC* ➢ The rebate mechanism will involve the use of cash coupons, handed out by the Government to tunnel users, at manual toll lanes of EHC and/or WHC. Preferably another rebate scheme for auto-lanes needs to be implemented at the same time so that auto-lane users would not be attracted to manual lanes. ➢ Considerations need to be given to logistical and administrative arrangements for allocating and distributing the coupons to motorists, especially if different rebate are provided for different classes of vehicles *Rebate scheme administered by the tunnel operators* ➢ Operationally the rebate scheme is much easier to administer through franchisees by charging users lower tolls and the Government reimburses the difference between original and lowered tolls. ➢ Agreement between the Government and franchisees must be reached on terms and conditions of the scheme. ➢ Furthermore, depending on how the scheme is funded, separate funding allocation or even enabling legislation may be required. The scheme may be funded by funding allocations approved by LegCo. If, however, appropriation was required, separate enabling legislation would be required, which would also need the support of LegCo.

Management and Organisational Structure implications
➢ No significant management and organisational structure implications.

6 FINANCIAL ANALYSIS

6.1 Scope and basis

6.1.1 The scope of work includes certain financial analysis of the Cross Harbour Tunnel ("CHT"), Eastern Harbour Crossing ("EHC") and Western Harbour Crossing ("WHC") as of 31 December 2008 (the "Base Date"), based on the different toll scenarios provided by the Transport Planning Team.

6.1.2 This financial analysis will not focus on the absolute values derived for EHC and WHC, but rather, on comparing the relative change in values derived under the different toll scenarios. This serves to illustrate the direction and the relative magnitude in the change in values for EHC and WHC under the different toll scenarios (a total of nine scenarios have been selected to be compared against Base Case).

6.1.3 The absolute values derived and considerations for EHC and WHC may change substantially depending on a number of factors, such as the timing of the transaction, the state of the economy, the sellers' plans (EHC and WHC shareholders), toll/traffic forecasts and valuation assumptions to be adopted by the sellers, etc.

6.2 Basis of value

6.2.1 The valuation analyses of EHC and WHC are determined based on the value of the entities to the equity shareholders, from a market participant's point of view. As such, the projection periods adopted for the valuations are the remaining years in the respective franchise agreements of EHC and WHC. The franchisees of EHC and WHC are New Hong Kong Tunnel Company Limited and Western Harbour Tunnel Company Limited, respectively.

6.2.2 The projection period for the valuation of EHC is based on the remaining years in the franchise agreement under which New Hong Kong Tunnel Company Limited has been granted an exclusive right to operate EHC. Based on this assumption, the projection period is for 8 years (expiring in year 2016) as of the Base Date. As mentioned before, Base Date (31 December 2008) refers to when this financial analysis was based on.

6.2.3 The projection period for the valuation of WHC is based on the remaining years in the franchise agreement under which Western Harbour Tunnel Company Limited has been granted an exclusive right to operate WHC. Based on this assumption, the projection period is for 15 years (expiring in year 2023) as of the Base Date.

6.3 Objective and purpose

6.3.1 This financial analysis outlines and compares the financial impact on CHT, EHC and WHC, under the different scenarios provided by the Transport Planning Team, with the aim to assist the Government in deciding on the possible implementation options available to the Government regarding CHT, EHC and WHC (i.e., buying out the franchises of EHC and/or WHC, extending the franchises of EHC and/or WHC, providing concessions to franchisees of EHC and/or WHC, and forming a common ownership of CHT, EHC and WHC, etc.).

6.4 Financial analysis

6.4.1 Values of EHC and WHC

6.4.1.1 The values derived for the EHC and WHC represent the equity value for each respective entity, which reflects the value to the shareholders of an entity after consideration for the entity's outstanding debt and cash, i.e., net debt position. This means that when the entire equity stake in an entity is acquired, the acquirer would also need to consider the entity's net debt as of the acquisition date.

6.4.1.2 A financial analysis in respect of the formation of a common ownership of CHT, EHC and WHC has been considered; however, such analysis would not be meaningful given that the value of a newly formed entity consisting of CHT, EHC and WHC would not equal to the sum of the values, as the values for EHC and WHC were derived with reference to their remaining franchise terms. Other financial considerations, including but not limited to control premium/discount and marketability discount would also need to be addressed in assessing the financial impact to the Government under the common ownership option.

6.4.2 Differences in values

6.4.2.1 The change in values of EHC and WHC when different toll scenarios are adopted have been calculated to represent the increase or decrease in the values of EHC or WHC (in comparison with Base Case), as of the Base Date.

6.4.2.2 The focus of this analysis is on the change in values of EHC and WHC under each of the different toll scenarios. The analyses on the different implementation options available to the Government are based on the change in values derived as a foundation. The term will be based on the original franchise periods of EHC and WHC, up until FY16 and FY23, respectively, since it is assumed that EHC and WHC will be transferred back to the Government under the original BOT agreement.

6.4.2.3 Although values of EHC and WHC (and changes in them) have been determined under this study, they are not presented in this report for their commercial sensitivity.

6.4.3 Option: Buy-back EHC and/or WHC

6.4.3.1 Assuming that the Government wishes to have complete discretion over the toll levels of EHC and WHC, one option is for the Government to buy back EHC and WHC. To buy back WHC at its equity value, it implies that the Government also has to take over the outstanding loan being adjusted for arriving at the equity value. Government has to repay loan in one lump sum or through its repayment schedule.

6.4.3.2 The values of EHC and WHC are expected to decrease under certain toll scenarios. Under these scenarios, any decreases in value represent a reduction in earnings to the Government as a result of selecting toll scenarios other than Base Case. In this way, the Government is in essence subsidizing EHC and WHC users by means of public funds. As explained before, the "Differences in Values" analysis only covers the remaining franchise periods of EHC and WHC. It should be noted that in any case, the Government will be earning toll revenues from EHC and/or WHC beyond the agreed termination date(s) of the existing franchise agreement(s) should the Government decide to buy back either, or both, of these tunnels since

EHC and WHC will be transferred back to the Government at the end of their respective franchise periods.

6.4.4 Option: NOPAT analysis as a reference for provisions of concessions to franchisees of EHC and WHC

6.4.4.1 In addition to the valuation analysis, this financial analysis compares each scenario's impact on the underlying net operating profit after tax ("NOPAT") for CHT, EHC and WHC. The NOPAT analysis is performed as the bottom line and expected returns are considered significant factors for franchisees of these assets. Consequently, focus is placed on analysing the change in annual NOPAT for CHT, EHC and WHC under each scenario when compared to Base Case, and also to identify whether any increase in annual NOPAT for CHT is sufficient to compensate for any decreases in the annual NOPAT for EHC and WHC as a reference for the purpose of providing concessions to the franchisees.

6.4.4.2 The NOPAT analysis helps to illustrate the expected annual improvement or decline in the net profits of CHT, EHC and WHC under different toll scenarios when compared to Base Case, and to draw a reference for the level of the compensation to the franchisees of EHC and WHC as a result of the different scenarios adopted.

6.4.4.3 It should be noted that analyses beyond the franchise periods are not meaningful for EHC and WHC, with operation of the tunnels expected to be transferred back to the Government at the end of their respective franchise agreements.

6.4.4.4 The compensation that the Government eventually pays to the franchisees of EHC and WHC will depend on a number of factors, including but not limited to the financial forecast assumptions adopted by the tunnel franchisees and the bargaining power of the relevant parties. It is at the Government's discretion how much of the expected gain in NOPAT for CHT will be shared with the franchisees of EHC and WHC under the different toll scenarios.

6.4.5 Option: Extension of EHC and/or WHC franchises

6.4.5.1 As opposed to other financial options available to the Government, there are no explicit financial outlays required by the Government under the franchise extension option. The Government however would have to forfeit the revenue expected under the different franchise extension periods if the original franchise periods are extended.

6.4.5.2 Financial implications of the buy-back and franchise extension options are not presented in this report for their commercial sensitivity.

6.4.6 Option: Increase CHT tolls and rebate to EHC and/or WHC users

6.4.6.1 This option involves an increase in tolls for all classes of vehicle at the CHT. Under this option, a cash-back is offered by the Government to motorists using the WHC/EHC, but with the reimbursement from the Government, the rebate would not affect the levels of any of the tolls actually collected by the WHC or EHC. Toll scenarios in Group B or Group C can be implemented with this option. The financial implication to the Government varies for each toll scenario, and from one year to another.

6.4.6.2 Under Group C toll scenarios, the rebate option to EHC users involves increasing the CHT toll and providing a corresponding rebate in the EHC toll to EHC users, and implementing the rebate through the EHC franchisee. For example, financial implication of implementing the rebate option to effect the C1 toll scenarios will be approximately -$25 million plus any premium and administrative expenses to be incurred by the EHC franchisee (assuming the rebate is administered through the EHC franchisee for 2011).

6.4.6.3 The table below summarises the financial implications of the rebate option using toll scenarios in Groups B and C in 2011.

Table 6-1 Financial Implications to the Government in 2011 under the Rebate Option

	Financial implications to Government under the rebate option (in million HKD, 2011)
B-1	-25
B-2	+181
B-3	+280
C-1	-25
C-2	+181
C-3	+280

7 EVALUATION OF PROPOSALS AND RECOMMENDATIONS

This section presents the assessment of the performance of the nine better toll scenarios, and evaluation of the feasibility of the six implementation options available to the Government identified in Chapter 5 by assessing the level of difficulty and implementability of each of these options.

7.1 Assessment of Better Toll Scenarios Performance

Table 7-1 summarizes the objectives and goals of each of the better toll scenarios and their benefits and/or disbenefits to the overall traffic conditions.

Table 7-1 Summary of Performance of Better Toll Scenarios

Better Toll Scenario	Objectives / Goals	Benefits/Disbenefits to the Overall Traffic Conditions
Group A represents the scenario where the Government can only adjust the tolls at CHT (as of the present situation), and the extent to which the tolls at CHT have to be increased in order to achieve desirable distribution of cross-harbour traffic.		
A-1	➢ An upward adjustment of the toll at CHT, with at least 50% increase (from $20 to $30) would have to be made in order to be effective in diverting traffic to WHC and EHC. However, WHC will be rather congested up to 2016.	➢ Overall cross-harbour traffic would be reduced marginally (1%) in 2011 when compared with the Base Case. ➢ Queue reductions at CHT vary between 63% and 75% in years 2011 – 2026.
A-2	➢ An upward adjustment of the car toll at CHT from $20 to $25 would have to be made and a change to CHT toll structure (to a 0.5s structure) in order to be effective in diverting traffic to WHC and EHC.	➢ Overall cross-harbour traffic would be reduced by about 3% in 2011 when compared with the Base Case. ➢ Queue reductions at CHT vary between 67% and 79% in years 2011 – 2026.
A-3	➢ Modify CHT toll structure to the EHC toll structure. Toll level for car remains at $20, tolls for all other vehicles will be increased to various degrees because of the change in toll structure.	➢ Overall cross-harbour traffic would be reduced by about 3% in 2011 when compared with the Base Case. ➢ Queue reductions at CHT vary between 67% and 92% in years 2011 – 2026.

Better Toll Scenario	Objectives / Goals	Benefits/Disbenefits to the Overall Traffic Conditions
Group B represents the scenario where the Government has the freedom in setting the tolls at all the three RHCs		
B-1	➢ It involves raising the car toll at CHT from $20 to $25 and reducing the car tolls from $25 to $20 at EHC. Toll levels of other vehicles will be adjusted accordingly.	➢ Overall cross-harbour traffic would experience a very slightly reduction (less than 1%) in 2011 when compared with the Base Case. ➢ Queue reductions at CHT vary between 52% and 64% in years 2011 – 2026.
B-2	➢ Modify both toll structures at CHT and EHC to 0.5s toll structure. It involves raising the car toll at CHT from $20 to $25 and reducing the car tolls from $25 to $20 at EHC.	➢ Overall cross-harbour traffic would experience a small decrease of 1% in 2011 when compared with the Base Case in 2011. ➢ Queue reductions at CHT vary between 77% and 79% in years 2011 – 2026.
B-3	➢ It involves keeping the car toll at CHT at $20, and changing the CHT toll structure to the same structure as at EHC. Car toll is reduced from $25 to $20 at EHC (tolls for other vehicle types at EHC also decrease by the same proportion)	➢ Overall cross-harbour traffic would experience a small decrease of 2% in 2011 when compared with the Base Case. ➢ Queue reductions at CHT vary between 77% and 94% in years 2011 – 2026.
Group C represents the scenario where the Government has the freedom to set the tolls at CHT and EHC only.		
C-1	➢ Toll level for car at CHT will be increased to $25 and toll level for car at EHC will be reduced to $20. Toll levels of other vehicles will be adjusted accordingly.	➢ Overall cross-harbour traffic would decrease very slightly (less than 1%) in 2011 when compared with the Base Case. ➢ Queue reductions at CHT vary between 52% and 64% in years 2011 – 2026.
C-2	➢ Modify both the toll structures at CHT and EHC to a 0.5s toll structure. Toll level for car at CHT will be increased to $25, while toll level for car at EHC will be reduced to $20.	➢ Overall cross-harbour traffic would be reduced marginally (1%) in 2011 when compared with the Base Case in 2011. ➢ Queue reductions at CHT vary between 77% and 79% in years 2011 – 2026.

Better Toll Scenario	Objectives / Goals	Benefits/Disbenefits to the Overall Traffic Conditions
C-3	➢ It involves keeping the car toll at CHT at $20, and changing the CHT toll structure to the same structure as at EHC. Car toll is reduced from $25 to $20 at EHC (tolls for other vehicle types at EHC also decrease by the same proportion).	➢ Overall cross-harbour traffic would experience a small decrease of 2% when compared with the Base Case in 2011. ➢ Queue reductions at CHT vary between 77% and 92% in years 2011 – 2026.

7.2 Implementability of each of the Implementation options

Based on the assessment of the traffic "performance" of the nine better toll scenarios, the level of difficulty and implementability of each of the implementation options have been evaluated and summarised in the following sections.

7.2.1 Forming a Common Ownership of CHT, EHC and/or WHC

7.2.1.1 A common ownership could be formed by either a transfer by all of the shareholders of WHC, EHC and CHT of their shares to a new holding company, or by WHTCL, NHKTCL and the Government agreeing to sell their businesses to a new company in exchange for shares in the new company.

7.2.1.2 This implementation option in theory can give the Government some control over the tolls of all three RHCs, but negotiations and implementation will be most complicated and difficult. This implementation option is likely to involve substantial Government funding or asset transaction.

7.2.1.3 Agreements from the franchisees on traffic and financial projections as well as expected return would be difficult to be obtained. In addition, valuation will be more difficult than a straight purchase of the franchises since in addition to ascertaining the value of each entity, the relative valuations also become relevant. There would also need to be in place consistent franchise arrangements for each of the WHC, EHC and CHT. Accordingly, the existing WHC Project Agreement would need to be terminated. Similarly, the WHC and EHC Ordinances would probably need to be repealed, CHT removed from the Schedule to the RT Ordinance, and a new ordinance enacted to cover all three tunnels.

7.2.1.4 From an organizational and management point of view, it is the most complex option since, in addition to establishing the new boards of directors and senior management teams, appropriate governance policies would need to be established and there would be issues of balancing the different interests of the shareholders. 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 interest of other shareholders. A fair toll setting and toll revenue distribution mechanism that is acceptable to the shareholders of EHC and/or WHC, the Government and the public will be extremely difficult to agree upon.

In particular, if EHC and/or WHC were asked to forego their toll setting autonomy, compensation in form of higher-than-reasonable shareholding and hence toll revenue share might be required.

7.2.1.5 Any examples of common ownership from international experience have not been found. Having reviewed, common ownership is the most difficult option to implement. It may not be worthwhile to pursue it further in view of the availability of other implementation options and the benefits to be derived in comparison to the benefit to be derived from other implementation options. Therefore this option should not be considered further in view of its low feasibility and that it does not offer any additional benefit in comparison to the benefits to be derived from other implementation options.

7.2.2 Buy-back EHC and/or WHC

7.2.2.1 Buy-back EHC and/or WHC seems to be an attractive implementation option as it would give the Government control over the tolls of all three RHCs. However, using the buy-back option to implement toll reduction will involve huge capital outlay for the Government and is in fact a Government subsidy to EHC and WHC users by means of public funds.

7.2.2.2 On top of that, this implementation option will involve negotiations with the franchisees which are expected to be extremely difficult and time-consuming. The prices for the buy-backs are determined based on the toll, traffic and other business assumptions that are currently projected with reference to the prevailing economic, market and operation information. However, the prices to be asked by franchisees will be unpredictable because it is not easy to gain agreement from the franchisees on traffic and financial projections (which are forecasts and highly uncertain) and expected return.

7.2.2.3 The buy-back option would present further complications due to the obligations of the shareholders of each of WHTCL and NHKTCL under their respective shareholders' agreements, such as the right of pre-emption, and, dependent on whether a transfer of shares or revocation is adopted, the requirement for consent by all the shareholders or at least majority consent. The complex ownership structure of the two franchisees, the nature of the transactions and the involvement of all shareholders in the transactions will no doubt make agreement of the negotiations more difficult to reach.

7.2.2.4 Furthermore, based on both international experience and recent commercial transactions of entities in HKSAR, in all likelihood the Government would need to offer a premium over the fair market price before the shareholders would accept the buy-back since they are driven by profit motives. On the other hand, LegCo members would want a fair deal. These different objectives would increase the difficulty of negotiation.

7.2.2.5 From the traffic point of view, it is not feasible for the Government to implement low toll levels for all three RHCs after buying back EHC and WHC, as some advocates or the public might have suggested. The traffic conditions would deteriorate rather than improve because the overall traffic level will be significantly increased. In addition, buy-back WHC may not be worthwhile given the little room for downward toll adjustment constrained by its connecting roads.

7.2.2.6 It is also important to note that the ownership of EHC will revert to the Government in 2016, so there seems to be no point in buying back EHC after a protracted negotiation process. As far as WHC is concerned, the Government will have a much stronger hand on the negotiation table in dealing with WHTCL after the ownership of EHC reverts to the Government in 2016 when the Government will own two out of the three RHCs. As well, the Central Wan Chai Bypass will open to traffic in 2017 whereupon more traffic can be diverted from the CHT to WHC without causing unacceptable traffic problems on the inter-connecting road network, especially along the Connaught Road Central corridor.

7.2.2.7 From the legal perspective, a buy-back of the franchise rights by Government is like any other commercial transaction requiring negotiation and agreement between the two parties except that it is subject to the prior consent of the Chief Executive in Council and will require legislative changes. The WHC Ordinance and EHC Ordinance govern the right and ability of WHTCL and NHKTCL to transfer the franchise of WHC and EHC respectively. Existing agreements between each of NHKTCL and WHTCL and third parties would need to be novated to Government (or terminated and new agreements with Government executed), the EHC and WHC Ordinances would need to be repealed and the two tunnels added to the RT Ordinance and Regulations. Hence the Government would need to ensure that it had the support of LegCo. The Government will need to convince the majority of LegCo members that the considerable cost will be outweighed by the benefits of reducing queues at the CHT and improving the distribution of traffic across the three RHCs.

7.2.2.8 Based on the above analysis, this appears a more difficult option to implement than all other studied implementation options except the common ownership option.

7.2.3 Extension of EHC and/or WHC Franchises

7.2.3.1 This implementation option does not involve additional expenditure to the Government for the purpose of improving traffic conditions at the CHT and better distribution of traffic across the three RHCs. In addition, lower tolls would be expected for crossing the harbour via WHC and EHC, which would be welcomed by the public (in reality toll reduction at WHC may not be an option according to the better toll scenarios due to congestion at connecting roads). However, it is important to note that using franchise extension to implement toll reduction is also a Government subsidy to EHC and WHC users by means of public funds.

7.2.3.2 In order to achieve the better toll scenarios, agreement from the shareholders of WHTCL or NHKTCL, as the case may be, must be obtained to extend the franchise period in exchange for reducing existing tolls or giving up the right to increase tolls in future, or both. The Government should be prepared to pay a "premium" for this. There is also public expectation for a change in the toll-setting mechanism to give more control to the Government to set the tolls at EHC and/or WHC. Also, it will be extremely difficult to secure agreement of the two franchisees to abolish the existing toll setting mechanisms for WHC or, in the case of EHC, give up the expected IRR of 15% to 17%, as determined in previous arbitral award, for the EHC will be abolished and to be replaced by new toll adjustment mechanisms. Furthermore, extension periods asked by franchisees would be much longer than what have been assessed simply based on the amount of revenue loss estimated under the consultancy.

7.2.3.3 The major difficulty in implementing this option is reaching commercial agreement with WHTCL and NHKTCL on the period of extension and new toll levels based on the toll, traffic and other business assumptions that are currently projected with reference to the prevailing economic, market and operation information. The Government's offer has to be attractive enough in the eyes of the shareholders before they would accept it since they are under no obligation to agree. On the other hand, the community and LegCo would want a fair deal. These different objectives would increase the difficulty of negotiation.

7.2.3.4 There is no prohibition in either the WHC Ordinance or the WHC Project Agreement in extending the franchise period. Similarly, the EHC Ordinance does not prohibit extending the franchise period. Accordingly, an extension of the franchise period for either tunnel would need to be agreed between the Government and the respective franchisee. Legally, once agreement is reached, the WHC Project Agreement will need to be amended by a supplemental agreement and LegCo will need to pass legislation amending the WHC Ordinance. The EHC Ordinance would require a similar amendment for such an extension. Therefore, the Government will need to ensure that it has the support of LegCo in agreeing to an extension of the franchise in each case.

7.2.3.5 There would not be any changes to the management and organizational structure of any of the three RHCs. Although no additional direct expenditure by Government is likely to be involved and road users might enjoy lower tolls at WHC and EHC, but CHT toll may have to be increased if the better toll scenarios are followed. Government will also lose revenue in terms of NOPAT that could otherwise be earned if the franchise periods are not extended.

7.2.3.6 Therefore, it is considered that this should not form the recommended option if there is a better alternative for achieving the Study objectives.

7.2.4 Increase CHT Tolls

7.2.4.1 Increase CHT tolls is an implementation option with no capital outlay involved for the Government. This implementation option also does not require negotiation with franchisees. However, WHC will become rather congested before the completion of CWB if CHT's toll increases. WHC's traffic will be within tolerable limits if, in addition to toll increases, the toll structure of CHT is also changed. But this, will impact heavily on commercial vehicles. Therefore obtaining public support could be a challenge.

7.2.4.2 Legally and from an organisational point of view, this implementation option is the most straightforward and presents the least difficulty to implement. The Chief Executive in Council can increase the tolls for the CHT by amending the Second Schedule to the RT Regulations to reflect the new tolls and publishing it in the Gazette. However, in practice the Chief Executive in Council will need to have the support of LegCo before increasing the CHT tolls because all subsidiary legislation (the Second Schedule to the RT Regulations being subsidiary legislation) must be laid on the table of LegCo at the next sitting of LegCo after publication of the Gazette. LegCo may pass a resolution requiring that such subsidiary legislation be amended in any manner whatsoever. Hence the Government would need to be satisfied that increases to the CHT tolls would pass the scrutiny of LegCo.

7.2.4.3 Increasing the CHT tolls would therefore raise political and public policy issues. The Government will need to convince the LegCo that the impact of toll increases on the users of the CHT will be outweighed by the benefits of reducing queues at the CHT and improving the distribution of traffic across the three RHCs. As has happened in the past, user groups such as taxi and goods vehicle associations will probably lobby Government not to increase the tolls on these vehicle classes.

7.2.4.4 LegCo members have in the past expressed strong objection to any toll increase at the CHT without commensurate scenarios to reduce tolls at the WHC and EHC. Although it is a relatively and comparatively less difficult option to implement in comparison to most of the other implementation options, its political acceptance and hence implementability may be relatively low.

7.2.4.5 The effectiveness of this implementation option in improving cross-harbour traffic distribution would be reduced if both WHC and EHC operators actually respond to the toll increase at CHT by raising their tolls as well. This would easily result in a lose-lose situation for both the Government (for failing to achieve the traffic objective) and for the tunnel users (who have to pay higher tolls for all three RHCs).

7.2.4.6 As a stand-alone option, this should not form a recommended option. When combined with another implementation option, however, they can form a more plausible package.

7.2.5 Provision of Concession to EHC and/or WHC franchisees

7.2.5.1 If the better toll scenarios were followed, CHT tolls will be increased and tolls of the other RHCs will be decreased initially (toll reduction at WHC may not be an option according to the better toll scenarios due to congestion at connection roads). The Government would need to reach agreement with the respective franchisee to lower the tolls and on monetary compensation. In any case, the incentive would need to ensure that it gives enough financial incentive to franchisees to participate. However, the complexity of negotiations on the amount of net revenue loss to be compensated, which involve traffic and financial projections, expected returns, etc. may not be avoidable.

7.2.5.2 The greatest strength of this implementation option is its inherent flexibility, an agreement under this implementation option can last for a limited period only, be modified or withdrawn much more easily than buy-back or extension of franchise which are one-off deals. There is no need for any change to the organisational or management structure of any of the three RHCs If combined with the option of increasing CHT tolls, the package may be able to achieve all the traffic objectives and yet be revenue neutral or near neutral. This will help to resolve the political and public policy issues that would be considered by the LegCo, such as whether it would require Government expenditure, or whether road users should be subsidized from the public coffer.

7.2.5.3 There is no legal mechanism pursuant to which WHTCL or NHKTCL is obliged to reduce the tolls. Government would therefore need to reach agreement with the respective franchisees to lower the tolls by monetary compensations. The magnitude of the compensation however, must be agreed between the Government and the franchisees involved. Negotiation on such an agreement will not be straight-forward or easy as each party would certainly have its own idea of what constitute a revenue level that a franchise deserve and hence the loss of revenue suffered as the result of toll reduction. There will be considerable discussion on disputes over details such as traffic projection in the franchise period. The annual NOPAT compensation

for the tunnels is determined based on the toll, traffic and other business assumptions that are currently projected with reference to the prevailing economic, market and operation information. Obviously, different assumptions will lead to different outcomes. The Government and LegCo would also need to examine carefully the potential cost, the terms and the time frame of the concession. Legally, once agreement is reached, the WHC Project Agreement would need to be amended by a supplemental agreement, and LegCo would need to pass legislation amending the WHC Ordinance. The EHC Ordinance would require a similar amendment. Hence the Government would need to ensure that it had the support of LegCo in agreeing toll reductions and corresponding incentives.

7.2.5.4 Apart from the difficulty of negotiating and agreeing with WHTCL and NHKTCL a reduced toll level and an incentive acceptable to both parties, LegCo would consider the political and public policy issues such as the cost to the general public. They would also likely debate whether the cost of the incentive and increased Government participation in the tunnels are justified by the envisaged reduction of queues at the CHT and improvement to the traffic conditions.

7.2.5.5 This is a more difficult option to implement than a straight tunnel increase at the CHT. However, this is an easier implementation option compared with common ownership, buy-back or franchise extension. Accordingly, it is recommended that this implementation option should receive a higher priority than the previous four implementation options in selecting which option to proceed with.

7.2.6 Increase CHT tolls and rebate to EHC and/or WHC users

7.2.6.1 This implementation option combines an upward adjustment of toll at CHT with giving a rebate to motorists using the WHC/EHC. It is thus a new Toll-Related measure. In line with legal requirement, the toll increase at CHT and the rebate scheme should be kept separate although they are traffic-wise related and should therefore be implemented at the same time. There is no need for any change to the organisational or management structure of any of the three RHCs.

7.2.6.2 Under the rebate option, as the real toll (after rebate) would be reduced, it is expected that a certain amount of traffic would divert from the CHT to WHC/EHC. This should be welcomed by the franchisees as their revenue would be boosted, thus franchisees should have incentives to cooperate on this measure.

7.2.6.3 A decision would need to be made as to whether CHT toll revenue would be directly deployed to rebate the users of WHC/EHC and hence RT Ordinance be amended accordingly. If this is not the case, a separate funding approval by LegCo may be required.

7.2.6.4 It will be necessary to obtain the approval of LegCo on CHT toll increase and consult user groups, especially commercial users. Therefore immediate implementation of this option might not be realistic. However, it is still a short to intermediate term option comparing to other implementation options. This option has the advantage of being flexible as both the magnitude and period of this rebate can be adjusted.

7.2.6.5 This implementation option may be viable although it requires certain important pre-conditions for it to work, such as the ability to increase the toll levels of CHT both initially and over the years, and the other RHCs agree not to increase their toll levels or better still, lower it somewhat. The increased toll revenue at WHC/EHC should also have an effect of postponing any future application for toll increase. It would have no impact on existing franchise agreements or the WHC and EHC Ordinances. Users of CHT would experience a significant improvement in traffic conditions and reduction of travel times whilst those who choose to use WHC/EHC would enjoy a lower effective toll. The Government would be able to take actions early in alleviating congestion at the CHT and addressing the problem of unbalanced tolls at the road harbour crossings.

7.2.6.6 The administration and logistical arrangements of the rebate option would have to be worked out with WHC/EHC franchisees, however, it is considered that there are at least three possible rebate schemes in which this option can be implemented:

Scheme administered by tunnel companies

- Operationally, this is the easiest to implement. Tunnel operators will charge users the rebated tolls and the Government reimburse the tunnel companies the difference between the reduced tolls and the current toll levels. There would be extra administrative work on the part of WHTCL and NHKTCL, and auditing changes to be made.

Cash coupons

- Under this rebate scheme, the rebate mechanism will rely on the use of cash coupons, handed out by the Government to the tunnel users. This is considered less feasible to be implemented in practice because of the following reasons:
  - The associated logistical and accounting problems are extremely complicated to both the Government and franchisee(s) involved. In a three month period, there would be over 20 million cross harbour transactions, and different coupons would need to be issued and processed for different classes of vehicles.
  - Cash coupons must be used alongside with rebate at auto-lanes too; otherwise road users would be attracted from the auto-lanes to cash paying lanes at the toll plaza. Processing of cash coupons at toll booths will also prolong transaction time.
  - Government would have little control over whether the coupons will be used at EHC or WHC and by how much. Therefore, it is a much less flexible option compared with other rebate mechanisms.

Combined use of Autotoll for Autotoll booths and Octopus at manual booths

- Under this rebate scheme, both Autotoll and Octopus Card Ltd would be asked to administer the rebate scheme for automatic and manual toll booths (provided that the RHCs involved are installed with Octopus). Given that Octopus is not available at EHC or WHC, this is considered the least feasible rebate mechanism.

7.2.6.7 This option would be able to gain easier political acceptance in general. It can be considered as a short to intermediate term solution to alleviate the current congestion at CHT and address the problem of uneven tolls at the three road harbour crossings, although the effect of Government rebate on traffic would be more gradual to realise.

7.3 Proposal Recommendations

7.3.1 In light of the analysis presented above, we have identified the degree of difficulty of implementation of the six implementation options available to Government.

7.3.2 The nine better toll scenarios identified can only be implemented if they combine with the implementation options available to the Government, in order to form meaningful proposals. However, it is evident that some of the toll scenarios may not be compatible with an individual implementation option. The following examples have been identified:

- Group A toll scenarios do not require buy-back, extension of franchises and concession to franchisees
- Group B and Group C toll scenarios are incompatible with the implementation option of increasing CHT tolls only

7.3.3 Therefore the following proposals are recommended for the Government's consideration:

- Better toll scenarios under Group A can be a standalone proposal which does not require any other option to support its implementation. On the other hand, the other six scenarios would require the support of implementation options to make them viable proposals for the Government;
- Better toll scenarios under Groups B and C can be combined with the buy-back option of EHC and/or WHC, the extension of EHC and WHC franchises option, the concession to WHTCL and NHKTCL option, formation of common ownership option and rebate to users option where appropriate;
- As discussed in the previous section, the ownership of EHC will revert to the Government in 2016, so there seems to be little point in buying back EHC, and the Government will be in a stronger position in dealing with WHTCL after the return of the ownership of EHC;
- Although the negotiation with WHTCL and NHKTCL on the extension of franchises would be less difficult and complex than the buy-back option, in terms of legal, management and organisations, 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 involve highly contentious and subjective parameters and assumptions such as traffic / financial projections and expected returns. Therefore the case for negotiating with NHKTCL is not a strong one, and there are advantages in postponing the negotiation with WHTCL to 2016;

- Under the concession to WHTCL and NHKTCL option, the Government would also need to negotiate and reach an agreement with the respective franchisee to lower the tolls by either reimbursing the franchisee the difference between the tolls as lowered and the current toll level or other monetary compensation based on NOPAT.

- Increase CHT tolls and rebate to EHC and/or WHC users option may be viable although it requires certain important pre-conditions for it to work, such as the ability to increase the toll levels of CHT both initially and over the years, and the other RHC franchisees agree not to increase their toll levels. As the real toll (after rebate) would be considerably reduced although the EHC and/or WHC tolls would remain at the present level, it is expected that significant amount of traffic would divert from the CHT to WHC and/or EHC. This should be welcomed by the franchisees as their revenue would be boosted. This approach would be able to gain easier political acceptance in general, and be more supportable by the majority of members of Legco Panel on Transport. It can be considered as a short to intermediate term solution to alleviate the current congestion at CHT and address the problem of uneven tolls at the three road harbour crossings. Users of CHT would experience a significant improvement in traffic conditions and reduction of travel times whilst those who choose to use WHC/EHC would enjoy a lower effective toll. The Government would be able to take actions early in alleviating congestion at the CHT and addressing the problem of unbalanced tolls at the road harbour crossings.

7.3.4 Based on our study of the combination of better toll scenarios and the implementation options available to the Government, the following recommendations in the short, intermediate and long terms are provided for the Government's considerations:

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, together with effective toll equivalent to toll scenario under Groups B and C, i.e. the rebate option

- Conduct a trial run on the rebate option to test the travel behaviour of RHC users in response to the option and validate the traffic benefits envisaged

Intermediate Term (2013 – 2017)

- Continue with Short to Intermediate Term solution

- Towards the end of EHC franchise in August 2016, negotiate with WHTCL regarding the implementation of the concession option. At this time Government will have a stronger hand in the negotiations with WHTCL as Government will own two out of the three RHCs

- Additionally, the Central Wan Chai Bypass 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

Long Term (2018 – 2023)

- Implement the package of concession or rebate option if successfully negotiated with WHTCL with toll scenario under Groups B and C to replace the Short to Intermediate Term solution

- Failing that, consider the implementation options of extension of franchise or buy-back together with any of the above toll scenarios

- As far as better toll scenarios are concerned, toll scenarios under Group B are ranked first in combination with any of the above implementation options as they would yield the best traffic results

Long Term – after 2023

- Implement any of the above toll scenarios

7.3.5 As presented in the previous chapters, the financial implications of providing concessions to EHC and WHC franchisees and rebate to EHC and WHC users needs to be taken into account in more detail. Concerning the financial impact of concession to EHC and/or WHC, the Government would need to go through a complicated process of reaching an agreement with the franchisee(s) to lower tolls by either reimbursing the franchisee(s) the difference between the tolls as lowered and the current toll level or other monetary compensation based on NOPAT. In any case, sufficient financial incentives to franchisees are required for them to participate.

7.3.6 Sensitivity tests have also been conducted to examine the possible financial implication of the provision of concession to EHC and WHC franchisees option under toll scenarios under Groups B and C using transport model. It is important to note that the compensation for the tunnels is determined based on the toll, traffic and other business assumptions that are currently projected with reference to the prevailing economic, market and operation information. Therefore, different assumptions will lead to different outcomes.

7.3.7 The implementation option for proposed toll increase at CHT and rebate at EHC and WHC can be implemented together with effective toll equivalent to toll scenarios under Groups B and C from short to medium term. Vehicles using CHT would experience an increase in toll, and all vehicles at one or both the EHC and WHC would be offered the rebate, not just those which switch from CHT to the other two tunnels.

7.4 Timing for Implementation

7.4.1 It is difficult to be precise on the time required to implement each of the implementation options considered above at this stage. However, it would be reasonable to point out that there are three main factors which would dictate the time required to complete the implementation of the different implementation options. These are:

(a) Time required to negotiate with the EHC and/or WHC franchisees and get Government approval;

(b) Time required for the reorganisation of the management structure, if required; and

(c) Time required for overcoming the legal obstacles and completing the procedures

7.4.2 For the implementation options of "Buy-back EHC and/or WHC" and "Forming a common ownership of CHT, EHC and WHC without buying out the franchises", the negotiation of the proposals with the franchise holders would involve a typical process with the following major tasks:

- Set objectives and build a business case for the implementation option adopted
- Consult TAC and LegCo Panel on Transport and other relevant consultative bodies
- Confirm the strategies for the implementation of the option
- Appoint advisors (Financial, Legal, Subject Matter Expertise etc)
- Develop negotiation approach, it may be necessary to approach CITIC, the major shareholder first
- Conduct full costs/benefits analysis
- Obtain consensus from relevant parties, Financial Secretary, etc.
- Negotiate a purchase price or exchange of shares and structure the deal
- Negotiate in-principle agreement with the -franchisee
- Conduct due diligence
- Seek approval from Executive Council
- Finalise purchase price
- Obtain approval from the relevant parties, Financial Secretary, LegCo etc.
- Announce deal
- Close deal (the franchise is revoked or shares transferred/exchanged)

7.4.3 From a reorganization of management structure point of view, the implementation would involve the following steps:

- For the implementation option of forming a common ownership of CHT, EHC and WHC without buying out the franchises, a new organization would be mandatory.
- Define the strategies for the new organization
- Stabilize organization
- Structure integration to capture benefits by establishing an integration project team
- Make the main "people plan"
- Maintain communication with employees, customers, investors and regulators
- Integration and continue to meet customers' needs

7.4.4 From a legal point of view, the implementation would involve the following steps:

- Government formulates strategy and commercial approach to buy-back or form a common ownership
- Government signs a non-disclosure agreement with the franchisees
- Government obtains a copy of the relevant shareholders' agreement
- The terms of the transfer or exchange are negotiated and agreed

- A new shareholders' agreement governing the organization, management and business of the new company to set up would need to be negotiated and agreed between all the shareholders if the implementation option of Forming a common ownership of CHT, EHC and WHC is embarked upon
- The major shareholder obtains the consent of all other shareholders to agree to sale of franchise or exchange of shares and their terms
- compliance with the relevant Stock Exchange rules, e.g. those shareholders who are public listed companies would need to satisfy disclosure requirements and obtain shareholder and/or board approval
- Simultaneously, Government obtain approval from LegCo
- Completion would take place and associated formalities undertaken

- Repeal of EHC and/or WHC Ordinance under the implementation option of buy-back or provide a single franchise to operate and maintain all three RHCs for the agreed period for the implementation option of Forming a common ownership of CHT, EHC and WHC
- Add EHC/WHC to the Schedule of RT Ordinance under the buy-back option or remove CHT from the Schedule under the implementation option of Forming a common ownership of CHT, EHC and WHC

7.4.5 Apparently, no matter which implementation option the Government selects, it is going to be a complicated and time consuming process, especially under the current economic condition and the political climate. In terms of timing for implementation, it depends on the intention of each party involved, and it is likely to be dragged along at the price/valuation negotiation stage which is subject to the market conditions. As such, the Government is recommended to manage the time well as the market conditions may affect the valuations of the tunnels quite substantially.

7.4.6 In view of the fragmented ownership structures of both WHTCL and NHKTCL, and depending on the price/evaluation and the intention/financial situation of the franchisees and whether just one tunnel company or both are involved, optimistically it would take more than six months for the negotiation and not less than another six months for due diligence. Taking into account the typical legal and Government approval procedures, it may take at least two to three years to get the deal closed if everything goes smoothly. It is noted that the acquisition of KCRC by MTRC took more than three years, even though KCRC was wholly owned by Government, and the major shareholder of MTRC was also Government.

7.4.7 The time required for the implementation option of extending the franchises of EHC and/or WHC is expected to be less than the other two implementation options. No public expenditure is required for this implementation option and the procedure to overcome legal obstacles is less cumbersome. Therefore, 2-3 months could be saved in comparison.

7.4.8 Concession by WHC and/or EHC with reimbursement from Government to operators is legally more complicated than extending franchises of EHC and/or WHC. On the other hand, there would not be a need to reorganize the management structure under this implementation option. Therefore, we consider that it would take more or less the same time for implementation as the implementation option of extending franchises of EHC and/or WHC.

7.4.9 It is important to note that there are many factors affecting the time, viability and effectiveness of the implementation of the four options, including the number of approving authorities, the company structures of the tunnel companies, the readiness of the due diligence in terms of i) legal issue, ii) accounting and reporting, iii) operational and iv) business requirements.

Appendices

Appendix A

International Experiences

Appendix A: International Experiences

No two toll roads are exactly the same. Nevertheless, international experience may be applied or used for reference in the formulation of better toll scenarios, consideration of options for re-negotiation with NHKTCL and WHTCL on the financial, organizational and legal mechanisms necessary to bring about the revised toll structures, as well as improving the operation of the three road harbour crossings in Hong Kong. The following relevant aspects are applicable:

Franchise Extension

The extension of franchise of the Western Harbour Crossing (WHC), and possibly that of the Eastern Harbour Crossing (EHC) as well was one of "Franchise-Related" measures examined in this Study. In this respect, lessons may be drawn from the following two case studies:

- The New and Old Severn Bridges in the United Kingdom
- The Dulles Road (Greenway) of the State of Virginia in the United States of America

In the case of the New and Old Severn Bridges, the two bridges are not commercially competing against each other since they share a common toll scheme and are operated by the same concessionaire. The duration of the franchise is flexible and will end once the concessionaire has received an amount of revenue specified in the concession agreement, subject to a maximum of 30 years from 1992. With this flexibility, lower-than-expected traffic levels do not necessarily lead to higher tolls as the toll rates are fixed by legislation and the duration of the concession is extended automatically to give the operator more time to make up for the loss of income. The road users of the two road harbour tunnels (WHC and EHC) and LegCo's Panel on Transport will probably welcome this feature, as an alternative to a revised toll structure based on projected tunnel traffic, in the re-negotiation with WHTCL and NHKTCL as it may lead to lower toll rises. However, it should be noted that when the concession contract was signed, the Old Severn Bridge was already carrying volumes of traffic well over its design capacity. This acted as a strong incentive for the concessionaire to accept the conditions governing toll level adjustment. As well, the toll level adjustment is obligatory and made annually, based on the rise in retail price index, the concessionaire does not need to apply for it and the legislature has no means to veto it. This implication has to be made clear in the public consultation process including tabling of revised legislation in Legco.

The case of the Dulles Road Greenway cannot be more different. Whilst the termination date for the concession may end earlier if the debt is paid off earlier than expected, it may be extended by State Corporation Commission of the Virginia State Government in USA (SCC) to take account of any refinancing. In fact, the concession period was extended from around 46 years to 66 years due to refinancing of the project. Although some academics believe that the problems caused by demand uncertainty faced by the Dulles Greenway could have been avoided by adopting the kind of "Least Present Value of Revenue" franchise agreement used by the UK Government for the bidding of concession for the Severn Bridges, we consider the real problem was the traffic demand and growth being much lower than those originally envisaged when the Dulles Greenway improvements were conceived. Before its opening, it was estimated that there would be a daily flow of about 35,000 vehicles, but the actual traffic turned out to be only 8,500 vehicles/day. This over-estimate of traffic is exacerbated by the toll adjustment mechanism adopted, which requires an elaborate process of approval and is not based partly or wholly on inflation. Despite several toll increases approved by SCC, the Dulles Greenway has not made any net profits or positive rate of return since its commencement, due to lower than expected level of traffic. Even in recent years, toll revenues have been just sufficient to cover direct operating costs, but not interest and principal payment of its debts. In a sense, despite the good

intentions of SCC when the contract was re-negotiated, the concession period may have to be extended indefinitely unless the contract is re-negotiated again. It is therefore necessary to ensure that the projected traffic levels are reasonable as far as possible.

Government Buy-back

The Government buying back the WHC and/or the EHC from their respective concessionaire was another "Franchise-Related" measure examined in this Study. In this respect, the 91 Express Lanes of the State of California in the United States of America (USA) may serve as a precedent. The 91 Express Lanes were originally built in the early 1990's at a cost of HK$1,014M and operated on a BTO basis by the concessionaire CPTC. In 2002 the Government (OCTA) purchased CPTC's interest (the remaining 27 years of operating and receiving tolls out of its original 35 years term) in the franchise agreement for a sum of HK$1,619M. The purpose of the purchase was neither rationalising its utilisation nor bailing out CPTC from insolvency. In fact, the operator reported net profits by 1998. Rather, it was to eliminate a "non-compete" agreement with CPTC, the prior franchised private consortium, that prevented improvements to a nearby freeway.

The experience of the above Government buy-back shows that this measure would involve substantial funding from the public coffer. As well, in a market economy it is not possible to force the franchisees to sell at a price they see as anything less than being very attractive. On the other hand, a clean break with CPTC enabled OCTA to carry out essential improvements to the road network and have a freer hand in adjusting tolls, unencumbered by the franchise agreement. It is therefore a two-edged tool.

Unlike the USA, Europe had neither highway trust funds nor tax-exempt bonds. As the need for motorway network became obvious after World War II, first France and then Italy, Spain and Portugal all adopted the toll-funded, long-term concession model. Many of the toll road companies started out as state owned and retained majority state control, but in the last decade, most of them have been privatised. Therefore, the Government buying back private enterprise goes against this world trend except in the recent Global Finance Crisis (GFC) when the market failed to safeguard the interest of investors as well as the public.

Many city authorities conducted comparison studies in the planning stage, which showed that the public-funded option would have a lower capital cost than the private-funded or PPP option. However, they still opted for the private-funded model for the following reasons:

- The proposed highway did not have a high priority for public spending.
- The extra cost brought by private financing was outweighed by the advantage of transferring the risk of cost overrun to the private sector.
- An unwillingness to raise public debt.

The Eastern Distributor contract expressly envisaged a range of circumstances under which the public authority must enter into re-negotiation with the concessionaire, and provided the rules for handling an early termination of the concession. In a recent debate on the benefits or otherwise of private toll roads in the legislature of the State of Texas, USA, it was proposed in Senate Bill 17 that future toll road contracts should set out clear terms for buy-backs. This would enable the Government to buy back, if necessary, a franchise at fair market value, avoid vague and arbitrary standards, and circumvent lengthy litigation that would otherwise be inevitable. Although similar provisions are too late for incorporation into WHC and EHC franchise agreements, it may be worthwhile to anticipate and specify these issues including buy-back in future negotiation with private consortia for strategic highway projects to be built under the BOT model.

Forming a Common Ownership for CHT, WHC and EHC

This measure aims at addressing the imbalances and unfairness of the existing tolling system in a specific road network without the need to buy out the franchises. The new entity formed by the common ownership would take over the toll collection role, implement a fair and equitable tolling system and divide revenue among the operators. Although much touted by academics as a fair and equitable network toll system, in practice it involves complex legal, financial and organizational issues, which would require protracted discussion with the franchisees, especially when there are a multitude of share holders. In particular, it would be difficult to reach agreement on the valuation of the remaining franchises, overcome the legal hurdles and consolidate the entities with very different characteristics. Hence we have not been able to find a true previous or existing example of network tolling. The closest example is the Melbourne City Link which provides connections between three existing freeways, thus enabling them to operate as a whole system. The lesson learned is the need for long range strategic planning studies, concession area market research, travel characteristics surveys, ETC market penetration surveys, stated preference surveys, traffic operation studies, toll policy analysis, system concept design as well as VES system planning which went into the project. As well, an independent authority was established at an early stage to monitor the State's risk, negotiate with various Government agencies, organise and participate in extensive community consultation and contribute to the resolution of a host of construction, operation and public affairs issues.

Toll Policy and Toll Adjustment Mechanism

The 91 Express Lanes and Dulles Greenway are the only two toll facilities which have a public consultation process before any toll adjustment is made. However, in the former case, the opinion of the Route 91 Advisory Committee is not binding. In all other cases including the Severn Bridges, the Eastern Distributor and the Melbourne City Link, toll adjustment was automatic and indexed annually or quarterly to the consumer price index or a combination of the consumer price index and average weekly earning. In this light it seems the toll adjustment mechanisms enshrined in franchise agreements signed by Government with WHTCL and NHKTCL, despite their good intentions, are less specific than the above examples and could more easily lead to arbitration. In regard to the implementation of a better toll option and re-negotiation with NHKTCL and WHTCL on the financial, organizational and legal mechanisms necessary to bring about the revised toll structures (e.g., Government buy-back), it is worthwhile to consider whether a more specific but also more flexible toll adjustment mechanism, similar to that adopted for adjustment of omnibus bus fares, should be adopted to minimize the reliance on arbitration.

Most toll road authorities included in the above case studies used toll surcharge as a tool to manage congestion in peak hours. In the case of Route 91, upward toll adjustment on the express lanes is triggered for a particular direction of traffic during the "super peak" if the hourly volumes in that direction of the toll road are "consistently too heavy for a specified period of time", thus leading to traffic congestion. Traffic level will be reviewed again six months after the super peak toll adjustment. The interesting point of this particular peak hour surcharge scheme is that to maintain free flow at all times on the express lanes toll increases during rush hours can be quite substantial (up to 860% of the toll rate during non-rush hours). CHT is congested during most hours of day time. Hence steep toll increases during peak hours, as a stand-alone measure, may not be a good tool to tackle congestion at CHT.

On the other hand, the effectiveness of managing traffic demand by varying the toll level over the day was demonstrated by the following two projects:

- Variable Bridge Tolls at Lee County of the State of Florida in the United States of America
- Time-of-Day Tolling at Sydney Harbour Crossings in Sydney, Australia

In both cases the authorities not only moderately increased the toll at peak hours but also reduced the toll at low usage periods such as night time. Consequently, there was a significant shifting of trips from the AM peak to the pre-peak. In the period before the AM peak traffic was up, while in the AM peak it was down. In the period after the AM peak traffic went up slightly. Before the Time-of-Day Tolling at Sydney Harbour Crossings scheme was introduced, there were some adverse comments from the public that it would have very little effect on peak hour travel demand or cause traffic problems on the approach roads if drivers stall to avoid the surcharge. The success of the scheme has proven the skeptics wrong but also demonstrated the politically sensitive nature of such measures. Therefore, effective communication and adequate publicity to explain the scheme would be a key to successfully launching any similar measures in HKSAR.

The M4/M5 Motorway Cash-back Scheme in Sydney, Australia had nothing to do with rationalizing the utilization of tolled roads. Nevertheless, the scheme has been successfully implemented for more than 11 years and proved to be an effective way of directly subsidizing road users for using certain tolled facilities through the use of E-tags and their account providers in the collection and refunding of toll revenues. This would help to overcome the legal, logistical and accounting problems which have been identified in considering the Toll Increase at CHT & Toll Reduction at WHC/EHC by subsidising WHTCL or NHKTCL. It should be noted that, however, the effect of toll increase at CHT would be felt in full immediately but the effect of giving rebate to motorists using WHC and EHC would be more gradual and less transparent.

Financial Performance and Finance Reporting

Both the Severn Bridges and the Eastern Distributor use the internal rate of return to assess the return to investing in the facility. When the Route 91 Express Lanes were originally operated by the private operator, the rate of return was also calculated and capped. As well, the Dulles Greenway uses the rate of return on equity for measuring its performance.

The Severn Bridges are the only tolled facility studied which is required to submit their audited annual accounts to the legislature. The other selected toll facilities are only required to submit their audited accounts to their regulator, or to the related Government department or advisory body. It is worth the consideration of the Government whether similar financial reporting requirements should be incorporated in the re-negotiation with NHKTCL and WHTCL on the financial, organizational and legal mechanisms necessary to bring about the revised toll structures (e.g., extension of franchises).

Dispute Resolving Mechanism

All selected examples have a dispute resolving mechanism in their concession contract. The parties concerned can refer the dispute to independent experts for adjudication if they fail to resolve it through negotiation. Disputes concerning the Severn Bridges are referred to a panel of independent experts first. If the experts cannot make a unanimous decision, the dispute will then be referred to arbitration. The WHC and EHC already have similar dispute resolving mechanism in place.

Innovation in Operation and Management

Many toll road projects examined in this Study have incorporated Intelligent Transport Systems (ITS) innovation in their operation and management. ETC was almost universally deployed as an effective means to minimise operating cost in toll collection as well as an indispensable tool in managing traffic flows through variable tolling schemes, as in the case of Variable Bridge Tolls at Lee County, New Jersey Turnpike, and Time-of-Day Tolling at Sydney Harbour Crossings.

Ensuring optimized traffic flow is a mandate of Triborough Bridge and Tunnel Authority (TBTA). In this respect, one of the most advanced tools used by TBTA in proactive problem solving is its geographical Information System (GIS) using ArcIMS and Arc View 8 software. The software can be used to record, locate and analyse traffic accidents in real time so that delays and revenue loss are minimised, normal traffic flow restored as early as possible, and potential traffic hazards eliminated before they happen by establishing collision trends from a historical database on a micro-level. The recent chaos on Gloucester Road and adjacent areas due to a burst water main, one of the major approach roads to the CHT, is a case in point. Such a system would be invaluable in traffic control centers to deal with incidents which cause widespread congestion.

One of the most sophisticated, state-of-the-art, fully electronic open road tolling systems in the world was developed and used in the Citylink project in Melbourne, Australia. It enabled the toll road to operate without any toll plaza or toll gates; road users are simply charged according to the distance they have traveled on the toll road.

Appendix B

Detailed Toll Tables for the Better Toll Scenarios in 2011

Detailed toll tables for the better toll scenarios in 2011

Year 2011 Toll Assumptions for Base Case

Types of Vehicles	CHT	EHC	WHC
Car	$20	$25	$50
Taxi	$10	$25	$45
MC	$8	$13	$23
PLB	$10	$38	$60
LGV	$15	$38	$60
MGV	$20	$50	$85
HGV	$30	$75	$115
Extra Axle	$10	$25	$30
SD	$10	$50	$90
DD	$15	$75	$128

Year 2011 Toll Assumptions for Better Toll Scenario A1

Types of Vehicles	CHT	EHC	WHC
Car	$30	$25	$50
Taxi	$15	$25	$45
MC	$12	$13	$23
PLB	$15	$38	$60
LGV	$23	$38	$60
MGV	$30	$50	$85
HGV	$45	$75	$115
Extra Axle	$15	$25	$30
SD	$15	$50	$90
DD	$23	$75	$128

Year 2011 Toll Assumptions for Better Toll Scenario A2

Types of Vehicles	CHT	EHC	WHC
Car	$25	$25	$50
Taxi	$19	$25	$45
MC	$12	$13	$23
PLB	$25	$38	$60
LGV	$28	$38	$60
MGV	$38	$50	$85
HGV	$56	$75	$115
Extra Axle	$19	$25	$30
SD	$31	$50	$90
DD	$47	$75	$128

Year 2011 Toll Assumptions for Better Toll Scenario A3

Types of Vehicles	CHT	EHC	WHC
Car	$20	$25	$50
Taxi	$20	$25	$45
MC	$10	$13	$23
PLB	$30	$38	$60
LGV	$30	$38	$60
MGV	$40	$50	$85
HGV	$60	$75	$115
Extra Axle	$20	$25	$30
SD	$40	$50	$90
DD	$60	$75	$128

Year 2011 Toll Assumptions for Better Toll Scenario B1

Types of Vehicles	CHT	EHC	WHC
Car	$25	$20	$50
Taxi	$13	$20	$45
MC	$10	$10	$23
PLB	$13	$30	$60
LGV	$19	$30	$60
MGV	$25	$40	$85
HGV	$38	$60	$115
Extra Axle	$13	$20	$30
SD	$13	$40	$90
DD	$19	$60	$128

Year 2011 Toll Assumptions for Better Toll Scenario B2

Types of Vehicles	CHT	EHC	WHC
Car	$25	$20	$50
Taxi	$19	$15	$45
MC	$12	$9	$23
PLB	$25	$20	$60
LGV	$28	$23	$60
MGV	$38	$30	$85
HGV	$56	$45	$115
Extra Axle	$19	$15	$30
SD	$31	$25	$90
DD	$47	$38	$128

Year 2011 Toll Assumptions for Better Toll Scenario B3

Types of Vehicles	CHT	EHC	WHC
Car	$20	$20	$50
Taxi	$20	$20	$45
MC	$10	$10	$23
PLB	$30	$30	$60
LGV	$30	$30	$60
MGV	$40	$40	$85
HGV	$60	$60	$115
Extra Axle	$20	$20	$30
SD	$40	$40	$90
DD	$60	$60	$128

Year 2011 Toll Assumptions for Better Toll Scenario C1

Types of Vehicles	CHT	EHC	WHC
Car	$25	$20	$50
Taxi	$13	$20	$45
MC	$10	$10	$23
PLB	$13	$30	$60
LGV	$19	$30	$60
MGV	$25	$40	$85
HGV	$38	$60	$115
Extra Axle	$13	$20	$30
SD	$13	$40	$90
DD	$19	$60	$128

Year 2011 Toll Assumptions for Better Toll Scenario C2

Types of Vehicles	CHT	EHC	WHC
Car	$25	$20	$50
Taxi	$19	$15	$45
MC	$12	$9	$23
PLB	$25	$20	$60
LGV	$28	$23	$60
MGV	$38	$30	$85
HGV	$56	$45	$115
Extra Axle	$19	$15	$30
SD	$31	$25	$90
DD	$47	$38	$128

Year 2011 Toll Assumptions for Better Toll Scenario C3

Types of Vehicles	CHT	EHC	WHC
Car	$20	$20	$50
Taxi	$20	$20	$45
MC	$10	$10	$23
PLB	$30	$30	$60
LGV	$30	$30	$60
MGV	$40	$40	$85
HGV	$60	$60	$115
Extra Axle	$20	$20	$30
SD	$40	$40	$90
DD	$60	$60	$128

Appendix C

Traffic Flows for the Better Toll Scenarios in 2011

Base Case	Car/Taxi	Goods Veh	Public Transport	Total
CHT	73000	35000	13700	121700
EHC	55100	12300	3900	71300
WHC	43100	7800	7300	58300
TOTAL	171300	55100	24800	251300

A1	Car/Taxi	Goods Veh	Public Transport	Total
CHT	67500	35500	13300	116300
EHC	57200	11500	4200	73000
WHC	44500	7000	7800	59300
TOTAL	169300	54100	25300	248700

A2	Car/Taxi	Goods Veh	Public Transport	Total
CHT	72900	30200	14000	117100
EHC	53500	13300	3900	70700
WHC	39500	8100	7200	54800
TOTAL	165800	51600	25100	242600

A3	Car/Taxi	Goods Veh	Public Transport	Total
CHT	77600	28100	14200	120000
EHC	52400	14800	3800	71000
WHC	36800	9600	6800	53100
TOTAL	166800	52500	24800	244100

B1	Car/Taxi	Goods Veh	Public Transport	Total
CHT	70100	33700	13500	117400
EHC	59900	14100	4200	78200
WHC	40200	6500	7200	54000
TOTAL	170300	54300	25000	249500

B2	Car/Taxi	Goods Veh	Public Transport	Total
CHT	75800	28200	13800	117800
EHC	56200	17700	3800	77800
WHC	37800	8000	6700	52600
TOTAL	169800	53900	24400	248100

B3	Car/Taxi	Goods Veh	Public Transport	Total
CHT	77100	27100	14100	118300
EHC	55100	17200	3800	76100
WHC	34900	9100	6900	50900
TOTAL	167100	53400	24800	245300

C1	Car/Taxi	Goods Veh	Public Transport	Total
CHT	70100	33700	13500	117400
EHC	59900	14100	4200	78200
WHC	40200	6500	7200	54000
TOTAL	170300	54300	25000	249500

C2	Car/Taxi	Goods Veh	Public Transport	Total
CHT	75800	28200	13800	117800
EHC	56200	17700	3800	77800
WHC	37800	8000	6700	52600
TOTAL	169800	53900	24400	248100

C3	Car/Taxi	Goods Veh	Public Transport	Total
CHT	77100	27100	14100	118300
EHC	55100	17200	3800	76100
WHC	34900	9100	6900	50900
TOTAL	167100	53400	24800	245300