

TPDM Volume 1 Chapter 1 – Transport Planning

1.1 References

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- (2) Second Comprehensive Transport Study Appendices (1989)
- (3) The White Paper on Transport Policy in Hong Kong (1990)
- (4) 1992 Travel Characteristics Survey Final Report (1993)
- (5) Updating of Second Comprehensive Transport Study Final Report (1993)
- (6) Freight Transport Study Final Report (1994)
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- (11) Third Comprehensive Transport Study Technical Report (1999)
- (12) Third Comprehensive Transport Study Strategic Environmental Assessment Technical Report (1999)
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- (14) The Second Railway Development Study Final Report (2000)
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- (16) Setting Up and Updating of Base District Traffic Models for Traffic Impact Assessments in Hong Kong Island North and Kowloon West - Final Report (2000)
- (17) Setting Up and Updating of Base District Traffic Models for Traffic Impact Assessments in Kowloon East, Hong Kong Island East and South - Final Report (2000)
- (18) Setting Up and Updating of Base District Traffic Models for Traffic Impact Assessments in North East New Territories, Sai Kung and Tseung O - Final Report (2000)
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1.2 Introduction

1.2.1 Objectives

- 1.2.1.1 To contribute to sustainable development in Hong Kong, an efficient and environmentally friendly transport system is necessary. As Hong Kong and Mainland China continue to develop, the demand for passenger and goods movements increases. The transport system in Hong Kong needs to be better managed and planned, and suitably developed and expanded to cope with the increasing transport demand over time. Transport planning is therefore required to duly consider all these future developments in formulating the framework to meet the ultimate goal of achieving and maintaining mobility of passengers and goods.
- 1.2.1.2 Very broadly speaking, transport planning covers short, medium and long term planning of highways, railways, other public transport and traffic management, with due regard to the environmental impacts. Covering a range of growth scenarios as defined by the envelope of assumptions of the Third Comprehensive Transport Study (CTS-3), its objectives are-
- (i) To examine the effects of new developments and/or redevelopments on the existing and future transport systems;
 - (ii) To evaluate alternative transport strategies and policies;
 - (iii) To formulate transport strategies and policies; and
 - (iv) To establish transport investment programme and priorities.
- 1.2.1.3 Transport planning normally involves an analytical process, which builds on a number of quantitative techniques. Experience in analytical transport planning in Hong Kong has been developed since the seventies in an attempt to predict travel demands and patterns in different areas with alternative transport systems.
- 1.2.1.4 It is important to understand the strengths and limitations of these quantitative techniques. The applications of these techniques are often restricted by certain assumptions, availability of traffic and transport databases, and, to a lesser extent nowadays, limitation of computers. Analytical transport planning tries to apply general mathematical relationships or models to simulate, at certain points in time, the collective travel behaviour of individuals. Experience has shown that such behaviour is likely to change over time. Thus, its outputs are by no means exact replication of what will happen in future, irrespective of how sophisticated the transport models may be.
- 1.2.1.5 Indeed, the quantitative techniques or models are merely planning tools for planners to test different sets of assumptions or scenarios and thus to build up an understanding of the key causal factors and the effects of their variations on the forecasts of travel demands and patterns. When correctly applied, the techniques can form a sound basis for the assessment of alternative courses of action and the evaluation of particular transport proposals.
- 1.2.1.6 This section of the manual aims at providing some insight into what can be achieved by the use of transport planning techniques so as to help planners and administrators decide which decisions and policies can be aided by the use of transport model.

1.2.2 Integrated Planning Process and Planning Hierarchy

- 1.2.2.1 Transport demand is largely a derived demand. Such demand is generated not because it gives satisfaction directly but because it enables persons or goods to be relocated in such a way as to allow a direct demand to be satisfied. One does not move goods just for the satisfaction of moving them but because they are demanded in some other place. Similarly, most people make a journey to work because they prefer to live away from their place of work, not because they like travelling. In general people choose their place of residence with due consideration to the facilities available in the transport system. It can thus be seen that transport demand is a result of the interaction between land-use and transport system. In respect of the environmental issue, transport is considered to have contributed to environmental problems, particularly with regard to air quality, noise and ecological impacts. Therefore, in the planning of a city, an integrated planning process involving interactive land-use, transport and environment planning exercises is essential. Readers of this chapter are reminded of the importance of integrated planning, with particular focus on the transport aspect and the associated land-use and environmental interactions in the planning process.
- 1.2.2.2 Until the end of the 1970's, transport planning was carried out in parallel with but separated from land-use planning. Transport plans were prepared in an outline form when major land development plans were formulated. Details of the transport plans were then progressively developed in accordance with the land-use plans. This approach could have resulted in the uneconomic use of resources, as the transport plans thus established might not be optimal with respect to the actual land-use developments.
- 1.2.2.3 Recognising the importance of effective co-ordination between land-use and transport planning, an optimisation planning approach integrating land-use planning with transport planning was established in the early 1980's. Subsequently, a 3-level hierarchy of transport planning studies and models has evolved as follows-

<u>Level</u>	<u>Purpose</u>	<u>Model</u>	<u>Application</u>
1	Strategic land-use development	T160 and CBM ¹	Formulate land-use development strategy taking into account transport project and policy requirements
2	Strategic transport project programming and policy formulation	CTS ²	Identify strategic transport project and policy requirements of land-use development recommended in Level 1 studies
3	Sub-regional and local transport planning and traffic management	Various sub-regional & district models	District traffic analyses

- 1.2.2.4 Land-use planning and transport planning in Hong Kong were separately dealt with before the formulation of the first territorial development strategy for Hong Kong in the early 1980's. Subsequently the Government decided to integrate both planning of land-use and transport to arrive at the most cost-effective option for development. More recently, environmental issues have also constituted a major element in all levels of planning and development. With the re-union of Hong Kong to China in 1997, there has been significant increase in the integration of social and economic activities between the Hong Kong Special Administration Region (HKSAR) and the Mainland, which has led to the rapid growth in the boundary traffic. In order to study these cross boundary movements, strategic

land-use - transport planning studies have been extended to cover the Pearl River Delta area. Two land-use - transport models, namely the T160 model and the Cross Boundary Model (CBM) are used. The T160 model was developed making reference to the transport model developed for CTS-2. It is used to study the land-use - transport impact within the Territory. The CBM was developed under the Feasibility Study for Additional Cross-border Links Stage I Investigations on Traffic Demand. It provides the cross boundary vehicular and passenger traffic forecasts at each crossing point.

¹ Cross Boundary Model

² Comprehensive Transport Study

- 1.2.2.5 The CTS-2 model was developed in the Second Comprehensive Transport Study and was subsequently enhanced in the Study for the Conversion and Enhancement of the CTS-2 Computer Programs (often referred to as the Model Enhancement Study) in 1993-1995. The enhanced CTS-2 model was integrated with the Freight Transport model developed in the Freight Transport Study. With some adjustments, the combined model was validated in the Third Comprehensive Transport Study against observed traffic and transport data in 1997. This CTS-3 model, and its subsequent updates in due course, will be the main transport planning tool within the Government. It is used to forecast demands by each main type of transport mode and the traffic conditions in future years under different assumptions on land-use, economic growth, transport network, transport policy, cross boundary traffic as well as port and airport developments. New transport projects or some changes in the transport policy where their effects on the generalised costs of trip making are quantifiable can be analysed by incorporating them in the CTS model and then comparing the projected traffic flows from model runs with and without these projects or policies. Other transport changes may entail special models to be developed on individual merits, or they could be evaluated with the aid of less formal analysis.
- 1.2.2.6 Transport models for sub-regional and local area studies can be developed based on the appropriate boundary conditions of the CTS model for the study area, such as the control totals of the forecast traffic into and out of the area. There are currently a number of computer packages available in the market specifically developed for these studies. These packages have the capability of simulating complex traffic movements in localised network and are therefore suitable for investigating local road improvement schemes and traffic management measures.
- 1.2.2.7 More recently, due to growing public environmental awareness and concern, environmental issues have also constituted a major element in all levels of planning and development. Traffic information generated from the transport models or investigations, together with air pollutants and noise emission factors for different transport modes and vehicle types, forms the basis for assessing the potential environmental implications under the various tested scenarios. Varying the assumptions of the proposed scenarios such as land-use, economic growth, transport network, transport policy, major developments and details of the transport proposal could affect the environmental implications. Comparing the environmental implications under different scenarios and alternative proposals could facilitate the refinement of the transport proposals through an iterative process to achieve better environmental performance while meeting the social and economic goals.

1.3 Administrative Procedure

1.3.1 General

1.3.1.1 The administrative procedure involved in the course of a transport planning study is broadly as follows-

- (i) Preparation of Study Brief
- (ii) Setting up of Steering Group
- (iii) Setting up of Working Group
- (iv) Setting up of Environmental Study Management Group, if necessary
- (v) Consultation
- (vi) Preparation of Study Reports and Deliverables
- (vii) Conduct of Meetings

Depending on the scope of the study, the environmental component may be in the form of a strategic environmental assessment as carried out in CTS-3. There are often benefits to conduct the consultation exercise at an early stage so as to solicit the views of the public before detailed recommendations are finalised. However, the need for and the most suitable timing of consultation will have to be determined on the individual merits of the study. The task of preparing the consultation document will also differ from one study to another accordingly. Details of the individual steps are described below.

1.3.2 Study Brief

1.3.2.1 The study brief should include the objectives of the study, study area, scope of study and main tasks to be carried out. As part of the Agreement with the consultants, a programme should be included defining the time frame for completing the study.

1.3.2.2 The draft study brief should be circulated to Transport Bureau and relevant government bureaux and departments for comments. If consultants are to be employed in undertaking the study, the study brief should only be finalised after the pre-submission meeting with all shortlisted consultants. In this respect, the most updated version of the Engineering and Associated Consultants Selection Board Handbook provides guidelines on the format of the study brief to be prepared.

1.3.3 Steering Group

1.3.3.1 Other than studies with pure technical content, a Steering Group should be formed at the outset of the study. The main functions of the Steering Group are to provide guidance to the study team on all policy and important technical issues and to endorse the study findings and recommendations. Accordingly, the Steering Group for the transport component should be chaired by a senior officer of Transport Bureau or Transport Department as appropriate, at least at D2 level. Other members should consist of senior representatives from relevant government bureaux and departments such as Transport Bureau, Financial Services Bureau, Economic Services Bureau, Housing Bureau, Works Bureau, Environment and Food Bureau, Planning and Lands Bureau, Transport Department, Highways Department, Planning Department, Hong Kong Police Force, Environmental Protection Department, Territory Development Department, Buildings Department, Lands Department, Housing Department, Home Affairs

Department, and Agriculture, Fisheries and Conservation Department. Meetings should be scheduled to oversee and guide the study and to co-ordinate comments from government bureaux and departments with a view to making the study recommendations acceptable to various parties and the public as far as possible.

1.3.3.2 An example of the terms of reference for a Steering Group is as follows-

- (i) To monitor and co-ordinate all activities related to the study so as to achieve timely completion;
- (ii) To guide the study team on policy and technical aspects related to the study as required by the Agreement;
- (iii) To ensure close liaison and to facilitate quick exchange of information between various government bureaux and departments and the study team;
- (iv) To identify and resolve any differing opinions arising from the study;
- (v) To advise on land, financial and environmental matters for considering transport improvement proposals;
- (vi) To receive and consider working papers and reports to be prepared by the study team;
- (vii) To endorse the recommendations and the Final Report of the study; and
- (viii) To co-ordinate and endorse documents for consultation if necessary.

1.3.4 Working Group

1.3.4.1 To provide government departments' technical inputs to the study team and feedback on proposals developed by the study team during the course of the study, a Working Group should be set up. The Working Group is formed by representatives from relevant government departments at working level who are directly involved in the study. It should be chaired by an officer of Transport Department at least at D1 level. Scheduled and ad hoc meetings should be arranged to discuss and solve any problems encountered in an expedient manner. In cases when other government departments need to be consulted, corresponding representatives should be invited to attend these meetings on an ad hoc basis.

1.3.4.2 An example of the terms of reference for a Working Group is as follows-

- (i) To monitor the study progress and review the study programme;
- (ii) To guide the study team on policy and technical aspects related to the study as required by the Agreement;
- (iii) To ensure close liaison and to facilitate quick exchange of information on traffic and transport matters among various government departments, relevant parties and the study team;
- (iv) To identify and resolve differing opinions arising from the study on traffic and transport aspects; and
- (v) To receive and consider technical notes, working papers and reports on traffic and transport aspects to be prepared by the study team.

1.3.5 Environmental Study Management Group

1.3.5.1 Apart from the Steering and Working Groups, an Environmental Study Management Group might need to be set up. The need for setting up the Environmental Study Management Group and the technical requirement for environmental assessment, if necessary, should be determined early in consultation with Environmental Protection Department at the stage of drafting of the Study Brief. The Environmental Study Management Group is chaired by representatives from Environmental Protection Department. Other members consist of representatives from other relevant government departments at working level who are directly involved in the environmental aspects of the study. Scheduled and ad hoc meetings should be arranged to discuss and solve any problems encountered in an expedient manner. In cases when other government departments need to be consulted, corresponding representatives should be invited to attend these meetings on an ad hoc basis.

1.3.5.2 An example of the terms of reference for an Environmental Study Management Group is as follows-

- (i) To monitor the study progress and review the study programme related to environmental aspects of the study;
- (ii) To guide the study team on environmental aspects related to the study;
- (iii) To ensure close liaison and to facilitate quick exchange of information on environmental matters among various government departments, relevant parties and the study team;
- (iv) To identify and resolve differing opinions arising from the study on environmental aspects; and
- (v) To receive and consider technical notes, working papers and reports on environmental aspects to be prepared by the study team.

1.3.6 Study Reports and Deliverables

1.3.6.1 Technical notes, working papers and reports are produced in the course of the study describing input data, model development, results of analyses and other technical issues. An appropriate set of draft final reports is prepared at the end of the study to summarise the findings and present the recommendations on both traffic and transport and environmental aspects. These documents need to be endorsed by the respective Steering Group, Working Group and Environmental Study Management Group, and circulated to relevant bureaux and departments and, if necessary, District Councils for comments before the preparation of the Final Report and the Executive Summary.

1.3.6.2 The details of the reports/papers to be produced during the course of the study are as follows-

- (i) Inception Reports
Inception Reports for the transport and environmental components of the study should be prepared at the commencement of the study outlining the study team's understanding of the study scope and requirements, and the methodology with which the study will proceed. Specifically, they shall contain a work programme, a list of work tasks and description for each, together with a list of papers and reports to be prepared by the study team.
- (ii) Progress Reports
Progress Reports should be prepared, normally at monthly intervals, on all aspects of work relating to the study in accordance with the work programme set out in the Inception Reports. The Progress Reports shall include a list of those parts of the work which are not proceeding in accordance with the work programme, explanations for the delays, as well as proposals to expedite progress.

- (iii) Working Papers
Working Papers pertaining to topics as agreed in the Inception Reports should be produced. It may be necessary to supplement these by producing technical papers or notes to document technical details and discussions.
- (iv) Draft Final Reports
Draft Final Reports are to be produced to summarise all findings and recommendations, on the respective transport and environmental aspects, for the study.
- (v) Final Reports¹
The Final Reports should be produced at the end of the study. They should be the respective amended versions of the Draft Final Reports, which have incorporated comments where appropriate from concerned parties and endorsed by the Steering Group as appropriate. Apart from the Final Report related to transport issues, a self-explanatory final report on environmental issues, such as the Strategic Environmental Assessment Report, should be produced. The environmental final report would facilitate consultation with the Advisory Council on the Environment and others where necessary.
- (vi) Executive Summary
An Executive Summary of each of the Final Reports should be produced, printed and bound separately. It is usually necessary to publish a Chinese version of the Executive Summary for public consumption. Posting of the Executive Summary on TD's home page would facilitate public's access to the study findings and recommendations.
- (vii) Committee Papers and Presentation Materials
At various stages of the study, committee papers and presentation materials may have to be prepared for presenting findings of the study to various standing committees for consideration.

¹The Final Report and Executive Summary are sometimes renamed Technical Report and Final Report respectively, for instance in CTS-3.

1.3.7 Meetings

- 1.3.7.1 Apart from Steering Group, Working Group and Environmental Study Management Group meetings, regular meetings of the study team are necessary for the purpose of monitoring the progress and sorting out technical problems and policy issues early.

1.3.8 Consultation

- 1.3.8.1 The recommendations of transport planning studies would affect the interests of different sectors. It is important that the affected sectors are properly and adequately consulted so that their views are taken into account in developing the transport strategy.
- 1.3.8.2 Depending upon the timing of the consultation exercise, the objectives of consultation may vary. In the event of early stage consultation, the objectives may include-
 - (i) To publicise the transport planning study being conducted; and
 - (ii) To seek the views of the public, and various affected sectors and interest groups on some of the planning parameters before detailed analyses are proceeded with and recommendations are finalised.

If consultation is conducted towards the end of the study, the objectives may become-

- (i) To seek guidance and acceptance from within Government on the draft transport strategy(ies) and plan(s);
- (ii) To publicise the findings and recommendations of the study; and
- (iii) To obtain the views of the various affected sectors on the draft transport strategy(ies) for further consideration by Government before drawing up a final strategy(ies) for implementation.

1.3.8.3

Depending on the nature of the study and the issues involved, the following parties may be included in the consultation process-

- (i) Committees within Government
 - (a) Steering Group, Working Group and Environmental Study Management Group of the study
 - (b) Transport Senior Directorate Meeting
 - (c) Committee on Planning and Land Development
 - (d) Chief Secretary's Committee
 - (e) Executive Council
- (ii) Transport and environmental advisory bodies
 - (a) Transport Advisory Committee
 - (b) Legislative Council Panels on Transport and Environmental Affairs
 - (c) Advisory Council on the Environment
 - (d) Town Planning Board
- (iii) Public
 - (a) Political Parties
 - (b) Green Groups
 - (c) District Councils
 - (d) Area Committees
 - (e) Professional Bodies
 - (f) Academics
 - (g) Members of the public
- (iv) Transport sectors and trade
 - (a) Vehicle fleet owner associations
 - (b) Vehicle driver associations and trade unions

- (c) Transport operators
- (d) Transport user associations
- (e) Property developers and consultants

1.3.8.4 A consultation document with Chinese translations may need to be prepared for consultation. Posting of the consultation document on TD's home page would facilitate the consultation process.

1.3.8.5 The various Final Reports and Executive Summaries should be made available to the public, such as placing them in public libraries and District Offices, putting them on sale, uploading onto the internet for viewing and downloading, etc. For the Strategic Environmental Assessment Report(s), they could also be made available at the environmental resources centres and the Environmental Impact Assessment Ordinance register office.

1.4 Territorial Transport Planning

1.4.1 General

1.4.1.1 Territorial transport planning studies provide the basis for formulating broad transport strategies for the whole Territory for the next 15 to 20 years. Recommendations of these studies normally include transport infrastructure development programme and policy measures for managing road use. In view of the extension of the planning horizon in the study “Hong Kong 2030: Planning Vision and Strategy”, due consideration would be given to extending the transport planning horizon to beyond 20 years.

1.4.1.2 With the outputs of territorial transport planning studies forming the basic framework, district traffic studies further investigate the traffic and transport implications of strategic transport projects and policy measures on the individual sub-regions/districts and formulate transport projects and management proposals to meet local transport demands. To contribute to sustainable development, strategic environmental assessments are integrated into territorial transport planning studies. Individual transport projects and management proposals are further subject to environmental impact assessments and other assessments before implementation.

1.4.1.3 Each of these district studies may in turn put forward strategic transport infrastructure proposals to cope with the developments within their respective planning areas. All these strategic proposals are then reviewed in a co-ordinated manner within territorial transport planning studies from time to time with the objective of producing an integrated and up-to-date transport strategy for the Territory. In this way, transport strategies developed from territorial transport planning studies and district traffic studies are refined and updated interactively in an iterative manner.

1.4.2 Study Approach

1.4.2.1 An outline of the various steps of a typical territorial transport planning study is as follows-

- (i) Inception phase
- (ii) Traffic surveys
- (iii) Development of transport model
- (iv) Preparation for transport testing
- (v) Analysis and evaluation of transport projects and policies
- (vi) Transport infrastructure development plans
- (vii) Transport policy measures
- (viii) Implementation plans
- (ix) Further updates

These tasks are briefly described below.

1.4.3 Inception Phase

- 1.4.3.1 During the inception phase, the objectives of the study and the issues to be analysed as set out in the study brief are reviewed critically. After the study objectives are refined and established, the analytical techniques to be used and the detailed study process are then defined.
- 1.4.3.2 Inception Reports as described in paragraph 1.3.6.2 (i) should then be prepared for endorsement by the Steering Group, Working Group and Environmental Study Management Group of the study, as appropriate. It will form the basis of monitoring the study as it progresses.

1.4.4 Traffic Surveys

- 1.4.4.1 Traffic surveys may need to be carried out to provide data for the development of a transport model, quantification of the existing transport problems and situation as well as meeting specific study requirements.
- 1.4.4.2 The surveys to be conducted may include home interviews, road-side counts and questionnaire surveys. Detailed description of these surveys is contained in Volume 8 - "Surveys".

1.4.5 Development of Transport Model

- 1.4.5.1 A transport model is often required as a study tool to provide traffic forecasts for the future design years. A suitable model needs to be developed or updated to suit the specific requirements of each individual study.
- 1.4.5.2 As a prerequisite in developing a transport model, it is necessary to define the zoning system and the transport networks first. The process is briefly described in the following paragraphs.

Zoning System

- 1.4.5.3 An early step in any transport planning study is to define the area which is to be studied in detail. This could be the whole Territory in the case of a territorial transport planning study, or one of its sub-regions or districts in the case of a sub-regional or district traffic study. The study area will have to be divided into small units referred to as traffic zones. This is done so that the origins and destinations of travel can be closely defined geographically and the factors associated with trip making such as population and employment can be spatially quantified and collated as input to a transport model.
- 1.4.5.4 The size and, therefore, the number of zones required are related to the type of study, viz. territorial, sub-regional and local area. In general, the size should not be so small that the relevant data collected are statistically unreliable, or so large that all differing data are aggregated making a useful analysis of the traffic implications not possible. An unnecessarily large zone would also create concentrated traffic loading at particular spots of the network, thereby distorting the overall situation.
- 1.4.5.5 The delineation of zone boundaries should take the following consideration into account-
- (i) Compatibility with census enumeration units (i.e. Tertiary Planning Unit and Street Block) so as to permit the use of census data;
 - (ii) Homogeneity of activities, or alternatively predominance of one land-use;
 - (iii) Anticipation of changes in land-use or transport network; and
 - (iv) Accessibility of road and public transport.

In respect of the last factor, the zoning system should reflect in particular the catchment area of rail service. For rail stations, this is normally defined as the development within a range of 500m to 1km. This is a guideline only. The zoning system should also be capable of indicating the use of major roads and, therefore, zones should not span several major roads.

1.4.5.6

A system of 329 traffic zones was developed for use in the CTS-3 model, which has been expanded to a PVS¹ 338-zone system. The 338 traffic zones are shown in Diagrams 1.4.5.1, 1.4.5.2 and 1.4.5.3 for Hong Kong Island, Kowloon (including Tsuen Wan) and the whole Territory respectively.

¹PVS – Planning Vision and Strategy

DIAGRAM 1.4.5.1: CTS-3 TRAFFIC ZONE FOR HONG KONG ISLAND

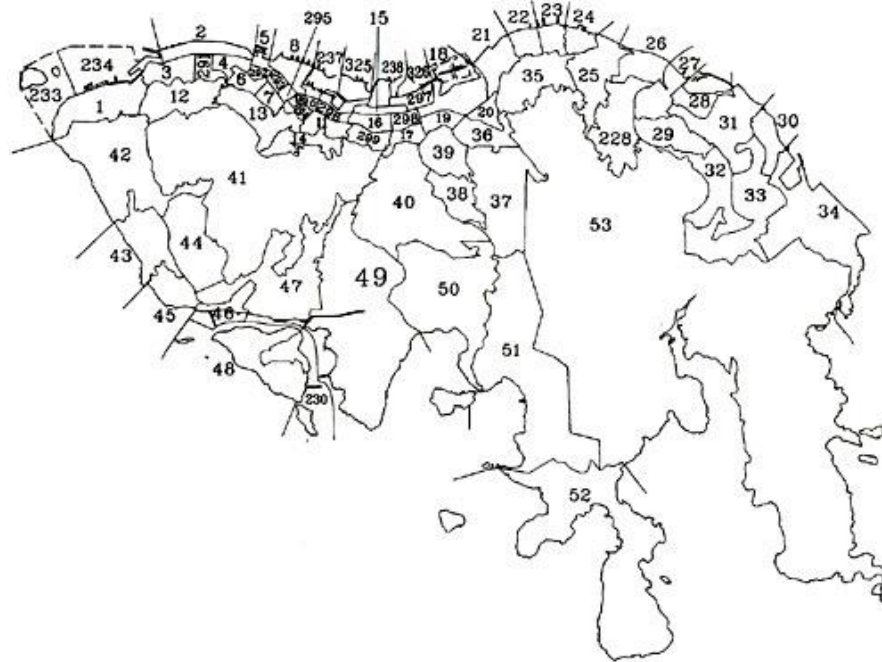


DIAGRAM 1.4.5.2: CTS-3 TRAFFIC ZONE FOR KOWLOON & TSUEN WAN

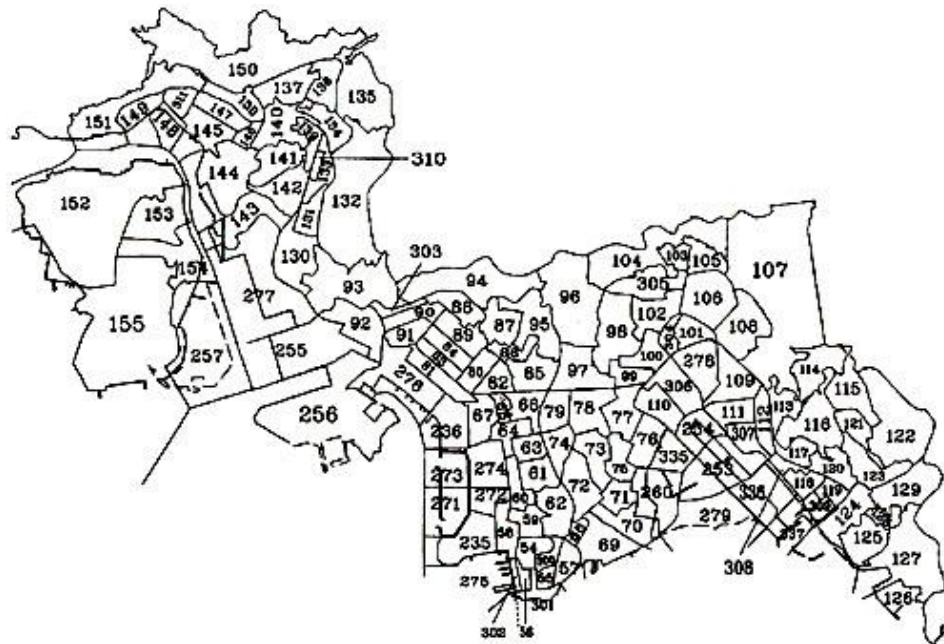
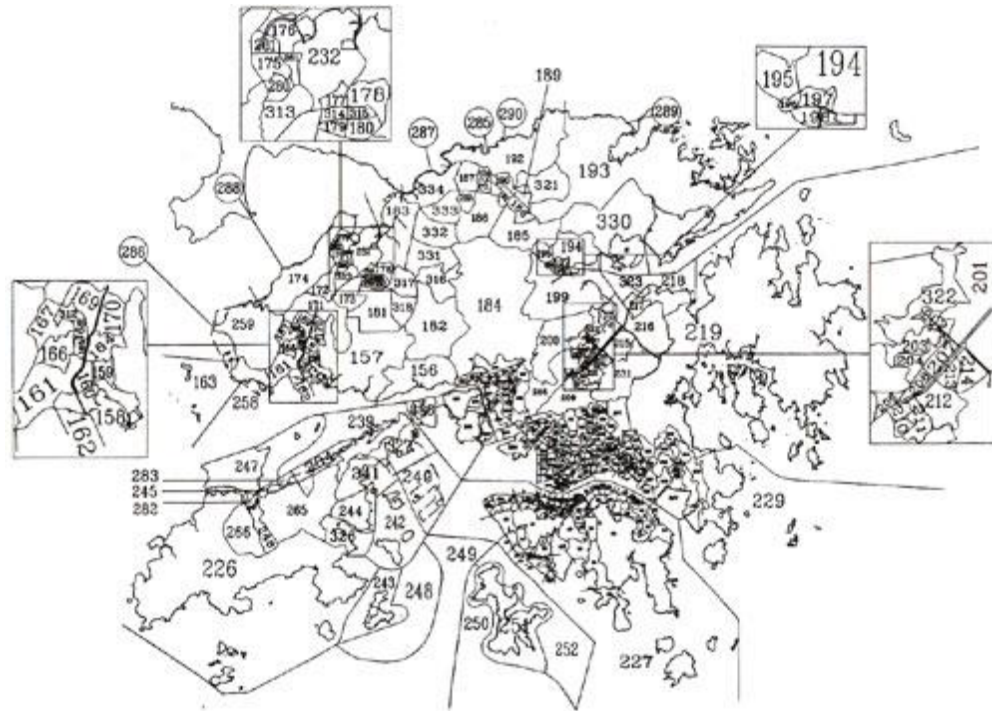


DIAGRAM 1.4.5.3: CTS-3 TRAFFIC ZONE FOR THE WHOLE TERRITORY



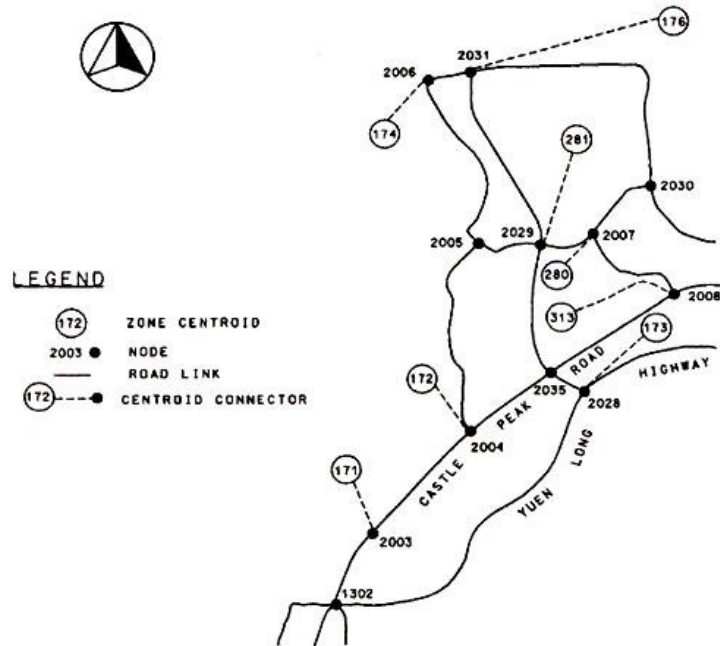
Transport Networks

- 1.4.5.7 In the CTS model, there are two types of networks, viz., the road and the public transport networks. The former consists of a vast network of roads used by cars, taxis, goods vehicles, special purpose buses as well as road-based public transport, i.e. buses and public light buses. As regards the public transport network, all routes traversed by rail and all other modes of public transport, except taxis, are included.
- 1.4.5.8 The type and number of roads to be included in a road network depend on the level of detail the study is aiming at. For strategic studies, it could be down to district distributor roads whereas local distributor roads are also included for sub-regional or local area studies. The normal practice is to keep the network to manageable size to include those roads contributing to the major movement of persons, vehicles and goods.
- 1.4.5.9 The inventory of a road network provides the basis for determining the adequacy of the existing system and the starting point for planning future improvements. For the purpose of computer simulation, a road network map is prepared to illustrate each link in the network and allocate unique numbers to all nodes to describe the network, where
- (i) A ZONE CENTROID is the notional centre of all trip production or attraction within a zone, rather than the geometrical centre, and is determined from the land-use and knowledge of the area;
 - (ii) CENTROID CONNECTORS are links which allow access to and from a traffic zone to all principal streets within and adjacent to the zone, and all trips leaving or entering the zone must travel along these connectors connecting the zone centroid to the network;
 - (iii) A NODE is a numbered point describing one end of a network link and generally represents either an intersection of routes or a zone centroid; and

- (iv) A LINK is an element of the network which connects two nodes and generally represents either a length of road or rail track.

Other detailed coding of junction layout having significant effect on road capacity such as the green time and turn penalty at the road junction is included in the modelling of the road network. As an illustration, a typical section of a road network map is shown in Diagram 1.4.5.4.

DIAGRAM 1.4.5.4: ROAD NETWORK DIAGRAM OF TUEN MUN – YUEN LONG CORRIDOR



1.4.5.10

A network describing public transport services is far more complex than a road network. The inventory of the public transport system includes the following major data-

- (i) Transport routes by type of services;
- (ii) Location of interchange points, terminals and stops;
- (iii) Priority measures such as bus-only lanes; and
- (iv) Operating characteristics of each of the public transport facilities such as
 - (a) Route number and streets traversed
 - (b) Hours of operation
 - (c) Minimum, maximum and average headways by time period
 - (d) Running time by route segment and by time period
 - (e) Layover (trip turn round) time by time period
 - (f) Type of vehicles assigned and their capacities

1.4.5.11

The coded public transport network is defined in terms of links and lines. A link in a public transport network is mainly defined as-

- (i) The nodes at each end;
- (ii) The distance between the nodes;
- (iii) A mode; and
- (iv) The time to traverse the link via the specified mode.

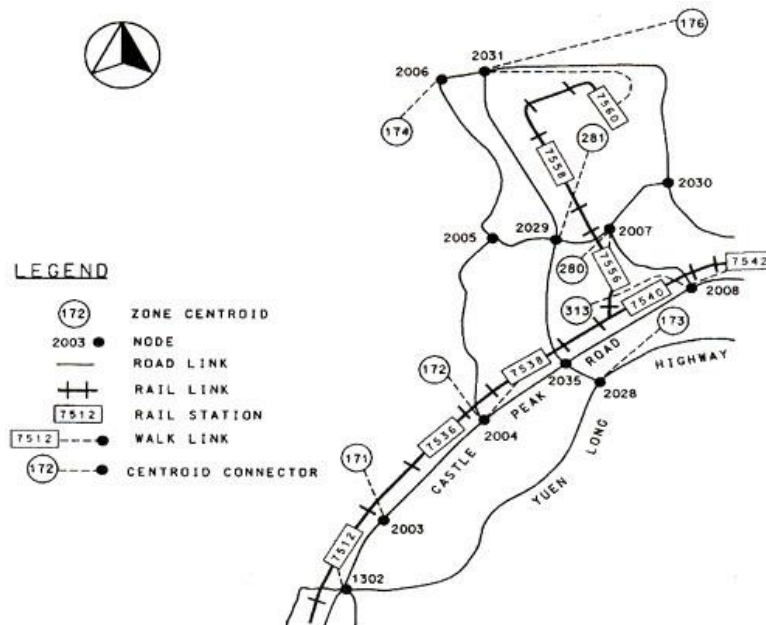
A line describes a route and its level of service. Its description contains mainly-

- (i) A mode designation;
- (ii) A line number
- (iii) A headway (or frequency); and
- (iv) A sequence of node numbers describing the route of line as an ordered set of interchange points.

1.4.5.12

The mode designation on both link and line data represents public transport categories such as local bus, express bus, tram, rail, ferry, etc. In addition, centroid connectors and walk links are considered mode types, which however do not have any associated lines. Centroid connectors are used to connect the zone centroid to the public transport system. They represent the walk, cycling or drive to or from the bus stop, or other station of the public transport system. Walk links are used to connect bus stops or other stations to permit walking transfers. As an illustration, a typical section of link/line map in a public transport network is shown in Diagram 1.4.5.5.

DIAGRAM 1.4.5.5: PUBLIC TRANSPORT NETWORK DIAGRAM OF TUEN MUN – YUEN LONG CORRIDOR



Note: Road based public transport routes are expressed in sequence of road node numbers

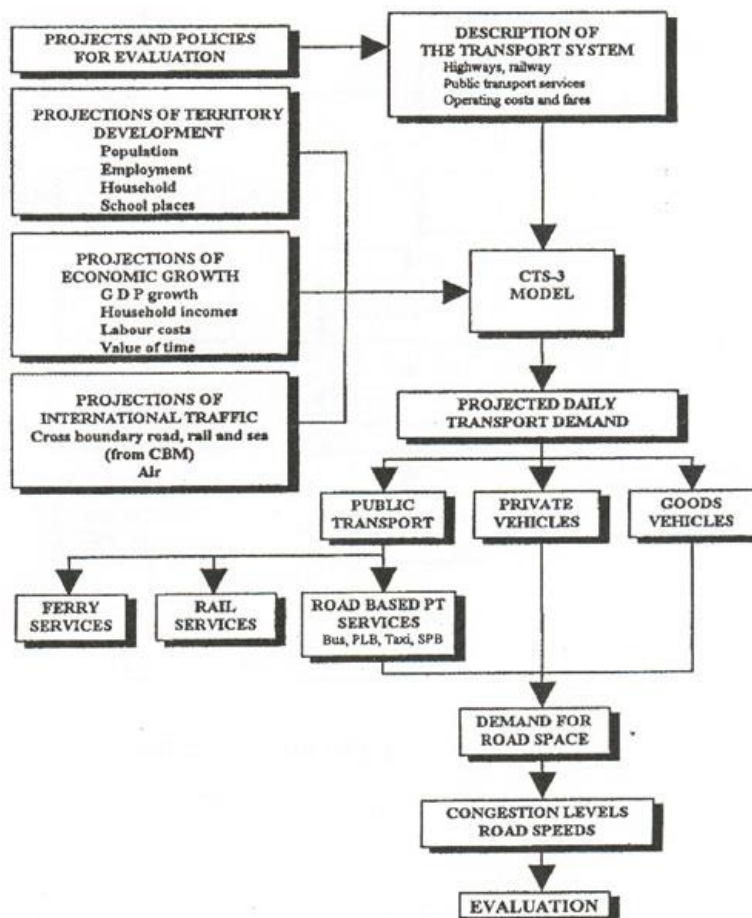
1.4.5.13 After defining the zoning system and the transport networks, the structure of the transport model should be established. Normally, the transport model consists of a series of linked sub-models which process in a step by step manner the input data and produce finally traffic flows on all parts of the transport system by time period of the day, and with estimates of travel speed and congestion level. A brief discussion of the CTS-3 transport model currently used in territorial transport planning studies is discussed below.

CTS-3 Model

1.4.5.14 The CTS-3 model was validated to the base year of 1997 in CTS-3 by using the enhanced CTS-2 model calibrated to the 1992 traffic situation and the trip making data obtained from traffic surveys conducted in CTS-3.

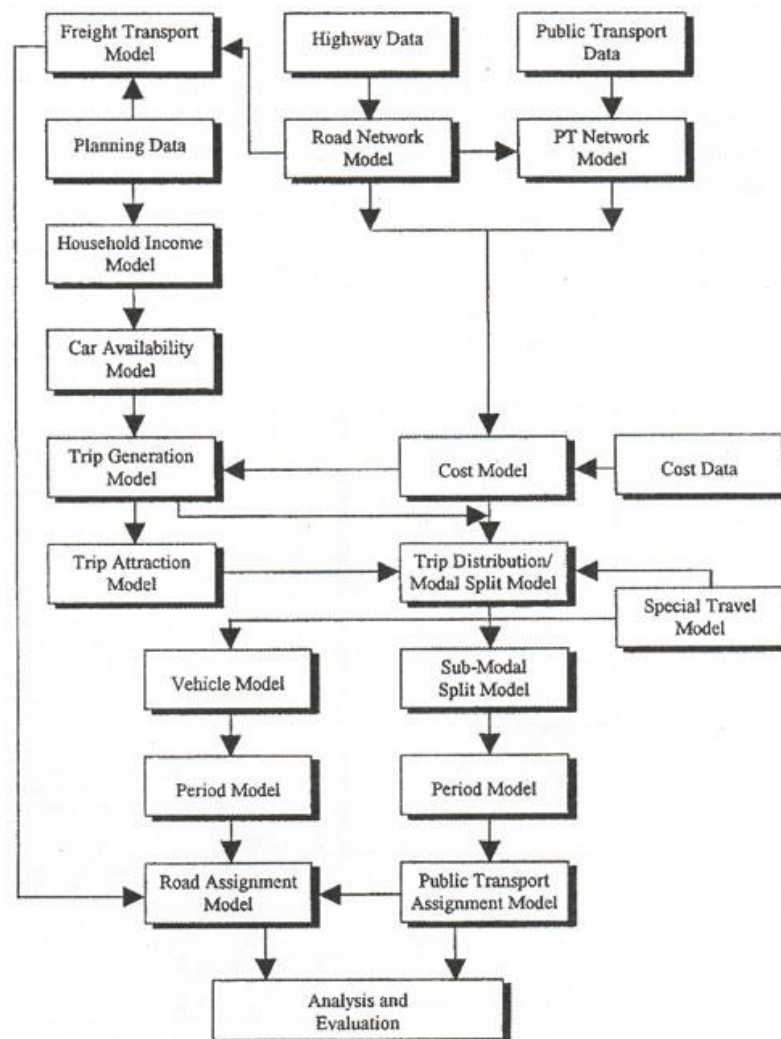
1.4.5.15 The analytical process of the CTS-3 model is summarised in Diagram 1.4.5.6. With input assumptions described in Section 1.4.6, traffic projections are made by this model for the morning peak, evening peak, off-peak periods and for an average weekday. These include traffic flow projections for private vehicle, taxi, goods vehicle, special purpose bus and road-based public transport, passenger forecasts for different public transport modes, levels of road congestion and traffic speeds on road links. Input assumptions have fundamental influence on the outputs of the CTS-3 model and appropriate range of assumptions should be used. Thus, by changing the appropriate input assumptions, the model can be used to provide traffic data for evaluating new transport infrastructure projects and transport policies.

DIAGRAM 1.4.5.6: ANALYTICAL PROCESS OF THE CTS-3 MODEL



The CTS-3 model is a suite of transport planning models comprising mainly the following as shown in Diagram 1.4.5.7-

DIAGRAM 1.4.5.7: CTS-3 MODEL OUTLINE



- (i) Household Income Distribution Model produces an income distribution by CTS-3 zone for each design year;
- (ii) Car Availability Model determines the number of car-available and non-car-available households in each CTS-3 zone taking account of ownership and usage costs and zonal household income;
- (iii) Road Network Model simulates the strategic highway network in the Territory;
- (iv) Public Transport Network Model simulates the public transport network in the Territory consisting of MTR, KCR, LRT, tram, ferry, PLB, bus and special purpose bus services;
- (v) Cost Model calculates the generalised travel costs which comprise the travelling time and the monetary travel costs divided by the appropriate value of time, for different transport modes, trip purposes and car availability classes;
- (vi) Trip Generation Model estimates the person trip generations for each CTS-3 zone by trip purpose, age group and car availability class;

- (vii) Trip Attraction Model estimates the person trip attractions for each CTS-3 zone by trip purpose and car availability class;
- (viii) Combined Trip Distribution and Modal Split Model estimates the distributions of person trips from each CTS-3 zone to other CTS-3 zones and the splits of these person trips between the private and the public modes for different trip purposes and vehicle car availability classes
- (ix) Sub-Modal Split Model estimates the splits of public transport demands between two CTS-3 zones among the various modes for different trip purposes;
- (x) Vehicle Model converts the private person matrices for different trip purposes and car availability classes into car and taxi vehicle matrices;
- (xi) Period Models estimate the proportion of daily travel that occurs in the morning peak, evening peak and off-peak periods;
- (xii) Road Assignment Model produces for each road link and each time period traffic demand by vehicle type, and other congestion indicators, including the volume/capacity ratios and link speeds;
- (xiii) Public Transport Assignment Model estimates the passenger flows for each public transport link and each time period;
- (xiv) Equipment Requirement Model estimates the number of vehicles required and the frequency of rail services to meet the projected demand; and
- (xv) Financial and Economic Evaluation Models estimate the financial and economic returns from road and rail projects.

1.4.5.17 It should be emphasised that the CTS-3 model is developed for strategic transport planning. It is most appropriate for the following-

- (i) Forecasting traffic in major corridors and on primary roads;
- (ii) Forecasting public transport demands on major facilities;
- (iii) Testing of transport policies; and
- (iv) Providing inputs to Level 1 and 3 studies.

Freight Transport Model (FTM)

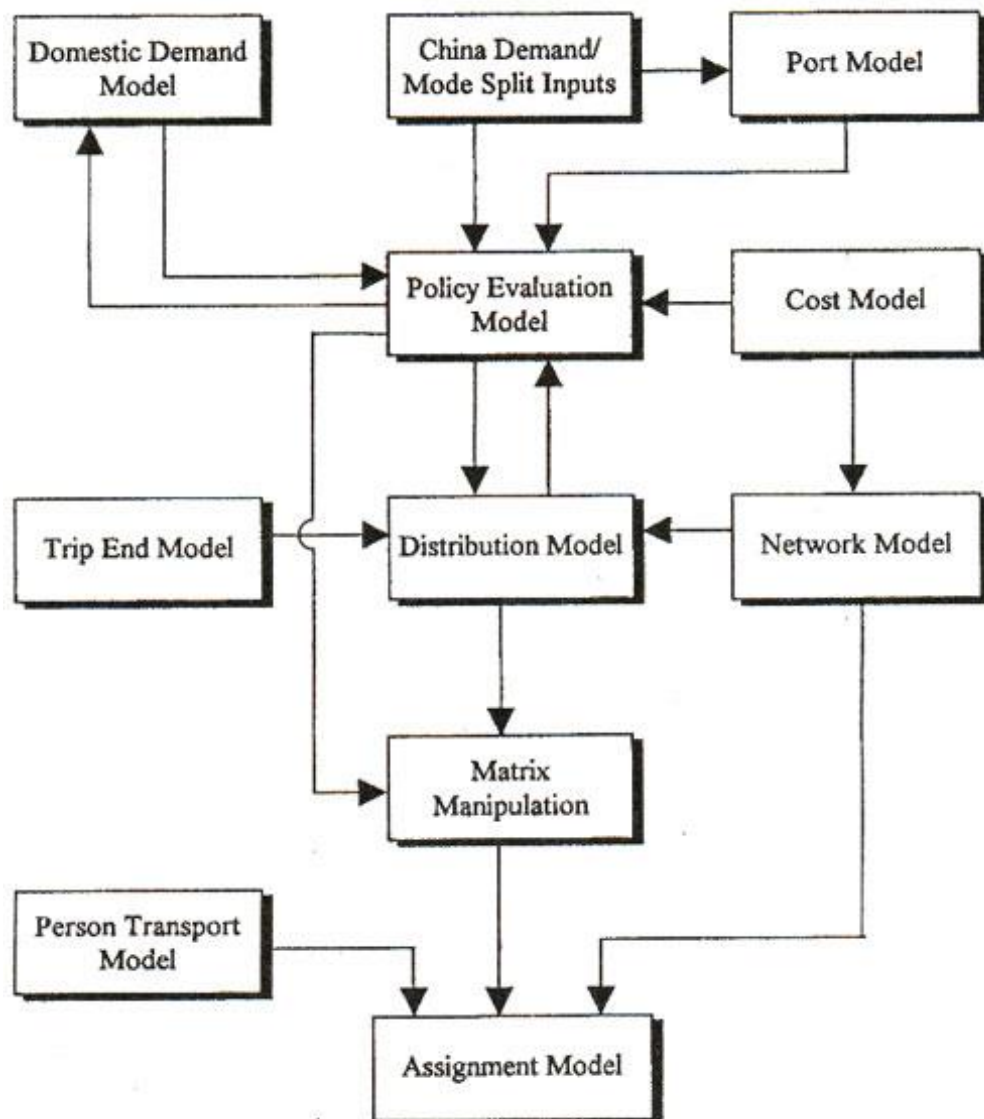
1.4.5.18 The FTM of CTS-3 was converted from the FTM of the Freight Transport Study. Parts of the original FTM that were not applicable to CTS-3 were not converted. The overall structure of the FTM of CTS-3 is shown in Diagram 1.4.5.8.

1.4.5.19 The FTM comprises the following models-

- (i) Port Model produces forecasts of goods to be transported using the road network of the Territory on the basis of the Port Cargo Forecasts;
- (ii) Domestic Demand Model forecasts the growth in local freight transport demand and service trips;

- (iii) Cost Model calculates the goods vehicle operating costs;
- (iv) Policy Evaluation Model estimates the goods vehicle fleet size and control totals of vehicle-kilometres;
- (v) Network Model simulates the strategic highway network in the Territory;
- (vi) Trip End Model produces domestic trip ends by goods vehicle type and by time period;
- (vii) Distribution Model links the trip ends to form trip matrices for each vehicle type, using a gravity model program on a daily basis; and
- (viii) Assignment Model assigns traffic by time period and by goods vehicle type on to the road network.

DIAGRAM 1.4.5.8: FREIGHT TRANSPORT MODEL STRUCTURE



1.4.6 Preparation for Transport Testing

1.4.6.1 The projections of the future demand depend on the assumptions of future development of the Territory and its transport system. It is necessary to collate all this information and prepare it in a form suitable for input to the transport model. These assumptions normally include-

- (i) Projections of territory development
 - (a) Land-use data
- (ii) Projections of economic growth
 - (a) Gross Domestic Product (GDP) growth
 - (b) Value of time
- (iii) Transport system
 - (a) Transport infrastructure
 - (b) Vehicle operating costs
 - (c) Public transport fares
- (iv) Transport policies
 - (a) Level of vehicle ownership
 - (b) Tolls
- (v) Trip making characteristics
- (vi) Projections of international and cross boundary traffic
 - (a) Cross boundary traffic forecasts
 - (b) Port forecasts
 - (c) Airport forecasts

1.4.6.2 The future is driven by too many variables to be accurately predicted. It is difficult to foresee events that will occur or conditions that will exist in 15-20 years time. CTS-3 has therefore examined a wide range of development scenarios in defining an envelope of study assumptions. The value of using different scenarios is the contrasting pictures they paint and the diverse implications they suggest.

1.4.6.3 These input planning data are constantly under review and are updated periodically by various government bureaux and departments. Whenever there are major changes in the planning assumptions, traffic projections for transport links from the CTS-3 model should be updated. The following paragraphs discuss the source of these planning data.

1.4.6.4 Land-use data - Projections of the future growth, distribution and characteristics of population, employment, households, school places, incomes, resident workers and resident students are prepared by Planning Department on a regular basis. The CTS-3 329-zone system has been expanded to a PVS 338-zone system to take account of the latest land-use development. These are based on forecasts by the Working Group on Population Distribution, the Working Group on Projections, Census and Statistics Department, Education Department and Housing Department. Major updates of land-use data

were and have been carried out in the light of the findings of Population Census and By-census, and strategic planning studies such as the Territorial Development Strategy Review and Metroplan Review.

1.4.6.5 GDP growth - Medium-term projections of economic growth over the next ten years measured by changes in the GDP are updated from time to time by Financial Services Bureau. Together with the population and employment projections, estimates of the growth in GDP per head and per employee are also derived as a basis for estimating the respective growth in incomes and labour costs for the various design years.

1.4.6.6 Value of time - Traffic forecasting uses behavioural values of time, which influence the choice between modes. These are assumed to increase in line with incomes, with separate values used for car-owning and non-car-owning households. For project evaluations, evaluative values of time, which are derived from the behavioural values, are used. The latest sets of values have been obtained by means of stated preference surveys in the 1992 Travel Characteristics Survey, together with updating in CTS-3.

1.4.6.7 Transport infrastructure - Based on the key findings of the Second Railway Development Study, Government has formulated the Railway Development Strategy 2000. The Strategy maps out the preferred railway network expansion plan up to the year 2016, which is adopted as input assumption of the CTS-3 model. In respect of highway projects, a strategic project review system has been developed following completion of CTS-3 to reassess, on a regular basis, the need, effectiveness, timing, scope and priority of concerned projects before implementation in the light of the latest development. Network assumptions in the CTS model are updated regularly, taking account of findings and recommendations of strategic and sub-regional transport planning studies, engineering feasibility studies of transport projects, development planning studies and the latest public transport route development plans and proposals.

1.4.6.8 Tolls - Initial tolling assumptions for road tunnels and crossings for input into transport planning studies are normally derived from the recommendations of studies on individual corridors. In general, all toll charges have been assumed to have no real increase over the planning horizon. Such assumptions are regularly updated in the light of the latest information available.

1.4.6.9 Vehicle operating costs - Operating costs are developed for private cars, taxis, goods vehicles and special purpose buses and categorised as-

- (i) Perceived costs - to reflect the costs on which travellers base their travel decisions,
- (ii) Financial costs - to be used in financial evaluations, and
- (iii) Economic costs - to be used in economic evaluations.

The estimates of such costs are based on data available for representative vehicles regarding vehicle price, tax, insurance costs, consumption of fuel, oil and tyre as well as expenditure on maintenance. As regards public transport, operating costs are assessed based on cost information obtained from the operators.

1.4.6.10 Public transport fares - It is necessary to make a projection of fare levels in order to forecast patronage for each public transport mode. In CTS-3, upon review, future year fares on all modes are assumed to remain constant in real terms as at 1998 levels, i.e. to increase at the same rate as inflation.

1.4.6.11 Transport policies - "Hong Kong Moving Ahead – A Transport Strategy For The Future" contains various transport policies on the continued development of Hong Kong's transport system. The development of these policies has been based on recommendations of CTS-3. Recommendations/assumptions made in CTS-3 are subject to regular review as an on-going exercise in

light of the latest development. As and when necessary, ad hoc transport planning studies are carried out to provide input to Transport Bureau for investigating transport policy options and developing policy plans. Endorsed policy measures are subsequently incorporated into new transport planning studies to update previous traffic projections and recommendations.

- 1.4.6.12 Trip making characteristics - Large-scale household interview surveys on travel characteristics have been carried out about every ten years soon after each Population Census. Three such surveys were conducted in 1973, 1981 and 1992 respectively. The survey results have been used to update assumptions on trip-making patterns and characteristics used in both territorial transport planning studies and district traffic studies. They were also used in calibrating the CTS models.
- 1.4.6.13 Cross boundary traffic forecasts - Future passenger movements to and from Mainland China by road, rail and sea have been forecast by the Crosslinks Further Study Stage I using the CBM. Updated forecasts would be produced by Planning Department whenever there is a major change in the input assumptions such as port cargo forecast, HKSAR or Guangdong Province planning data.
- 1.4.6.14 Port forecasts - Port cargo forecasts were made by the Port and Airport Development Strategy Study in 1989. Subsequently, these forecasts have been updated periodically by the Port Development Strategy Review.
- 1.4.6.15 Airport forecasts - Air passenger and freight demand forecasts were made by Transport Study for the New Airport in 1996. Subsequent updates are prepared periodically by the Airport Authority.

1.4.7 Analysis and Evaluation of Transport Projects and Policies

- 1.4.7.1 The testing of transport projects and policies follows a clearly defined programme, with evaluations of results at each stage. Testing required for developing the transport strategy may include-
- (i) Committed network tests - Transport projections are made assuming completion of only those projects currently under construction or otherwise firmly committed, and with no change in current transport policies.
 - (ii) Maximal network tests - Transport projections are made assuming construction of a large number of transport projects, but assuming that current transport policies are maintained.
 - (iii) Policy tests - Different policies for managing the growth of transport demand are investigated.
 - (iv) Initial strategy tests - Tests are conducted to evaluate the initial strategy devised from the above tests with a view to screening low priority projects from further consideration.
 - (v) Revised strategy tests - Tests are undertaken to develop a revised strategy.
 - (vi) Sensitivity tests - Series of tests are performed on the revised strategy to assess the implications of varying the input parameters. Sensitivity tests can also be applied to test assumptions of different scenarios and different ranges of values for the variables described in Section 1.4.6.
 - (vii) Final strategy tests - A final set of tests is made incorporating minor adjustments to the revised strategy based on the results of the sensitivity tests.

- 1.4.7.2 The above tests provide the bases for evaluating the need and priority of transport infrastructure projects and policies. These were evaluated from seven different criteria, including operation, financial, economic, budgetary, developmental and environmental aspects, and public acceptance in CTS-3. The evaluation result using each of these seven criteria was awarded as far as possible to each of the transport infrastructure projects and policies under consideration.

Operation evaluation

- 1.4.7.3 The simplest approach is to measure the physical impact of the projects on the transport system in terms of loading and congestion levels. For both road and rail projects, a high utilization is one of the indicators for viability. A balanced use of the concerned projects in the same corridor and consideration of the other six criteria should be looked into in details for assessing the viability.
- 1.4.7.4 For a road project, screenline volumes are normally used to indicate how well the project performs in reducing or eliminating congestion across a defined set of screenlines. In general, it is desirable that a screenline should operate at a volume/design capacity (v/c) ratio up to 0.8 - 0.9 during the peak hour. This allows some spare capacity for fluctuations within that hour and for variations between the different roads across the screenline.
- 1.4.7.5 Link volumes are also an indicator of utilisation of a road project. It does not necessarily follow, however, that a well-used road link is a viable project, since the traffic may have been attracted from roads that are not initially overloaded. On the other hand, a lightly used project is almost certainly not viable. In general, a peak hour v/c ratio of 1.0 or less indicates a satisfactory level of traffic on the proposed road.
- 1.4.7.6 For a rail project, the likely patronage of a new rail line is crucial to its viability. The maximum projected daily loading for the key link of the rail line and the total new riders on the rail systems are useful indicators. The degree of use of the project is reflected by comparing the peak hour link flows with the capacity of the rail line.
- 1.4.7.7 Design capacities for rail lines should allow for a reasonably comfort environment even in the peak hour. Normal capacities assume maximum loading for short periods in the peak hour are acceptable.

Financial evaluation

- 1.4.7.8 This shows the impact of the project on the financial costs and revenues of the affected organisations and interest groups. This information is important but does not generally permit a conclusion on whether it is in the best interests of the community.
- 1.4.7.9 The internal rate of return (IRR) is used by the private sector to measure the financial return from a road project. In the past, there were a number of road projects awarded to the private consortia for construction under a "Build, Operate and Transfer" (BOT) package within a franchised period of 30 years. These include the Eastern Harbour Crossing, the Tate's Cairn Tunnel, the Tai Lam Tunnel and the Western Harbour Crossing. Reference may be made to the allowable financial returns from these projects in the future financial evaluation of road projects to be constructed within a BOT package.

1.4.7.10 The financial evaluation of a rail project should indicate whether the revenues alone are sufficient to pay for the costs of constructing, equipping and operating the line. Generally speaking, a potential new operator will compare the expected annual operating surplus (revenues less operating costs and less an allowance for interest on and depreciation of capital) with the capital investment to identify the financial return on that investment. In the Second Railway Development Study (RDS-2), a 40-year period is used in the evaluation for future rail projects. In addition, marginal revenue is used, which represents a gain on revenue to the whole rail system including direct and indirect benefits from the new rail project.

1.4.7.11 The single year rate of return (SYRR) is also a useful indicator to compare the financial returns of a number of candidate rail projects for a common design year. This is defined as the annual operating surplus (revenues less operating cost) expressed as a percentage of initial construction costs. The intent of this evaluation is to test the viability of the candidate projects on a “stand alone” basis. Therefore, the financial return does not include revenue from non-transport sources such as property development. By carrying out this evaluation, all projects worthy of consideration can be identified and prioritised for more detailed evaluation in the next stage. In CTS-3, assessment of SYRR formed part of the financial evaluation work.

Economic evaluation

1.4.7.12 The objective is to place comparable values on all costs and benefits resulting from projects, thus showing which ones are of the greatest value to the community as a whole. The economic evaluation is more broadly based than the financial evaluation, considering such things as travel time savings, changes in congestion costs, and the benefits to travellers from having a better choice of transport modes or routes.

1.4.7.13 In an economic evaluation, the costs of each candidate project in economic terms are compared with the anticipated benefits of the project to the community. The economic costs of a highway project comprise the construction cost and the economic land cost, which reflects the opportunity cost to society of diverting the land required for the project away from its best alternative use. The economic benefits of having a highway project in place generally consist of passenger time and vehicle operating cost savings due to reduced travel distance and increased traffic speed. Also included in the benefits is the permitting of trips to be made which, in the absence of the project, are suppressed due to lack of road capacity. The results of the evaluation are expressed in the ratio of annual economic benefits of the project for a single design year to the total economic costs, termed the SYRR. This indicator forms a measure by which the candidate projects can be ranked in order to establish priority.

1.4.7.14 A 40-year period is used in RDS-2 for the evaluation of economic viability of a rail project. Such an evaluation compares the economic costs and the benefits. The economic costs comprise mainly the construction cost, the cost of the rolling stock and the annual operating costs, and the benefits consist of passenger time savings, non-rail public transport operating cost savings and road user savings. The derived savings, hence the economic IRR will be affected by the VOT adopted.

1.4.7.15 It should be noted that not all community costs and benefits are included in the economic evaluations commonly adopted for transport proposals in Hong Kong. For example, the economic evaluation does not cover the environmental benefits of railway projects, or benefits to pedestrians and tourists due to pedestrianisation proposals. In some transport proposals, these non-monetarised or intangible benefits could help to strengthen the justifications.

Budgetary evaluation

- 1.4.7.16 The evaluation is to assess whether the proposed major transport infrastructure projects are affordable. It involves checking transport infrastructure expenditure against the forecast budgets and, if a mismatch between the required expenditure and budgets is found, then further assessment will need to be conducted to consider how travel demand could be satisfied. It involves estimation and comparison of the total budgets likely to be available for major transport infrastructure projects at the designed time periods and the transport infrastructure expenditure required up to those time periods. Budgetary evaluation is considered different from other evaluation criteria in a way that the latter are applied for individual projects.
- 1.4.7.17 The possible available budget can be prepared by performing an analysis of the past relationship between transport infrastructure investments and the growth of the economy and public expenditure. Using historical data, the future budget can be estimated as a proportion of the GDP. Another estimate as a proportion of public expenditure can also be derived. The budgets for the future transport development programme taken as the average of these two estimates are derived for different periods separately for highway and railway investments. However, it should be noted that the investment budgets thus derived are based on past needs and expenditure patterns. As such, they do not take into consideration the future transport needs, in particular the increasing reliance on providing passenger rail systems because of environmental and spatial constraints. Moreover, these budgets do not take into account the increasing share of maintenance cost of newly completed projects.

Developmental evaluation

- 1.4.7.18 This is the extent to which a policy, strategy or project may be strategically necessary or desirable for land-use and other developments.
- 1.4.7.19 A number of projects may be seen as mainly contributing to the success of other projects. Most typically, these projects will be for transport infrastructure (road and/or rail) within a new town. Strictly, such projects should be considered, together with all the other infrastructure requirements, of that project. The benefits may be economic, though there will often also be a large strategic element, particularly if it is required that the transport infrastructure acts as a catalyst to the development and is in place before traffic volumes would otherwise warrant. Other developmental indicators that could boost the rating of a project would be suitable links to areas in the surrounding Pearl River Delta, or the provision of an alternative route where the existing one is subject to severe congestion or the possibility of closure.
- 1.4.7.20 Development evaluation will however only indicate a priority ordering for the concerned policy, strategy or projects.

Environmental evaluation

- 1.4.7.21 The earlier CTS-1 and CTS-2 did not formally attend to the environmental impacts of transport. CTS-3 came at a time when there was growing concern among the community of the costs of mobility on the environment. Therefore, CTS-3 incorporated a major new feature which was the inclusion of a strategic environmental assessment. It marked the first time that environment planning was integrated into the strategic transport planning process.

- 1.4.7.22 The objective of the Strategic Environmental Assessment (SEA) is to ensure that the transport framework to be developed would be environmentally acceptable. The SEA addresses potential environmental impacts of different transport scenarios and examines environmental constraints on further strategic transport developments. The scope of the SEA may be defined by the possible key impacts of the transport system on the environment, comprising air quality, noise situation and ecology.
- 1.4.7.23 An iterative interface between the transport and SEA analyses helps refine the proposed transport scenarios, with the results of the transport analysis fed into the SEA to identify the possible environmental issues for consideration which in turn facilitate the study of the proposed transport scenarios, having due regard to the concerns of the SEA. The iterative analysis interface in the environmental evaluation is intended to minimize the environmental impact due to the proposed transport scenarios.
- 1.4.7.24 The misconception that the SEA is only applied to the output of studies should be corrected. Indeed the SEA aims at the integration of environmental factors into all stages of the studies, from scenarios development, options formulation, to the identifications of the recommended strategies. Developing options, which improves both the transportation and environmental situations is better than identifying end-of-pipe environmental mitigation measures to reduce problems caused by options developed based on transport considerations only.
- 1.4.7.25 It is necessary to take note of the baseline environmental conditions and constraints, and the potential positive or negative environmental implications of various transport options at the early stage of transport studies or investigation. The understanding of various concerned environmental issues could help to develop transport scenarios which have better environmental performance. The chance of finding the scenarios environmentally unacceptable later in the studies is also reduced.

Public acceptance

- 1.4.7.26 This is the extent to which a policy, strategy or project may be considered acceptable by the general population and specialised transport related and political bodies of Hong Kong. In general, it is likely that public acceptability will prove to be more of an issue regarding transport policies, especially restrictive policies, rather than infrastructure projects. However, the latter will possibly receive objections on social or environmental grounds.
- 1.4.7.27 A public consultation exercise would form one primary source for the public acceptability evaluation. This exercise will obtain the public's views in general terms on the acceptability of various types of transport issues.
- 1.4.7.28 Public acceptability can only be subjectively estimated and incorporated into the priority ordering of projects, ranging from "undesirable" to "welcomed". Projects, policies and strategies considered unacceptable will not need to be taken forward to other evaluations.

1.4.8 Transport Infrastructure Development Plans

- 1.4.8.1 Transport modelling can be a tool used to assess the need for new transport infrastructure. Assumptions on the reference transport networks and the levels of traffic restraint are required as inputs to the formulation of the infrastructure development plans. The reference transport networks covering both roads and railways are determined by Transport Bureau with reference to Comprehensive Transport Studies, Railway Development Studies and the latest known infrastructure programme. Similarly, the input assumptions on the growth of private vehicle fleet and goods vehicle fleet for the various design years are also determined by Transport Bureau.

- 1.4.8.2 It should be noted that the railway blueprint promulgated under Railway Development Strategy 2000 has set out a network expansion plan up to 2016 and such should be taken as a given in all future transport modelling work. The development programme of the railway network has been worked out carefully taking into consideration the need to maintain an efficient rail network, the impact of individual projects on the network as a whole, the capabilities of the railway corporations and the construction industry to take on projects, and the relative priorities of the individual projects as determined by the latest development needs of Hong Kong. No additional railway projects should be contemplated or evaluated without the agreement from Transport Bureau. As for the future highway network, Transport Bureau will reassess the need for and timing of each proposed major highway infrastructure through an annual review mechanism. The annual announcements by Transport Bureau should provide a basis for the networks to be adopted in the various model runs.
- 1.4.8.3 The results of the model runs should be interpreted with utmost care. Before formulating any recommendations on new transport infrastructure, one should conduct a thorough evaluation using the seven evaluation criteria mentioned above in Section 1.4.7.

1.4.9 Transport Policy Measures

- 1.4.9.1 The general approach to the development of transport policy measures for alleviating traffic and transport problems is as follows-
- (i) To develop a number of transport policy aims based on the objectives set out in the transport strategy "Hong Kong Moving Ahead – A Transport Strategy For The Future (1999)" and/or the study brief as appropriate;
 - (ii) To develop a number of possible measures to address both the current problems and the future scenarios;
 - (iii) To establish a set of criteria for evaluating these measures in relation to the policy aims;
 - (iv) To use the strategic transport model to evaluate the results of implementing various possible measures;
 - (v) To use the results of the evaluation to select proposed measures to meet some or all of the policy aims; and
 - (vi) To select those measures which are recommended to be incorporated into an overall transport strategy.

Policy aims

- 1.4.9.2 For most strategic transport planning studies, the main transport policy aims are to provide a transport system for the domestic and international movements of passenger and goods vehicle, which is-
- (i) Operationally efficient;
 - (ii) Financially competitive;
 - (iii) Economically viable;
 - (iv) Within budget;
 - (v) Conducive to land-use and other types of development;

- (vi) Environmentally acceptable;
- (vii) Acceptable to public; and
- (viii) Safe

through the administration of implementable schemes.

Criteria for evaluating measures

- 1.4.9.3 The criteria for evaluating alternative transport policy packages could vary from study to study, depending on the nature of the measures under consideration and whether economic benefits and impacts in terms of vehicle fleets, traffic volumes, speeds, etc. can be quantified.
- 1.4.9.4 The framework to evaluate alternative transport demand management options can include the following assessments-
- (i) Impacts on vehicle fleets and traffic volumes measured in terms of passenger car unit-km travelled by area and by time period;
 - (ii) Impacts on traffic speeds by area and by time period;
 - (iii) Economic benefits to the community comprising-
 - (a) Operating cost savings
 - (b) Passenger time savings
 - (c) Public transport operator savings
 - (d) Generated traffic benefits
 - (v) Effectiveness;
 - (vi) Ease of administration;
 - (vii) Flexibility in varying the level of charges;
 - (viii) Selectivity in targeting vehicle types, area and time period; and
 - (viii) Environmental impacts in respect of air quality and noise level, if appropriate.
- 1.4.9.5 The outputs of evaluations of the options for (i), (ii) and (iii) were compared with the corresponding parameters for a selected year, as the yardstick to measure the benefits likely to be generated. The average traffic speeds prevailing in current year of assessment could be taken as the target to be achieved in developing the transport infrastructure investment programme and road use management measures in CTS and other studies to provide input to Transport Bureau for formulating transport policy plans.

1.4.9.6 In some instances, transport benefits cannot be quantified and a qualitative approach in evaluating policy packages may be adopted to assess the proposed options with respect to the following-

- (i) Benefits to-
 - (a) Transport operators
 - (b) Transport users
 - (c) The community
 - (d) The environment
 - (d) Life and property
- (ii) Relative importance; and
- (iii) Ease of implementation.

Formulation of strategy

1.4.9.7 Based on the outcomes of the evaluation, suitable measures are selected for incorporation into an overall transport strategy. The views of the Steering Group, Transport Bureau and other departments, and where appropriate, those of the relevant transport policy committees/groups, the professional bodies, the academic institutions, the affected transport operators and trade as well as associations of transport users should be consulted if possible prior to formulating a draft transport strategy. This ensures that the measures recommended in the draft strategy can stand a high chance of becoming acceptable to the public and the Legislators. After the formal consultation, the draft strategy can then be refined further and finalised taking into consideration the views gathered.

1.4.10 Implementation Plans

1.4.10.1 Recommendations on transport infrastructure and transport policy measures are packaged into a phased implementation plan with priorities assigned. Such an implementation plan is normally developed progressively in the course of a transport planning study based on the results of evaluations, estimates of the investment budget and other resources allocated to take the recommendations further as well as the outcomes of consultation.

1.4.10.2 The implementation plan normally consists of proposals for the short, medium and long terms. Short-term proposals are urgent ones to tackle pressing transport problems. These may include ongoing measures that need to be strengthened or co-ordinated with other short-term measures to make these ongoing ones more effective. Where the demands are projected to occur after a few years' time, the proposals would be implemented as a medium-term item. However, because of resource and implementation problems that cannot be solved in the short term, proposals that are considered necessary to tackle pressing problems may have to be deferred as medium-term items. Long-term proposals are those requiring major investments to solve problems in the more distant future as well as those depending on the development of new technology.

- 1.4.10.3 While most transport planning studies prepare transport infrastructure development plans and transport policy measures for the planning horizon of the study covering the short to long terms, the emphasis is on identifying projects and measures for implementation within the next few years. However, medium to long term development plans are required to provide a framework for co-ordinated transport planning throughout the entire planning horizon.

1.4.11 Further Updates

- 1.4.11.1 Hong Kong is a dynamic city, which is moving forward all the time. The planning assumptions on the future development of the Territory, economic growth, development of the transport system, transport policies, trip-making characteristics and international traffic projections may change within a short period of time. Accordingly, the developed transport strategy should therefore be reviewed at regular intervals in the light of changing developments.
- 1.4.11.2 For the short term, the forecast transport demands on strategic corridors should be updated by means of the CTS model as and when new planning data are made available. The traffic situation should also be closely monitored using data from the Annual Traffic Census and other surveys with a view to projecting the future demand on the assumption of trend-based growth if appropriate. By using both the CTS forecasts and survey data, the short-term transport strategy can be reviewed. Where necessary, actions should be taken to initiate highway improvements or transport policy measures to cope with the actual growth trend.
- 1.4.11.3 There is considerable uncertainty attached to any long-term forecast of development in Hong Kong. Not only will there be many unforeseen changes, but many factors such as spatial constraints in the urban areas, impact of congestion on trip generations, etc. cannot be properly addressed by the existing transport model in forecasting the distant future. Accordingly, long-term forecasts should only be regarded as indicative.
- 1.4.11.4 The process of planning for the long term inevitably starts with sketch plans based on available information, and proceeds to detailed engineering and other investigations which can lead to substantial modifications of the original concept. For this reason, transport plans for more than 5-10 years ahead must be heavily qualified by the uncertainties attached to the developments they are to serve, and need regular updating whenever possible. In this regard a strategic project review system has been developed to reassess the concerned highway projects before implementation in the light of the latest development.
- 1.4.11.5 The development of a transport strategy is normally based on a fixed land-use plan. Changes in land-use could have a significant bearing on the developed transport strategy. Recognising this, the Territorial Development Strategy and its Review together with CTS-3 and its Update are working towards a better co-ordination of land-use, transport and environment planning to help reduce pressure on the transport system and the environment. Continuing reviews and updates of the land-use, transport and environmental aspects of these two studies are necessary.
- 1.4.11.6 If the future transport infrastructure development plans are updated and substantially different from those recommended in strategic transport studies, such as the CTS-3, then there could be major changes to the environmental implications of the whole transport network. In this regard CTS-3 has recommended conducting a "Strategic Environmental Monitoring and Audit" to monitor the assumptions and forecasts used in the CTS-3 SEA and the related environmental impacts arising from the future developments.

1.5 District Transport Planning

1.5.1 General

- 1.5.1.1 Over the years, a number of district traffic studies have been carried out. The main objective of these studies is to establish a preferred transport plan in the short to medium term for the district being studied, taking into account the policy intentions of the transport strategy. It is an integral part of the urban transport planning process, which is crucial to the overall planning and development of the city.

1.5.2 Study Approach

- 1.5.2.1 The general approach in carrying out a district traffic study can be outlined in the procedure shown below-

- (i) Definition of objectives
- (ii) Preparation stage
- (iii) Transport modelling
- (iv) Problem identification
- (v) Development and evaluation of candidate improvement schemes
- (vi) Development of preferred transport plan
- (vii) Preliminary design

- 1.5.2.2 Although they may be undertaken to meet different study objectives, different types of district traffic studies involve the following basic study procedure-

- (i) A survey and analysis stage which establishes the present traffic demands and how these are being met, and the relationships between these demands and the urban environment;
- (ii) A prediction and plan formulation stage which projects for some future date the likely travel demands, based on the data collected and the relationship established in the survey and analysis stage and puts forward proposals to meet the demands; and
- (iii) An evaluation stage which attempts to assess whether the transport proposals put forward can provide the capacity, the level of service and safety to satisfy the projected demands, with maximum benefits to the community at minimum cost.

1.5.3 Definition of Objectives

- 1.5.3.1 The objectives of a district traffic study can be broadly determined as follows-

- (i) To identify the existing and potential traffic and transport problems in the study area;
- (ii) To develop transport model(s) for testing and updating of traffic circulation, and formulation and evaluation of improvement schemes; and

- (iii) To recommend new transport infrastructure, detailed improvements to existing transport infrastructure, and traffic management schemes to cope with traffic, parking and pedestrian demands arising from the existing and proposed developments/redevelopments within and outside the study area, having regard to promoting more sustainable transport mode choices including public transport, walking and cycling.

1.5.3.2 In a systematic planning process, setting of objectives is an essential step. The objectives form a basis for establishing criteria against which all plans are measured. An explicit statement is made and formal process is created to connect the plan with these objectives.

1.5.3.3 The objectives may fall into several groups. Some are quantifiable; others have to be related to the plan qualitatively. Some objectives can be measured in the same units as others, and consequently the trade-offs between opposing objectives can be estimated. Some objectives relate to things which can only be accomplished through detailed design after the general location of a new transport facility has been determined.

1.5.3.4 In response to growing public environmental awareness and concern, consideration should also be given to include an environmental element in setting objectives, so as to ensure that the recommended transport proposals would be environmentally acceptable.

1.5.4 Preparation Stage

1.5.4.1 During the preparation stage, significant data/information has to be collected. There are various kinds of important data/information such as-

- (i) Statistical & census data,
- (ii) Annual traffic census,
- (iii) Saturation flow survey,
- (iv) Goods vehicle usage interview,
- (v) Overnight parking inventory,
- (vi) Pedestrian movement survey,
- (vii) Footpath inventory,
- (viii) Existing traffic counts and other survey results,
- (ix) Planning data,
- (x) Traffic aid drawings and other plans,
- (xi) Highways design drawings,
- (xii) Development programme,
- (xiii) Accident records,
- (xiv) Public complaints,
- (xv) Territorial traffic matrices and network data,

- (xvi) Highway projects being planned or under construction,
- (xvii) Traffic signal data,
- (xviii) Public transport information, and
- (xix) Any environmental issues related to traffic.

1.5.4.2 During the problem identification stage, information about the current stage of the traffic system, and how it is changing over time, is required. With the help of the data collected, one could understand the likely effect of each proposed scheme and acquire knowledge of values to be used in assessing the overall worthiness of each scheme to different sectors of the community concerned.

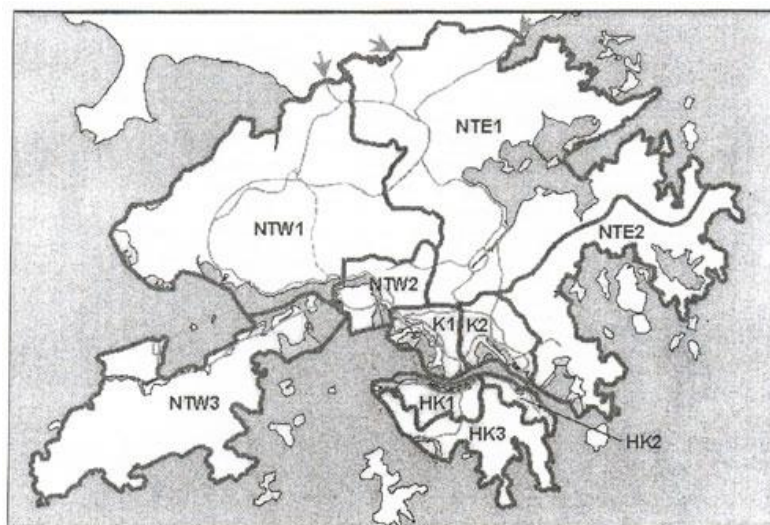
1.5.5 Transport Modelling

1.5.5.1 During this stage, transport models are developed for the base year and design year(s). Transport modelling plays an important role in forecasting travel demands and identifying network deficiency problems. The traffic forecasts from the models will be used for assessing candidate improvement measures. In developing the models, the study area is sub-divided into much finer zones than the CTS zones. Planning data are split among these zones and adjustments are made on the trip generation and attraction matrices produced by the CTS model to obtain expanded matrices for input to the Base District Transport Models (BDTMs). In addition, highway networks with greater details are prepared for the study area.

1.5.5.2 Ten BDTMs covering the following different areas of the whole Territory are developed and updated for use in district transport planning.

<u>Hong Kong Island</u>	<u>New Territories West</u>
BDTM-HK1 (NW)	BDTM-NTW1
BDTM-HK2 (NE)	BDTM-NTW2
BDTM-HK3 (S)	BDTM-NTW3
<u>Kowloon</u>	<u>New Territories East</u>
BDTM-K1 (W)	BDTM-NTE1
BDTM-K2 (E)	BDTM-NTE2

DIAGRAM 1.5.5.1: BOUNDARIES OF TEN BDTMs



- 1.5.5.3 The commercial package, SATURN, is used in all BDTMs. “SATURN” stands for Simulation and Assignment of Traffic to Urban Road Network and is particularly useful for modelling traffic condition of the urban road network with short distance between junctions, commonly found in the local road network of Hong Kong. With greater zonal and network details and better traffic simulation capability, BDTM can be used to assess the impact of development within the study area on the existing, committed and proposed highway networks. It is a very useful tool for assessing traffic management schemes in the congested district road networks of Hong Kong. The models can effectively simulate traffic operations at signalised and priority junctions, road intersections and roundabouts and take into account a number of important practical factors, such as bus stops, laybys, lane sharing, blocking back, downstream bottleneck etc. BDTMs also enable traffic to be reassigned to alternative routes in response to congestion.
- 1.5.5.4 The four-stage approach of transport modelling is maintained in the entire process. The first three stages, viz., trip generation, trip distribution and modal split, are taken care of at the CTS level. Cordon vehicle matrices from the CTS model are used as the boundary conditions for input to the BDTMs. Transport planning at district planning level is concentrated at the last stage, i.e. trip assignment by running the BDTM developed for the concerned district.
- 1.5.5.5 The BDTMs developed have undergone a model calibration process to ensure the networks and the matrices produced present a true picture of the actual traffic situation.
- 1.5.5.6 Trips with origins or destinations at zones within the BDTMs are called internal (I) trips while trips cross the boundaries are external (E) trips. The properties of ‘external to external’ (E-E) trips are inherited from CTS models and therefore have to be maintained. ‘Internal to Internal’ (I-I) trips, which are of less importance to CTS models, are critical to BDTMs. In the development of BDTM matrices, both the top-down and the bottom-up methods are used. Initial BDTM matrices are formed by the disaggregation of CTS matrices (top-down). They are then furnished with the trips generated by the developments, i.e. disaggregated planning data, by BDTM zones (bottom-up).
- 1.5.5.7 Network checks like minimum generalised time path and selected link analyses are carried out to warrant the simulation of the actual behaviour of the travellers by the encoded network. Network parameters (mainly on junctions) are adjusted to rectify any unusual travel patterns reported from these analyses. Green time optimisations of signalised junctions are carried out by the BDTMs to make sure that the junctions are most efficiently used.
- 1.5.5.8 When the BDTMs are considered well calibrated by comparing the modelled traffic flows with the observed flows on selected screenlines, matrix estimation technique is used to fine-tune the resulting traffic volumes. It is important that care should be taken in applying this technique, because it might force the matrix to undergo some undesirable factoring so as to match with the traffic counts or boundary conditions, in particular if the calibration of the models against ground counts is inadequately carried out. To avoid undesirable factoring, the differences of the matrices before and after the matrix estimation process are compared and are limited to reasonable tolerances.

1.5.6 Problem Identification

1.5.6.1 Problem identification is a key stage in any investigation leading to the subsequent formulation of solutions. Existing and likely future deficiencies in the transport system can be identified using information from the following sources-

- (i) Information collected during the data collection and public consultation stages; and
- (ii) Forecasts of future year traffic conditions emerging from the BDTMs.

1.5.6.2 Typical traffic problems and issues identified during the normal district planning process are as follows-

- (i) Capacity problem at certain road sections or junctions;
- (ii) Queue length problem;
- (iii) Parking and loading/unloading problem;
- (iv) Pedestrian circulation/capacity problem;
- (v) Inadequate facilities for cyclists;
- (vi) Accessibility problem for certain part of the road network;
- (vii) Public transport provision/operation problem;
- (viii) Road safety problem; and
- (ix) Anticipated future development.

1.5.6.3 While the key focus is on traffic problems, with stronger call for integrated planning and public participation, other transport related concerns of the public, such as traffic noise and exhaust emissions, should also be noted.

1.5.7 Development and Evaluation of Candidate Improvement Schemes

1.5.7.1 After the identification of problems and issues, a series of potential improvement projects aimed at overcoming the problems are developed wherever possible. In some cases more than one potential project will be formulated for a particular deficiency. For junction improvements a preliminary assessment of project feasibility having regard to capacity is conducted using traffic forecasts from the BDTMs and junction analysis programmes such as TRANSYT, TRAFFICQ, OSCADY, PICADY and ARCADY.

1.5.7.2 Potential improvement projects/measures usually comprise-

- (i) Infrastructure scheme;
- (ii) Traffic improvement scheme;
- (iii) Road widening scheme; and
- (iv) New transport policy measure.

1.5.7.3

The most commonly used traffic improvement techniques are as follows-

- (i) Signal control;
- (ii) Imposition of speed limit;
- (iii) Making street one-way;
- (iv) Restricting the direction of movements at junction;
- (v) Restricting the use of part of the carriageway by particular categories of vehicles;
- (vi) Exclusion of vehicles by dimension or weight with or without exemption for access;
- (vii) Limitation on parking and loading/unloading, including special provision for parking by those with a mobility handicap and control of footway parking;
- (viii) Temporary regulation for special events, roadworks, developments and emergencies;
- (ix) Enforcement of traffic regulation by the police or traffic wardens;
- (x) Clear and comprehensive direction signing and lane marking;
- (xi) Comprehensive and clear street name plates to assist access traffic;
- (xii) Direction signing for cyclists and pedestrians to encourage them to use intended routes and crossing places;
- (xiii) Charging for on-street and off-street parking;
- (xiv) Reallocation of existing highway space among pedestrians, cyclists, parked or other stationary vehicles (including delivery vehicles), public service and general vehicular traffic, by introducing or realigning kerbs and other changes of level, bollards and other physical barriers, and differences in surface colouring or texture;
- (xv) Changes in layout at junction;
- (xvi) Closing or opening of streets to some or all vehicular traffic in one or both directions for part or full time by installing or removing physical barriers;
- (xvii) Changes to surface level, surface texture or alignment to influence speed;
- (xviii) Alterations to signs and markings, either to reinforce other physical measures or for regulatory or information purpose;
- (xix) Pedestrianisation schemes;
- (xx) Provision of crossing facilities for pedestrians or cyclists;
- (xxi) Provision of stopping places for public service vehicles and shelters for passengers;
- (xxii) Provision of taxi ranks;
- (xxiii) Alterations to landscaping of the street furniture, including resurfacing for environment improvement; and
- (xxiv) Traffic calming schemes.

1.5.7.4 After the formulation of schemes, a series of hybrid options are defined. These options will undergo testing. All the pros and cons will be listed for evaluation. Again, extensive use of the BDTMs is made. The projects are evaluated against traffic engineering, highway engineering and environmental aspects as well as comments received through public consultation.

1.5.7.5 There are a number of evaluation criteria such as-

- (i) Network effect;
- (ii) Public transport operation;
- (iii) Parking provision;
- (iv) Servicing provision;
- (v) Pedestrian facilities;
- (vi) Implementation and operating cost;
- (vii) Environmental effect;
- (viii) Engineering feasibility;
- (ix) Land issues; and
- (x) Political acceptability.

The details will be discussed below.

1.5.7.6 Network effect comprises effects on link and junction capacities, traffic diversion required, overall vehicle travel distance and vehicle travel time for the study area, and queue length within the study area etc. All the above information could be tested using the BDTMs and with the help of other traffic engineering software.

1.5.7.7 Impact on public transport operation should be included to see if any route diversions, any changes on public transport priority, and any improvements in public transport facilities are necessary.

1.5.7.8 Parking provision refers to both on-street and off-street parking.

1.5.7.9 Servicing provision refers to all loading/unloading and picking/setting down activities.

1.5.7.10 For pedestrian facilities, both at grade and grade separated provisions should be considered.

1.5.7.11 The cost of candidate improvement schemes is one of the major items to be evaluated. Although a formal and complete Cost and Benefit Analysis is normally not anticipated at this level, some preliminary cost estimate is required.

1.5.7.12 Environmental impact is another important evaluation criterion. A preliminary environmental impact assessment is required, with some preliminary consideration and awareness in relation to environmental issues.

1.5.7.13 Traffic Engineers, Transport Officers, Highway Engineers, Environmental Specialists, Geotechnical Engineers and probably Structural Engineers should be consulted to see whether or not the candidate schemes are feasible both in terms of engineering and other considerations.

1.5.7.14 Last but not the least, land issues should also be considered. District Lands Officer(s) should be consulted in relation to the required land intake and the estimated cost.

1.5.7.15 Political acceptability includes the consideration of the perceived response of each of the political bodies to a particular scheme.

1.5.8 Development of Preferred Transport Plan

1.5.8.1 Assessments of the evaluation results are required to be conducted. A scoring system on the above evaluation criteria might be set up for providing reference information to facilitate the selection of certain options. Allocating scores to factors of different disciplines could be subject to challenge by parties of different interests, and the scoring system should be used with caution. Based on the evaluation results, preferred schemes are picked out and grouped into hybrid options. The hybrid options will undergo further evaluation and assessment.

1.5.8.2 Then the results will be presented to relevant departments as well as District Council(s) for comments. Taking into account comments received, the schemes are refined and selected as recommended projects for the study area. The recommended projects will form the basis of a preferred transport plan.

1.5.9 Preliminary Design

1.5.9.1 After a preferred transport plan has been selected, a preliminary engineering feasibility study of every proposed transport infrastructure scheme with preliminary environmental review should be carried out so as to confirm the feasibility of the proposal. Proposals identified as designated projects under the Environmental Impact Assessment Ordinance would require Preliminary Environmental Review to be conducted in the Preliminary Project Feasibility Study. Reference should also be made to the Environmental Impact Assessment Ordinance, the Works Bureau Technical Circular 18/98 and the then Planning, Environment and Lands Bureau Technical Circular 10/98 regarding environmental evaluation, if appropriate.

1.5.9.2 Preliminary design and cost estimates of the traffic improvement and pedestrian schemes should be prepared as recommended in the preferred transport plan. This should include the consideration of major temporary traffic diversion during implementation of major road projects, land resumption, environmental consideration, traffic and pedestrian circulation and other matters that need attention.

1.5.9.3 Layout drawings of the recommended schemes should be prepared to an appropriate scale generally of 1:1000 illustrating any additional transport infrastructure requirements, interchange facilities and other details as required. Vertical road profiles should be drawn to a scale of 1:250 and other details should be provided at such intervals and to such a scale as appropriate.

1.5.9.4 Layout plans for traffic aids (e.g. traffic signs, direction signs, bollards, guardrailings, safety fences, road studs, pedestrian crossings, road markings, etc.) should be prepared to an appropriate scale generally of 1:500.

1.5.9.5 Design calculations and phasing diagrams for traffic light signal installations/modification in association with any traffic management scheme(s) and/or major traffic diversion schemes recommended should be prepared.

1.5.9.6 A detailed implementation programme should also be prepared for the transport plans recommended with priority ranking.

1.5.10 Special Topics

1.5.10.1 The main objective of a district traffic study is normally to develop a preferred transport plan for short and medium terms. However, due to different nature and characteristics of different districts, some specific tasks are often included as part of the study.

1.5.10.2 Typical examples of these special topics are as follows-

- (i) Development of interface with TRANSYT;
- (ii) Surveys on special traffic and transport topics;
- (iii) Contingency measures for unexpected events;
- (iv) Formulation of traffic calming schemes; and
- (v) Assessment for park and ride facilities.

1.6

Previous Studies

1.6.1 Territorial Transport Planning Studies

1.6.1.1 Transport planning in Hong Kong can be said to have commenced in early 1960's with a traffic forecast study of the cross harbour tunnel. This was followed by a series of increasingly formal and systematic studies as follows-

- (i) Passenger Transport Survey (1966);
- (ii) Mass Transport Study (1967);
- (iii) Long Term Road Study (1968);
- (iv) Hong Kong Comprehensive Transport Study (1976);
- (v) 1981 Special Survey on Transport Characteristics Survey (1982);
- (vi) Land-use Transport Optimisation Study (1984);
- (vii) Territorial Development Strategy (1984);
- (viii) Trucking Industry Study (1984);
- (ix) Second Comprehensive Transport Study (1989);
- (x) Port and Airport Development Strategy Study (1989);
- (xi) Metroplan (1990);
- (xii) Updating of Second Comprehensive Transport Study (1993);
- (xiii) Travel Characteristics Survey (1993);
- (xiv) Railway Development Study (1993);
- (xv) Freight Transport Study (1994);
- (xvi) Territorial Development Strategy Review (1994);
- (xvii) Conversion and Enhancement of Second Comprehensive Transport Study Computer Programs (1995);
- (xviii) Parking Demand Study (1995);
- (xix) Third Comprehensive Transport Study (1999);
- (xx) Second Railway Development Study (2000);
- (xxi) Feasibility Study for Additional Cross-border Links Stage 1: Investigations on Traffic Demand (2000);
- (xxii) Cross Boundary Travel Survey (2000);
- (xxiii) The Second Parking Demand Study (2001);

- (xxiv) Hong Kong 2030 : Planning Vision and Strategy (on-going); and
- (xxv) Travel Characteristics Survey 2002 (under planning).

1.6.2 District Traffic Studies

1.6.2.1 As part of the district transport planning work, a number of district traffic studies have been carried out, which include the following-

- (i) North Kowloon Traffic Study (1984);
- (ii) East Kowloon Joint Traffic Study (1987);
- (iii) Western District Traffic Study (1988);
- (iv) Engineering Feasibility Investigation for Improvements to the Mid-Levels East - West Road Corridor (1989);
- (v) Tsim Sha Tsui Traffic Study (1987);
- (vi) West Kowloon Reclamation Traffic Study (1990);
- (vii) Central Kowloon Traffic Study (1990);
- (viii) Northwest Kowloon Traffic Study (1989);
- (ix) Cross Harbour Tunnel Traffic Study (1988);
- (x) Wan Chai District Traffic Study (1991);
- (xi) Northwest NT Open Storage Traffic Impact Study (1993);
- (xii) Island East Traffic Study (1993);
- (xiii) Sha Tin and Ma On Shan District Traffic Study (1996);
- (xiv) Comprehensive Traffic Review for East Kowloon (1998);
- (xv) Tuen Mun and Yuen Long District Traffic Study (2001);
- (xvi) Hong Kong Island North and Kowloon West District Traffic Study (2001); and
- (xvii) Setting up and Updating of Base District Traffic Models for Traffic Impact Assessments in Hong Kong, Kowloon and New Territories (on-going).

1.6.2.2 As the recommendations of these district traffic studies are intended to resolve short to medium term traffic issues, traffic situations upon implementation of the recommendations are closely monitored with a view to coping with the transport demand arising from the concerned existing and proposed developments/redevelopments.

TPDM Volume 1 Chapter 2 – Public Transport Study

2.1 References

- (1) Study of Cross Harbour Public Transport Services Final Report (1986)
- (2) The White Paper on Transport Policy in Hong Kong (1990)
- (3) Cross Harbour Public Transport Services Study - III Final Report (1991)
- (4) Updating of Second Comprehensive Transport Study Final Report (1993)
- (5) Nathan Road Corridor Public Transport Study Final Report (1993)
- (6) Area Public Transport Network Efficiency Studies - North East New Territories
- (7) KMB Improvement Studies - Urban Kowloon Network Final Report (1994)
- (8) Transport Study for the New Airport (TRANSNA) Final Report (1996)
- (9) Area Public Transport Network Efficiency Studies - Cross Harbour Bus Study Final Report (1997)
- (10) “Third Comprehensive Transport Study”, Final Report and Technical Report, October 1999, Transport Department, Hong Kong Government.
- (11) “Hong Kong Moving Ahead - A Transport Strategy For The Future”, October 1999, Transport Bureau, Hong Kong Government.
- (12) Planning for Public Transport - Peter R. White
- (13) Economics of Public Transport - CA Nash

2.2 Introduction

2.2.1 The purposes of this chapter are:

- (i) to outline the approach in conducting the public transport study; and
- (ii) to present the transport models and the associated elements which are commonly used in the study for forecasting the public transport demand on a regional basis.

2.2.2 In this chapter, public transport refers to the most commonly used modes of public transport in Hong Kong. These include railways, buses, minibuses and ferries.

2.2.3 Public transport carries nearly 90% of all person trips in Hong Kong. It will continue to carry the bulk of person trips as a comprehensive range of transport services is available to passengers at reasonable fares with different choices in modes.

2.2.4 In October 1999, the Government published “Hong Kong Moving Ahead – A Transport Strategy for the Future” on the basis of the recommendations of the Third Comprehensive Transport Study (CTS-3). One of the major transport strategies in Hong Kong is to provide a balanced public transport network which encourages the maximum utilization of railways. Franchised bus and other transport services will continue to play an important role in areas not accessible by railways as well as feeding passengers to railways. Since public transport carriers are capital intensive and may require a long lead time for delivery upon acquisition, there is a need to plan ahead by conducting detailed study to project their requirements.

2.2.5 Basically, the purpose of public transport study is to forecast demand and changes in travel pattern and to match it with the supply of public transport services.

2.2.6 So whenever there are new major transport developments, such as the opening of new railways or cross harbour tunnels that will have a impact on passenger travel pattern, it is the practice of Transport Department (TD) to conduct public transport studies to review and reorganise the transport network in order to improve their operational efficiency and maximise the utilization of resources, e.g. Study on Development of an Integrated Public Transport System (DIPTRAN), Cross Harbour Public Transport Study (CHAPTS), Study on Nathan Corridor Public Transport Services (NACOPTS), Area Public Transport Network Efficiency Study (APTNESS) and Studies on co-ordination of Other Public Transport Service with New Railways (SCOPTS). The major recommendations of these studies have formed the basis for formulating the Route Development Programmes for respective franchised bus and ferry operators.

2.3 Public Transport Study

2.3.1 General

- 2.3.1.1 The role of a public transport study is to devise a system of models at appropriate level for evaluating public transport network in a comprehensive manner which would facilitate network development and rationalisation as well as assessment on financial viability.
- 2.3.1.2 Public transport study normally covers a region or sub-region. It involves an analytical process which builds on a number of quantitative techniques.
- 2.3.1.3 Analytical transport study tries to apply general mathematical relationships or models to simulate the travel behaviour of individuals whose particular patterns obey no fixed mathematical rule. The applications of quantitative techniques are often restricted by certain assumptions, availability of databases and limitation of computer software. They are merely planning tools for planners to test different sets of assumptions or scenarios with a view to building up an understanding of the key factors and the effects of their variations on the forecasts of travel demand and pattern. The techniques can form a basis for assessment of alternative actions and evaluation of transport proposals.

2.3.2 Planning Horizon

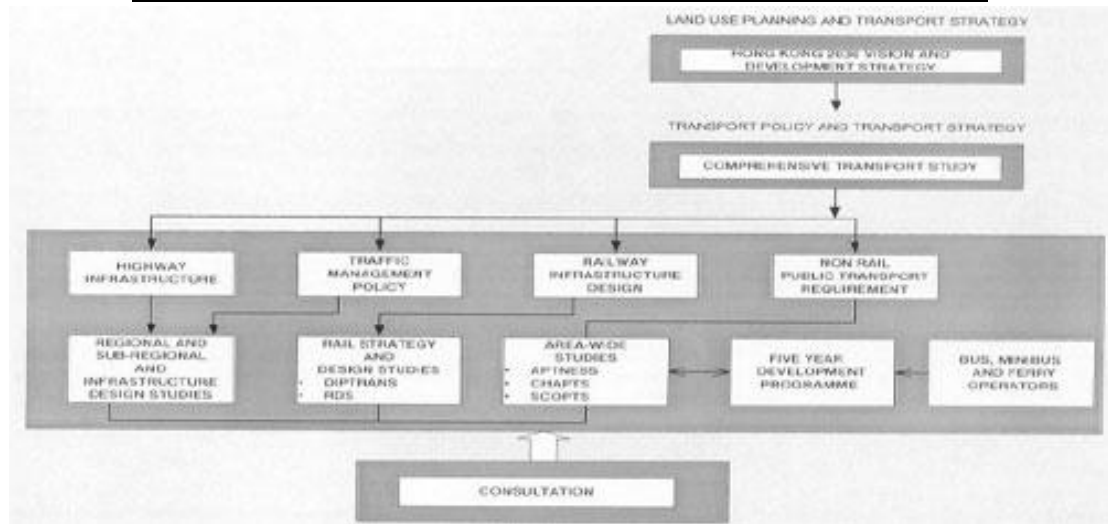
- 2.3.2.1 Public transport study covers short, medium and long term planning. Normally, short term planning covers planning period of one to two years. For medium term planning, its planning period will cover up to five years. As for long term planning, the planning period is above five years.

2.3.3 Integrated Planning Process and Planning Hierarchy

- 2.3.3.1 The position of a public transport study in the integrated planning process is illustrated schematically in Diagram 2.3.3.1. The planning hierarchy for the territory includes the Hong Kong 2030 Vision and Development Strategy which reviews and updates strategic land use/transport plans, CTS-3 for identifying the strategic transport projects and policy requirements and the Railway Development Study on rail strategy. These are then followed by appropriate regional transport studies.
- 2.3.3.2 The main transport planning tool within Government is the CTS-3 model developed in 1999. The CTS-3 model is developed by combining and building upon two existing territory-wide models - the Enhanced CTS-2 Model produced by the Model Enhancement Study, and the Freight Transport Model (FTM) produced by the Freight Transport Study (FTS). It is designed to deal with strategic territory-wide issues, concentrating on large scale corridor and highway movements. It is the basis of most transportation planning in the territory.
- 2.3.3.3 CTS-3 model is used to forecast demand by each main type of transport mode and the traffic conditions in future years under different assumptions of land-use, economic growth, transport network and transport policy. New transport projects or changes in the transport policy can be analysed by incorporating them in the CTS-3 model and then comparing the projected traffic flows from the model runs with and without these projects or policies.
- 2.3.3.4 The models and procedures need to be refined, where appropriate, to meet the objectives of individual study.

2.3.3.5 Apart from territory-wide study level, public transport study will also be carried out at region or district level, if necessary. The study area of a regional based public transport study normally covers a region, or one to two new towns located proximately. The review on public transport services between Tai Wai (Sha Tin) and Ma On Shan in relation to the development of Ma On Shan Rail Link is one of the examples. The focus of a district based public transport study will be on local area only. The re-organisation of bus services in Tsing Yi upon opening of Tung Chung Line in 1997 is an example of this type of study.

Diagram 2.3.3.1: Integrated Planning Process and Planning Hierarchy



2.3.4 Administrative procedures

2.3.4.1 The administrative procedures for conducting a large-scale transport study are broadly as follows :

- (i) Seeking funds for appointment of consultants for conducting the study;
- (ii) Preparation of study brief;
- (iii) Selection of consultants;
- (iv) Setting up of Steering Group;
- (v) Setting up of Working Group;
- (vi) Preparation of Study Reports and Deliverables; and
- (vii) Public consultation.

2.3.5 Study Objectives

2.3.5.1 In conducting a public transport study, its aim is to review the existing public transport services and assess the future development of public transport services in the Study Area.

2.3.5.2 The major outputs are recommendations on a viable overall transport plan and route development programmes for various modes taking into account the transport policy, demand, major developments and infrastructural changes in the Study Area.

2.3.5.3 The typical study objectives are :

- (i) identify problems and issues;
- (ii) review the provision of public transport services in the Study Area;
- (iii) review the patronage of public transport services in the Study Area;
- (iv) forecast future patronage demand;
- (v) formulate alternative public transport development strategies;
- (vi) establish evaluation framework;
- (vii) assess the effect of implementing alternative public transport development strategies;
- (viii) recommend a viable development programme;
- (ix) reassess transport infrastructure requirements to be compatible with the recommended network;
- (x) examine the need for any legislative change required for the recommended strategy;
- (xi) propose the consultation strategy and a implementation time frame; and
- (xii) carry out broad assessment of the impact on the total public transport system throughout the study period.

2.3.6 Public Transport Demand

2.3.6.1 The planning for new rail infrastructure is conducted as part of the territorial transport planning process. The rail operators are required to forecast their patronage and plan for improvement of their services.

2.3.6.2 The planning for bus services are carried out by the franchised operators in collaboration with TD. They are required to prepare an annual “Five-Year Forward Planning Programme” including a route development programme with a view improving and optimising their services to meet changes in demand and public expectation.

2.3.6.3 Green minibuses (GMB) are to supplement the mass carriers serving areas where physical accessibility constraints or demand does not justify the provision of high capacity modes. TD is responsible for planning of green minibus services, including introduction of new routes and changes to existing services. It is Government’s policy to limit the total number of minibuses and to encourage the conversion of red minibuses (RMB) to GMB.

2.3.6.4 Ferry is an essential mode for outlying islands and a supplementary mode in the urban area. Most of the ferry services in Hong Kong are now operated under a licensing system. The licensed operators are not required to prepare forward planning programmes. Normally, TD is responsible for planning of ferry services. The factors which will be taken into account in planning of new routes include: availability of piers, financial viability of the route, provision of alternative services and any impact on existing routes.

2.3.6.5 One of the main tasks for a public transport study is to forecast public transport demand. It may be predicted by the land-use transportation model, time-series trend analysis and the regression analysis.

2.3.6.6 Land -use Transportation Model

Public transport demand may be projected as a by-product of forecasts for all modes of transport produced within a land-use transportation study. Such forecast usually relates to a specific design date of about 5 - 10 years which are based on forecasts on population, employment, education, car ownership level, income level, economic growth, value of time, public transport fares and comfort. Alternatively, a model specific approach can be adopted. In the long run, it is related to variables such as population size, income level, economic variable, public transport fares and car ownership level. In the short run, aspects of service quality such as frequency, speed and fare which can be influenced markedly by the operator are more emphasised. A common feature of such model is the lack of importance of variables reflecting characteristics of competing modes. In addition, it is fairly difficult to include variables such as comfort and convenience.

2.3.6.7 Time-series Trend Analysis

Of specific forecasting methods, extrapolation is the simplest method. However, there is limitation to such method as the same trend and relationship will continue to be assumed in those external variables affecting demand. It is difficult to select the past period from which a trend is to be drawn for projection. Nevertheless, extrapolation may be useful in the short run, particularly if the projection is broken down into meaningful categories.

2.3.6.8 Regression Analysis

There are demand forecasting models based on multiple regression in which elasticity of demand of major quality variables such as frequency and fares are incorporated. With the regression model, the relationship between the variables can be evaluated. However, the development of a regression model requires an extensive data collection in order to meet the needs of individual organization which often involves considerable time and expense. It also requires expertise in the selection of variables to ensure the relationship that has a logical and meaningful interpretation. For these reasons, regression models are appropriate for making medium and long-term forecasts.

2.3.7 **Peak hour demand**

2.3.7.1 Like all major cities, Hong Kong has to face the problem of providing sufficient public transport capacity to meet peak period demand. The magnitude of problem depends on the level of demand and the capacity constraints. The peak hour demand of a new housing estate of a developed/developing area can be forecasted either by projecting the trips generated during peak hour or by applying the peak hour factor to calculate the peak hour demand of similar estate in the same area. For new area, it may have to apply peak hour factor of other area with similar demand. A public transport study is normally aimed at making recommendations for resolving the problems during peak hours.

2.3.8 **General approach**

The general approach to conduct a public transport study comprises nine stages :

- (i) Inception period;
- (ii) Data Collection and Analysis;
- (iii) Input Assumptions;
- (iv) Model Development;
- (v) Strategy Development and Testing;

- (vi) Evaluation of Strategies;
- (vii) Recommendations on Public Transport Strategy;
- (viii) Consultation with relevant parties on the recommendations; and
- (ix) Implementation Programme.

2.3.8.1

Inception

During this stage, the study objectives, the resources requirement, the study approach and the basic methodology for the study are set out. Key issues and constraints related to the Study will be reviewed. In addition, all available relevant data are collected for model calibration, problem identification, option development and evaluation purposes. In addition, a study programme is drawn up with the critical paths identified.

2.3.8.2

Data Collection/Analysis

- (i) It is necessary to acquire up-to-date information for conducting qualitative and quantitative analysis of existing services. There is also a need to identify the planned and committed developments. The information may be readily available or has to be collected through surveys.
- (ii) The existing available information may include:
 - (a) Existing public transport services;
 - (b) Travel pattern and travel time of passengers;
 - (c) Existing and proposed transport infrastructures;
 - (d) Land use and development proposals;
 - (e) Patronage data;
 - (f) Operation and cost data for alternative modes of transport;
 - (g) Traffic data;
 - (h) Route development programmes of public transport operators;
 - (i) Social and economic data such as population, employment, education and inflation etc.;
 - (j) Recommendations of sub-regional traffic studies and traffic impact assessment of developments;
 - (k) Existing, planned and committed transport facilities; and
 - (l) Strategy and recommendation of public transport schemes such as Bus Only Lane.

- (iii) Additional information to be collected through surveys is often required, e.g. :
 - (a) Origin and destination survey;
 - (b) Stop/terminus boarding /alighting survey;
 - (c) Screenline survey;
 - (d) Passenger interview survey (access/egress mode and reason for mode selection); and
 - (e) Stated preference survey (to project passenger behaviour by a survey conducted on hypothetical situation with a set of alternative scenarios and choice questions to solicit response for target respondents).
- (iv) The information collected or collated are used to develop a database for the study. It is common that reference can be made to the database of relevant studies conducted in the past. If the database of a previous study is to be adopted, the information is used to review the previous model performance and for refining the model formulation. The information is also used to identify problems, develop feasible options and evaluate options.

2.3.8.3

Input Assumptions

- (i) It is necessary to adopt various input assumptions to conduct a study. The assumptions may be derived from empirical data collected. The accuracy and appropriateness of the assumptions will affect the quality of the study findings and recommendations directly. To assess the impact of change in assumptions on the recommendations, sensitivity tests on different sets of assumption would need to be conducted.
- (ii) Policy input

The study's policy assumptions normally require the endorsement by the Steering Group. For public transport studies, the assumptions are normally related to the guidelines on inter-modal co-ordination, fare policy, role of public light bus and viability of modes etc. However, there may be other consideration such as the land use and the limitation on development of a particular area.
- (iii) Land-use and Socio-economic Data

The assumptions on land use distribution and development are based on the agreed land-use and socio-economic data in terms of the land use plan, projected population, employment and education enrollment figures, age distribution, income level and population distribution published by the Working Group on Population Distribution, Census and Statistics Department and Planning Department.
- (iv) Fare Index

The fare levels of public transport services play an influential role in forecasting trip demand, route and mode choice. Fares are vital to derive the revenue estimates for evaluation of different transport options.

- (v) Major Highway Projects/Infrastructure Programme
The major planned and committed highway projects and infrastructure programmes as given in the Development Programmes of Highways Department and Territory Development Department, as well as other relevant information are used for input into the model.
- (vi) Public Transport Network
The inputs on public transport network are based on the latest information on TD's official schedule of services, the operators' forward planning programmes and the recommendations of the recent transport studies. These inputs should be reviewed against the latest transport policy, land use and socio-economic assumptions.

2.3.8.4

Model Development

- (i) This entails an updating/refinement of model for the study plus additional procedures to evaluate options associated with new development.
- (ii) The CTS model is designed to deal with strategic territory-wide issues, concentrating on the large scale corridor and highway movements. It is the basis of most transportation planning in the Territory. For public transport studies, a more detailed zoning system which is different from CTS model may be required.
- (iii) Public Transport Model
In general, a public transport model consists of the following :
 - (a) A refined zoning system, including regional and sub-regional basis;
 - (b) Trip matrices consisting of zone to zone public transport movements;
 - (c) A detailed road and public transport network and assignment model to determine costs and hence paths between zone pairs;
 - (d) A public transport modal split model to determine the allocation of trips between modes; and
 - (e) A public transport assignment model to estimate the demand for individual route.
- (iv) Network and Assignment Model
A network and assignment model is used to determine costs and hence paths between zone pairs. Its application is as follows:
 - (a) The public transport network for CTS is for strategic purpose which needs to be refined for a specific public transport study. In some circumstances, the strategic CTS network needs to be extended and refined to cover new zones like reclamation areas and to enable accurate modelling of the sub-modal split between various modes.
 - (b) The base network needs to be converted to suit the format of the computer software for running the model.
 - (c) The public transport services in the network are updated to incorporate the committed network changes for the future years.

- (d) Various methods can be used to obtain the modal split. One of the methods to develop the modal split model is to base on the results of stated preference (SP) surveys and recalibrate the model on the basis of the revised costs from the updated networks and the overall observed modal split. The following variables are commonly included in the model:
 - model preference (a constant)
 - waiting time
 - access/egress time
 - time in mode
 - fare
- (e) For each zone pair, utilities are calculated from network costs for all modes and the proportion by each mode is calculated.
- (f) The inter-zonal times and costs are obtained from model assignment paths restricted to each mode. The preferred paths may be determined by penalising trips requiring interchanges.
- (g) The resultant cost matrices are used to recalibrate the modal split model.
- (v) A more detailed explanation of the public transport modelling process is given in section 2.3.9.

2.3.8.5

Strategy Development and Testing

- (i) Prior to establishing strategies for implementation, it is necessary to consider various options. This stage involves:
 - (a) Strategy development
 - (b) Identification of options
 - (c) Development of modal strategy
 - (d) Evaluation of strategies
 - (e) Recommended strategies
- (ii) Strategy Development
A number of strategies and options for different modes will be assessed through the following process:
 - (a) identification of options for each mode;
 - (b) development of strategies from the modal options; and
 - (c) combination of modal strategies into multi-modal strategies for testing and evaluation.

(iii) Identification of Modal Options

The reference networks and initial options are tested and the output is analysed so that problems with the reference cases can be assessed. The ability of the initial options to overcome these problems and fulfil the requirements of the evaluation criteria are identified. Options are then developed, refined and evaluated.

(iv) The options are directed towards the optimisation and rationalisation of services in order to make best use of the planned infrastructures, to suit the changing land use pattern and to address particular policy concerns. The options are identified in terms of new routes, route withdrawal, frequency and fare changes. During the process, discussion will be made with the public transport operators with reference to their route development programmes. The evaluation procedures may be designed to evaluate the identified options as well as to allow additional options to emerge for subsequent evaluation.

(v) Development of Modal Strategies

The modal strategies are built up from the modal options. The basic approach is to develop three broad strategies for each mode :

- (a) a base case;
- (b) a low level of service; and
- (c) a high level of service.

(vi) The level of service is defined in terms of network coverage, fare level and frequency. By combining these strategies of each mode into multi-modal strategies, it will generate a number of scenarios for testing.

(vii) The basic testing framework is modified to reflect the key policy concerns which are identified during the course of study. An example of the modal strategy definition, in conceptual terms, is shown below :

Mode	Base (1)	Modal Strategy "Low" Level of Service (2)	"High" Level of Service (3)
Ferry	Reference network suggested by TD.	Withdrawal of specified routes in the study area, new routes, frequency adjustments on selected routes and high fare assumption.	Keep existing routes in the study area, new routes, frequency adjustments on selected routes, low fare assumption and addition of land interchange service as found appropriate.
Bus	Route development programmes and other proposals conforming to policy.	Partial relaxation of policy on competition.	Complete relaxation of policy on competition.

(viii) Testing and Evaluation of strategies

Based on the modal options and strategies, a program of test can be devised to examine the impact of different combinations of modal strategies. The testing can be divided into stages and an example illustrating the combination of strategies to be tested by stages is shown below :

Stage	Strategy Test	Description
1	T1 (Base)	The bus/ferry/MTR services included in the tests are in accordance with the agreed items in the route development programmes.
2	T2	"High" level of service for bus.
	T3	"High" level of service for rail.
	T4	"High" level of service for ferry.
3	T5	"High" level of service for bus & rail.
	T6	"High" level of service for bus & ferry.
	T7	"High" level of service for rail & ferry.
4	T8	"Low" level of service for bus & ferry.
	T9	"Low" level of service for bus, rail & ferry.
	T10	"Low" level of service for bus & rail.
	T11	"Low" level of service for rail & ferry.
5	T12	High level of service for rail but low level of service for bus and ferry.
	T13	High level of service for bus but low level of service for rail and ferry.
6	T14	Refined strategy network based on results of T1-T13 tests described above.

- (ix) At each stage, the basic elements of each modal strategy are reviewed so that refinements to the inputs can be made. The tests will demonstrate the implications of all potential combinations of modal strategies and the impact of different emphasis in provision of public transport services.
- (x) Sensitivity tests are undertaken on the recommended options to reflect the possible changes in planning assumptions so as to determine the robustness and transport infrastructure requirements of the route development programmes.

2.3.8.6

Evaluation of Strategies

- (i) The evaluation of the multi-modal strategies will be undertaken using a framework approach.
- (ii) The framework involves the evaluation of strategies for three separate groups, i.e., public transport users, public transport operators and the community. The evaluation for each group will be based on a number of factors, including the operational, financial, economic, social effects and public acceptability.
- (iii) In certain cases, it will be possible to place a quantifiable value on the evaluation criteria, for example, average fare and revenue etc. As for other factors, it may need to have qualitative judgements and some ranking would have to be given to the strategy.

- (iv) The main effect of alternative networks on public transport users is the change in levels of service arising from different options. These include :
 - (a) average fare;
 - (b) average travel time(i.e. in-vehicle time);
 - (c) average waiting time; and
 - (d) average number of interchange involved.
- (v) The main impact on the operators is the financial viability in respect of their overall network or on an individual route basis. The assessment is as follows:
 - (a) changes in revenue;
 - (b) change in fleet requirements;
 - (c) changes in operating costs; and
 - (d) changes in cost recovery ratio (CRR).
- (vi) The basic criteria for evaluation of the strategies' effect on the community are :
 - (a) economic evaluation;
 - (b) policy consideration; and
 - (c) traffic consideration.
- (vii) Economic evaluation - The economic analysis of each option will be based on the following estimates :
 - (a) number of vehicle kilometres and hours;
 - (b) passenger hours;
 - (c) operating costs;
 - (d) changes in fleet and depot requirements; and
 - (e) interchange requirements.
- (viii) Values of time and the determination of capital and operating costs should be based on the most recently available information.
- (ix) Policy Consideration - An indicator reflecting the degree of conformity to the stated policy objectives can be applied to individual strategy.
- (x) Traffic Consideration - Different strategies will lead to different volumes of public transport vehicles and hence cause different levels of traffic congestion on road links. Accordingly, the traffic implications will be assessed on an overall basis.
- (xi) The assessment includes a comparison between the financial impact on public transport operators, in terms of the resources consumed, and the savings in travel times in order to demonstrate the trade-off.

2.3.8.7

Recommendations

To develop a coherent future strategy, it is necessary to maintain a balance between the costs and benefits to the public transport users, operators and the community. In addition, flexibility should be provided to modify the details of the strategy whenever situation warrants.

2.3.8.8

Consultation Strategy and Implementation Programme

- (i) To facilitate smooth implementation of the recommendations of the study, a consultation strategy to seek views of the concerned parties (e.g. District Councils) should be formulated before finalising the proposals.
- (ii) Having completed the consultation and duly considered the views of relevant parties, the study will put forward the recommended route development programmes for the public transport operators with the suggested implementation programme.

2.3.9

Public Transport Modelling Process

2.3.9.1

This section provides more details on the public transport modelling process on a regional scale. The public transport model projects the volume of patronage as a function of land use. Hence, a change in either the land use data or the assumed network configuration will have impact on the travel patterns. As population grows, the number of passenger trips is expected to increase. If the road and highway network change, the travel pattern will change.

2.3.9.2

A public transport model comprises of three main components:

- (i) a traffic zone system and associated demographic data;
- (ii) a base network (public transport and road); and
- (iii) an algorithm (four-stage transportation modelling procedure).

2.3.9.3

The general form of the public transport model is depicted in Diagram 2.3.9.3. The approach starts by considering a zoning and network system, and the collection and coding of planning, calibration and validation data. The model is presented as a sequence of four-stage sub-models, which includes trip generation, distribution, modal split and trip assignment.

2.3.9.4

It should be noted in the public transport modelling process that the highway modelling should also be considered simultaneously as the patronage forecasts will be significantly affected by the road traffic conditions.

2.3.9.5

Patronage forecasts for strategic and local area links within the territory involve two levels of modelling, i.e. the territory-wide strategic model and local or sub-area model. The hierarchy of public transport model involving the two levels of modelling is illustrated in Diagram 2.3.9.5.

2.3.9.6

Refinements are necessary in the sub-area modelling process to detail the network and zonal characteristics. Network expansion and matrix disaggregation are the procedure for the conversion of a strategic model to a sub-area model. Diagram 2.3.9.6 shows the disaggregation of a matrix in CTS level to sub-area level.

Input Parameters

Zoning System

- 2.3.9.7 A zoning system is used to aggregate the individual households and premises into manageable chunks for modelling purposes. For a particular study, a zoning system is normally developed with the model of the CTS as the basis and combined with the more detailed zoning system developed in previous studies. The disaggregation of zones is sometimes necessary due to special condition such as the importance of the areas around the ferry piers for a cross harbour public transport study.

Land Use and Demography Data

- 2.3.9.8 Land use planning data indicate where people live, where they work, shop and go to school. For each zone the following data are specified:

- (i) Population
- (ii) Households
- (iii) Household income
- (iv) Resident workers
- (v) Resident students
- (vi) Age distribution in 10 categories
- (vii) Residential parking spaces per household
- (viii) School places in 4 categories
- (ix) Employment places in 12 categories
- (x) Hotel rooms
- (xi) Market stalls
- (xii) Cinema and theatre seats
- (xiii) Hospital beds
- (xiv) Container vehicle parking
- (xv) Container yards
- (xvi) Container depots
- (xvii) Container vehicle repair yards
- (xviii) Open storage sites

Networks

- 2.3.9.9 As mentioned in paragraph 2.3.9.4, public transport and highway models should be considered simultaneously in the modelling process. Therefore, the model requires the highway network and public transport to be described. A network is described in terms of nodes and the road links connecting them. In addition, nodes are required to represent zone centroids, the points where trips start and finish. They are connected to the network by notional links such as ‘centroid connectors’.
- 2.3.9.10 The highway network includes all roads in Hong Kong down to the level of local distributor if they carry through traffic. The following information is required for each road link :
- (i) Road type
 - (ii) Frontage type
 - (iii) Geographical sector
 - (iv) Area volume delay function
 - (v) Link volume delay function
 - (vi) Distance
 - (vii) Peak and off-peak speeds
 - (viii) Number of intermediate traffic signals on link
 - (ix) Carriageway type and width
 - (x) Junction type and width
 - (xi) Junction type and characteristic
 - (xii) Capacity
- 2.3.9.11 Public transport services and their accessibility to the public are represented in the public transport network by route and walk links. All franchised bus, ferry, rail and GMB/RMB services are included in the route data which consist of the operating frequency and structure of the service (in terms of a sequence of nodes representing interchange points with other routes or modes). The following information is required for each public transport service :
- (i) Fare
 - (ii) Vehicle capacity
 - (iii) Headway
 - (iv) Operating speed
 - (v) Dwell time
 - (vi) Layover time

Modelling Algorithm

- 2.3.9.12 The control of the modelling process is represented by a four-stage transport model, which includes trip generation, trip distribution, modal split and traffic assignment. The first two stages i.e., trip generation and trip distribution, are aimed at producing person trips generated/attracted in each zone and are represented in a matrix format. Once the trip matrices have been obtained, they are then splitted into vehicle and public transport matrices for further process. These matrices are then assigned to public transport and highway networks simultaneously to produce volumes of patronage and vehicle on public transport and highway networks respectively.

Trip Generation

- 2.3.9.13 The aim of the trip generation is to project the number of trips likely to attract to a zone, irrespective of origin and leaving a zone, irrespective of destination.
- 2.3.9.14 The standard approach to obtain the required zonal trip totals is to derive relationships which estimate household trip generation rates from observed data. The number of trip will be dependent on land use data.

Trip Distribution

- 2.3.9.15 The process of distributing modelling may be viewed as building up a matrix of person-movements and, in general terms, the number of trips in the matrix cell is likely to be related to:
- (i) Characteristics of the origin/production zone;
 - (ii) Characteristics of the destination/attraction zone; and
 - (iii) Characteristics of the separation, i.e., the perceived 'generalised cost' of travel between zones.

Trip Matrices

- 2.3.9.16 There are various methods for compilation of a new set of trip matrices such as the gravity model, logit model and disaggregation model. Alternatively, the trip matrices of CTS or previous studies can be used as the basis and updated to include the new planning data and additional zones. The public transport trip matrices are divided into modal matrices for different modes i.e. MTR, KCR heavy & light rail, bus, ferry, public light bus, tram and taxi.
- 2.3.9.17 To devise the public transport matrices, it may be necessary to pre-determine the combined loading to the public transport networks. The operators' return and public transport surveys like origin and destination surveys and screenline survey undertaken are used to control the overall number and distribution of public transport trips. Where necessary, adjustment (factoring) to the previous matrices should be made to reflect the latest information and through factoring process to build the future matrices. Very often, the trip matrices produced will be crossed checked with the forecast by CTS.

Modal Split

- 2.3.9.18 The separation of trips by private car and those by public transport. For this process it is customary to assume that people who do not have a car available will be captive public transport passengers. These trips would be assigned, without further consideration to the public transport system.

2.3.9.19 People with a car available to them, however, do not necessarily always use it – they have a choice of travelling either by car or by public transport – a modal choice. This choice is assumed to be based on their perception of the generalized cost of each of the alternative modes of travel and this is customarily express in the form:

$$\frac{T_{ij}^{car}}{T_{ij}^{all\ modes}} = \frac{F(C_{ij}^{car})}{F(C_{ij}^{all\ modes})}$$

Where T_{ij}^{car} = number of trips between i and j by private car.

$T_{ij}^{all\ modes}$ = number of trips between i and j by all modes.

F = function of separation of zone.

C_{ij}^{car} = the generalised cost for travelling by private car between i and j.

$C_{ij}^{all\ modes}$ = the generalised cost for travelling by all modes between i and j.

Hence, when costs by each mode are the same then the modal split will be 50/50.

2.3.9.20 Another methods of modelling the modal split are by the use of “diversion curve”, usually determined from the survey data, and “nested logit” model. Within a nested structure, the first choice may be between private car and public transport. For those choosing public transport, there may be a further choice between bus and rail.

Traffic Assignment

2.3.9.21 An assignment model takes a matrix of trips (which is the output of the trip distribution process) and assigns it as traffic onto an appropriate network i.e., the public transport and highway network. The assignment process is as follows:

- (i) Choice of route for each zone pair;
- (ii) Aggregation of path flows on the links of the chosen paths;
- (iii) Introduction of supply-side constraints, as a result of the volume of link flows nearing or exceeding capacity; and
- (iv) Estimation of the resulting generalised cost for each zone pair.

2.3.9.22 According to the concept of optimal strategy, multipath transit assignment technique is best suited for public transport assignment model and high-frequency urban transit networks.

Diagram 2.3.9.3: The Transport Model

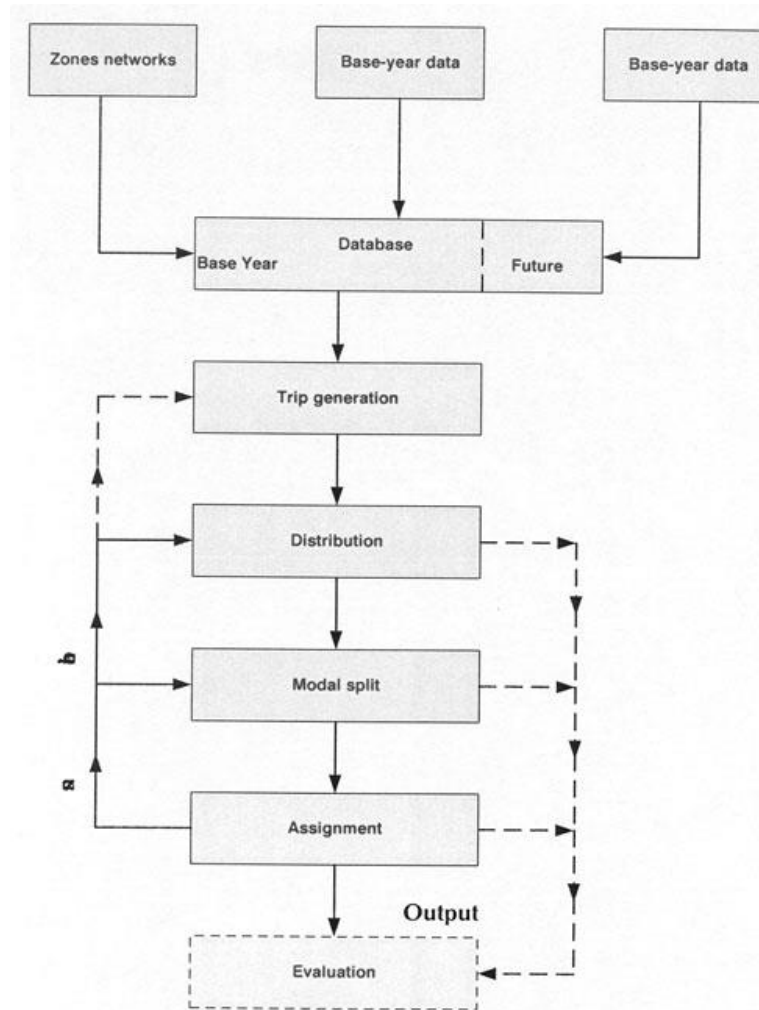


Diagram 2.3.9.5: Hierarchy of Public Transport Models

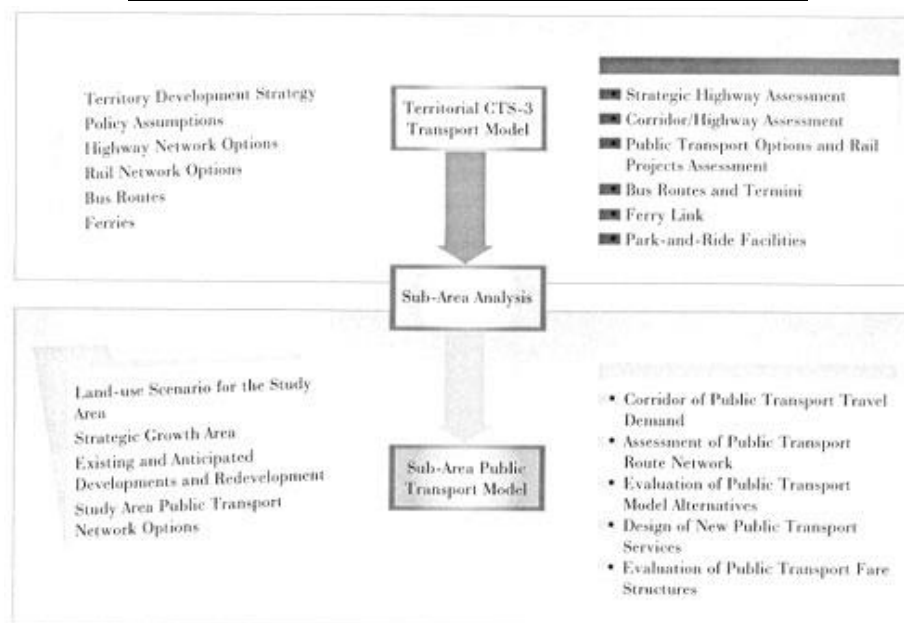
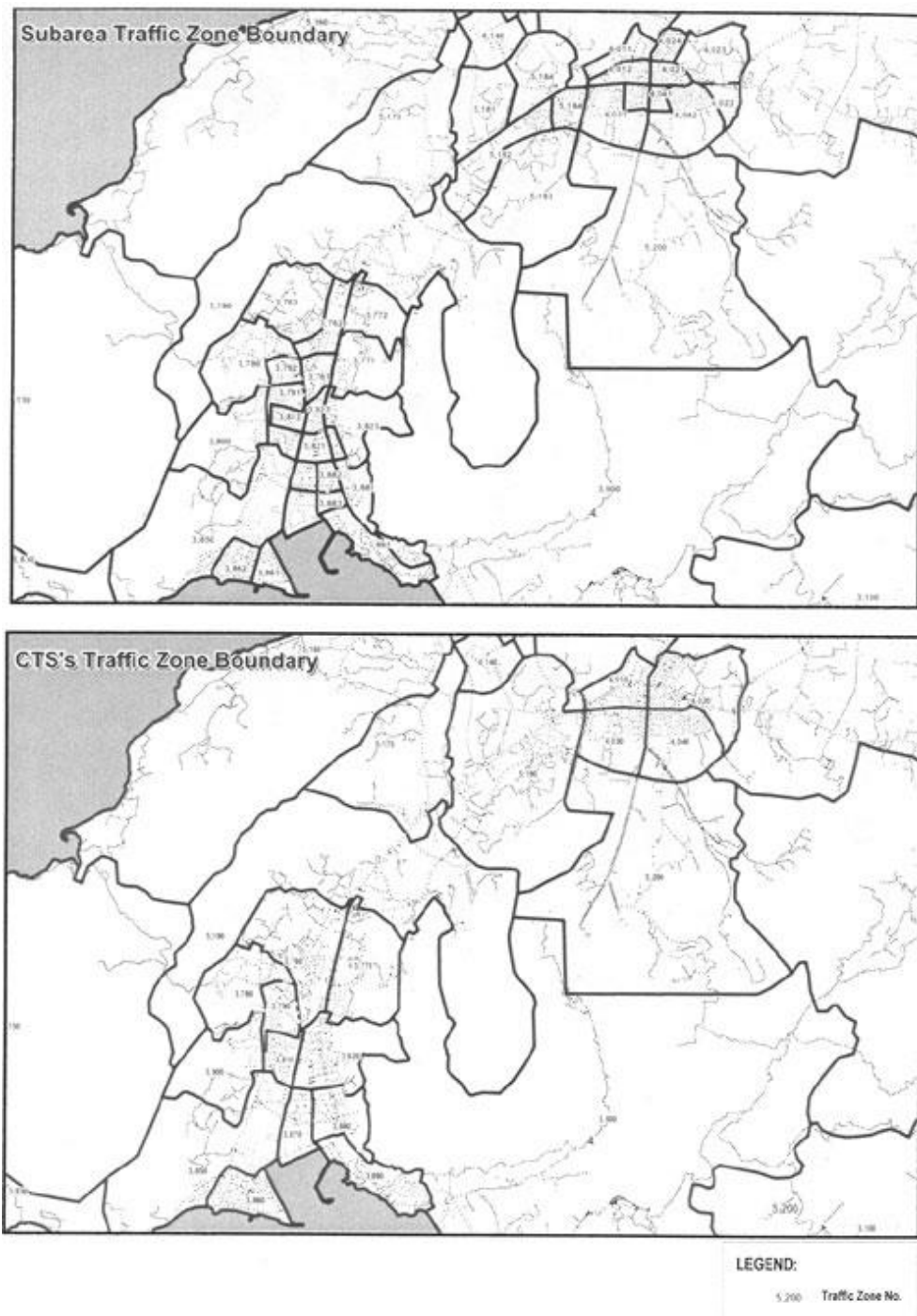


Diagram 2.3.9.6: CTS and Subarea Traffic Zone Systems



2.3.10 Model Validation

2.3.10.1 The objective of the model validation process is to ensure that the model accurately replicates the existing patterns of movements for design years forecasting in respect of the areas and modes which are of particular interest to the study. The main validation criteria to assess the ability of the model is to project patronage on a corridor basis and make comparison between the observed and modelled patronage by service. The public transport elements of the model have to be validated as follows:

- (i) Daily public transport boardings
- (ii) Daily public transport persons trips across screenlines
- (iii) Daily rail link flows
- (iv) AM peak rail link flows
- (v) PM peak rail link flows

2.3.10.2 The model is validated through the comparison of modelled patronage with the observed flows. If there are discrepancies between the observed and synthetic flows, the model should be recalibrated or the output matrices should be adjusted to reflect actual situation.

2.3.10.3 There is no hard and fast rule to validate the degree of accuracy of a model and it mainly depends on the intention of its application. A model which is developed to compare alternative solutions to a particular problem should be most adept at reproducing those parts of the study area in the immediate region of the problem and those which may be significantly affected by any possible solution.

2.3.11 Model Application

2.3.11.1 The final modal split model is incorporated into the computer software for running the program and testing alternative networks. From the base network, subsequent strategy test networks are created and revised travel costs are obtained from each transport mode. These are then used to rerun the modal choice model which produces the revised trip matrices for each mode. These matrices are then separately reassigned to the network to obtain the link and service loading for each mode.

2.3.11.2 Issues that may be examined include :

- (i) Impact of new public transport investments e.g. new rail systems and new stations;
- (ii) Potential demand for major new transport initiatives, including park and ride schemes;
- (iii) Results of different transport strategies, network structure and service level;
- (iv) Effects of overcrowding both on vehicles and inside stations;
- (v) Implications of different fare policies and structures;
- (vi) Extent of mode shift between private car and public transport in response to road congestion, traffic restraint or public transport improvements within multi-mode models; and
- (vii) Impact of improvement to a public transport interchange.

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3.1 References

- 1 Transport Planning and Design Manual Volume 2,
"Highways Characteristics", Transport Department, Hong Kong
- 2 Hong Kong Planning Standards and Guidelines, Chapter 8,
"Internal Transport Facilities", Planning Department, Hong Kong
- 3 Departmental Circular No. 14/97,
"Guidelines and Requirements of Traffic Impact Assessment (TIA) for Proposed Developments and
Transport Facilities", Transport Department, Hong Kong
- 4 Departmental Circular No. 4/00,
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Transport Department, Hong Kong
- 5 Planning Manual,
Planning Department, Hong Kong

3.2 Introduction

- 3.2.1 Hong Kong is one of the world's most densely populated cities. Land is a precious resource. As land suitable for development in Hong Kong is at a premium, it is necessary to optimise deployment of this limited resource to meet competing demands such as housing, commerce, industry, recreation and transport. It is therefore essential to control land use and development to achieve a balance amongst various demands.
- 3.2.2 Control of land use is achieved through formulating, monitoring and reviewing the town planning and associated programme. Transport Department plays a supportive role throughout the town planning process, i.e. formulation of planning standards and guidelines, preparation and implementation of various types of town plans.

3.3 Hierarchy of Town Plans

- 3.3.1 Hong Kong at present has a three-tier planning system comprising the formulation and definition of development strategies at the territorial, sub-regional and district/local levels. Various types of statutory and administrative plans at different levels have been prepared. At the district/local level, these development strategies are translated into district plans, namely statutory and departmental plans. Statutory plans are prepared under the Town Planning Ordinance (TPO). They include Outline Zoning Plans (OZPs) and Development Permission Area (DPA) Plans. Departmental plans are non-statutory in nature and they include Outline Development Plans (ODPs) and Layout Plans (LPs). Transport Department is involved in the preparation and implementation of these plans.
- 3.3.2 Territorial Development Strategies Territorial development strategies set out the long term land use and transportation framework which are required to sustain the growth of population and economic activities. The primary objective is to achieve the best living environment within constraints set by resource availability and the time frame within which the target population have to be accommodated.

Sub-Regional Plans

- 3.3.3 Based on the territorial development strategies, sub-regional planning statements are produced by Planning Department. These statements provide sub-regional policy guidelines following which territory-wide goals are translated into sub-regional planning objectives. Throughout this process, Transport Department advises on matters relating to traffic engineering and provision of transport facilities.

District Plans

- 3.3.4 The town planning process proceeds further from a general sub-regional level to a more specific level involving the preparation of district plans. They include the statutory OZPs and DPA Plans as well as non-statutory ODPs and LPs. Both OZP and DPA Plan are intended to lay down the broad statutory land use planning framework for an area, whereas DPA plan is prepared for the rural areas which require immediate planning control prior to the preparation of an OZP. ODP provides more specific and detail land use information for a district. LP gives full details of the planned development in an area.
- 3.3.5 Town plans are prepared to control land-use and developments in the territory. It also provides a framework for land disposal for public and private development. The administrative procedures in handling these plans and commenting on the transport provisions are detailed in the following sections.

3.4 Statutory Plans

3.4.1 General

- 3.4.1.1 There are two types of statutory plans, viz. Outline Zoning Plans (OZPs) and Development Permission Area (DPA) Plans. They are prepared by the Town Planning Board (TPB) under the directive of the Chief Executive (CE) in accordance with the Town Planning Ordinance.

Outline Zoning Plan (OZP)

- 3.4.1.2 An OZP is a district plan showing the proposed principal land uses and major road and rail systems for individual planning area. In general, OZP may designate land-use zoning including residential, commercial, industrial, open space, government, institution, community, comprehensive development areas, village type development areas, agriculture, open storage, green belts, country parks and other specific use. Major road patterns and railway lines are shown on the plan. OZP provides a basis for land-use control and provision of infrastructure. It also serves to provide development guidance for the public and private investments to achieve a balanced and optimal use of the scarce land resources.
- 3.4.1.3 OZP is prepared together with a Schedule of Notes gazetted to form part of the plan. The General Notes of the Schedule set out the permitted uses in all zones. Land-uses are specified under two columns. Column 1 uses are conforming uses and are always permitted under the OZP. Column 2 uses may be permitted with or without conditions on application to the TPB. The Notes may also specify other planning restriction such as maximum plot ratio, site coverage, building height and other special requirements where appropriate.

Development Permission Area (DPA) Plan

- 3.4.1.4 DPA plans have been prepared since the enactment of the Town Planning (Amendment) Ordinance 1991 mainly for the non-urban areas. They also indicate land use zoning and are accompanied by a set of Notes specifying uses which are always permitted and those which require TPB's permission. Non-conforming development which does not exist before the publication of the DPA plan or those without obtaining the necessary planning permission will constitute an unauthorized development and will be subject to enforcement action under the TPO. DPA plans are interim plans. They are effective for three years from the date of first publication and will be replaced by OZPs within the period. The effective period may be extended by the Chief Executive in Council for up to one additional year on application by the TPB. The provisions for enforcement will however continue to be applicable in the areas after the DPA plans are replaced by OZPs.
- 3.4.1.5 A statutory plan is always accompanied by an Explanatory Statement which sets out the authority and intention of the land-use zoning. The Statement contains information on population, target land use pattern, communication and utility services planned for the area.

3.4.2 Rezoning / Amendment to Statutory Plans

- 3.4.2.1 Under the existing TPO, there is no provision for application to the TPB to rezone a certain site or to amend any draft or approved plan so that development not permitted by the zoning or Notes may be allowed. However, the TPB has adopted an administrative practice to consider such requests as part of the plan-making process. The current practice is that upon receipt of a rezoning request, relevant Government departments will be consulted and a paper will be submitted to the relevant Planning Committee of the TPB for consideration.

- 3.4.2.2 In considering the rezoning request, traffic impact on the planned transport infrastructure resulting from the rezoning should be carefully examined. Detailed traffic study may be required to ascertain the traffic impact to the surrounding areas.

3.4.3 Section 16 Application

- 3.4.3.1 For those developments/land use which conform to the Notes of the statutory plans (uses permitted under the General Notes or Column 1 uses), no planning permission from the TPB is required. For the Column 2 uses, planning permission from the Town Planning Board is required. Applicant may seek permission from the Town Planning Board to change the land use under Section 16 (S.16) of the Town Planning Ordinance for those developments/land uses which do not conform with the statutory plans. This mechanism provides flexibility in land use planning and better control of development to meet the changing needs.
- 3.4.3.2 Section 16 Application received by the Town Planning Board has to be processed within a statutory time limit of two months. It is therefore important to observe the deadline set for providing comments to the Planning Department. A checklist for checking S.16 Applications is given in Appendix 1.
- 3.4.3.3 In examining S.16 Application, traffic impact of the proposed development on existing and committed transport infrastructures should be carefully assessed. While the traffic impact caused by small scale individual private developments might appear tolerable, the application may set an undesirable precedence for similar applications in the future. The cumulative traffic impact of such developments may overload the existing/planned transport infrastructure provided in the area. The consequence of approving S.16 Application should therefore be considered carefully.
- 3.4.3.4 Under the Buildings Ordinance, the Building Authority may refuse to give approval to building plans which would contravene any statutory plan prepared under the TPO or a master layout plan approved by the TPB under S.4A(2) of the TPO. Apart from the Buildings Ordinance, development is also controlled through lease conditions, density zoning control and other special control measures such as moratorium. The S.16 Application also provides opportunity for government departments to recommend to the Town Planning Board to impose approval conditions for improving the living environment in the vicinity. Such approval conditions may include for instance, the provision of community facilities, parking facilities and improvement to local road networks etc., which are required as a result of the proposed development.

3.4.4 Section 17 Review of Planning Application

- 3.4.4.1 If aggrieved by the decision of the Planning Committee (i.e. either on the rejection of the application or being unsatisfied with conditions of approval), an applicant may apply for a review of the Committee's decision under section 17 of the TPO (S.17) within 21 days of being notified of the decision of the Committee. The review would be conducted within 3 months of the receipt of the application for review.
- 3.4.4.2 For the review, consultation with relevant Government department will be conducted. TD's representative may be required to attend the review hearing to provide expert advice on traffic/transport issues. For TD, comments on traffic related matters of the development proposals, e.g. traffic implication, vehicular access, car parking and loading/unloading provision would be sought.

3.4.5 Section 17B Appeal

- 3.4.5.1 An applicant who is aggrieved by a decision of the TPB on a review under section 17 of the TPO may lodge an appeal to the Town Planning Appeal Board. TD's representative may be requested to serve as a witness in the appeal hearing, if the application was rejected on traffic ground. He needs to prepare a witness statement with expert advice on traffic/transport matters for the deliberation of the appeal case.

3.5 Transport Considerations in Statutory Plans

3.5.1 General

- 3.5.1.1 Town plans are prepared for both existing and new development area. They are also revised as necessary to cope with the dynamic development of the territory. Statutory plans stipulate the intensity and types of land uses and indicate the proposed major infrastructures which are required to support these land uses. As far as traffic and transport facilities are concerned, relevant departments should ensure that the most up-to-date information of all approved proposed highway systems and railway networks, proposed vehicle parks/parking facilities, public transport interchanges or termini, ferry piers, street widening schemes, etc. are included in the town plan.
- 3.5.1.2 The transport aspects to be considered during the preparation and/or revision of statutory plans should focus on the local traffic and operational problems resulting from the proposed or change in land-use and/or development intensity and patterns.
- 3.5.1.3 For minor revision of a statutory plan involving only a few sites for which traffic associated with the proposed development is not significant, a less critical examination would usually suffice. Major revision such as comprehensive redevelopment of an old town would usually require detailed traffic study to ascertain the traffic impact to the surrounding areas.
- 3.5.1.4 The following lists the major areas which would require attention when processing the statutory plans. Each of these areas is further discussed in the following sections.
- (i) Transport policy/strategy
 - (ii) Integration of transport and land-use planning
 - (iii) Railway to serve as backbone of transport system
 - (iv) Provision of public transport services and facilities
 - (v) Environmental considerations
 - (vi) Capacity of road system
 - (vii) Cumulative traffic impact
 - (viii) Traffic impact assessment

3.5.2 Transport Policy / Strategy

- 3.5.2.1 The statutory plans should be examined with reference to the prevailing transport policy and strategy. The land-uses proposed on the statutory plans should facilitate the implementation of these policies and strategies for providing and maintaining a safe, efficient and reliable transport system in an environmentally acceptable manner for the development of Hong Kong. These objectives are summarised as follows:
- (i) Better integration of transport and land use planning
 - (ii) Better use of railways as the back-bone of transport system

- (iii) Better public transport services and facilities
- (iv) Better environmental protection measures in relation to transport infrastructure and activities

3.5.3 Integration of Transport and Land Use Planning

3.5.3.1 Better integration of land use and transport planning can reduce travel demands, thus alleviating the pressures placed on the transport system and adverse impact on the environment. It can also help to alleviate environmental impact caused by transport activities. In this respect, the following should be given due consideration when processing statutory plans:

- (i) Siting more intensive developments and major employment centres within easy pedestrian reach of rail stations and major bus stops/public transport interchanges.
- (ii) Provision of comprehensive pedestrian walkway system shall be seriously considered at the early stage of land use planning to form an integral part of the development plan. The walkways shall meet the pedestrian needs in providing better access, in particular, to railway stations, public transport interchanges and major social/economical activity nodes. The walkway system shall not require frequent level changing.
- (iii) Provision of pedestrian scheme/precinct shall be considered, in particular major shopping areas or other areas where environmental problem is a concern. Pedestrian schemes should also be encouraged in other places like waterfront areas, and other areas of high pedestrian usage.
- (iv) Environmentally non-polluting travel modes such as walking and cycling should be encouraged.

3.5.4 Railways as Transport Backbone

3.5.4.1 Being an environmentally friendly and efficient mass carrier, railways will form the backbone of the passenger transport network. This will be supplemented by other public transport modes. Future strategic developments should be located along railway alignments as far as possible. This will reduce the reliance on road-based transport, improve the environment and enhance the efficiency of the rail network.

3.5.4.2 Special attention shall be given at the land use planning stage to provide adequate transport facilities including transport interchanges to enable the railways to deliver its role as trunk carriers. Parking provision at development around railway stations shall be minimized as far as possible. Park-and-ride and kiss-and-ride facilities shall also be provided at strategic railway stations to encourage rail patronage, thus reducing travel demand and the associated environmental impact.

3.5.5 Public Transport Services and Facilities

3.5.5.1 While railways will be provided to serve as backbone of our transport system, franchised buses and other public transport modes will continue to play an important role in areas not accessible by railways as well as feeding passengers to railways. The following initiatives shall be given serious attention in processing statutory plans:

- (i) Convenient and comfortable interchange facilities at strategic locations, especially railway stations, should be provided.

- (ii) Park-and-ride and kiss-and-ride facilities should be planned at rail stations and major transport interchanges located on urban fringe areas.
- (iii) Parking provision at developments, especially development around railway stations should be minimised where appropriate.

3.5.6 Environmental Considerations

3.5.6.1 Traditional road-based transport modes are constant source of noise and air pollution. Their impact on the environment should be minimised as far as possible. Reference shall be made to Chapter 9 of HKPSG where appropriate. At the early town planning stage, attention shall be given to the followings:

- (i) According priority to railways
- (ii) Promoting walking and cycling as a mode of transport. To plan around the pedestrians in new town and redevelopment by providing suitable pedestrian and cycling facilities and in built-up areas by enhancing the facilities as far as practicable.
- (iii) Exploring new environmentally friendly transport modes.
- (iv) Introducing park-and-ride schemes and pedestrianisation schemes etc.
- (v) Provision of adequate protective measures to minimise environmental impacts.
- (vi) Allowance of sufficient buffer zones adjacent to expressway.
- (vii) Consideration of alternative land use not sensitive to noise and air pollution.

3.5.7 Capacity of Road System

3.5.7.1 The adequacy of a road system is generally measured in terms of its capacity to carry the predicted traffic in a target year. Road width, number and distribution of roads are the basic factors which determine the capacity of road system. The detailed road layout including width is usually shown and should be examined in the Outline Development Plan/Layout Plan. For the purpose of statutory plan, it is necessary to roughly assess the adequacy of the proposed road system by estimating the proportion of land dedicated for the road system. In this connection, Chapter 8 of the HKPSG provides some indicative guidance on the percentage of total land area required for access purpose in various zones.

3.5.8 Cumulative Traffic Impact

3.5.8.1 It is essential to ensure that the strategic road system proposed in the statutory plan is adequate to cope with the cumulative traffic impact upon full development in the area. This assessment would usually require a transport modelling exercise to be conducted for the strategic roads and local roads in the whole area. The result of the modelling exercise will provide insight into the anticipated traffic volume on these roads. This would provide useful basis for assessing the transport requirement for the proposed developments shown on the statutory plan and where these developments are excessive to overload the planned transport infrastructures in the area. It is therefore important that Planning Department, Transport Bureau our Transport Planning Division and Strategic Infrastructure Branch are consulted on the planned strategic routes likely be available within the development time frame for input to the transport model.

3.5.9 Traffic Impact Assessment

- 3.5.9.1 Where a planning application is submitted by a developer or government department to change land use which would likely result in higher traffic volume associated with the new land use, the applicant should also submit a Traffic Impact Assessment (TIA). The objective of such TIA is to identify any traffic problem caused by the new land use and to recommend appropriate traffic and transport improvement schemes to mitigate the adverse effects.
- 3.5.9.2 The TIA would give a good opportunity to examine the proposal in greater depth in the aspects of access to the development, parking provision, traffic circulation and turning facilities as well as adequacy of public transport facility.
- 3.5.9.3 A checklist for checking TIA submission is given in Appendix 2.

3.6 Outline Development Plans / Layout Plans (Departmental Plans)

3.6.1 General

- 3.6.1.1 Both Outline Development Plans (ODP) and Layout Plans (LP) are departmental plans used administratively within Government to guide the implementation of the town planning functions such as development programme, land sales, allocation of government sites, etc. Such plans carry no statutory effect, however, they are binding on all Government departments and are used as a basis for such work as considering lease modifications, formulating lease conditions and preparing development programmes.

Outline Development Plans

- 3.6.1.2 ODPs are district departmental plans prepared within the framework of the sub-regional development strategies and the statutory OZPs. ODPs would show greater details of development proposals such as roads, footbridges, density control and disposition of sites when compared with OZPs. Likewise where OZP shows an R(A) use, ODP would give more details on density and types and would mark it as a R1, PSPS sites, etc. ODPs also serve as a guide for development programming, development control, land sale and the reservation and allocation of Government sites.

Layout Plans

- 3.6.1.3 LPs are of local significance and prepared for unformed or newly formed land or redevelopment areas that require comprehensive planning. They indicate the detailed land use and development proposals of an area which may or may not be covered by an OZP or ODP. These include information such as road formation levels, road widths, site boundaries, footbridge links and development restrictions for individual lots or buildings. LPs are used as a basis for land sale and land allocations as well as implementation of land projects and other engineering and other projects.

3.7 Transport Considerations in Outline Development Plans / Layout Plans

3.7.1 General

3.7.1.1 In processing ODPs/LPs, attention should be given to the following areas which are further described in sections below:

- (i) compatibility between road system and land use
- (ii) provision of public transport facilities including railway system, public transport interchanges, bus termini, bus depots, public light bus termini, taxi stands and general loading/unloading facilities, etc.
- (iii) encouraging environmentally friendly transport modes including walking and cycling

3.7.2 Compatibility between Road System and Land Use

3.7.2.1 The ODP should be examined to ensure correct incorporation of information with regard to hierarchy of proposed roads, provisions of public transport termini, pedestrian facilities as well as approved highway programme, etc. In ODP or even more detailed town plans like Layout Plans (LPs), information of road width and hence the hierarchy of proposed roads can be checked. Information of width of roads and footways provides very useful clues to the hierarchical order of the roads within the network. Taking an industrial area as an example, a local 6.75 m wide carriageway would not obviously be adequate and satisfactory to cope with substantial heavy goods vehicle traffic circulating in the area. In considering the road width of the town plans, it is also important to examine at the same time that the approved street widening schemes have been correctly incorporated into the ODP. Failure to spot any missing details would cause unnecessary confusion to the public and Government Departments.

3.7.2.2 At critical junctions, attention shall be given to ensure adequate sightline for all approach roads. The requirement for visibility splays and corner splays stipulated in TPDM Volume 2 Chapter 4 should be followed wherever appropriate.

3.7.3 Public Transport Facilities

It is important to provide adequate public transport facilities to meet travel demand associated with the proposed land-use. The need for public transport facilities such as bus termini, bus depots, public transport interchanges, public light bus and taxi stands has to be considered in the ODPs/LPs. The locations of such facilities should be appropriately included in the ODP/LPs. For detailed requirements of public transport facilities, please refer to TPDM Volume 9.

3.7.3.2 Rail Facilities

- (i) The Transport Strategy stipulated the use of railway systems to form the backbone of the public transport network. As the rail network develops, more and more population and employment centres in the urban and New Territories areas will fall within the catchment areas of these rail systems.

- (ii) For planned railway lines, railway stations should be located within a walking distance of 500m from major housing, employment, shopping, commercial, cultural and other major activity centres attracting significant public patronage. These developments should be connected to the railway stations via pedestrian walkway systems. Where justified, the provision of travellers and escalators should be considered to promote the walking mode to/from the rail station. The ODP should be checked to ensure adequate provision of these transport facilities.
- (iii) Consideration should also be given to minimising the potential environmental impact of the railway system to the neighbouring developments, especially the noise sensitive receivers. Typical considerations would include optimum buffer distance separating the rail alignment and the noise sensitive receivers, provision of noise screening structures and decking of depots, etc.

3.7.3.3 Public Transport Interchange

- (i) For the purpose of enhancing inter-modal coordination, a network of high standard public transport interchanges (PTIs) and cross boundary coach terminus should be provided. PTIs should be conveniently located close to population and/or activity centres as far as possible. It should provide a comfortable environment in order to encourage public transport ridership.
- (ii) Major PTIs should facilitate bus-bus or multi-modal interchange. Accessibility should be the key factor for the choice of the PTI location. PTIs should preferably be located at or near to rail stations. PTIs should also be provided in town centres or other regional focal points where demands for public transport services and mode changing facilities are expected to be substantial.

3.7.3.4 Bus Terminus

- (i) To ensure smooth traffic circulation and safety on public roads, bus termini should be located off-street as far as possible. Bus termini should be provided within large residential development particularly public housing estates, major activities centres, ferry piers, railway stations etc. They should be centrally located to enhance accessibility on foot to/from neighbouring developments. The terminus should have good and convenient access and connectivity to the existing and proposed road system. Ingress and egress from the terminus should be located to minimising adverse traffic impact to traffic circulation in the adjacent road network.
- (ii) To optimise land use, consideration could be given to locate bus termini on the ground floor level of the multi-storey developments. Such a terminus should be carefully sited and designed to minimise adverse environmental impacts, particularly air and noise pollution to the developments above or nearby.

3.7.3.5 Bus Depot

- (i) Suitable sites should be designated for use as bus depot on a regional basis to facilitate maintenance and nighttime parking for buses. Bus depots should be provided on level terrain with convenient access to the adjacent road system.

- (ii) Bus depots should be located in areas which are not environmentally sensitive, e.g. industrial areas. At other areas, the provision of bus depot should be considered together with appropriate environmental mitigation measures, such as the provision of adjacent non-sensitive development to screen off the adverse environmental effect caused by the depot.

3.7.3.6 Public Light Bus Terminus

- (i) Green minibus service is usually provided to serve areas where the transport demand is financially insufficient to support other public transport modes. The current policy encourages the gradual conversion of red minibuses into regulated green minibuses (GMB).
- (ii) Minibus termini should preferably be located off-street as far as possible in close proximity to the major activity centres. They should be incorporated into public transport interchanges such as railway station and ferry concourse, as far as possible. If on-street GMB terminus is to be provided, they should be provided at lay-bys located on minor roads to minimise traffic disruption and/or congestion on the main roads.

3.7.3.7 Taxi Stand

- (i) Taxi stands should be provided off-street near activity/development centres and public transport interchanges. It should be located near pedestrian access to nearby developments or near to pedestrian desired line of travel. Consideration should be given to avoid taxi queuing up causing obstruction to other traffic.
- (ii) If on-street taxi stands are to be provided, they should be located on side roads to minimise adverse traffic impact as far as possible.

3.7.3.8 Others – Bus Bay, Loading/Unloading Bay

Apart from the public transport terminal facilities, bus bays and general loading/unloading bays should be provided at or near activity centres to meet public demand. Provision of these loading/unloading bays should be restricted, as far as possible, to local roads.

3.7.3.9 Ferry Terminus

- (i) A ferry terminus is the point of embarkation or disembarkation on a ferry route. It should be located in proximity as far as possible to residential, commercial or industrial developments which generates potential passenger movements. Other modes of land transport interchange facilities such as franchised buses, green minibuses and taxis should be planned within or adjacent to the ferry terminus. The surrounding road network should have adequate capacity for the anticipated volume of vehicular traffic associated with the ferry terminus.
- (ii) Provision of ferry services can ease road congestion and reduce land transport trips, the ferry terminus should be located as far as possible within easy walking distance from adjacent developments or public transport facilities. Adequate footway and crossing facilities should be provided in the vicinity. Furthermore, to improve comfort to passengers and encourage the public to use public transport services, provision of covered walkways linking adjacent developments and PTIs to the ferry terminus and graded-separated pedestrian facilities should be considered as far as possible.

3.7.4 Other Environmentally Friendly Transport Facilities

3.7.4.1 Pedestrian Facilities

- (i) Walking is one of the environmentally friendly modes of transport. Consideration should be given to promoting walking as far as possible. Pedestrian facilities, which may include traffic-free zone, grade-separated pedestrian walkway system with escalators and travellers where justified and pedestrianised area, etc. should be planned and integrated with the surrounding land uses. The pedestrian facilities should be safe, comfortable and being well integrated into the transport – land use design such that daily activities are accessible on foot and within acceptable travel distance and time as far as practicable.
- (ii) Pedestrian walkway systems that are more attractive than isolated and piecemeal footbridges and subways should be provided as far as possible in both new and built-up areas. To provide clear intention, pedestrian network, grade separated walkways, subways and pedestrianisation schemes should be shown on the ODP and Layout Plans where appropriate. Explanatory Statement of the relevant ODP/LP should clearly explain the planning intention of such schemes.

3.7.4.2 Cycling Facilities

Apart from recreation, cycling in certain new development areas is also a supplementary transport mode. It facilitates short-distance travel in an environmentally friendly manner. In planning of new towns, attention should be given to the provision of continuous cycle tracks and related facilities for recreation/tourism as well as for intra-district travel. In planning the cycle tracks, short-distance intra-district cycle routes should be planned to connect major residential developments, major transport interchanges and other activity centres in the vicinity. Recreational/tourism cycle routes should be provided along scenic spots and promenade areas if possible. The convenience of public transport connection to cycle parks shall have a bearing on its choice of locations. Cycle traffic should be segregated from other road users wherever possible. Cycle tracks should either be separated from adjacent carriageway or totally separated from other vehicle routes to minimise potential conflicts between vehicles and pedal cycles traffic.

3.7.4.3 Cycle Park

- (i) Where a scenic cycle route is planned, consideration should be given to the provision of a nearby cycle park. Cycle parking areas should be provided off road/cycle track to avoid obstruction to vehicular, pedestrian and cycle traffic. They shall be conveniently located close to the general destinations in order to encourage usage and to discourage illegal parking.
- (ii) In rural areas, residents (and villagers) often cycle along main roads to bus stops and railway stations and to continue their journeys using public transport services. Provision of bicycle storage facilities shall therefore be considered at rail stations and major PTIs at the early planning stage.
- (iii) Also in rural areas, where cycling is a common mode of transport, provision of cycle parking facilities should also be considered at major pedestrian generators such as shopping malls, public venues for sport, culture and entertainment, and public transport interchanges.

Appendix 1

Checklist for Checking of Application for Permission under Section 16 of the Town Planning Ordinance (Cap.131)

Contents

- Introduction
- Transport Department's Role
- Purpose
- Checking of Section 16 Application
- Other Supplementary Submissions
- Reference
- Annex A - TD's Role on Processing of Section 16 Application
- Annex B - Procedure for Processing Planning Application Under Town Planning Ordinance
- Annex C - Assessed Domestic Parking Situation in Various Districts & Recommended Categories of Parking Provision in Residential Developments
- Annex D - Tables 1 and 2 of Traffic Generation and Attraction Rates

Introduction

- 1 Statutory plans prepared by the Town Planning Board (TPB) under the Town Planning Ordinance (TPO) include outline zoning plans (OZPs) and development permission area (DPA) plans. Both plans indicate land use zones and are accompanied by a schedule of notes which sets out
 - (i) uses which are always permitted; and
 - (i) uses which may be permitted with or without conditions on application to TPB under Section 16 of the Town Planning Ordinance.
- 2 Where a plan provides the grant of permission for any purpose, an application for the grant of such permission shall be made to the Town Planning Board. The Board (TPB) may grant permission only to the extent shown or provided for or specified in the plan. A summary of Planning Department's response in clarifying TD's role on the processing of S16 Application is attached at Annex A. A flow diagram indicating the procedures for processing planning application under the Ordinance is shown at Annex B.
- 3 For major development, the applicant may be required to submit additional information on the technical assessment for the application such as environmental, drainage, geotechnical, transport, landscape and visual impact assessment, where appropriate. In case of small developments (e.g. NT Exempt Houses), no impact assessment is normally included in the submission.

Transport Department's Role

- 4 Planning Department will consult relevant Government departments during the processing of Section 16 Applications. Transport Department will be consulted on matters in relation to transport & traffic issues e.g. traffic implication, car parking spaces and loading/unloading provisions, etc.

- 5 Section 16 applications are approved on the terms of the application as submitted by the applicant to the TPB. Fundamental issues have to be considered in assessing the application, although minor amendments could be made to comply with the conditions imposed by the TPB
- 6 In processing of a Section 16 Application, Transport Department (TD) is expected to provide comments/inputs on the following: -
- (i) Traffic and Transport Facilities
 - (ii) Traffic Impact (resulting from the proposed development)
 - (iii) Traffic Improvement Measures to mitigate the traffic impact
 - (iv) Suggested Conditions of Approval (in granting Section 16 permission)

Purpose

- 7 The purpose of this Checklist is to provide guidelines on the checking of a Section 16 Application from TD's point of view.

Checking of Section 16 Application

- 8 Upon receipt of a Section 16 Application, it is recommended that the following be checked with reference to the existing & planned land-use and transport facilities in the vicinity of the development:
- Existing road layout plans.
 - Relevant Statutory Plans & Outline Development Plans/Layout Plans.
 - Layout plans of the road projects, which are committed or under planning.
 - Differences to previous applications, if any.
 - Any development study governing the land use of the development.
 - The boundary of the site. Will it encroach upon the resumption limits of government project(s), expressway boundary, approved road widening lines and existing roads?
 - Similar approved application(s) in the vicinity. If approved, will a precedent case be set? Will there be knock-on effects?
 - Proposed and permitted plot ratio of the proposed development.
 - The land status of the access road leading to the development.
- 9 It is necessary to assess the interactions of the proposed land development with the road network in the short to long terms. Also, the recommendations of the respective Development Strategy Review, Planning Statement Study and Development Feasibility Study as well as those of the district traffic studies commissioned by TD and other departments which cover the area in question should be checked.

Other considerations on Section 16 Applications are tabulated below: -

(i) Transport routes by type of services;

(a) Public Transport Facilities

- Check the timely provision of public transport facilities and infrastructure relating to bus/PLB/GMB/taxi/ferry. For instance, public transport termini, PLB/taxi stands, ferry piers etc. within or near the development are recommended whenever possible under the framework of OZP. These facilities and infrastructure should be located in an appropriate location, to be agreed by C for T, to facilitate the use of public transport in lieu of private cars. The relevant TO Division should be requested to provide comments on the need and provision of public transport facilities and infrastructure. For major developments, the TO Division will consult BD and FP Branches.
- Check the requirements of on-street bus lay-by at the frontage(s) of the development. If yes, the requirements (e.g. set-back of the boundary of the site) should be imposed in the planning approval conditions

(b) Parking Provisions

- The recommended provisions in the HKPSG should be followed flexibly taking into account various factors as stated therein. Reference should also be made to the assessed parking supply and demand situation conducted by TTSD from time to time and related recommendations, the latest one being shown in Annex C.
- Check whether or not the proposed parking provisions are compatible with the accessibility of the site, the land use, the development intensity and the average flat size of the site in case of a residential development.
- Check the visitor and motorcycle parking space requirements.
- Check the parking provisions in the area. If there is inadequate provision in the area, the higher limit of the parking standard for all vehicle types or a particular vehicle type (e.g. motorcycle) should be adopted.
- Check that the parking spaces provided are sufficient to meet the operational requirements of the development in case that no parking standard for a particular type of land use development is available.
- After the above checking, whether the development site can accommodate the required parking provisions should be established. If it is not feasible, either a lower level of provision should be recommended or our objection to the application should be raised.

(c) Loading / Unloading Bays

- Impose the requirements of loading/unloading bays within the development as far as practicable in order to avoid the loading/unloading activities to be carried out on public roads.
- Check the adequacy of loading/unloading area within the site in order to obviate the reversing vehicle movements in and out of the land lot.

(d) Pedestrian Facilities

- Check the pedestrian crossing facilities, the required width of footpath and requirements of corner splay(s).
- Check the opportunity on expanding the existing elevated walkway or subway network or providing a new system.
- Check whether 24-hour free pedestrian passage through the proposed development is required or not.
- Examine the change of the pedestrian movements after the proposed development. The pedestrian facilities (e.g. footbridge system) in the vicinity should be checked and improvements incorporated if possible.

(e) Other Facilities

Other existing facilities and infrastructure such as bus termini, ferry pier, PLB/GMB/taxi stands, bus stops, lay-bys, refuse collection point (RCP) in the vicinity of the development should be examined. Relocation of such facilities requires thorough consultation of relevant companies/departments (e.g. bus companies, public transport operators and trade, LCSD).

(ii) Traffic Impact

The applicant may be requested to submit a TIA to substantiate his application if considered necessary. For Traffic Impact Assessment (TIA), reference should be made to TD Circular No. 14/97 “Guidelines and Requirements of Traffic Impact Assessment Studies” and No. 4/00 “Involvement of Transport Bureau in TIAs for Major Developments”.

(a) Roads and Junctions

If a traffic impact assessment is not included in the Section 16 Application, a traffic analysis on the roads and junctions in the vicinity taking account of the planning application should be submitted by the applicant for the worst scenarios.

- Check whether the roads in the vicinity are up to current standard.
- Ensure that the additional traffic generated from the proposed development does not saturate the design capacity by the envisaged vehicle and pedestrian movements.

For the traffic analysis:

- Check the appropriateness of the adopted trip rates with reference to the Tables 1 and 2 of Traffic Generation and Attraction Rates as shown in Annex D and growth factors, the volume of trip generations/attractions, the reasonableness of the proposed distribution of development traffic onto the road network, the existing flows, the junction capacity calculations (Questions like: Are pedestrian phases included in the assessment? What is the proposed cycle time? Is it too long? What is the expected queue length at junctions?)

(b) Ingress and Egress Points

The following should be checked on the ingress and egress points: -

- Whether the location is acceptable e.g. away from junctions, crossings and bends, and proposed run-in should not be sited on the frontage of trunk roads and primary distributor roads.
- Check any necessary restrictions on use of ingress/egress points such as left in/left out arrangements.
- Check the need for separate access to different land uses on the development such as a public lorry park and residential developments. Check whether heavy vehicles making left turns into the lot would likely encroach on to the opposite lane.
- What is the likely travelling route of the users?
- Is the proposed ingress/egress point placed at a convenient location to the users?

(iii) **Traffic Improvement Measures to mitigate the traffic impact**

If the traffic analysis indicates that the capacities of immediate roads and junctions are inadequate, appropriate road improvement and traffic management schemes should be devised and implemented.

(a) Traffic Improvement Measures

The proposed traffic improvement measures (e.g. road widening and junction improvement, etc.) should be examined in conjunction with other improvement works in the vicinity:

- Check whether the roads in the vicinity are up to current standard.
- Check whether the proposed traffic improvement measures are practical and effective in resolving the problem and its feasibility taking account of various factors including likely acceptance by the public.
- Will the applicant be able to undertake the proposed traffic improvement measures? Has the applicant indicated his intention to undertake the proposed traffic improvement measures?
- Is the location of the proposed traffic improvement measures too far away from the development making it a proposal for the consideration of the Government only? Under such circumstances, will the Government be prepared to do it for the applicant?
- Check whether felling trees and land resumption are required in the road/junction widening proposals.

Where necessary, the applicant should be requested to submit proposals for:

- Footbridges/subways connecting to the site;
- Public transport facilities and infrastructure within and outside the site;
- Improvements to road sections fronting the site and leading to the development.

(b) Implementation

Implementation of traffic improvement measures arising from developments is a very complicated issue unless the measures are simple in nature. Problems relating to the implementation of the traffic improvement measures include:

- Which party to finance the measures
- Who is the works agent?
- How will it affect premium assessment?
- Which department to take up the works required under the Roads (Works, Use & Compensation) Ordinance?
- Any land resumption problem if it is regarded as a private project?

(iv) **Suggested Conditions of Approval (in granting Section 16 permission)**

- TD's role on processing an S16 Application is to provide comments for the consideration of TPB. Therefore TD should be prepared to substantiate any suggested conditions of approval and that the conditions would be enforceable through appropriate mechanism. Nevertheless the decision on the adoption of any conditions would be under the jurisdiction of TPB.
- Appropriate terms and conditions for all necessary traffic and transport improvement works should be properly addressed. Either TD or HyD shall spell out whether the Government has programme for the proposed traffic and transport improvement measures. If no, conditions to implement the traffic improvement should be imposed in granting the S 16 permission.
- Depending on the site conditions, the applicant may be required to take up the maintenance and operation responsibility for certain public facilities e.g. footbridges and green areas, etc.
- Conditions imposed shall clearly define the management and maintenance responsibility, duration for completing the works and handing over arrangement.

Other Supplementary Submissions

- 11 Where applicable, other supplementary information such as Environmental Impact Assessment (EIA), Drainage Impact Assessment (DIA), Traffic Impact Assessment (TIA) and Master Layout Plan may be submitted together with the Section 16 Application for comments. The authority for EIA and DIA shall be the Environmental Protection Department and Drainage Services Department respectively.
- 12 For Comprehensive Development Area (CDA) zones, as governed by section 4A of the TPO, the applicant may be required by TPB to prepare a Master Layout Plan and submit it for TPB's permission. It should be noted that an application for the grant of such permission should be made to TPB under Section 16 of the TPO. A "Development and Accommodation Schedule" is generally provided under the Master Layout Plan to indicate the extent of compliance with the lease conditions. The acceptability of the Development and Accommodation Schedule" is under the jurisdiction of Planning Department and Lands Department. Transport Department shall provide comments: -
- on the provision of parking spaces and loading/unloading bays based on the Schedule;
 - on the provision of parking spaces and loading/unloading bays based on the Schedule;

Reference

Reference	Issue By	Remarks
Hong Kong Planning Standards and Guidelines - Chapter 8	Planning Department	Table 11 of Chapter 8 revised in October 1996
Hong Kong Planning Standards and Guidelines - Chapter 8 - Table 11 - Industrial-Office Parking Standards	Planning Department	Table 11 of Chapter 8 revised in September 1997
Revised Recommendations on Parking Standards for Private Car Parking for Different Districts (see Annex C)	Transport Department	Revised Recommendations on Private Car Parking Standards issued by TD on 24/4/97
Transport Planning & Design Manual	Transport Department	
Traffic Generation and Attraction Rates	Transport Department	See Annex D
Departmental Circular No. 14/97 Guidelines and Requirements of Traffic Impact Assessment (TIA) Studies	Transport Department	17 October 1997 (This supersedes the Departmental Circular 2/95)
Departmental Circular No. 4/00 Involvement of Transport Bureau (TB) in Traffic Impact Assessment (TIAs) for Major Developments	Transport Department	18 January 2000

Annex A

TD's Role on Processing of Section 16 Application

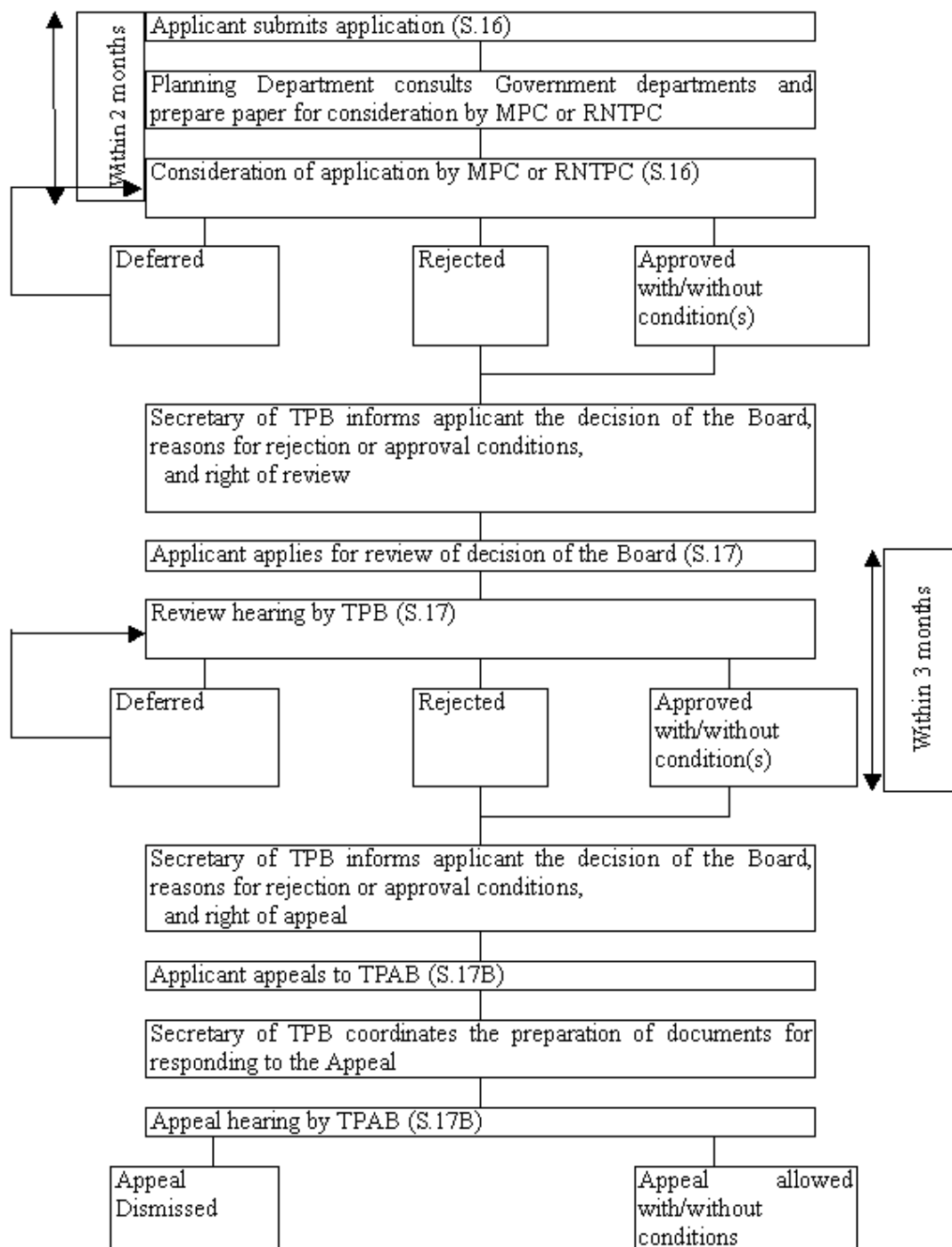
Issues	Planning Department's Advice
(i) The circumstances under which section 16 application is required	Statutory plans prepared by the Town Planning Board (TPB) under the Town Planning Ordinance (TPO) include outline zoning plans (OZPs) and development permission area (DPA) plans. Both plans indicate land use zones, uses which are always permitted (Column 1) and uses which may be permitted with or without conditions on application to the TPB under section 16 of the Ordinance.
(ii) The relationship between zoning amendment application and section 16 application	Under the Ordinance, there is no provision for "application" to the TPB to rezone a particular site or to amend any statutory plan so that development not permitted by the zoning or Notes of the plan may be allowed. There is however an administrative practice for the Planning Department to process such a request for rezoning or amendment as part of the plan-making process. After departmental consultation, the rezoning proposal will be submitted to the Planning Committee of TPB for consideration. If the Planning Committee supports the request, subsequent amendment(s) to the relevant statutory plan will be made under section 5 or 7 of the Ordinance. If the Planning Committee does not agree to the requested rezoning, the Secretary of TPB will inform the proponent accordingly. Under the Ordinance, there is no provision for a review of TPB's decision on rezoning request.
(iii) The process on handling planning applications by Plan D, TPB and its Committees	<p>Upon receipt of an application, Plan D will consult relevant Government departments/offices. A Planning Committee Paper on each application would be prepared by Plan D for submission to the Planning Committee within the two-month statutory period. If aggrieved by the decision of the Planning Committee (i.e. either on the rejection of the application or being unsatisfied with conditions of approval), an applicant may apply for a review of the Committee's decision under section 17 of the Ordinance. The review by TPB would be conducted within 3 months of the receipt of the application for review.</p> <p>During the review, consultation with relevant Government departments will be conducted. For TD, comments on traffic related matters of the development proposals, e.g. traffic implication, vehicular access, car parking and loading/unloading provision would be sought. Engineer of TD may be requested to serve as a witness to attend the hearing. He needs to provide witness statement with expert advice on traffic/transport matters for the deliberation of the case during the review.</p> <p>If an applicant is again aggrieved by TPB's decision upon review, the applicant has the right to appeal to an independent Appeal Board whose decision will be final.</p>
(iv) The roles of TPB and Transport Department on the processing of section 16 applications	<p>In considering a planning application, the Planning Committee would usually take into account factors such as planning intention. Also, Government would usually take into account factors such as planning intention, Government policies, social, economical and environmental impacts of the development on the wider area, traffic and infrastructural implications, and compatibility of land uses. Where the development proposals could demonstrate an improvement to the existing environment or would bring about planning gains (e.g. the provision of Government, institution or community facilities or public open space) to the neighbourhood or the community at large, favourable consideration may be given to such planning applications. The Planning Committee may, in approving a development scheme, impose conditions including those requiring the provision of public facilities or certain infrastructure, which are related in scale and kind to the proposed development.</p> <p>As mentioned in (iii) above, Plan D will consult relevant Government departments during the processing of the section 16 applications including Transport Department to seek comments on matters related to the development proposals, e.g. traffic implication, car parking and loading/unloading provisions, etc.</p>

<p>(v) The role of Transport Department on the processing of section 17 review</p>	<p>For the section 17 review, Plan D will conduct consultation together with relevant Government departments including TD. TD's representative may be required to attend the review hearing to provide expert advice on traffic/transport issues. Comments on traffic related matters of the development proposals, e.g. traffic implication, vehicular access, car parking and loading/unloading provision would be sought.</p> <p>An applicant who is aggrieved by a decision of the TPB on a review under section 17 of the TPO may lodge an appeal. TD's representative may be requested to serve as a witness in the appeal hearing, if the application was rejected on traffic ground. A witness statement with expert advice on traffic/transport matters needs to be submitted for the deliberation of the appeal case.</p>
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Annex B

Procedure for Processing Planning Application Under Town Planning Ordinance

Procedure for Processing Planning Application Under Town Planning Ordinance



Notes:

TPB – Town Planning Board

RNTPC – Rural and New Town Planning Committee

MPC – Metro Planning Committee

TPAB – Town Planning Appeal Board

Annex C

Assessed Domestic Private Car Parking Situation in Various Districts

District	Category
Central and Western	B
Wanchai	B
Eastern	A
Southern	B
Yau Tsim Mong	A
Sham Shui Po	A
Kowloon City	A
Wong Tai Sin	A
Kwun Tong	A
Tsuen Wan	C
Tuen Mun	D
Yuen Long	D
North	D
Tai Po	C
Sai Kung	B
Sha Tin	A
Kwai Tsing	B
Tung Chung	B
Tai Ho	B

Notes :

Category A to D in descending order, with Category A requiring the highest rate of parking provision and Category D the lowest.

Recommended Categories of Private Car Parking Provision in Residential Developments (in connection with HKPSG Parking Standard)

	A	B	C	D
Public Rental	1 per 13	1 per 14	1 per 15	1 per 16
HOS/HS	1 per 5	1 per 6	1 per 7	1 per 8
R1/SCH	1 per 4	1 per 5	1 per 6	1 per 7

Annex D

Traffic Generation and Attraction Rates

Table 1 - Traffic Rates for Residential Developments at 95% Confidence Level

Development Density / OZP Zoning	Average Flat Size (sq.m)	Upper Limit / Mean / Lower Limit	Accessibility Level (See Note)	Car Park Ratio (Number of flats for each car park space)	AM Generation Rate	AM Attraction Rate	PM Generation Rate	PM Attraction Rate
					(pcu/hr/flat)			
Subsidised Housing: Public Rental	30	Upper Limit Mean Lower Limit	A	7 ~ 20	0.0413 0.0242 0.0071	0.0406 0.0226 0.0046	0.0242 0.0177 0.0112	0.0262 0.0201 0.0140
	40	Upper Limit Mean Lower Limit			0.0539 0.0432 0.0325	0.0439 0.0326 0.0213	0.0278 0.0237 0.0196	0.0339 0.0301 0.0263
Subsidised Housing: HOS / PSPS	50	Upper Limit Mean Lower Limit		4 ~ 8	0.0761 0.0622 0.0483	0.0573 0.0426 0.0279	0.0350 0.0297 0.0244	0.0451 0.0401 0.0351
Private Housing: High-Density / R(A)	60	Upper Limit Mean Lower Limit	A	4 ~ 8	0.1021 0.0718 0.0415	0.0709 0.0425 0.0141	0.0415 0.0286 0.0157	0.0464 0.0370 0.0276
	70	Upper Limit Mean Lower Limit			0.1117 0.0888 0.0659	0.0729 0.0515 0.0301	0.0454 0.0356 0.0258	0.0551 0.0480 0.0409
	80	Upper Limit Mean Lower Limit			0.1379 0.1058 0.0737	0.0905 0.0605 0.0305	0.0563 0.0426 0.0289	0.0689 0.0590 0.0491
Private Housing: Medium-Density / R(B)	100	Upper Limit Mean Lower Limit	A	1 ~ 4	0.2203 0.1887 0.1572	0.1219 0.0942 0.0665	0.1115 0.0862 0.0609	0.1563 0.1214 0.0864
	120	Upper Limit Mean Lower Limit			0.2601 0.2246 0.1890	0.1469 0.1157 0.0845	0.1353 0.1068 0.0783	0.1862 0.1468 0.1074

	140	Upper Limit Mean Lower Limit			0.3042 0.2604 0.2166	0.1756 0.1372 0.0988	0.1626 0.1275 0.0924	0.2207 0.1722 0.1237
Private Housing: Medium-Density / R(B)	100	Upper Limit Mean Lower Limit	B	1 ~ 4	0.2228 0.1961 0.1695	0.1460 0.1116 0.0772	0.1383 0.0955 0.0528	0.1499 0.1321 0.1142
	120	Upper Limit Mean Lower Limit			0.2595 0.2325 0.2056	0.1808 0.1461 0.1113	0.1773 0.1340 0.0908	0.1842 0.1662 0.1482
	140	Upper Limit Mean Lower Limit			0.3021 0.2689 0.2357	0.2234 0.1805 0.1377	0.2258 0.1725 0.1192	0.2226 0.2004 0.1782
Private Housing: Low-Density / R(C)	180	Upper Limit Mean Lower Limit	B	0.7 ~ 1	0.3276 0.2772 0.2268	0.2407 0.1769 0.1131	0.2233 0.1635 0.1037	0.3097 0.2394 0.1691
	240	Upper Limit Mean Lower Limit			0.3524 0.3012 0.2500	0.2837 0.2189 0.1541	0.2842 0.2235 0.1628	0.3948 0.3234 0.2520
	300	Upper Limit Mean Lower Limit			0.3896 0.3252 0.2608	0.3423 0.2609 0.1795	0.3598 0.2835 0.2072	0.4970 0.4074 0.3178

Note: Accessibility Levels refer to the ease of access to public transport systems

Level A = Well served by public transport systems with railway station / light rail transit station / bus terminus or with no less than five bus / mini-bus routes, within 500m of the development site.

Level B = With very limited public transport.

Table 2 - Traffic Rates for Non-Residential Developments at 95% Confidence Level

Land Use	Unit	Upper Limit / Mean / Lower Limit	AM Generation Rate	AM Attraction Rate	PM Generation Rate	PM Attraction Rate
Retail / Shopping Complex (Office + Retail)	(pcu/hr/100 sqm GFA)	Upper Limit	0.3307	0.3342	0.3839	0.4504
		Mean	0.2296	0.2434	0.3100	0.3563
		Lower Limit	0.1285	0.1525	0.2360	0.2622
Office	(pcu/hr/100 sqm GFA)	Upper Limit	0.2361	0.3257	0.1928	0.1510
		Mean	0.1703	0.2452	0.1573	0.1175
		Lower Limit	0.1045	0.1646	0.1217	0.0840
Industrial Building	(pcu/hr/100 sqm GFA)	Upper Limit	0.1153	0.1727	0.1648	0.1260
		Mean	0.0926	0.1386	0.1350	0.1049
		Lower Limit	0.0698	0.1044	0.1053	0.0838
Hotel	(pcu/hr/guest room)	Upper Limit	0.1814	0.2082	0.1697	0.2183
		Mean	0.1329	0.1457	0.1290	0.1546
		Lower Limit	0.0843	0.0832	0.0883	0.0908

Note:

1. Peak periods quoted in the above tables are the normal morning and evening peak periods on weekdays. Retail / Shopping Complex and Hotel may have higher traffic rates at other periods.
2. The above traffic rates are based on limited sample sizes and survey data to estimate the likely ranges of traffic rates for common developments. Direct applications of these rates may not necessarily reflect the particular traffic characteristics of individual developments. Users shall exercise professional judgement in using them. If necessary, independent surveys shall be conducted to verify / determine the appropriateness of the rates to be adopted.

Appendix 2

Checklist for Checking of Traffic Impact Assessment (TIA) for Major Developments

Purpose

1. The purpose of this checklist is to provide a reference to assist engineers in Transport Department to comment on TIA submissions for major developments in addition to the guidelines set out in Departmental Circular No. 19/97.

Criteria for requiring TIA

2. Reference should be made to the Departmental Circular No. 14/97 on the requirements of a TIA submission.

Involvement of Transport Bureau

3. For major developments which are expected to generate substantial traffic impact and would require road improvement or new transport infrastructure, comments from the Transport Bureau on the TIA should be sought. A set of criteria has been drawn up to provide guidelines on the necessary referral to TB. Reference should be made to Departmental Circular No. 4/00 for details.

TIA Report

4. In general the following items should be covered by a TIA submission:
 - (a) Study Area
 - (b) The Site
 - (v) Existing Traffic Situation
 - (d) Proposed Development
 - (e) Future Network
 - (f) Traffic Forecast
 - (g) Traffic Analysis
 - (h) Recommendations and Implementation
5. Apart from the criteria and requirements listed in the Departmental Circular No. 14/97, the following additional items should also be examined in handling and checking TIA reports:

<u>Study Aspects</u>	<u>Items to be checked</u>
(a) Study Area	<ul style="list-style-type: none"> Check whether the study area includes all roads and junctions adjacent to the development and include the interchanges with trunk roads. In some cases the simulation area for transport modelling may be greater than that study area.
(b) The Site	<ul style="list-style-type: none"> Check land use data and planning assumptions against those shown on the cc-Mail Bulletin Board under the site "Transport Planning Database" and TD Intranet. Consult TPD if necessary on any identified data deficiency or land use changes, especially if the developer proposes land use changes to reflect the currently observed environment. Check OZP,ODP/LP to see whether there is any discrepancy between the development and Government's proposal in terms of land use, road widening, and pedestrian facilities e.g. any encroachment of the site on the future road reserve.
(c) Existing Traffic Situation	The public transport facilities (railway, bus, GMB, taxi and ferry), road networks (district and local), and pedestrian facilities within the study area should be identified. The existing performance of the local road network around the development would be assessed by a capacity analysis and, if appropriate, a queue length analysis on identified junctions.
Road Network	<ul style="list-style-type: none"> Check the submitted road networks plans against the latest road network plans with particular reference to the proposed changes to be implemented by Government in respect of junctions, road layout, signal control systems and traffic management. Identify existing junctions with critical reserve capacities (RC) and design flow/capacity ratios (DFC), and existing road links with critical volume/capacity (V/C) ratios. Check whether a traffic survey is required to provide the latest traffic figures in order to establish a basis for ascertaining the existing problems and the future year traffic forecast.
Public Transport Facilities	<ul style="list-style-type: none"> Identify transport facilities e.g. railway stations, public transport interchange, bus stops and lay-bys, GMB and taxi stands, and ferry piers, etc. that serve the development. Check any operation problem and capacity deficiency on the existing transport facilities.
Traffic Flow and Junction Assessment	<ul style="list-style-type: none"> Check the peak hour flows in the TIA submission against <ol style="list-style-type: none"> the available traffic counts by TE Division, the data provided by TTSD upon request for key stations, and the data which are already listed in the Annual Traffic Census report, results of surveys to be arranged by TE Division if no data are readily available. Compare with other similar TIA studies, if any, on the existing RC and DFC ratio for critical junctions and V/C ratio for road links. Check calculations for the base year capacity assessment of junctions.
Traffic Survey	<ul style="list-style-type: none"> Check the methodology and the suitability of sites for carrying out traffic counts.

<u>Study Aspects</u>	<u>Items to be checked</u>
(d) Proposed Development	
Parking Provision	<ul style="list-style-type: none"> • Check against HKPSG and the latest TD's requirements. • Check whether the proposed parking provisions are reasonable having regard to the accessibility of the site, the availability of public transport interchange (PTI) and railway stations in the vicinity, the land use, the development intensity, the average flat size, the adjacent parking facilities and any special operational needs. • Check whether the parking provision for all vehicle types including light goods vehicles (LGV), bicycles and motorcycles meet TD's requirement e.g. high rate of motorcycle provision i.e.10% of total private car parking spaces may be required in areas with deficiency of motorcycle parking spaces. • Check adequacy of queuing and waiting space for car lifts if provided near the entrance of a multi-storey car park building.
Loading / unloading Area	<ul style="list-style-type: none"> • Check against the HKPSG with reference to TD's latest requirements (e.g. Goods vehicle provision is 50% LGV and 50% M/HGV in HKPSG-Parking Standards for Retail, Industrial and Industrial-Office Developments).
Public Transport Facilities / Interchange	<ul style="list-style-type: none"> • Check the forecasts on public transport trips generated from the development which form the basis for requirements of PTI. • Check the ingress/egress points from safety consideration and the internal traffic circulation near the entrance by swept path analysis. • Check whether bus bays (40m long for three 12m buses) provided are adequate for additional bus services on increased population. • Check whether GMB bus bays (15m for 2 GMB) and taxi stands are provided at a convenient and safely accessible location. • Check whether adequate queuing area and appropriate pedestrian linkage are provided within the interchange. • Check whether facilities for the disabled are included and in compliance with the standard.
Pedestrian Facilities	<ul style="list-style-type: none"> • Check the locations and arrangement of pedestrian crossings from safety and convenience viewpoints. • Check the compatibility of the proposed pedestrian facilities with the adjacent pedestrian network. • Check the linkage on the existing/proposed public transport facilities e.g. a proposed footbridge may change the direction of pedestrian flow and would necessitate changes to the existing pedestrian crossing. • Check the sufficiency of remaining space on footpath after accommodating the landing of stair cases and ramps of footbridges.
Development Access	<ul style="list-style-type: none"> • Check whether the vehicular access is provided in accordance with TPDM standards • Check whether the ingress/egress points are acceptable in terms of safety and convenience. • Check whether there is adequate queuing space between the proposed drop gate and the main road.
Traffic generation	<ul style="list-style-type: none"> • Check whether it is acceptable to adopt the trip generation and attraction rates with reference to the Tables 1 and 2 of Traffic Generation and Attraction Rates. Users shall exercise professional judgement in applying any traffic rates. If necessary, additional surveys shall be carried out as appropriate.

<u>Study Aspects</u>	<u>Items to be checked</u>
(e) Future Network	
Planned Infrastructure / Major Developments	<ul style="list-style-type: none"> • Check the assumed programme of the planned infrastructures/major development against the latest situation. The assumptions stipulated in the TIA may not be up-to-date. • Check the assumptions on the committed and planned transport infrastructure/major developments within the study area and assess the cumulative traffic impact when the development is completed.
(f) Traffic Forecast	<p>TIA report should provide a set of traffic forecasts on:</p> <ol style="list-style-type: none"> 1. traffic growth within the study area (if the growth factor method is adopted to estimate the future traffic based on the existing traffic flows); 2. traffic generated by the existing and other proposed major developments/infrastructures within the study area; 3. traffic generated from the development. <ul style="list-style-type: none"> • Check the planning horizon for traffic forecast, which should be set at the time when the development is completed or preferably at a design year within 5 years of the completion. • Check the future year traffic and public transport forecasts by comparing with existing flows and forecasts of other similar studies. • Check the assumptions on the distribution of the development traffic onto the road network and the modal split taking into consideration the planned infrastructures and developments in the vicinity. • Check the forecasts of traffic on critical links against those for the same links from other TIAs or output from the territory transport model such as CTS or the latest regional model developed in regional traffic studies.

<u>Study Aspects</u>	<u>Items to be checked</u>
(g) Traffic Analysis	<p>The analysis should assess the traffic impact on the identified junctions/road links upon the completion of the development. The roads and junctions with unacceptable reserve capacities should be identified and improvement measures should be proposed in the TIA report.</p> <p>For complex cases or long term developments, output from the territory transport model such as CTS or the latest regional model developed in regional traffic studies should be used to set the boundary conditions of the local transport model covering the study area.</p> <p>For relatively simple cases and short term development, the growth factor method may be accepted by using the historical traffic growth information and the existing counts provided that:</p> <ul style="list-style-type: none"> ◦ the study area is almost fully developed or the development pace and growth have become stabilized; ◦ there is no major change in the land use therein for the planning horizon in question; ◦ no major transport infrastructure will be completed in the study area and its hinterland as to cause a significant change in the existing traffic pattern.
(i) Modelling Methodology (for complex cases)	<ul style="list-style-type: none"> • Check the land use data, GDP, network and other planning assumptions. See available information in cc-Mail Bulletin Board/TD Intranet and consult TPD if necessary. • Check the traffic flows against the output from the “Base District Traffic Models” if available. • Consult TPD on modelling methodology if there are difficult technical problems.
(ii) Growth Factor Methodology	<ul style="list-style-type: none"> • Estimate traffic generation and attraction rates with reference to the Tables 1 and 2 of Traffic Generation and Attraction Rates. • Check the traffic growth factor with reference to the Annual Traffic Census reports and historical growth rate data. • Compare the provision of parking spaces, loading/unloading facilities, proposed pedestrian facilities, site accessibility and the proximity to railway stations / PTI between the proposed development and the Tables 1 and 2 of Traffic Generation and Attraction Rates. If the proposed trip rate is considered inapplicable, it will be necessary to ask the applicant to carry out surveys on similar type of developments with comparable traffic and transport characteristics for justification of the trip rate used. • Check the traffic forecast on critical links with reference to the existing traffic counts and the traffic forecast in other TIAs for the same links.
(iii) Reserve capacity (RC) and Queue Length assessment at critical junctions	<ul style="list-style-type: none"> • Check calculations for future year capacity assessment of critical junctions. • Compare with other similar TIA study for the same junctions, if any, to check the validity of the analysis. • Check that the cycle time of traffic signals should be limited to 90 seconds for design purpose. • Check that traffic will not tail back to affect the upstream junctions and the road width/lanes assumptions for the junctions is reasonable and achievable.

<u>Study Aspects</u>	<u>Items to be checked</u>
(h) Recommendations & Implementation	In order to mitigate the traffic impacts resulting from the development, improvement measures may include junction design, road widening, signal control proposal or modifications, and pedestrian schemes. Public transport facilities and other traffic management measures may also be included in the TIA report.
Improvement Proposal	<ul style="list-style-type: none"> • Check whether the proposed measures are effective in resolving the problem and its likely acceptance by the public. • Check the feasibility as well as tree felling and land requirements of the proposed measures.
Implementation	<p>Implementation of improvement measures is a complicated issue unless the measure is simple and straightforward.</p> <ul style="list-style-type: none"> • For less complicated issue, it would be most desirable to obtain prior to the TIA approval the agreement for the improvement measures to be implemented by the developer, under an enforceable mechanism before the completion of the development and to the satisfaction of Transport Department and Town Planning Board where appropriate. • If the TIA is commissioned by Government, or the mitigation measures are complicated (e.g. flyover or subway) or far from the subject site, the mitigation measures may have to be implemented by Transport Department via the normal channels (Departmental procedures for PWP as stipulated in DI Chapter 8 refer).
Traffic Impact during Construction	<ul style="list-style-type: none"> • Check any traffic implication during construction of the development and improvement schemes, and request traffic management schemes if necessary

<u>Relevant Document</u>	
Transport Planning and Design Manual	Volume 1 Transport Planning Volume 2 Highway Design Characteristics
Departmental Circular No. 14/97	Guidelines and Requirements of Traffic Impact Assessment (TIA) Studies (This supersedes the Departmental Circular 2/95)
Departmental Circular No. 4/00	Involvement of Transport Bureau (TB) in Traffic Impact Assessment (TIAs) for Major Developments

TPDM Volume 1 Chapter 4 – Transport Considerations in Building & Development Plans

4.1 References

- 1 Town Planning in Hong Kong,
Town Planning Office, Building and Lands Development,
Hong Kong, 1988.
- 2 Civil Engineering Manual, Volume III,
Civil Engineering Office, Highways Office, Public Works Department, 1973.
- 3 Departmental Circular No. 2/94,
"Processing of Building Plan Submissions", Transport Department,
Hong Kong 1994
- 4 Departmental Circular No. 14/97,
"Guidelines and Requirements of Traffic Impact Assessment (TIA) for Proposed Developments and
Transport Facilities", Transport Department, Hong Kong 1997
- 5 Transport Planning and Design Manual Volume 2,
"Highways Characteristics", Transport Department, Hong Kong
- 6 Transport Planning and Design Manual Volume 4,
"Road Traffic Signal", Transport Department, Hong Kong
- 7 Transport Planning and Design Manual Volume 7,
"Road Traffic Parking", Transport Department, Hong Kong

4.2 Introduction

- 4.2.1 Since useful guidelines in preparing comments on building plans can be found in the Departmental Circular No. 2/94, the objective of this section is to highlight the principles of these guidelines.
- 4.2.2 Further guidelines on checking of traffic facilities for building plan submissions are at the annex.

4.3 Vehicular Access

4.3.1 Generally a building must have some form of connection with local roads, by which the development is served, unless it is just part of a building complex. It may be a simple run-in or access road leading to the development. It should be noted, however, that vehicular access should only be approved on the basis that it would allow traffic to/from the development to join or leave the public roads linked to it in a safe manner and to manoeuvre safely at the entrance and exit without undue hindrance or other adverse effect on other traffic. Where there is potential hazard posed by topography or any other factors, the proposed vehicular access should not be approved unless adequate mitigatory measures are incorporated. There are also provisions in the Building Ordinance stating the grounds on which approval or consent to building works may be refused for dangerous access.

4.3.2 To meet the above requirement it is important to satisfy the following basic design criteria:

- (i) the vehicular entrance and exit must be of sufficient width. If an access road, private street or cul-de-sac is provided, it should be to the standard of the Building Regulations,
- (ii) any visibility splay should be commensurate with the design speed of traffic on the public road connected to the entrance and exit, and
- (iii) the location of access should be chosen such that:
 - (a) safe manoeuvring on the route leading to the development can be maintained;
 - (b) the adverse effect caused by the development on the road traffic should be reduced to a minimum; and
 - (c) vehicular access should be located on local roads as far as possible. Access fronting primary or district distributors should be avoided as far as possible. If access fronting primary or district distributors cannot be avoided, it should be designed as left-in and left-out.

In deciding the location of access, locations of accesses to other developments in the vicinity should also be considered in order to avoid as far as possible conflicts in vehicles manoeuvring among them.

4.3.3 Inbound and outbound traffic of a development generally have to perform many turning movements. Adequate width of a vehicular access and an adequate turning area within the lot are essential to the safe manoeuvring of vehicles to/from the building and help obviate the need for reversing into/out of the building. If the vehicular access is connected to a single two-lane carriageway road, it is necessary to check that the run-in is wide enough for safe left turns of long vehicles entering/leaving the lot without the need to encroach onto the opposite lane. However, the width should not be too wide to create undue pedestrian/vehicular conflicts. Vehicular access point should generally be designed in accordance with the Volume 2, Chapter 3.6 and Volume 7, Chapter 7.5.2 of the Transport Planning and Design Manual.

- 4.3.4 Consideration should be given to the types of vehicles which are allowed to access to the building. It is generally known that the minimum turning radius of vehicles vary with the size and construction of the vehicles. Therefore the access point should better be checked for the minimum turning radius of the design vehicle plus certain allowance for longer vehicle available in the Territory. But too wide an access point would have the disadvantage of encouraging inbound/outbound traffic to perform turning movements at high speeds. For small developments, turn-tables might be a necessary facility to avoid reverse movements to/from the development, which pose potential hazard to other road users and cause difficulty to pedestrians in crossing the run-in. However, turn-tables are quite a passive tool in the sense that their usefulness is dependent on the owners' willingness to operate and maintain them, and should therefore be used as a last resort.
- 4.3.5 A couple of decades ago, road design had not taken visibility into account and hence resulted in many precarious situations when outbound traffic from a development merged with the main traffic stream abruptly because of impaired sight line. Presently the Transport Planning and Design Manual Volume 2, Chapter 3.6.3 requires that any access to a development should satisfy the requirement of visibility splay. It should be checked in accordance with the method stated in the Manual and the standard of visibility splay should be commensurate with the design speed of traffic on the public road connected to the junction with the building site. This requirement may entail the felling of trees, set-back of structures, splaying of corner or widening of the run-in according to site conditions. If it is known that there are mature trees on the adjacent footpaths which may affect the visibility to the approaching traffic in one or both directions, the developer should be asked to clear with the Leisure and Cultural Services Department regarding the possibility of transplanting/felling some of these trees before granting of approval. Relocation of the run-in should also be considered in order to avoid felling of mature trees.
- 4.3.6 In some cases however the scope of improvement to visibility may be seriously limited by the site or topographical constraints. In this regard sharp bend and steep gradient of the linking road are two readily noticeable considerations to be given to the design in respect of road safety. Visibility on the inside of a sharp bend is very likely below the safe standard. For steep roads, the sight line of drivers joining them at the sag point would be obstructed by the carriageway and they may become unaware of any on-coming traffic at the crest of the steep road. Moreover the usual speed of traffic and potential braking and skidding hazards on steep roads make them highly unfavourable with respect to provision of access point. Having regard to the above safety considerations it is always advisable not to approve vehicular access at these locations.
- 4.3.7 In the vast majority of building submissions, there is usually only one road from which the development is served. Where a development has, however, the frontage of two roads, the opportunity should be used to select the one which would have less adverse effect on the local traffic or even the regional traffic. For instance, one of them may be a lightly trafficked minor local road while the other a busy primary distributor. Clearly the former should be considered in preference to the latter should traffic condition be the only consideration to traffic engineers and town planners. Along the same line of argument, it can be further inferred that the road which would induce residents of the building to use a less heavily trafficked route or less critical junction would present a far more favourable choice than the other.

4.3.8

As mentioned above, access to a development may be a run-in or an access road. The determination on which of them should be used depends on the local circumstances, which vary case by case. The designers should have to exercise their own judgement taking into account the particular local circumstances to justify their decision on the type of access to the development at issue. As a general guideline, an access road may be considered for the following situations :

- a multi-storey carpark for public use
- residential developments for population of 7500 (equivalent to approximately 2400 residential units and above)
- non-residential developments of gross floor area exceeding 100,000m²
- a public transport interchange/bus terminus on the ground floor
- a large hotel development with conference and banquet facilities

Consideration should also be given to the following in the determination on the type of access and the layout design :

- the priority of pedestrians - run-ins should be used if priority of pedestrians is a primary concern,
- the appropriate width of run-ins and access roads having regard to the safety of pedestrians,
- the continuation of tactile guide paths and provision of drop-kerbs at run-ins to assist the visually impaired or the disabled.

4.4 **Layout of Development**

4.4.1 **Road Widening Lines**

- 4.4.1.1 A building submission should be checked against the town plan or the record of approved road widening line to see if the building site is affected by any road widening line or road improvement scheme.
- 4.4.1.2 If there is one and according to the Highways Department it would be implemented in the not distant future, the Lands Department should be forewarned of the proposed works so that no vehicular run-in should be granted on that side of the road affected by the works. On the other hand, temporary access may be approved with the condition that permission would be withdrawn prior to the commencement of the road widening project.

4.4.2 **Footway and Corner Radius**

- 4.4.2.1 In old districts existing footways are likely not up to the standard in the Transport Planning and Design Manual. During peak hours, pedestrians often overspill onto the carriageway.
- 4.4.2.2 With the emergence of ever complicated highway systems, concerned Government Departments are under pressure to search for space to accommodate more directional signs, especially roadside directional signs. Early planning for wide footpath at major junctions is required to reserve room for future roadside furniture. Moreover there are more and more pressure from the population for better bus shelters, bus bays, loading/unloading bays, tree planting, etc along main roads. All these needs can be better met if they can be taken into account when comments on building submissions are made.
- 4.4.2.3 The Transport Department should therefore take every opportunity, in liaison with the Lands Department and other concerned parties, to make requests to developers or Government Departments for widening the existing footway. This can be done when developers apply for change in land use under S.16 of the Town Planning Ordinance or pursuing lease modifications or land sales instigated by the Lands Department. Improvements to existing footways can normally be made possible by setting back of the building line. It is relevant to note that a corner splay should be provided in accordance with the Transport Planning and Design Manual Volume 2, Chapter 4.3.8 in order to maintain adequate footway width at the junction of two footways.
- 4.4.2.4 Regarding the corner radius at road junctions a design in accordance with the Transport Planning and Design Manual Volume 2, Chapter 4.3.14 and Chapter 4.3.15 not only facilitates the turning movements of vehicles and gives good visibility, but also helps provide good siting of pedestrian crossings with adequate separation between them. By comparison, a small corner radius would cause adjacent crossings to pack too close together such that pedestrians are tempted to cross the junction diagonally.

4.4.3 Traffic Circulation

- 4.4.3.1 The Buildings Department is responsible for the examination of building plans with respect to internal circulation and the manoeuvring of vehicles inside the car parks of the development. Then the checking of circulation at the entrance and the exit virtually becomes the responsibility of traffic engineers, who are concerned with any queuing problems at vehicular accesses. Obviously any tail-back at an entrance would create congestion on roads fronting the development. To prevent this problem, in the first place there has to be sufficient waiting space at the entrance. This is particularly important for developments with car lifts. The provision of car lifts and the associated waiting spaces is generally justified by calculations based upon the probability theory. For developments with the entrance controlled by drop-bars, adequate waiting spaces between the drop-bars and the public road should be provided.

4.4.4 Car Parks and Loading/Unloading Bays

- 4.4.4.1 All parking layouts should be designed with adequate clear visibility such that the conflict of a vehicle emerging from a ramp and another vehicle reversing into/leaving a parking lot could be minimized. Parking spaces should be designed such that a vehicle may be parked with the minimum reversing manoeuvre.

- 4.4.4.2 Where a mechanical car parking system is proposed, the applicant should be asked to advise on the size of the waiting area to be provided and show that the area will be large enough to accommodate the anticipated vehicles waiting to enter the car park without causing a tail-back on to the public road. In the assessment of the size, the following factors should be taken into account :

- the estimated hourly traffic volume that would use the mechanical parking system and the conventional car park (if there is one) during peak hours,
- the longest time taken to park a car at the most remote location of the parking system, and
- the average waiting period during peak hours.

The applicant should also be asked to provide a contingency plan in case of mechanical failure during peak hours. As a contingency measure, additional parking towers, or more preferably, some conventional parking spaces, should be reserved for emergency use.

- 4.4.4.3 Where spaces are sometimes provided within the building development for the parking of motor vehicles and bicycles, for safety reasons, it is desirable to provide separate access and segregated parking spaces for these two categories of vehicles. Access to a bicycle park within the development does not require the provision of a standard run-in with drop-kerb. Bicycle parking areas should be designed to be located on the ground floor near the entrance and grouped together.

- 4.4.4.4 Loading/unloading areas inside a lot should be designed so that ground floor shops/workshops/offices are directly accessible to these areas. Goods vehicles are normally loaded and unloaded from the rear and perpendicular loading bays are most commonly provided. Normally recommended is the hammer head design, in which a space of approximately one goods vehicle length is reserved in front of the loading bay for reverse manoeuvring. The Authorized Person should be requested to indicate on the submitted plan the swept path of the manoeuvre of the goods vehicle into and out of the bay. Where there is severe constraint, a turn-table should be provided.

4.5 Parking Provisions

- 4.5.1 The standards on parking provision is given in the Hong Kong Planning Standards and Guidelines for various types of developments. Engineering judgement must, however, be used in applying these standards in a flexible way and is generally related to several factors: the accessibility to public transport, the availability of public car parks in the locality and the spare capacity of the supporting road network.
- 4.5.2 It should be noted, however, that there is a risk of over-provision of car parks for residential developments even though a ratio of car parking spaces to flats is specified in the Hong Kong Planning Standards and Guidelines. For a given plot ratio it can be designed to have a large number of smaller flats or a small number of large flats. It is rather clear that the former scenario would entitle developers to more car parking spaces than the latter. Precaution has to be taken in such cases and an initial view on the minimum floor area for one car parking space must be formed before examination of the submission.
- 4.5.3 Notably, the current trend in the properties business is to build large scale developments with mixed uses, such as malls, offices, restaurants and hotels in the commercial area like Central. It is understandable that offices tend to get the major share of the parking provisions in the day-time during weekdays whereas the malls and restaurants in the same development would be able to utilize most of the parking spaces after office hours. In this way the combined requirement would be much smaller than if they are considered separately. This kind of situation naturally demands special attention of engineers.
- 4.5.4 Any proposal to provide a high traffic generator, e.g. a car park or a development with a level of parking provision higher than the standard set out in the Hong Kong Planning Standards and Guidelines must be substantiated by a Traffic Impact Assessment. However, under section 2(5)(b) of the Town Planning Ordinance, the Town Planning Board has delegated its authority to the District Planning Officer to consider planning applications for minor amendments to development proposals with planning permission previously granted by the Board under section 16 of the Ordinance. These amendments include:

Categories of Minor Amendments	Approved by DPO under TPB's delegated authority	Processed by D of Plan under TPB's delegated authority	Considered by TPB	Remarks
Changes in the total number of parking spaces	Not exceeding 50 parking spaces or 5% of the approved minimum level of provision whichever is the lesser.*	Exceeding 50 parking spaces or 5% of the approved minimum level of provision but not exceeding 100 parking spaces or 10% of the approved minimum level of provision whichever is the lesser.	Exceeding 100 parking spaces or 10% of the approved minimum level of provision whichever is the lesser.	*Notwithstanding the 5% limit, changes not exceeding 10 parking spaces may be approved by DPO provided that C for T does not object to the changes.
Changes in the total number of loading / unloading spaces	Not exceeding 5% of the approved minimum level of provision.#	Exceeding 5% but not exceeding 10% of the approved minimum level of provision.	Exceeding 10% of the approved minimum level of provision.	#Notwithstanding the 5% limit, changes not exceeding 2 loading / unloading spaces may be approved by DPO provided that C for T does not object to the changes.

- 4.5.5 The Transport Department has also agreed to allow a flexibility of $\pm 5\%$, subject to the maximum of 50 spaces, to the provisions for each type of vehicle space in land grants for the parking, and loading and unloading of such motor vehicles. A standard parking clause to this effect has been incorporated into the Lands Administration Office Technical Circular No. 687.
- 4.5.6 In consideration of the ever changing driving habits of the general public, for a number of reasons, say, fiscal measures imposed by the Government, departmental guidelines should always be sought on the flexible application of the parking standards of the Hong Kong Planning Standards and Guidelines.

4.6

Pedestrian Facilities

- 4.6.1 For large commercial or office developments and comprehensive development areas (CDAs), passageways within the development should be provided to link up public footbridges / walkway systems, public transport interchanges and railway stations, including escalators or lifts between different levels of the passageways. Reference should be made to Volume 6, Chapter 8 for provision of lifts and ramps for the disabled within developments.

Guidelines on Checking of Traffic Facilities for Building Plan Submissions: -**1 Layout of Carparks and Loading/Unloading Spaces**

HKPSG Chapter 8 – Internal Transport Facilities provides guidelines on the provision of parking and the dimensions of standard parking spaces and loading/unloading bays. For ease of reference, the dimensions are reproduced below and supplemented with TD's latest requirements:

Table 1 – Car Parks and Loading/Unloading Spaces

Stall Dimensions for Car Parks & Loading/Unloading Bays	<u>Length (m)</u>	<u>Width (m)</u>	<u>Min. Headroom (m)</u>
Motorcycles	2.4 (min. 2m)	1	2.4
Private Cars and Taxis	5	2.5	2.4
Coaches and Buses	12	3.5	3.8
Light Goods Vehicles	7	3.5	3.6
Medium/Heavy Goods Vehicles	11	3.5	4.7
Container Vehicles	16	3.5	4.7
Disabled Carpark	5	3.5	2.4
Light Buses	8	3	3.3
Car Park Aisles	<u>Parking Angle</u>	<u>Aisle Width (m)</u>	
		<u>Desirable</u>	<u>Minimum</u>
(a) Private Cars, and Taxis (one-way)	0°	3	-
	30°	3	-
	45°	3.6	-
	60°	4.2	-
	70°	4.7	-
	80°	5.3	-
	90°	6	5.5 (absolute min. 5.0m)
	90° (two-way aisle)	7.5	6.0 (absolute min. 5.5m)
(b) Light Goods Vehicles (one-way)	90°	10	-
	45°	7	-
(c) Medium /Heavy Goods Vehicles (one-way)	45°	8	-
	90°	12	10
	90° (two-way aisle)	16	10
(d) Container Vehicles (one-way)	45°	11	-
	90°	16	-

Access Roads/Driveways

- (i) For private access roads/driveways within the development, the criteria stipulated in the Building (Private Streets and Access Roads) Regulations should be followed.

Table 2 - Access Roads/Driveways

Width for Straight Sections		Desirable Width (m)	Minimum Width (m)	Absolute Min. Width (m)
Residential Area	One-way	5.5	4.0	3.0 (private cars only)
	Two-way	7.3	5.5	5.0 (private cars only)
Industrial Area & Area of Mixed Usage	One-way	6.0	5.5	3.5
	Two-way	10.5	7.3	6.0
Gradient		Desirable	Maximum	Absolute Maximum
Straight Ramp	For Private Cars	1:10	1:7	1:6
	For Goods Vehicles	1:10	1:8	-
Helical Ramp	For Private Cars	1:12.5	1:8	-
	For Goods Vehicles	1:12.5	1:10	-
Vertical Clearance	All Vehicles	Vertical clearances for structures over pavements should be 5.1m (min.)		
Horizontal Clearance	All Vehicles	Horizontal clearance should be 500mm. If impracticable, clearance from railings and posts for signs should not be less than 200mm.		
Widening of Access Roads / Driveways on Bends				
Width of Access Roads/Driveways		Permitted Radius of Curve at Centre Line		Min. Widening Required/(m)
6m or less		Less than 18m		1.2
		18m to 24m inclusive		1.0
		Over 24m		0.6
More than 6m		Less than 18m		1.0
		18m to 24m inclusive		0.6
		Over 24m		0.3

- (ii) Notes on Access Roads and Driveways:
- Access roads with an overall width clear of any obstructions of at least 6m, which may include adjacent kerbs, footways or verges, must be provided to allow fire service appliances to operate in the event of emergencies.
 - The Authorized Person should be requested to indicate with dimensions on the submitted plan local widening of roads and driveways in accordance with the above recommendations for all bends.

Ramps in Multi-Storey Car Parks (for Cars and Taxis)

Table 3 - Ramps for Cars and Taxis in Multi-Storey Car Parks

Ramps in Multi-Storey Car Parks(for Cars and Taxis)			
Residential Area		Straight Ramps	Helical Ramps
	One-way	3.0m	3.65m
	Two-way (with no central kerb)	6.0m (min 5.5m)	-
Max. Gradient	See "Gradient" in "Access Road/Driveways"		
Horizontal Clearance from Structures	For Straight Ramps	300mm	
	For Helical Ramps	600mm	
Minimum Curve Radius	For Straight Ramps	5.5m (min. inner radius at bends)	
	For Helical Ramps	9.0m (min. outer radius)	

Notes on Ramps:

- (i) Ramps in a multi-storey car park are generally operated one-way. The use of two-way ramps is not recommended.
- (ii) Ramps should be designed without conflict points at both ends, e.g. no pedestrian crossings and junctions at both ends of a ramp.
- (iii) At the upper end of ramps, adequate clear visibility should be provided to minimize conflicts of movements of vehicles at the upper floor and the approach ramp.

Reference:

- (i) Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 8 “Internal Transport Facilities”
- (ii) Building Ordinance Cap. 123 and Building (Private Streets and Access Roads) Regulations
- (iii) Transport Planning & Design Manual (TPDM):
 - (a) TPDM Vol. 7 Sections 5.4.6 - 5.4.8 for goods vehicles parking layout.
 - (b) TPDM Vol. 7 Section 7.3.3 for private cars parking layout.
 - (c) TPDM Vol. 7 Section 5.4.5 for access road.
 - (c) TPDM Vol. 7 Tables 7.4.3.1 & 2 for ramps.