Transport impact guidelines for site development: Literature review

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Literature review

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Land Transport New Zealand is a Crown entity established under the Land Transport New Zealand Amendment Act 2004. The objective of Land Transport New Zealand is to allocate resources in a way that contributes to an integrated, safe, responsive and sustainable land transport system. Each year, Land Transport New Zealand invests a portion of its funds on research that contributes to this objective.

The research detailed in this report was commissioned by Land Transport New Zealand.

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Acknowledgments

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Abbreviations and acronyms

AADT	Annual average daily traffic
DCLG	Department for Communities and Local Government (United Kingdom)
DfT	Department for Transport (United Kingdom)
GFA	Gross floor area
IHT	Institute of Highways and Transportation (United Kingdom)
IPENZ	Institution of Professional Engineers in New Zealand
ITE	Institute of Transportation Engineers
LOS	Level of service
LTMA	Land Transport Management Act 2003
MoT	Ministry of Transport, New Zealand
OZP	Outline zoning plans (for use in Hong Kong)
PPG13	Planning policy guidance note 13: Transport (United Kingdom)
RMA	Resource Management Act 1991
RTA	Road and Transport Authority (of New South Wales, Australia)
TDM	Travel demand management
TfL	Transport for London
TIA	Transport impact assessment
TLA	Territorial local authority
TRAVL	Trip Rate Assessment Valid for London (database)
TRICS	Trip Rate Information Computer System (United Kingdom)

Contents

Executive summary

Beca Infrastructure Ltd was commissioned by Land Transport New Zealand to undertake research and prepare a good practice guide for sustainable land use development for use by all practitioners of transport planning in New Zealand.

The methodology put forward in the guide is intended to be flexible enough to be useful in considering the transport impact of all land-use developments.

The research covered the following main areas:

- comparison of New Zealand and international best practice
- consultation on the most appropriate approach for a transport impact assessment (TIA) good practice guide in New Zealand
- methodology flow-chart and checklist.

This report summarises the results of a literature search in New Zealand and a wider search of relevant worldwide literature, supplemented by inputs from international experts.

The report includes a comparison of best practice in New Zealand and internationally and a qualitative assessment of the 'pros and cons' of each approach. This assessment takes into account the differing statutory requirements and land-use planning issues in the countries whose practices have been compared with those of New Zealand.

The other countries included in the literature search and comparisons are:

- Australia
- Hong Kong
- Singapore
- United Kingdom
- United States.

A summary of the findings is included in the following table:

Table E1 Comparison of overseas best practice for sustainable development impact assessment.

Content of guideline	Australia	Hong Kong	Singapore	United Kingdom	United States
National statutory guidance document[a]	No – New South Wales RTA guide used for most assessments	Yes – Part of Transport Planning and Design Manual	Yes – LTA guide	Yes – Scotland and Northern Ireland Only. English guidance is in draft form.	No
Threshold for scoping TIA	Not in guidelines	Not in guidelines	Yes	Yes	Yes
Methodology guidance	Yes – Checklist	Yes – Checklist	Yes - Checklist	England and Northern Ireland	Yes- both
Suggested study area limits	No	No	No	No	Yes – land use types/development sizes.
Assessment of committed and consented developments	Yes	Yes- check that list of developments is up to date. Assess cumulative impact	Generally in background growth, but nearby developments added	Local developments in addition to background growth	Local developments in addition to background growth
Background traffic growth	Assessment of historical trends	Traffic growth factor from Annual Traffic Census report and historical data	Generally 2–3% per annum	Obtained from national model or traffic flow data	Model data or historical trends from existing data
Trip generation data	Guide includes trip rate data	Surveys of similar developments	Surveys of similar developments	Usually obtained from TRICS database	ITE Trip Generation 7th edition
Multi-modal data available	Some mode split data available	According to survey data	According to survey data	Multi-modal trip data available	Some local data available
Local trip effects (eg pass-by, diverted trips)	No specific mention	No specific mention	No specific mention	Consider pass-by and diverted trips. Intra-site trips for mixed use/retail	Consider pass-by and diverted trips. Intra-site trips for mixed use/retail
Assessment years	No specific mention	Future year data provided by models at 5-year intervals	Opening year and opening year +5. 2015 if significant development	Up to 15 years after opening. 5 years after the application is submitted and 10 years where the development affects the strategic road network (in English draft guidance).	Generally 5 years after opening
Assessment of intersection impacts	Key intersections	Usually only at site access – can extend further for larger developments	All intersections significantly affected	According to scope	Affected intersections should operate at acceptable LOS
Impact mitigation at	Yes- provided for under	Usually site access only – can	Usually site access only	Yes – provided for under	Depends on local

[a] In the case of Hong Kong, this applies only to the Hong Kong Special Administrative Region

Content of guideline	Australia	Hong Kong	Singapore	United Kingdom	United States
intersections by developer	Section 94 legislation	extend further for larger developments		legislation	conditions but see above
Assessment of safety	Yes – site access and parking; traffic calming etc for residential subdivisions	Yes – Site access and pedestrian safety	Site access layout and pedestrian facilities	Low-level safety audit and assessment of existing road safety.	Works designed to appropriate standards
Internal transport design and operation	Full assessment of standards, potential queuing effects	Parking only – generally sites are too constrained for anything else	Assessment of queuing impacts	Parking, circulation, alternative modes	Parking, circulation, alternative modes
Walking and cycling	Discussion with authority and operators about options	Integration with existing and planned future pedestrian routes	Crossing/bridge to bus stop or MRT station	Full consideration of walking and cycling site access and integration with offsite links	Level of service assessments based on delay at crossings and fully integrated on site facilities
Public transport	Consultation with operators and planning authority	Identify nearby facilities; check for capacity deficiencies; check bus bay provision is adequate	Rail and bus stop distances. Trip rates require adjustment if development not close to PT node	Full consideration of public transport access. Developer contributions to services and infrastructure where appropriate	LOS-based on service frequencies; service changes or improvements funded by site developer or building tenants with operator/agency
Travel plans and TDM	No specific mention	No mention	No mention	Part of national policy guidance and in guidelines	TDM measures suggested as means of increasing alternative mode share
Development parking	Assessment of proposed supply against standards and peak demand; assessment of layout	Analysis of parking provision and peak demand; motorcycle parking; entry/exit barrier capacity; layout	Analysis of parking provision and peak demand; entry/exit barrier capacity; layout	Based on local guidelines and parking demand surveys where appropriate. Layout standards available. Maximum parking set in national policy	Design standards and guidelines available. Parking generation document provides guidance on capacity. Queuing and circulation guidelines
Servicing	Servicing design guidelines included in RTA document	To be checked against parking/servicing guidelines	Provision and operation of servicing area	Routes and facilities to be outlined in draft English guidance.	Servicing guidelines included
Construction impacts	Yes	Yes	Separate study may be required	No specific mention	Assessment of implementation schedule and impacts
Development phasing	Yes	No specific mention	No specific mention	Yes and may be linked to developer contributions	

The research undertaken for this report suggests that the absence of national guidelines for transport impact assessment in New Zealand may be limiting the opportunities for sustainable development.

Where guidelines do exist, they do not appear to sufficiently promote the need to consider the sustainability of developments and this may have long-term disbenefits.

The review of TIA guidelines in other countries suggests that in some countries, such as Hong Kong and to a lesser extent the United Kingdom, sustainable development is a key aspect of the planning process.

While the methods for preparing TIAs overseas appears not to differ significantly from those in New Zealand, it is suggested that opportunities to improve the assessment of development sustainability are currently being lost.

The integration of travel plans and access by sustainable travel modes in development planning, as promoted quite heavily in the English and Scottish guidelines, are a key element in the transport impact guidelines that were developed as part of this research.

Abstract

Beca Infrastructure Ltd was commissioned by Land Transport New Zealand to undertake research and prepare a good practice guide for sustainable land use development to be used by all practitioners of transport planning in New Zealand. Research was undertaken during 2005–2007.

The methodology put forward in the guide is intended to be flexible enough to be useful in considering the transport impact of all land-use developments.

The research covered the following main areas:

- comparison of New Zealand and international best practice
- consultation on the most appropriate approach for a transport impact assessment (TIA) good practice guide in New Zealand
- methodology flow-chart and checklist.

The report summarises the results of a literature search in New Zealand and a wider search of relevant worldwide literature, supplemented by inputs from international experts.

The report includes a comparison of best practice in New Zealand and internationally and a qualitative assessment of the 'pros and cons' of each approach. This assessment takes into account the differing statutory requirements and land-use planning issues in the countries whose practices have been compared with those of New Zealand.

1. Introduction

1.1 Background

Beca Infrastructure Ltd was commissioned by Land Transport New Zealand (Land Transport NZ) to undertake research and prepare a good practice guide for sustainable land use development to be used by all practitioners of transport planning in New Zealand.

The methodology put forward in the guide is intended to be flexible enough to be useful in considering the transport impact of all land-use developments.

The research covered the following main areas:

- comparison of New Zealand and international best practice
- consultation on most appropriate approach for a transport impact assessment (TIA) good practice guide in New Zealand
- methodology flow-chart and checklist.

The research was peer reviewed by international experts as well as end-users in New Zealand.

1.2 Scope of this report

This report summarises the results of a literature search in New Zealand and a wider search of relevant worldwide literature, supplemented by inputs from international experts.

The report includes a comparison of best practice in New Zealand and internationally, and a qualitative assessment of the 'pros and cons' of each approach. This assessment takes into account the differing statutory requirements and land-use planning issues in the countries whose practices have been compared with those of New Zealand.

The other countries included in the literature search and comparisons are

- Australia
- Hong Kong
- Singapore
- United Kingdom
- United States.

It is understood that transport impact assessments in Canada are generally prepared using the same guidelines as those in the United States.

1.3 Format of this report

Following this introductory chapter, Section 2 summarises the literature search for relevant documents in New Zealand. Section 3 then summarises the literature reviews undertaken for the other countries considered in the report. An assessment of the availability of trip generation data in each country is provided in Section 4, since this is a key aspect of preparing TIAs for developments. Best practices for considering the transport impact of developments are summarised and compared in Section 5.

1.4 Terminology

There is a wide variety of names for the assessment of transport impacts arising from a development proposal. For the purposes of this report, it has been assumed that the following titles are interchangeable:

- transport assessment
- transport impact assessment
- transportation assessment
- traffic impact assessment
- traffic impact study
- traffic report.

While many of these titles refer only to traffic, it is often clear from the corresponding guidelines that consideration of all relevant modes of travel is included. For the purposes of this report, the generic term *transport impact assessment*, or the abbreviation *TIA*, has been used.

2. New Zealand literature search and legislative context

2.1 Methodology

A literature review was carried out to obtain information and research regarding international guidance for preparing TIAs. A number of sources were used which included

- internet
- books
- government publications
- journals
- reports
- conference papers.

The research team also made use of their overseas knowledge to collect information.

2.2 Background

The literature search for New Zealand focused on national guidelines and regulations, as well as local policies and guidelines in major urban centres.

A list of internet links to the documents referred to in this document is provided in Appendix A.

No national guide is available for preparing TIAs in New Zealand, however, practice is generally similar to that in Australia, the United States and the United Kingdom.

2.3 National planning legislation

2.3.1 Background

The planning legislation in New Zealand, like other countries, sets out the way in which developments have to be assessed by planning authorities. Such legislation is, therefore, an important part of understanding the limitations for carrying out TIAs and requiring mitigation works.

2.3.2 Land Transport Management Act

New Zealand's Land Transport Management Act 2003 (LTMA) defines the role of Transit New Zealand (Transit NZ) to manage the state highway network and defines its statutory duties in this respect. While this legislation does not directly influence development planning, it sets the context in which development planning should link to the national transport policy.

2.3.3 Resource Management Act 1991

New Zealand's Resource Management Act 1991 (RMA) sets out the duties of local authorities and other statutory planning authorities to consider the impact of development proposals, including transport impacts.

The Act also requires territorial local authorities (TLAs) to produce and update the district plans against which all resource consent applications are assessed.

In addition to the district plan legislation, the RMA also defines how the resource consent process must be managed and sets out the process to be followed for the local authorities' notification. The RMA includes legislation defining the process to be followed for hearings, should these be requested by the planning authority. It also defines the process for any party making a submission on notified resource consents.

The Environment Court's role and procedures are defined in the RMA, including the right to appeal against decisions made in hearings or in the Environment Court itself.

2.4 Ministry of Transport

2.4.1 Background

The New Zealand government's Ministry of Transport (MoT) is responsible for national transport legislation and strategy for all travel modes. As well as the *New Zealand Transport Strategy* (Ministry of Transport 2002), it has also recently released *Getting there – on foot, by cycle* (Ministry of Transport 2005).

2.4.2 New Zealand Transport Strategy

The *New Zealand Transport Strategy* focuses mainly on the national policy. While it is has some relevance to sustainable development, the document makes no explicit reference to development impacts or the responsibilities of developers.

2.4.3 Getting there – on foot, by cycle

This document was released in 2005 and details the MoT's national strategy for pedestrian and cycle travel modes. The document identifies 10 priorities for action to improve walking and cycling in New Zealand.

Priority 3 in the document is to 'encourage collaboration and co-ordination of efforts for walking and cycling'. Within this priority it is recognised that a variety of stakeholders, including transport professionals and developers must be relied upon to collaborate in the design of walking and cycling infrastructure at the early stages of development planning.

The fourth priority is identified as encouraging 'land use, planning and design that supports walking and cycling'. This action requires the involvement and co-operation of transport professionals and developers to ensure that new developments are located and designed to encourage walking and cycling trips.

2.5 Transit New Zealand

Transit NZ has a statutory duty to manage the state highway network to achieve an integrated, safe, responsive and sustainable land transport system. Transit NZ's policy has been defined in two documents, *Planning policy manual* (Transit NZ 1999) and *Planning policy manual supplement* (Transit NZ 2005).

The supplement was produced to update the 1999 document to reflect changes in Transit NZ's policies following the enactment of the LTMA in 2003. It is understood that the *Planning policy manual* will be revised in the near future to reflect all changes. The documents emphasise Transit NZ's focus on:

- protecting the hierarchy of roads
- being involved in development proposals at the earliest stage to ensure the development of integrated land use and transport solutions
- ensuring Transit NZ is recognised as an affected party for developments generating traffic on or near state highways
- opposing unacceptable reductions in the function of state highways caused by land use developments seeking direct or indirect access.

Transit NZ aims to avoid the degradation of the state highways by proactively ensuring land use, supporting road networks and ensuring other forms of transport are effectively integrated.

The *Planning policy manual supplement* includes a list of considerations for assessing the impact of activities and subdivision on state highways. Some of these are directly applicable to the generation of transport impact assessments, such as:

- whether the specific proposal will materially compromise traffic safety
- the status and effect of existing access arrangements, including potential for rationalising accesses and the cumulative impact of additional access points
- nature and extent of any specific district plan infringements and their relevance to traffic, transport and integration issues
- how the activity will integrate with the existing and future land transport systems, including:
  - traffic generating characteristics of the activity
  - capacity of the existing and future land transport systems
  - cumulative effects on the existing state highway network and any relevant precedent considerations or future cumulative effects
  - where any new roads are proposed, consistency and connectivity with the district roading hierarchy
  - avoiding, where practicable, short distance private vehicle travel on the state highway network

  - any mitigation measures proposed including measures to reduce travel demand by private motor vehicles on the state highway network.
- consideration of alternatives including:
  - whether an adequate assessment of alternative sites and locations has been undertaken
  - alternative access arrangements.

2.6 Land Transport New Zealand

Land Transport NZ does not have any specific role in development planning in New Zealand, however, it does promote sustainable transport and also has responsibility for land transport funding across the country.

The focus on sustainable transport in the *New Zealand Transport Strategy* means that all territorial local authorities are encouraged to maximise access to sustainable travel modes such as walking, cycling and public transport. Although developers are generally only expected to provide access to such modes within their sites, the increase in availability of walking and cycling infrastructure makes such modes more attractive to all users and can, therefore, contribute to greater use of sustainable modes on a wider scale.

The ability of TLAs to request developer contributions to transport infrastructure, which many are now doing, allows continuing improvements in the availability of infrastructure for sustainable travel modes across the whole area. In this way, such infrastructure on individual development sites can be linked to an integrated network.

2.7 Territorial local authorities

2.7.1 Background

All TLAs within New Zealand must have a district plan that covers planning rules and methods for their area. These follow similar formats, as set out in planning legislation such as the Resource Management Act 1991. A small selection of district plans has been included in this literature search where they have made specific reference to TIAs.

2.7.2 Tauranga City Council

Section 12 of Tauranga City Council's Operative District Plan includes a list of information that the council requests should be provided as part of a traffic impact study for a development proposal exceeding a threshold of 25 on-site parking spaces, or otherwise needing a TIA.

In conjunction with this list of required information, a checklist template is provided as a downloadable form to be submitted with resource consent applications requiring a TIA. This includes columns to be checked by the applicant and counter-checked by a council officer.

2.7.3 Wellington City Council

Section 13.3.3 of the Wellington City Council Operative District Plan states that any activity involving the provision of more than 70 vehicle parking spaces per site is a discretionary activity (restricted) and requires a traffic report. A short list of issues to be addressed in the report is also provided.

2.8 Other organisations

2.8.1 IPENZ

The Institution of Professional Engineers in New Zealand (IPENZ) has published a number of discussion papers, of which one is *Sustainable transport in New Zealand* (IPENZ 2004).

Although this document is a broad summary of sustainable transport policy and initiatives around the world and in New Zealand, it also exhorts its members to learn about sustainable transport and use the principles in their day-to-day work. In many cases this will include a TIA.

2.8.2 New Zealand Trip Rate and Parking Database Bureau

The New Zealand Trip Rate and Parking Database Bureau is tasked with developing the availability of trip generation and parking data. New survey data is being added to the database, which is now available to transport planning practitioners in the form of a spreadsheet.

The bureau's work is discussed in more detail in Section 5.2 of this report.

2.9 Austroads

2.9.1 The organisation

Austroads is the association of Australian and New Zealand road transport and traffic authorities and aims to improve road and road transport outcomes.

Austroads documents are used by transport planning and traffic engineering professionals in New Zealand as a source of standards for the design of transport infrastructure.

2.9.2 Publications

Although Austroads does not publish specific guidance on carrying out impact assessments for developments, a number of documents have been published relating to sustainable transport and traffic engineering best practice.

2.10 Summary

The search of New Zealand literature on traffic impact assessment reveals that there is little advice on how such assessments should be undertaken. There also appears to be some inconsistency in how planning authorities require impact assessments for developments.

Anecdotal evidence is that the content and scope of TIAs varies according to the experience of those preparing and those reviewing them.

The lack of formal advice or guidelines in New Zealand means that there is a risk that key elements of a development's impact might not be considered, especially in unusual cases. In particular, in many cases there is a danger that only the traffic impacts of developments are considered and that opportunities to integrate developments into the wider transport networks can be missed.

3. Worldwide literature search

3.1 Introduction

In order to maintain a concise report, this literature review has focused primarily on the content of TIAs in a small number of countries around the world.

Where available, internet links to the documents reviewed in this report have been provided in Appendix A.

3.2 Australia

3.2.1 Background

The New South Wales Road and Transport Authority (RTA) document entitled *Guide to traffic generating developments version 2.2* (Roads and Traffic Authority 2002) is widely used across Australia, and also sometimes in New Zealand, by transport planning practitioners undertaking TIAs.

Each state in Australia has its own planning authority, although the RTA guide appears to be used by practitioners across Australia.

3.2.2 Guide to traffic-generating developments

Section 1 of the RTA guide (Roads and Traffic Authority 2002) summarises policies, legislation and key issues relating to all kinds of traffic-generating development. In addition, it sets out some general design principles for transport infrastructure of new developments.

Section 2 outlines methods of conducting traffic impact studies and issues to be addressed, including:

- existing proposals for improvements to the road network
- impact on road safety
- impact of traffic noise
- annual average daily traffic (AADT)
- volumes and historical trends on key adjacent roads
- peak-period traffic volumes and congestion levels at key adjacent intersections
- existing parking supply and demand in the vicinity
- parking provisions appropriate to the development
- traffic generation, attraction and trip distribution
- safety and efficiency of internal road network
- impact of generated traffic on local area
- safety and efficiency of access between the site and adjacent road network.

The section also includes a comprehensive checklist of issues that need to be addressed in a traffic impact study.

Section 3 of the guide provides detailed data and information for the calculation of traffic generation, including trip rates for a variety of land uses.

Section 4 of the guide outlines how to assess the effects of development traffic impacts, including references to the calculation of level of service for intersections, urban and rural roads. Section 4 also considers how to assess:

- impact on amenity
- impact on safety
- impact on road pavement
- public transport services
- pedestrian circulation.

Parking requirements for specific land uses are covered in Section 5 of the report and give parking supply rates for each land use. Section 6 provides design criteria for access and internal parking layout design, while Section 7 covers traffic and safety issues for vehicles, pedestrians, cyclists and bus service routing for residential subdivisions, including advice on traffic calming.

Section 8 considers cost issues for developments, including calculation of development contributions for road improvements and mitigation for road damage.

Sections 9 and 10 of the guide describe the administration of New South Wales' environmental planning policy and reference material respectively.

3.3 Hong Kong

3.3.1 Background

A summary of the development planning regime and transport assessment methodology in Hong Kong has been prepared by John Patient, a director of Sustainable Transport Planning (Asia) Ltd. This has been included in Appendix B and is summarised briefly below.

3.3.2 TIA procedure in Hong Kong

The historical association of Hong Kong with the United Kingdom means that transport planning practices and roading standards are quite similar.

Hong Kong uses outline zoning plans (OZP) in a similar way to district plans in New Zealand, with developers able to apply for changes to these plans or submit proposals conforming to them. The Transport Department has transport models covering the Hong Kong districts, with model years every five years to 2021, and the outputs from these are generally used for traffic assessments.

Traffic impact modelling for most developments is only undertaken to identify any potential problems in the network and developers are only expected to pay for local access effects. The Transport Department has a TIA checklist, which is included in the department's *Transport planning and design manual* (Transport Department 2001).

Design standards for transport infrastructure, both on the highway network and internally for developments, are contained in the Hong Kong Planning Standards and Guidelines document (see Appendix A).

3.3.3 TIA checklist

The checklist within the *Transport planning and design manual* states that a TIA should address:

- study area:
  - the site
  - existing traffic situation
  - road network
  - public transport facilities
  - traffic flow and junction assessment
- proposed development:
  - parking provision
  - loading/unloading area
  - public transport facilities
  - pedestrian facilities
  - development access
  - traffic generation
- future network, including planned infrastructure and/or major developments:
  - traffic forecast
  - traffic growth within study area
  - traffic generated by existing and other proposed major developments
  - traffic generated by the development
- traffic analysis
- recommendations and implementation:
  - improvement proposal
  - implementation
  - traffic impact during construction.

The checklist includes a comprehensive list and explanation of what should be covered and checked for each topic.

Overseas trip rates are not considered to be appropriate in Hong Kong because of the significant differences in mode split between Hong Kong and other countries. Within Hong

Kong itself, trip generation rates vary significantly according to a number of factors, including proximity to public transport, household income and car ownership.

3.4 Singapore

3.4.1 Background

The statutory authority controlling development impacts in Singapore is the Land Transport Authority. They have published *Guidelines for preparation of traffic impact assessment reports* (Land Transport Authority 2003) for developers and transport professionals.

3.4.2 Guidelines for preparation of traffic impact assessment reports

The guidelines cover all the information that is required to be included in TIAs in Singapore, in the form of brief descriptions of section headings and contents, as summarised below:

- study purpose and objectives
- site and study area description
- existing conditions
- anticipated nearby developments
- assessment years
- traffic forecasts
- trip generation
- trip distribution
- modal split
- assignment of traffic resulting from development
- assessment of change in roadway operating conditions resulting from the development traffic
- evaluation of junction performances
- pedestrians
- access provision
- recommendations for site access and transportation improvements.

Annexes to the document set thresholds above which a TIA is required and provide more detailed descriptions of what should be included.

3.5 United Kingdom

3.5.1 Background

There are a number of documents providing guidance on preparing TIA reports that have been produced by a wide variety of organisations and authorities in the United Kingdom.

Planning policy guidance note 13: Transport (Department of the Environment, Transport and the Regions 2001) was published by the national government and significantly increased the requirements for sustainable transport to be considered for TIA.

The Scottish Executive, which now controls planning legislation in Scotland, has produced one of the most comprehensive guides available, entitled *Transport assessment and implementation: A guide* (Scottish Executive 2005). This was published following a period of consultation on a draft document.

Transport for London (TfL) produced a best practice guide to assist those preparing planning applications for major developments in London. This document is entitled *Transport assessment best practice guidance document* (Transport for London 2006).

The Department for Communities and Local Government (DCLG) and the Department for Transport (DfT) have produced draft guidance for the production of transport assessments and transport statements. This document is entitled *Guidance on transport assessment* (DCLG and DfT 2006) and it supersedes the Institution of Highways and Transportation (IHT) document entitled *Guidelines for traffic impact assessment* (IHT 1994). The IHT guide remains valid for a significant proportion of the analysis required for TIAs. Planning authorities in the United Kingdom are able to request that developers mitigate the impacts of their developments, including off-site improvements.

3.5.2 Planning policy guidance note 13: Transport (PPG13)

The guidance published in PPG13 in 2001 initiated a significant change in United Kingdom national planning policy.

Section 2 of the guidance includes key changes in the way the transport effects of development are assessed and changes the name of such documents from 'traffic impact assessment' to 'transport assessment' to reflect the increased focus on all travel modes rather than just the private car.

The policy recognises that the need for, and scope of, transport assessments will change according to the scale of the development and the extent of the transport implications of the proposal. For major developments, it states that the assessment should illustrate accessibility to the development by all modes and the likely modal split of journeys. It proposes measures to improve access by public transport, walking and cycling as a means of mitigating transport impacts and reducing parking needs.

The guidance also stresses the need for developers to hold early discussions with the local authority to scope the assessment. Those developments conforming with the local development plan and including measures for access by non-car travel modes would be more likely to be consented quickly and the requirements of the transport assessment reduced.

Where large development sites do not conform with local development plans, because of location, the onus would be on the developer to prove why the development could not be

accommodated in preferred locations and illustrate how accessibility of the chosen site by all modes would compare to other possible sites.

Other sections of the document provide additional guidance on matters related to TIA, in particular to promote sustainability. The document includes sections on:

- travel demand management
- walking, cycling and public transport access (including public transport improvements as part of the development)
- travel plans for all major developments, smaller developments close to air quality management areas, new and expanded schools and where particular local transport problems exist.

The guidance also states that these travel plans should have measurable outputs and arrangements for enforcement. It suggests that in certain circumstances such enforcement should be binding through conditions attached to the planning application.

In Annex D of the document, national maximum parking standards are set. This is contrary to earlier guidance that set out minimum parking provision. The emphasis has shifted away from a 'predict and provide' approach for traffic toward a holistic assessment of travel demand that encourages sustainable modes of transport.

The publication of the document generally complements the IHT guidelines, since much of the traffic analysis would still be required in addition to assessment of access to developments by sustainable travel modes.

It is intended that the PPG13 document will be complemented by new guidance on transport assessments, published by the United Kingdom Department of the Environment Transport and the Regions, entitled *Guidance notes for transport assessments*. This document is in draft and is discussed below.

3.5.3 Guidance on transport assessment (DCLG/DfT)

The purpose of this document is to provide guidance on the preparation of transport assessments and transport statements (the latter is to be prepared when a full TIA is not required). It is intended to assist the stakeholders in determining the level and scope of assessment required for the development proposals.

Section 2 provides guidance on the scope and level of assessment required based upon the scale of proposed development. Early discussion with stakeholders is recommended to determine the assessment requirements and a pro-forma has been provided to aid the process. The two forms of assessment that could be undertaken are as follows:

- transport statement for developments with relatively small transport implications
- transport assessment for developments with significant transport implications.

The document gives thresholds for typical land uses that set out which form of assessment should be used. These thresholds are not absolute values but do represent a useful opening point for discussions. There is also an 'Initial Appraisal Consultation Form' to aid preliminary scoping discussions between the developer and highways authority.

Section 3 sets out the scope of transport statements. The requirements of the transport statement are set out broadly to provide:

- existing site information:
  - site location plan
  - permitted use of the existing site
  - existing and proposed land uses of adjacent sites
  - existing access arrangements
  - whether the site is within an air quality management area.
- baseline transport data:
  - qualitative description of the existing travel characteristics
  - existing public transport provision
  - description of the existing highway network
  - analysis of road accident statistics for the most recent three- or five-year period.
- proposed development information:
  - plans and layouts of the proposed development
  - the proposed land use
  - scale of development such as numbers of residential units and gross floor areas
  - design layout and access proposals
  - person trip generation and mode share
  - qualitative and quantitative description of the travel characteristics
  - proposed improvements to site accessibility via sustainable travel
  - proposed car parking strategy for the site
  - vehicular trip impact
  - transport implications of site construction
  - transport implications of service and freight vehicles
  - net change of traffic if the site has an existing planning permission.

Section 4 sets out the scope of transport assessments and includes a flow diagram for producing the TIA. It recommends preparing a scoping study for agreement with the stakeholders to determine the methodologies to be adopted, additional supporting data required and the extents of the assessment area. Detailed information regarding the input into the sections of the TIA is outlined within the guidance. This information covers topics such as:

- existing site information
- baseline transport data

- public transport assessment
- walking and cycling assessment
- road network assessment
- traffic data and traffic forecast
- safety considerations and accident analysis
- proposed development description
- appraising the impact of the proposed development including:
  - environmental
  - safety
  - economy
  - accessibility
  - integration
- assessment years
- time periods for analysis
- development trip generation including:
  - new trips
  - pass-by trips
  - linked trips
  - diverted trips
  - transferred trips
- adjustment of trip generation
- trip distribution and assignment
- travel plans
- mitigation.

3.5.4 Transport assessment and implementation: A guide (Scottish Executive)

The Scottish guide was published in 2005 and is split into three sections which are:

- first steps
- transport assessment and implementation scope and process
- delivery stages.

The first section includes a simple transport assessment form that has to be filled in for all planning applications. If a proposed development exceeds one or more defined thresholds, a full transport assessment is required. If these thresholds are not exceeded, the applicant must fill in a table summarising the likely number of people, cars and deliveries the development is estimated to generate in each direction during its AM and PM peak periods.

The second section starts by setting out the Scottish policy context in relation to transport assessment and major schemes requiring Scottish Executive support or funding. Section 2 also includes a flow chart overview of the transport assessment and implementation process. The transport assessment process is split into two stages, with the first stage assessing whether the development meets preferred location criteria (as set out in local and national planning guidance) and scoping discussions with the planning authority, before finishing with the preparation of a transport assessment form as summarised in the first section of the guide. The second stage then deals with the transport assessment itself, which would only be required if the development was large or had significant transport impacts.

It also states that person trips must be used as the basis for analysis undertaken for transport assessment and that no traffic growth factors should be applied beyond the year of opening. The Scottish document references the *Guidelines for traffic impact assessment* (IHT 1994). The IHT guidelines are dated with regard to current transportation policy but still represent a good basis for traffic assessments. The role of each stakeholder is also summarised.

The guide's third section summarises the key elements of the transport assessment and implementation process as:

- scoping
- transport assessment
- travel plan
- monitoring.

Each of these is dealt with in turn, along with a further flow chart showing the key elements of a transport assessment, which include:

- assessment of travel characteristics:
  - accessibility by different modes
  - calculate numbers who could reach the development
  - predict numbers travelling by each mode
- measures to influence travel to the site
- location and scale
- layout and design
- promoting individual modes
- managing car use and parking
- awareness raising and marketing
- incentives to individuals
- assessment of impacts
- impacts on safety, congestion, environment, local accessibility, parking and local community.

The flow chart shows the iterative process between assessment of impacts and assessment of travel characteristics and is followed by a short section discussing the scoping of transport assessments. The key points within this section are summarised below:

- assessing the development site:
  - site visit
  - measurement of accessibility to and from the site (generally this is by measuring likely travel times to the development by each mode)
  - estimating the travel generated and modal share, based on location, competing developments and linked trips
- appraising and mitigating impacts
- accessibility
- integration
- safety
- environmental impacts
- highway and traffic impacts
- traffic impact analysis (refers to the IHT guidelines but supplements these with further criteria) and suggests predicting traffic volumes for an opening year assessment, and a 15-year assessment for motorways and trunk roads (eg the state highway system)
- highway impact analysis (this is the impact of the traffic on the highway system
- parking impact analysis, including minimising the need for parking.

The final section of the guide considers how to influence travel to and from the development, including the following factors:

- location
- scale
- density and mix of uses
- layout and design
- promoting access on foot, by bike and public transport
- improving access for bus and rail users
- vehicular access and parking
- travel plans.

3.5.5 Transport assessment best practice guidance document (TfL)

The purpose of this document is to provide a high-level guidance for use within TfL and not to replace the borough council guidance on transport assessments. The guidance is relevant to developments that are deemed to be strategically important and which are referred to the

Mayor of London. These developments are, therefore, of a large scale and the need for a full TIA has already been established.

Section 4 of the guideline sets out the requirements for scoping the TIA and pre-application procedures. It recognises that small developments may not require all the elements of a full TIA and so some aspects can be scoped out early on in the consultation process. A checklist for the scoping process is contained in Section 4 of the guideline.

Section 5 sets out the TIA structure within a flow chart. This structure should be expanded upon where necessary if elements of the proposals require particular detail. The recommended structure of a TIA is:

- introduction
- baseline conditions
- trip generation and modal share
  - traffic flows
- impacts (road network)
  - junction analysis, parking standards, construction and servicing strategies (as a sub-document)
- impacts (pedestrian routes)
  - identification of desire lines, pedestrian flows and public realm improvements (as a sub-document)
- impacts (public transport network)
  - mode share, capacity analysis and public transport improvements) as a sub-document)
- mitigation and planning obligations
- interim travel plan.

Section 6 outlines the input requirements for the TIA to assess the baseline conditions and cumulative impacts. It requests that the planning history of the site is included to give background information on any extant planning permissions. A table provides details of the proposed development that will be required for inclusion in the TIA along with the start and finish date of the phasing, and plans of the development layout as well as geographical location. The required baseline data for each transport mode is set out in a table to ensure that a fully informed assessment of the existing conditions and future proposals is made. This includes an assessment of the existing capacity for motorised transport and comment upon committed future transport schemes and how these may affect capacity. It requires the cumulative impact of granted and submitted planning applications to be considered.

Section 7 discusses the organisation of the TIA in terms of assessing the impacts. This includes trip generation, servicing, construction and any changes to the transport infrastructure. Any remedial works to mitigate the impacts should be included within the transport assessment. Trip generation is required for all modes and split by mode. This trip

generation is required by time period and origin to fully assess the impacts upon the transport infrastructure. The recommended sources of trip generation data are the databases of survey information TRAVL (Trip Rate Assessment Valid for London) and TRICS (Trip Rate Information Computer System) supplemented by observed survey data where available.

Car-parking provision for the proposed development should consider the public transport accessibility level of the site. Areas with high accessibility (ie frequent services within walking distance serving key destinations) are required to provide less car parking to promote sustainable travel. Cycle parking is required but TfL does not have any standards regarding provision. The borough councils often provide these standards, as part of their parking strategy, and these should be adhered to.

Section 8 covers specific analytical techniques including trip generation and capacity analysis for the majority of transport modes. The trip generation for all modes should be based upon the TRAVL and TRICS databases (discussed later in this report). The Census 2001 data can be used to obtain a mode split for residential developments using the journey to work mode shares. This section suggests that linked trips be taken into account for mixed use developments where journeys may have more than one purpose, part of which could be accommodated within the site.

Section 9 reviews the proposals for mitigation measures following the assessment of the transport impact. Mitigation is required for roads that are operating above 85% saturation but generally developments only need to mitigate the impact of traffic associated with that site. Additional improvements may be required (such as physical measures to assist buses, cyclists and pedestrians) where appropriate.

Travel plans must be submitted alongside the TIA for most planning applications. The travel plan should be secured by planning conditions and contain targets, objectives and incentives. The travel plan should be written in parallel with the TIA although it is not specifically part of that document. Travel plans for larger speculative developments are required to provide the strategy for the site rather than provide specific details of the completed plan. The primary aim is to reduce travel to and from the site by single occupancy private cars.

3.6 United States

3.6.1 Background

The United States Institute of Transportation Engineers (ITE) is the main source of best practice manuals for traffic engineering and transport planning in the country. Other North American countries also use these guides, including Canada.

The relevant guides and reports produced by the ITE are:

- *Transportation impact analyses for site development* (ITE 2006)
- *Parking generation,* 3rd ed*.* (ITE 2004)
- *Trip generation*, 7th ed and *Trip generation handbook* (ITE 2003).

The trip generation reports are summarised in a later section.

The transportation impact document was published in 2006 and summarises ITE proposed recommended practice. It is not a statutory document.

The *Community guide to development impact analysis* (Edwards 2000) is a paper published at the University of Wisconsin. The content of this paper is also summarised in this section.

3.6.2 Transportation impact analyses for site development (ITE)

The ITE document is a relatively comprehensive guide to undertaking transport impact assessment and covers the key aspects of such studies in separate chapters.

The first main chapter considers when an impact assessment might be required, with a review of alternative thresholds used across the United States as a basis for undertaking TIAs. Measurable thresholds include:

- daily development trips
- peak-hour development trips
- site area being developed
- dwelling units or development gross floor area (GFA).

Examples of some of the thresholds used in the United States are included in the guidelines. In addition to these thresholds, suggested study area limits are included in the guidelines, which are based on the size and land use of the development proposals.

The guidelines also consider which study horizon years should be analysed and which time periods should be assessed. Generally they indicate that assessment should be undertaken for five years after the development date and suggest weekday and weekend time periods for which analysis should be undertaken. The third chapter of the guidelines also includes a suggested methodology flow chart for transport impact analysis.

The guidelines cover the methods for calculating development trip generation in significant detail but only consider such trips in terms of vehicle trips, rather than considering person trips as would be required to assess impacts for all travel modes.

There is an explanation of the analysis required to consider pass-by and diverted trips, and the guidelines also include additional consideration of existing trips for sites that are being redeveloped.

The guidelines provide advice on level-of-service criteria for intersection and link capacity analysis and also suggest thresholds for considering criteria for comparing intersection delay calculations.

The guidelines suggest that where the number of development trips made by alternative modes is quite low, the analysis of multi-modal travel impacts can be limited to qualitative

rather than quantitative methods. Suggested levels of service for public transport passengers, based on service frequencies are proposed as well as levels of service for pedestrians at crossings based on delay, which is based on data in the *Highway capacity manual* (Transportation Research Board 2000). In addition to these criteria, a further set of criteria is suggested as a means of considering quality of service for pedestrian, bicycle, public transport and car trips.

The same section of the guidelines also suggests a variety of techniques for reducing site traffic or peak spreading. While not specifically mentioning travel plans, the suggested measures appear to fall into this category. These measures are covered again in a later section of the document which considers the requirements for transport improvements to mitigate development impacts.

The final key section of the guidelines considers internal access design issues, including:

- site access intersections and driveways
- the impact of parking control measures and site access intersections on internal queuing
- internal speed control and traffic calming measures
- internal vehicle circulation
- service vehicle access
- parking capacity
- pedestrian, bicycle and public transport facilities.

The guidelines contain little detailed advice on the above issues but provide references to other documents. It is noted, however, that the guidelines warn against over-provision of parking capacity and recommend shared parking between compatible adjoining land uses where this is appropriate.

3.6.3 Community guide to development impact analysis (Edwards)

This paper discusses a series of analyses required when assessing the overall impacts of development. As well as fiscal, socio-economic and environmental impacts, the paper discusses traffic impacts. The paper's content is limited to traffic impacts rather than the impact on the wider transport network, although this is recognised as a limitation.

The paper discusses when a traffic impact study is necessary and suggests the comparison of expected trip generations against thresholds in a similar fashion to the ITE guide, which is referenced within the text. It suggest that the general threshold should be for developments anticipated to generate at least 100 inbound or outbound trips. A table showing the scale of developments likely to require impact study is provided in the paper based on ITE trip generation rates.

The paper also discusses whether impact study might be required even when the development thresholds are not exceeded. Conditions where Edwards suggests impact study might still be required include:

- high traffic volumes on surrounding roads affecting movement to and from the development
- inadequate sight distance at access points
- proximity of the proposed access points to other existing driveways or intersections
- drive-through operations.

Edwards then lists a series of thresholds used by various planning authorities across the United States.

Edwards also discusses how pass-by trips should be assessed and provides suggested pass-by rates for a number of different development types. These are repeated in Table 3.1.

Table 3.1: Suggested pass-by percentages for development land-use (Edwards 2000).

Land use	Pass-by percentages
Shopping centre	
Larger than 37,200 m^2 gross leasable area	20
9300 m^2 to 37,200 m^2 gross leasable area	25
Less than 9300 m^2 gross leasable area	35
Convenience market	40
Discount club/warehouse store	20
Fast-food restaurant	40
'Sit–down' restaurant	15
Service station	45
Supermarket	20

The paper also considers the impact of internal trips in multi-use developments. The paper states that the ITE has found that such factors could reduce gross trip generations by 24%.

Finally, the paper suggests the likely content of a traffic impact study, including:

- background:
  - description of proposed development
  - identification of peak hours and the need to assess weekend impacts
  - description of study area
  - location of proposed access points
- base traffic conditions
- description of road network and intersections adjacent to site and at access points
- counts during peak impact hours
- site traffic generation
- trip generation rates used and their sources
- traffic generated during peak impact hours
- site traffic distribution
- method used to distribute traffic

- table showing estimated traffic movements by direction
- discussion of traffic assignment methods and assumptions
- non-site traffic projections
- definition of design year
- identification of development in study area whose traffic is to be included in analysis
- adjustment of traffic volumes on local network.

4. Understanding overseas best practice

4.1 Background

The literature search carried out for this study has found many similarities among guidelines for TIA worldwide. Many of the key differences can be attributed to differences in planning regulations and roles of the statutory authorities in each country.

A good practice guide for assessing transport impacts of sustainable developments in New Zealand can draw on the wide-ranging experiences of all the countries and be tailored to match the regulatory situation in this country.

4.2 Key elements of TIA guidelines

4.2.1 National guidelines

Most countries whose practice has been considered in this report either have statutory national guidelines or guidelines published by organisations or authorities which are regarded as and used as a national resource. Some of these guides, such as the American ITE and Australian RTA documents, are used in other countries that do not have their own national guidelines.

4.2.2 Threshold for requirement of impact assessment

In many cases, thresholds above which a TIA is required are defined in TIA guidelines and these generally relate to the size of the proposed development.

Most guidelines either recommend or require developers to meet with planning authorities to discuss the scope of TIAs at an early stage.

Such thresholds are useful to developers, since they allow the need for a TIA to be determined at an early stage. There can, however, be problems with such guidelines, since local factors may require a TIA even if thresholds indicate such an assessment is unnecessary.

The use of such thresholds should not replace early contact with planning and transport officers at the relevant local authority to establish the need for and scope of the TIA.

4.2.3 Methodology flowchart or checklist

In some cases, a methodology flow chart has been produced as part of the guidelines, and this allows both statutory authorities and developers to understand the scope and requirements of any TIA undertaken. Many countries also have a checklist of issues that should be addressed or considered as part of a TIA.

Both a checklist and methodology flowchart are intended to be the key outputs from this research project. Analysis of those used by other countries reinforces the need for such tools to be adaptable to a wide range of different situations and to continue to be useful rather than a hindrance to transport planning professionals.

4.2.4 Recommended TIA study area limits

Only the American ITE document appears to suggest study area limits. These are provided separately for a selection of land uses and for different scales of development.

While these suggested limits can be a useful guide, it is likely that the study area limits will vary for each TIA. The extent of assessment needed is likely to depend on the location of the development, density of the surrounding roading network, the existing peak period traffic conditions and the development distribution. The proximity and attractiveness of alternative travel mode infrastructure and services may also affect the area of assessment in some cases.

4.2.5 Assessment of committed and consented developments

Most countries require the assessment of committed or consented developments to be included. This ensures that the impact assessment considers the likely base situation rather than simply depending on traffic survey data that may be out of data by the time the development opens. The only major exception to this appears to be in Hong Kong, where such development is taken into account through modelling undertaken by the Transport Department.

The need to incorporate impacts from other developments again reinforces the need to consult with the relevant planning authority at an early stage in the development planning process.

4.2.6 Background traffic growth

Recommended ways of dealing with background traffic growth vary among the guideline documents that have been reviewed. In Hong Kong, this traffic growth is included in traffic model data and so does not need to be considered other than using the model year closest to a development's projected opening date. By comparison in the United Kingdom, the national government provides trip end model data by location as well as national road traffic forecasts that can be used to estimate and apply growth factors to surveyed traffic flow data.

Where general data on traffic growth does not exist, it is possible to use previous traffic surveys to determine growth trends.

4.2.7 Trip generation data

New Zealand, the United States and the United Kingdom have a database of trip generation data for use by transport professionals. Other countries either have published

rates based on similar data, as in the Australian RTA guide, or else developers or transport professionals must obtain their own data through surveys.

The availability of good quality and comprehensive trip generation data is important in preparing TIAs. Proper use of the information is also important and care must be taken to use data from sites similar to those whose impact is being assessed. In this respect, the United Kingdom data in the TRICS database is likely to be the best available, especially since the data includes multi-modal trips. While the New Zealand data has a similar level of detail about each site, the number of sites within the database is limited and this restricts its usefulness.

It is suggested that data in the RTA and ITE guides should be used with caution, since it is hard to ensure that the data is for sites similar to those being assessed. It is, therefore, possible that the calibration of the United Kingdom data to New Zealand experience will provide the best means of accurately measuring the impact of sustainable developments while continuing to grow the existing New Zealand database.

4.2.8 Trip distribution

The methods for distribution of development trips onto the surrounding network can vary significantly and few of the guidelines deal with this subject in detail. This is because in many examples studied for this report, only the site access intersection impacts are considered in detail.

The ITE guidelines suggest a variety of methods including:

- gravity models
- survey data (such as intersection counts, origin-destination, postcode or interviews)
- traffic models.

The English guidelines also cover trip distribution and analysis of local trip effects. As well as the methods proposed in the ITE guidelines, the English document suggests that site catchment analysis and travel time isochrones can be used, and also discusses the use of data from retail impact assessment.

4.2.9 Local trip effects

The guidelines from the United Kingdom and the United States suggest that local trip effects should be considered as part of a TIA. In most cases such considerations generally apply to retail developments. These local impacts include existing trips that are diverted to the site from further afield or which pass by the site. The extent to which such effects need to be considered generally depends on the geographical scope of the impact assessment, since such effects become more important when considering impacts over a wider area and diverted trips generally have a lesser impact on the assessment of site access intersections.

None of the guidelines appear to consider internal site effects that might occur in mixed-use developments or in mixed retail developments.

Again, this is a feature of the United Kingdom TRICS database, since it is possible to identify sites that are part of larger developments and where external trip behaviour might be reduced as a result of combined trips.

4.2.10 Assessment years

The reviewed documents vary in the suggested ways of dealing with assessment years for TIAs. As would be expected, all countries whose guidelines have been reviewed suggest an assessment should be carried out for the year in which the development is planned to open, however, some also require future year assessments to be carried out to take account of background traffic growth.

The periods for which post-opening transport assessment is required appear to vary from 5 to 15 years. This variation depends partly on the statutory framework for development planning, since those countries where planning and highway authorities are able to request developer contributions need to ensure that any proposed development does not adversely affect the local road network's ability to accommodate future traffic flows. In the instances where developer contributions are not directly linked to impacts on the wider network, as in New Zealand, there is less emphasis on considering future traffic needs since the standard developer contributions are assumed to help fund the future development of the transport infrastructure.

4.2.11 Assessment of intersection impacts

The need to assess development impacts at nearby intersections varies across the documents that have been reviewed. In Hong Kong, only the site access intersection generally needs to be assessed, while in the United Kingdom development impacts often need to be assessed over a greater area.

Again, these differences are partly due to differences in planning legislation that, in some cases, allow authorities to request developer contributions to some or all of any off-site infrastructure improvements required to mitigate the impact of developments.

The United Kingdom approach, where developers must mitigate wider effects, can often lead to a piecemeal approach to transport infrastructure development that may not be integrated with the plans of the roading authorities.

Assessment periods are also an important element of impact assessment, since large retail or leisure developments may need additional impact assessment for weekend peak periods when the traffic they generate may be higher than during weekday peak periods.

4.2.12 Developer contributions

In most cases, developers are only expected to fund infrastructure improvements directly related to site access, these are often supplemented by developer levies related to the development's size and scale of impact. These levies are then used by the local authority to fund general capacity improvements.

In the United Kingdom, developers are expected to mitigate any material impacts on the transport infrastructure on a wider scale and these can also include contributions to public transport services or infrastructure.

Developer contributions to fund infrastructure works are being used increasingly in New Zealand although these do not relate to TIA findings. If increased consistency in TIAs can be achieved, a review of the methodology used for calculating developer contributions may be appropriate in order to demonstrate the link between traffic impacts and contributions required, as in the United Kingdom example.

4.2.13 Assessment of safety

Most guidelines for TIAs include a requirement to carry out a review of road safety records around a proposed site. Assessment of the safety of proposed roading improvements and access arrangements is also a feature of the guidelines in some cases.

In New Zealand, access to crash data is relatively easy and analysis of crash data appears to be included in most TIAs.

4.2.14 Internal transport infrastructure

All reviewed guidelines include an assessment of a development site's internal road layout and parking arrangements. In many cases, the relevant planning authority provides parking provision guidance; in some cases this guidance is defined in statutory planning documents. The detail in which internal effects must be assessed generally depends on the level of risk that poor design might have on the external transport network and, therefore, depends on a wide variety of factors.

At the very least, TIAs in New Zealand generally appear to include analysis to show that planned internal infrastructure either meets district plan requirements or would be sufficient for the needs of the development.

4.2.15 Alternative mode impacts

All guidelines require that at least some assessment of access to the development by alternative modes should be carried out. As might be expected, the relative importance of such assessment varies from country to country. The guidelines for Hong Kong require more consideration of public transport issues than those for Australia for example.

An increase in the detail when assessing alternative mode impacts and access is likely to require an increase in the level of multi-modal trip data available. This may require

greater detail when collecting trip generation data in New Zealand, with possible increased emphasis on person trip generation rather than vehicle trip generation.

4.2.16 Travel plans

The Scottish guidelines, widely used in the United Kingdom, place a significant emphasis on travel plans for developments. While consideration of alternative modes has been part of such assessments for many years in the United Kingdom, recent transport legislation reinforced the need to consider all modes, including travel plans, and changed their title from traffic impact assessments to transport assessments.

English policy requires travel plans to be submitted alongside planning applications that are likely to have significant transport implications. The travel plan initially submitted is often allowed to be an outline with a view to firming up the proposals when a specific occupier or end user of the land has been determined. The scope and content of the travel plan will be agreed with the local authority and secured as a condition upon the planning application. Local authorities have started to produce supplementary planning guidance to ensure that the targets and proposals within travel plans are satisfactory.

While most TIAs in New Zealand include an element of consideration of access by alternative travel modes, this is often limited to a brief consideration of walking, cycling and public transport access. If the sustainability of developments in New Zealand is to be maximised, travel plans will need to be a key feature of all TIAs. This may need to be supported by national and local planning policy changes.

4.2.17 Servicing arrangements

Assessment of development servicing is required by some guidelines, although there appears to be no requirement to assess the sustainability of servicing arrangements. For example, means of reducing the number of required servicing trips could be included to minimise the overall development impact.

4.2.18 Construction impacts

A number of the guidelines specifically mention that assessment of construction impacts should be carried out, particularly for large developments or where such impacts might be significant or sensitive.

In some cases construction traffic impacts, or the impacts of temporary traffic management, will form a significant part of development assessments and this will need to be reflected in New Zealand best practice.

4.2.19 Development phasing

Consideration of the phasing of larger developments is covered by some of the more comprehensive guidelines. It is important to assess interim development stages as well as the final situation, especially where the staging of development is accompanied by phasing of new transport infrastructure.

4.3 Summary of transport impact assessment best practice

The table below summarises the key elements of TIAs as suggested, or required by, the guidelines in each country included in this review.

Table 4.1 Comparison of overseas best practice for sustainable development impact assessment.

Content of guideline	Australia	Hong Kong	Singapore	United Kingdom	United States
National[(a)] statutory guidance document	No – New South Wales RTA guide used for most assessments	Yes – Part of Transport Planning and Design Manual	Yes – LTA guide	Yes – Scotland and Northern Ireland Only. English guidance is in draft form.	No
Threshold for scoping TIA	Not in guidelines	Not in guidelines	Yes	Yes	Yes
Methodology guidance	Yes – Checklist	Yes – Checklist	Yes – Checklist	England and Northern Ireland	Yes – both
Suggested study area limits	No	No	No	No	Yes – land use types/development sizes.
Assessment of committed and consented developments	Yes	Yes- check that list of developments is up to date. Assess cumulative impact	Generally in background growth, but nearby developments added	Local developments in addition to background growth	Local developments in addition to background growth
Background traffic growth	Assessment of historical trends	Traffic growth factor from Annual Traffic Census report and historical data	Generally 2-3% per annum	Obtained from national model or traffic flow data	Model data or historical trends from existing data
Trip generation data	Guide includes trip rate data	Surveys of similar developments	Surveys of similar developments	Usually obtained from TRICS database	ITE Trip Generation 7th edition
Multi-modal data available	Some mode split data available	According to survey data	According to survey data	Multi-modal trip data available	Some local data available
Local trip effects (eg pass-by, diverted trips)	No specific mention	No specific mention	No specific mention	Consider pass-by and diverted trips. Intra-site trips for mixed use/retail	Consider pass-by and diverted trips. Intra-site trips for mixed use/retail
Assessment years	No specific mention	Future year data provided by models at 5-year intervals	Opening year and opening year +5. 2015 if significant development	Up to 15 years after opening. 5 years after the application is submitted and 10 years where the development affects the strategic road network (in English draft guidance).	Generally 5 years after opening
Assessment of intersection impacts	Key intersections	Usually only at site access – can extend further for larger	All intersections significantly affected	According to scope	Affected intersections should operate at acceptable LOS

[(a)] In the case of Hong Kong, this applies only to the Hong Kong Special Administrative Region

Content of guideline	Australia	Hong Kong	Singapore	United Kingdom	United States
		developments			
Impact mitigation at intersections by developer	Yes – provided for under Section 94 legislation	Usually site access only – can extend further for larger developments	Usually site access only	Yes – provided for under legislation	Depends on local conditions but see above
Assessment of safety	Yes – site access and parking; traffic calming etc for residential subdivisions	Yes – site access and pedestrian safety	Site access layout and pedestrian facilities	Low level safety audit and assessment of existing road safety.	Works designed to appropriate standards
Internal transport design and operation	Full assessment of standards, potential queuing effects	Parking only – generally sites are too constrained for anything else	Assessment of queuing impacts	Parking, circulation, alternative modes	Parking, circulation, alternative modes
Walking and cycling	Discussion with authority and operators about options	Integration with existing and planned future pedestrian routes	Crossing/bridge to bus stop or MRT station	Full consideration of walking and cycling site access and integration with offsite links	Level of service assessments based on delay at crossings and fully integrated on site facilities
Public transport	Consultation with operators and planning authority	Identify nearby facilities; check for capacity deficiencies; check bus bay provision is adequate	Rail and bus stop distances. Trip rates require adjustment if development not close to PT node	Full consideration of public transport access. Developer contributions to services and infrastructure where appropriate	LOS based on service frequencies; service changes or improvements funded by site developer or building tenants with operator/agency
Travel plans and TDM	No specific mention	No mention	No mention	Part of national policy guidance and in guidelines	TDM measures suggested as means of increasing alternative mode share
Development parking	Assessment of proposed supply against standards and peak demand; assessment of layout	Analysis of parking provision and peak demand; motorcycle parking; entry/exit barrier capacity; layout	Analysis of parking provision and peak demand; entry/exit barrier capacity; layout	Based on local guidelines and parking demand surveys where appropriate. Layout standards available. Maximum parking set in national policy	Design standards and guidelines available. Parking generation document provides guidance on capacity. Queuing and circulation guidelines
Servicing	Servicing design guidelines included in RTA document	To be checked against parking/servicing guidelines	Provision and operation of servicing area	Routes and facilities to be outlined in draft English guidance.	Servicing guidelines included
Construction impacts	Yes	Yes	Separate study may be required	No specific mention	Assessment of implementation schedule and impacts
Development phasing	Yes	No specific mention	No specific mention	Yes and may be linked to developer contributions	

5. Availability of trip generation data

5.1 Background

When undertaking TIAs, availability of trip generation data is a key influence on methodology.

A brief summary of the availability of trip generation data in each country is provided below. A summary of the results of research into the similarities between data in New Zealand and overseas is also included.

5.2 New Zealand

Trip generation and parking data for New Zealand was published in 'Trips and parking related to land use – Vol 1: Report' and 'Trips and parking related to land use – Vol 2: Trip and parking surveys database' (Douglass Consulting Services and Traffic Design Group 2001a and 2001b).

Since publication of those reports, the New Zealand Trips and Parking Database Bureau has been set up to further develop the availability and quality of trip and parking generation data in New Zealand. This is updated with inputs from those in the transportation industry in New Zealand on a regular basis. In addition to the Transfund New Zealand data, transport planning practitioners in New Zealand also use American ITE data and the Australian RTA guide.

5.3 Australia

The RTA guide is commonly used by transport professionals to calculate trip rates but where the available data is not entirely relevant to individual sites, assumptions have to be made. Trip generation data provided in the RTA guide is only expressed in vehicle trips and, therefore, assumptions or additional survey data would be required to calculate trips by other travel modes.

5.4 Hong Kong

Hong Kong has a database of trip rates although it is understood that this is considered to be out of date and, therefore, is not widely used. When undertaking transport impact assessments, consultants usually undertake trip generation counts at similar existing developments. This information is not usually shared among transport professionals.

5.5 Singapore

Singapore does not have a published database of trip generation rates. Instead, development impacts are calculated using data from surveys of similar developments where these exist. If no relevant data exists or is able to be collected, the Land Transport

Authority directs trip generations to be calculated from first principles using other available data.

5.6 United Kingdom

5.6.1 TRICS database

The most commonly used trip generation data in the United Kingdom is obtained from the TRICS database, which was originally created by a consortium of local authorities but is now managed, developed and marketed by JMP Consulting Ltd. The database contains over 2,000 individual sites across the United Kingdom and almost 5,000 survey dates. The data within the system can be manipulated to include or exclude areas of the United Kingdom, such as Scotland or central London, individual sites and individual survey dates. The description of each site is highly detailed, allowing transport professionals to choose sites that closely match development proposals. During the past five years, an increasing amount of multi-modal trip data has been included in the database. For some sites, parking accumulation survey data is also available.

5.6.2 Other data sources

As well as the TRICS database, there are other sources of trip generation data, although these are less comprehensive and less well-used. The GENERATE database is similar to the TRICS database but is maintained on behalf of local authorities in the West Midlands and only has data for this relatively small area.

The TRAVL database is a multi-modal trip rate database comprising 350 surveys of sites in London. This database is specifically for use in London as it accounts for the high level of public transport accessibility compared with the United Kingdom in general.

The Department for Transport also maintains the TEMPRO (Trip End Model Presentation Program), although this is more appropriate for large-scale studies and understanding local traffic growth.

5.7 United States

5.7.1 Trip generation, 7th edition (ITE)

The ITE in the United States has published detailed reports into trip generation and parking generation data. These are updated periodically and the reports are now in their 7th edition.

The ITE trip generation documents generally consist of graphs showing plots of trip generation data for each type of trip generator. In all cases, the data is compared against different criteria such as GFA, number of employees and dwelling units. Data is also compared for different time periods for each trip generator type, including peak hour of trip generator, peak hour of adjacent street traffic. These comparisons are generally undertaken for AM, PM and weekend peak periods. Additional information, such as the number of sites, average size of sites and directional traffic split are also provided.

A significant drawback for the data is that there is no way of knowing how the individual sites in the data compare with sites in New Zealand. Although some statistical information is included, no individual site data is included and the data might include sites where local effects are significantly different.

Despite this inability to choose sites individually, the ITE data is commonly used in New Zealand and in many cases the statistical information provides confidence that there is little variation in trip generation. The volume of data in the ITE documents is also attractive to transport planning professionals in New Zealand.

5.7.2 Trip generation handbook (ITE)

The *Trip generation handbook* includes suggestions on how to deal with trip generation at multi-use sites where trip chaining and intra-site trips might occur. It also provides suggested reduction factors for combinations of land uses on one site. For example a reduction of around 20% in office trips is recommended for developments where office and retail co-exist, while for residential and retail sites a rate of over 50% is suggested for the weekday PM peak period.

While the trip generation data in the main documents is generally limited to private vehicle trips, the handbook also includes an appendix which suggests ways of assessing the impact of travel demand management and travel plan measures on vehicle trip rates. The appendix highlights the lack of accurate data available in the United States for such purposes but suggests possible trip rate reductions for a variety of development situations based on data from a study undertaken in Oregon entitled *Accessibility measure and transportation impact factor study* (JHK and Associates et al. 1996).

5.8 Comparison of New Zealand and overseas data sources

5.8.1 Background

In 2005, the New Zealand Trips and Parking Database Bureau commissioned two reports to compare New Zealand trip generation data with the commonly used overseas data. These were:

- *NZTPDB, UK TRICS, US ITE database comparison of variables* (NZTPDB 2005a)
- *UK and NZ trip rate correlation* (NZTPDB 2005b)

5.8.2 NZTPDB, UK TRICS, US ITE database comparison of variables

This report finds that the three data sources are generally similar, although the United Kingdom and ITE data is far more comprehensive than that of New Zealand.

The report suggests that 'site area' should be added to the data collected in New Zealand, as this is a commonly used and useful comparator in the other databases. It also notes

that the TRICS database in the United Kingdom is now a multi-modal database and allows person trips to be calculated.

The land use terminology in all three databases is found to be generally similar.

5.8.3 UK and NZ trip rate correlation research report

Following on from the report comparing the three trip rate databases in the United Kingdom, United States and New Zealand, the New Zealand Trips and Parking Database Bureau published a report that examined the correlation between the available New Zealand data and the data available within the TRICS database.

The comparison of data was undertaken for a selection of land uses that were directly comparable. Data for each land use from the two databases was compared and analysed statistically. This analysis shows that while the actual trip rates for each land use are different for the two countries, as might be expected, there are definite correlations between the data.

The report suggests multiplication factors could be used to convert United Kingdom trip rates from the TRICS database to the trip rates observed in New Zealand.

It should be noted, however, that the research appears not to look at individual sites in the TRICS database and compare these directly with sites in New Zealand. It is possible that a more detailed comparison might have shown even greater correlation between the data from the two countries. The research is also limited by the lack of survey sites in New Zealand compared with the number of sites in the TRICS database.

The report recommends further research should be undertaken including a more refined filtering methodology for comparing data from the two databases. Further research is also recommended to investigate correlation between parking data in the two surveys. Finally, new surveys are recommended on a selective basis so that direct correlations between data in the two databases can be undertaken. Any such work could lead to significant benefits for those preparing TIAs for sustainable development in New Zealand, especially if multi-modal data from the TRICS database can be used.

6. Conclusions and recommendations

6.1 Current New Zealand practice

The research undertaken for this report suggests that the absence of national guidelines for TIA may be limiting the opportunities for sustainable development.

Where guidelines do exist, they do not appear to sufficiently promote the need to consider the sustainability of developments and this may have long-term disbenefits.

6.2 Overseas practice

The review of TIA guidelines in other countries suggests that in some countries, such as Hong Kong and to a lesser extent the United Kingdom, sustainable development is a key aspect of the planning process.

While the methods for preparing TIAs overseas appear not to differ significantly from those in New Zealand, this report suggests that opportunities to improve the assessment of the sustainability of developments are currently being lost.

The integration of travel plans and access by sustainable travel modes in development planning, as promoted quite heavily in the English and Scottish guidelines, are a key element in the transport impact guidelines that were developed as part of this research.

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Appendix A. List of internet links

New Zealand

National policy documents

Getting there – By foot, by cycle
www.transport.govt.nz/getting-there/

Land Transport Management Act 2003
www.legislation.govt.nz/libraries/contents/om_isapi.dll?clientID=260015&hitsperheading=on&infobase=pal_statutes.nfo&record={EFD2341F}&softpage=DOC

New Zealand Transport Strategy
www.beehive.govt.nz/nzts/

Resource Management Act 1991
www.legislation.govt.nz/libraries/contents/om_isapi.dll?clientID=260028&hitsperheading=on&infobase=pal_statutes.nfo&record={F82ABA07}&softpage=DOC

Transit New Zealand

Planning Policy Manual
www.transit.govt.nz/content_files/technical/ManualSection286_FileName.pdf

Planning Policy Manual Supplement
www.transit.govt.nz/content_files/technical/ManualSection130_FileName.pdf

Tauranga City Council

Tauranga District Plan
http://council.tauranga.govt.nz/cm/old/filelibrary/districtplan/Chapter%2012.pdf

Tauranga District Plan Traffic Impact Assessment Checklist
http://council.tauranga.govt.nz/cm/forms/land-use-part-b2-checklist.pdf

Wellington City Council

Wellington City District Plan, Chapter 13
www.wellington.govt.nz/plans/district/volume1/pdfs/v1chap13.pdf

New Zealand Trips and Parking Database Bureau

To read documents, membership of the Bureau is required. The website link is:
www.nztpdb.org.nz/index.php?id=1001

Australia

Roads and Traffic Authority

Guide to Traffic Generating Developments Version 2.2 (Purchase required)
www.shop.nsw.gov.au//pubdetails.jsp?publication=5838

Hong Kong

Planning Department, Government of the Hong Kong Special Administrative Region

Hong Kong Planning Standards and Guidelines. Chapter 8 Internal Transport Facilities
www.pland.gov.hk/tech_doc/hkpsg/english/ch8/ch8_text.htm

Singapore

Land Transport Authority

Guidelines for Preparation of Traffic Impact Assessment Reports
www.redas.com/einformation/LTA_2003011701.pdf

United Kingdom

Department for Communities and Local Government[a]

Planning Policy Guidance 13: Transport
www.odpm.gov.uk/index.asp?id=1144015

Draft Guidance on Transport Assessment
www.dft.gov.uk/stellent/groups/dft_roads/documents/page/dft_roads_612257.pdf

Scottish Executive

Transport Assessment and Implementation: A Guide
www.scotland.gov.uk/Resource/Doc/57346/0016796.pdf

Transport for London

Transport assessment best practice
www.tfl.gov.uk/tfl/pdfdocs/TAGuidance_LQ.pdf

United States

Institute of Transportation Engineers

All ITE publications must be purchased from their bookstore at:
www.ite.org/bookstore/index.asp

[a] Previously Department of Environment Transport and the Regions

Wisconsin Land Use Research Program, University of Wisconsin

Community Guide to Development Impact Analysis

www.lic.wisc.edu/shapingdane/facilitation/all_resources/impacts/CommDev.pdf

Appendix B. Review of Hong Kong sustainable development planning practice

SUMMARY OF THE DEVELOPMENT PLANNING REGIME AND TRANSPORT ASSESSMENT METHODOLOGY IN HONG KONG

John Patient

1. DEVELOPMENT PLANNING

1.1 General Overview of Hong Kong

Hong Kong is a Special Administrative Region (SAR) of China and as such has autonomous powers for 50 years since it was handed back by the British in 1997 based on the 'Basic Law' which was co-written by China and the UK prior to handover.

It is therefore a 'unitary authority' to use UK terminology and makes its own laws known as 'ordinances'. It does not need to refer to the mainland Chinese authorities for any issues connected with development planning except insofar as these might have an impact on neighbouring provinces and regions. In many regards Hong Kong operates as a city state similar to Singapore.

The head of the Hong Kong SAR Government is the Chief Executive – a position broadly similar to that of the former Governor or to that of a mayor of a major US or Chinese city.

Hong Kong is part of the Pearl River Delta (PRD) region of China. Items requiring a degree of regional planning agreement with its neighbours and approval from Beijing would be, for example: major ports and airports and major transportation links across the boundary between Hong Kong and the remainder of the PRD. There are no known instances where housing or other similar development has been subject to regional planning consultations.

Due to the compactness of Hong Kong and its historical association with the UK, the highway standards in Hong Kong are generally based on old UK standards rather than the more generous standards found in the rest of China. Additionally Hong Kong drives on the left hand side of the road whereas China drives on the right and there are currently significant time and cost penalties for driving across the boundary between Hong Kong and the remainder of the PRD. Customs, immigration and quarantine (CIQ) checks are imposed on all border crossings mostly both on arrival and departure (even though these may only be separated by 100m) although there are moves to provide a single CIQ check to cover both.

1.2 Agencies with a Role in Development Planning

Apart from the major cross boundary transportation infrastructures mentioned above, Hong Kong is its own authority when it comes to development planning. It acts both as the state and local authority. There are several agencies involved.

The Town Planning Board

The primary agency for the approval of development proposals is the Town Planning Board which was set up as follows:

The Town Planning Board (the Board) is a statutory body established under section 2 of the Town Planning Ordinance (the Ordinance) with a view to promoting the health, safety, convenience and general welfare of the community through the systematic preparation of plans for the layout of such areas of Hong Kong as the Chief Executive may direct, as well as the types of buildings suitable for erection therein.

Under the Town Planning (Amendment) (No.2) Ordinance which came into operation in November 1991, the Town Planning Appeal Board has also been set up to hear all the appeals against the Board's decisions to reject the planning applications upon review.

Composition, powers and functions of the Board

For the better discharge of the Board's functions, two Planning Committees, namely, the Metro Planning Committee and the Rural and New Town Planning Committee were set up to facilitate the preparation of statutory plans and consideration of planning applications. Moreover, under the Town Planning (Amendment) Ordinance 1998, the Board is empowered to appoint committees, namely the Objection Hearing Committee, from among its Members to hear objections.

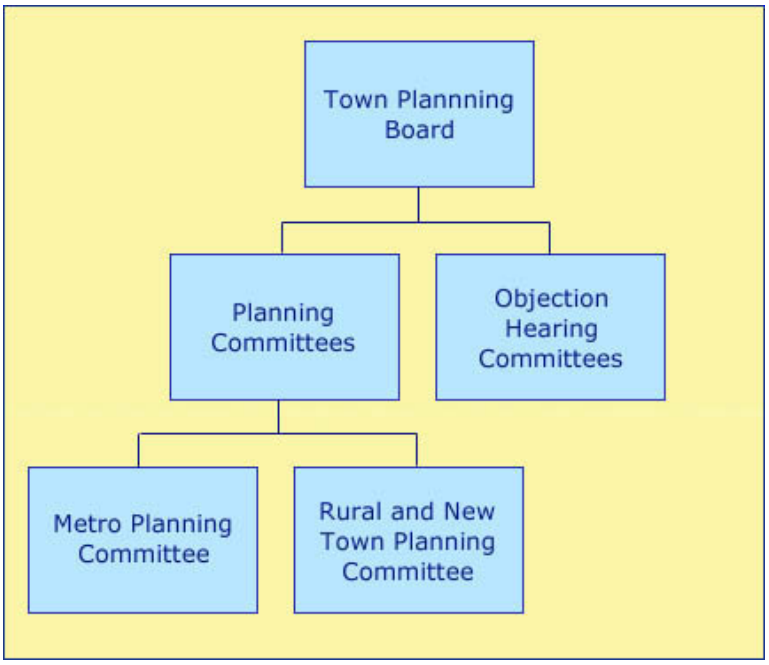

Figure B1. Town Planning Board

The Board's main functions are laid down in section 3 of the Ordinance, i.e. to promote the health, safety, convenience and general welfare of the community through the systematic preparation of plans (that is, **Outline Zoning Plans (OZPs)** and **Development Permission Area (DPA) Plans**) for the layout of such areas of Hong Kong as the Chief Executive may direct, as well as the types of buildings suitable for erection therein. The Board considers objections to these plans under section 6 of the Ordinance; and submits draft plans together with any unwithdrawn objections to the Chief Executive in Council under section 8 of the Ordinance for a final decision. It also considers applications and conducts reviews of applications under **sections 16 and 17** of the Ordinance respectively.

In addition, under section 25 of the Urban Renewal Authority (URA) Ordinance, Cap. 563 of the Laws of Hong Kong, the URA may submit any plan prepared under subsection (3)(a) of the Ordinance to the Board for consideration. Upon the submission of a plan so prepared by the URA, the Board may (a) deem the plan as being suitable for publication; (b) deem the plan as being suitable for publication subject to such amendments as the Board shall specify; or (c) refuse to deem the plan as being suitable for publication.

The Planning Department

Headed by the Director of Planning, the Planning Department is the executive arm of the Board, which is responsible for formulating, monitoring and reviewing town plans, planning policies and associated programs for the physical development of Hong Kong. It deals with all types of planning at the territorial, sub-regional and district levels and provides services to the Board.

The Environmental Protection Department

The Environmental Protection Department (EPD) was created in 1986 to co-ordinate and carry out pollution prevention and control activities. Major developments require an environmental assessment. On 1 April 2005 the environmental policy-making function carried out by the Environment, Transport and Works Bureau was subsumed within the EPD and the head of the Environment Branch of the policy bureau took up the dual role of Permanent Secretary for the Environment and Director of Environmental Protection. This significant development has placed the EPD in the position of both determining and implementing environmental policy.

The Transport Department

The Transport Department must be consulted on all major development proposals and would also comment on run-in locations and other factors affected by minor redevelopments.

District Councils

Hong Kong has a number of district councils which would be consulted on major development proposals prior to general public consultation.

Others

Other departments/agencies requiring consultation are:

- Highways Department
- Water Supplies Department
- Drainage Services Department
- Utility Companies

2. PROCEDURE FOLLOWED FOR DEVELOPMENT APPLICATIONS

2.1 General Procedure

Hong Kong is covered by Outline Zoning Plans (OZPs) which set out the type and intensity of development in each of the planning areas of Hong Kong. The preparation of the OZPs usually involves area wide traffic, environmental, water supply and drainage assessments undertaken by the Government as part of the OZP preparation process.

Any developer wishing either to change the OZP or who is about to start a development in accordance with the OZP is required to submit a planning application under either section 12A of the ordinance (changes) or section 16 (proposed development). The submission is made to the secretary of the Town Planning Board who will then authorise the Planning Department to act in dealing with the application.

Would be applicants are urged to consult the Planning Department prior to the submission of an application.

Additionally there is a requirement to submit detailed plans to the Buildings Department for approval prior to construction and these would be checked to ensure that the general proposals in the TIA had been adhered to.

2.2 Stakeholder Participation

There are 2 types of stakeholder; the Government Departments and the public. All relevant Government Departments are circulated with the proposals at the time of application and all documents within the application are available for public perusal until such time as the application is considered by the Town Planning Board. It should be noted that the Government operates a web site “Statutory Planning Portal” (http://www.ozp.tpb.gov.hk/default.aspx) through which all planning applications can be viewed. The public may object to the application during this period and the Government Departments will also give comments.

2.3 Objections and Appeals Process

Appeals and objections are firstly considered by the Appeals Board and the Objections Committee of the Town Planning Board. It is possible in theory for appeals and objections to be heard at the Court of Final Appeal provided the arguments revolve around matters of law.

3. DEFINING THE SCOPE OF TRAFFIC IMPACT ASSESSMENTS

All potential developers are urged to consult the Planning Department prior to submitting an application. During this process they will also be put into contact with appropriate division of the Transport Department. The developers' consultants may then discuss the scope of the TIA which accompanies the application.

In most cases the developers' consultants will avail themselves of the opportunity of discussing the scope of the TIA with the relevant Transport Department division and in particular the area of interest (AOI) of the traffic assessments.

4. TIME HORIZONS

The Transport Department of Hong Kong owns and updates regularly, what are known as Base District Traffic Models (BDTMS). These models, which use the SATURN suite of programs and incorporate both strategic and local traffic forecasts, have been developed for various planning horizons such as base year, 2011, 2016 and 2021. They include all the currently proposed population, employment and land use changes. Virtually all roads in Hong Kong are covered by the BDTMs.

Thus the methodology implicitly includes background traffic growth.

Depending on the size of the redevelopment, the developers' consultants would most probably use the BDTM as a basis for the traffic forecasts arising from the development and carry out local calibration with up to date traffic counts within the AOI to produce a local area traffic model cut out of the BDTM.

There is no fixed time horizon for the TIA, however the use of the BDTMs means that generally it is possible to undertake an assessment of traffic impacts 5-10 years after the opening of the development. The requirement is preferably a design year 5 years after opening. It would normally be easier to work to the BDTM dates than to interpolate between BDTMs. Pedestrian impacts would generally be year of opening.

For small developments, year of opening would normally be acceptable for the traffic assessments and growth factors from the base year traffic counts can be used if the AOI is sufficiently small that use of the BDTM is not worthwhile.

It should be noted that, except for very large developments, the Transport Department is only seeking to identify potential problems in the network. There is no requirement for the developer to pay for improvements except for the very local access effects.

The time horizon can be extended significantly if road traffic noise calculations are required under the Environmental Protection legislation. In this case traffic forecasts 20 years after opening are required in order to calculate the traffic noise. This is usually done by application of growth factors (with capacity limitations) beyond the last year of the BDTM forecast.

5. GUIDANCE ON WRITING TRAFFIC IMPACT ASSESSMENTS

The requirements for traffic impact assessments are in two parts, these being the scope of the assessment and the standards to be used.

The scope is given in Transport Department Circular TD14/97 however this was written for a specific purpose and is not readily available. The Government's TIA checklist at Appendix 1 is a more relevant document and was extracted form the Transport Department's Transport Planning and Design Manual (TPDM).

The standards for parking, loading and unloading, road widths etc are given in the Hong Kong Planning Standards and Guidelines (HKPSG) which is cross referenced to the TPDM. The relevant chapter is Chapter 8 – Internal Transport Facilities which can be viewed at the following web site:
www.pland.gov.hk/tech_doc/hkpsg/english/ch8/ch8_text.htm

6. DESIGN STANDARDS AND PARKING PROVISION

6.1 Design Standards

Design standards such as junctions, carriageway layouts, footway widths, parking stall layouts etc are contained in the HKPSG and/or TPDM and cross referenced to the TPDM. For adoptable roads reference would need to be made to the Highways Department standards for construction thicknesses, drainage etc.

There is also a set of architectural design standards which many architects use for the design of car parks and access ramps. These are generally lower than those contained in the TPDM.

6.2 Facilities Provision

The quantity of facilities such as parking, loading and loading, drop off etc is also defined in the HKPSG depending on the proposed land use. In terms of parking, the Government periodically carries out a parking demand study to determine and review the level of parking provision (for private vehicles, goods vehicles, cycles and motor cycles) throughout the SAR in order to ensure that the future parking demand is likely to be met both by land use type, at a district level and globally.

A summary of the latest parking demand survey can be found at the following website:

www.td.gov.hk/publications_and_press_releases/publications/free_publications/the_second_parking_demand_study_final_report_/index.htm

The level of provision is generally given as a maximum and minimum per unit of development. The units vary but may be per flat, per 100 m^2 gfa (gross floor area) etc depending on the land use type. Deviation from the standards would need to be justified by survey as outlined below.

6.3 Flexibility

In general Hong Kong design standards are at a minimum to start with and there is very little flexibility to reduce these. Adopting higher design standards can be done but has significant cost implications due to the price of land in the SAR.

Where the level of provision is proposed to be lower than that set by HKPSG then the developer's consultants would be required to make surveys of similar sites in Hong Kong to prove the case. For example, if the proposed level of residential parking provision is lower than standard then the case would have to be made by surveying the take up of parking spaces at similar residential properties elsewhere. There are many developments in Hong Kong which consist of multiple land uses such as residential, retail and office where economy of scale and mixed use of parking can reduce the overall number of spaces needed. Again it would be up to the developer to argue the case based on surveys.

The high population density of Hong Kong and intensive land use makes the use of overseas data generally of little relevance to the SAR.

7. CUMULATIVE EFFECTS OF DEVELOPMENTS

The existence of the BDTMs covering the whole of Hong Kong means that the effects of adjacent developments are covered in the background traffic forecasts and do not therefore need to be further considered in theory.

It should also be noted that the production of OZPs is also accompanied by a TIA so that the district wide traffic impacts of the OZP levels of development and land uses have already been identified to some extent and the main issue is the local traffic impacts of individual developments.

In practice the approach would be to identify the traffic zone in which the development is proposed, deduct that portion of the traffic arising from the proposed development which is already included in the model and then substitute the local traffic generations calculated to arise from the new development. The reason for this is that the traffic generations from the zone already in the model would be calculated on a strategic basis from the population and employment data changes forecast for the zone and these strategic level generations would be lower than locally observed traffic flows entering and leaving a similar site.

If there were several major adjacent developments proposed in the same traffic zone then it is probable (if they were all likely to come on stream at about the same time) that the Transport Department would require an estimation to be made of the local traffic flows from these zones to be made as well and appropriate substitutions made. However it needs to be borne in mind that the Transport Department is seeking to identify possible future public works requirements rather than seeking to get the developer to pay for improvements other than at the immediate access to the site.

Current building applications are kept on a register held by the Lands Department so it is relatively easy for the Transport Department to keep track of what is going on the any given area. These are also listed periodically when the BDTMs are updated.

8. DETERMINING THE SCOPE OF THE TIA

8.1 Inclusion of Pedestrians, Public Transport , Cyclists and Construction Traffic

The scope of the TIA includes inter alia public transport, pedestrian and cyclist considerations as set out in the checklist in Appendix 1. The extent to which any of these needs to be considered depends very much on the nature and location of the site.

For example a major new office block in the CBD would require the impacts of pedestrians generated by the site on the local footways to be assessed and this assessment may include routings to local public transport such as bus stops and the metro entrances.

However it is unlikely that the additional patronage forecasts for public transport would be an issue or a consideration since it would be deemed that the public transport companies would expand capacity to suit. However the opportunity may be taken to ask the developer to provide a bus lay-by if the existing bus stop locations make this suitable. The developer would certainly be requested to set the building line back at ground level if the pedestrian level of service needed to be improved on any or all of the adjacent footways.

For major developments (say of the order of 5,000 or more population) consideration would be given (by the Transport Department) to the need to provide bus service terminal points, taxi ranks etc depending on the location of the development and the extent to which the site is served by pass by bus services and the metro.

Additionally, particularly in urban areas, developers may be required to provide for future footbridge connections as part of the elevated walkway system. Normally the last developer also pays for the construction of the footbridge. This is not a particularly onerous requirements since developers can gain considerable benefits from the opening up of second level retail opportunities.

Facilities for cyclists would be requested in some rural areas but would be unlikely to be requested in the metro area.

For major developments the impact of construction traffic on the road network would also be required to be assessed together with any temporary traffic management measures (TTMs) during construction.

8.2 Area of Influence

Determination of the AOI is a bone of contention in Hong Kong and there are no strict rules. The author has conducted many TIAs for the Transport Department itself as well as for private developers and there is no fixed guidance. Attempts have been made to fix the AOI as links where the development traffic forms 5% or more of the link flow or an absolute value of say 50 pcus or more but have met with no success.

Basically the AOI is determined by the local district traffic engineer of the Transport Department and extends to all the links and junctions which he or she feels may be impacted by the development. Again it should be noted that the developer is not be asked to pay for improvements and it is mainly a matter of workload for the developer's traffic consultants.

8.3 Software

There is no requirement to use any particular software except that, since the BDTMs are based on the SATURN suite of programs then it is easier to use this for modelling so that the networks and other parameters do not have to be recoded.

In general many consultants use spreadsheets based on the TPDM formulae for traffic signal reserve capacity calculations and ARCADY for roundabouts. PICADY is commonly used for priority junction assessments.

9. POWERS OF THE LOCAL AUTHORITY

9.1 Rejection of Developments due to Traffic Impacts

It is unlikely that a development would be rejected solely on the grounds of the traffic impact since the development level for the site would also have been tested in the OZP preparation stage. However it is possible that, if the developer proposes an intensity of development far greater than that originally envisaged in the OZP or of a completely different and more onerous land use then the traffic impacts may be cited as part of the reason for rejection.

9.2 Request for Contributions to Transport Improvements

In general developers are not required to contribute cash towards transport improvements. They however may be required to provide space for bus termini or footway widening. They may also be required to provide set backs for future widening or landings for footbridges. However these may often be offset by additional allowances for gfa.

The power to request developers to provide transport facilities is frequently exercised although in many cases of new developments it should be noted that the requirements are often included in the OZPs so the developers are generally aware of them when bidding for the site.

Whilst developers can appeal against the requirements, any disputes are mainly settled by negotiation.

10. CALCULATION OF TRIP GENERATIONS AND PARKING DATA

10.1 Trip Generation

The Transport Department does maintain a database of trip generation rates for different land uses in Hong Kong (Data Record 439) but this is inadequate and out of date. Requests have recently been received by traffic consultants to provide the Transport Department with up to date information. There is no data sharing agreement in Hong Kong similar to the UK TRICS database.

Most consultants undertake fresh trip generation counts (pedestrian and vehicular) for similar land use types when they are commissioned to do a TIA and, whilst this information is published in summary in the TIA, it is not publicly available or shared.

Vehicular trip generation rates from other countries are not applicable to Hong Kong due to mode split, however daily person trips are similar to other developed economies. Within Hong Kong, vehicular trip generations vary significantly depending on proximity to bus routes and the metro as well as household income and car ownership.

10.2 Parking

Parking requirements are set out in HKPSG and can only be varied after detailed surveys of similar land uses in Hong Kong.

Where new land use types are encountered in Hong Kong for the first time then a pragmatic approach is adopted. The author has worked on two of these, the first being the Science Park Development which will eventually employ 23,000 people and the second being the 70,000 m^2 International Exposition Centre at Hong Kong's international airport. In both cases estimates of the most likely parking demand were made from fundamental analysis and a review of overseas provisions. However contingency arrangements were also made so that the parking provisions could be adjusted up or down in the light of experience once the facilities began operation.

11. KEY INNOVATIONS

The key innovation in Hong Kong is the production of the BDTMs covering the whole of the territory which provide a sound basis for undertaking TIAs and have removed all arguments about traffic forecasts. They were introduced in the late 1990's and are updated regularly.

The standard checklist at Appendix 1 is useful for developers to understand what is required in a TIA.

12. HOW WELL DOES THE SYSTEM WORK

There are several points of view as to how well the system works. From the Government's point of view it probably works quite well, the Government gets a lot of information about the local traffic effects and possible solutions as well as being able to check that the traffic and transportation aspects of the development comply with standards.

From the consultants point of view there appears to be a wide range of variability of analysis required depending on the district traffic engineer one is dealing with. In one recent case the author had to refer to the line manager to get a decision because the engineer was incapable of reaching a conclusion and made more and more unreasonable demands for detail. It is also notable that the quality of analysis produced by some consultants is less than that of others – however it is not possible to judge which the correct level is.

The existence of the BDTMs, the HKPSG and the TPDM make the traffic consultant's job more straightforward and supports him in dealing with developers and architects who, because of space limitations have a tendency to minimise the space available for transportation requirements.

APPENDIX 1: HONG KONG GOVERNMENT TIA CHECKLIST

TIA Report

4. In general the following items should be covered by a TIA submission:
   (a) Study Area
   (b) The Site
   (c) 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:

Study Aspects

Items to be checked:

(a) Study Area

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

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

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

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

Check the peak hour flows in the TIA submission against

(i) the available traffic counts by TE Division,

(ii) the data provided by TTSD upon request for key stations, and

(iii) the data which are already listed in the Annual Traffic Census report,

(iv) 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

Check the methodology and the suitability of sites for carrying out traffic counts.

(d) Proposed Development

Parking provision

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

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

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

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.at a convenient and safely accessible location.

Pedestrian facilities

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

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

Check whether it is acceptable to adopt the trip generation rate from Data Record No.439 or an updated version.

(e) Future Network

Planned infrastructure/major developments

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

TIA report should provide a set of traffic forecasts on:

(i) traffic growth within the study area (if the growth factor method is adopted to estimate the future traffic based on the existing traffic flows);

(ii) traffic generated by the existing and other proposed major developments/infrastructures within the study area;

(iii) traffic generated from the development.

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.

(g) Traffic Analysis

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.

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.

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:

- 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)

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 – Traffic generation is estimated by TTSD¡¯s Data Record No. 439 or an updated version by TPD (for relatively simple cases)

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 development referred to in the Data Record. This is to check whether the site has similar characteristics with the corresponding site adopted in the Record for establishing the standard trip rates. If the trip rate in the Data Record 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

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.

(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

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

Implementation of improvement measures is a complicated issue unless the measure is simple and straightforward.

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

Check any traffic implication during construction of the development and improvement schemes, and request traffic management schemes if necessary

Relevant Documents

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