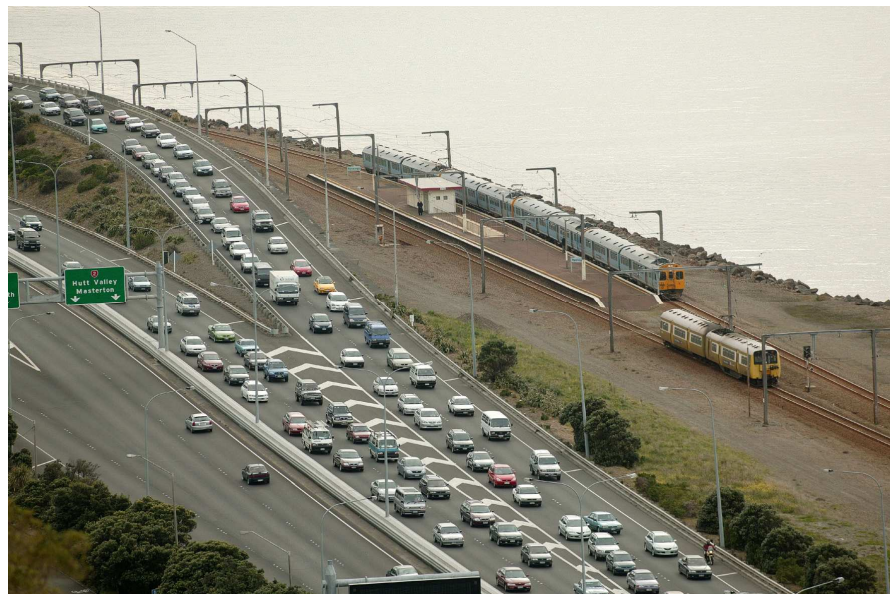# INTEGRATED LAND TRANSPORT AND LAND USE PLANNING OPPORTUNITIES FOR REDUCING CO$_2$ EMISSIONS IN URBAN NEW ZEALAND:

A CASE STUDY OF THE WELLINGTON REGION

Leonie Waayer

Thesis

ENVIRONMENTAL STUDIES 593

2008

Greater Wellington Regional Council

A 90 point thesis submitted to Victoria University of Wellington,
as partial fulfilment for the degree of Master of Environmental Studies

School of Geography, Environment and Earth Sciences
Victoria University of Wellington
June 2008

INTEGRATED LAND TRANSPORT AND LAND USE PLANNING OPPORTUNITIES FOR REDUCING CO_2 EMISSIONS IN URBAN NEW ZEALAND:

A CASE STUDY OF THE WELLINGTON REGION

Leonie Waayer

ABSTRACT

The New Zealand Government has the desire to be the first carbon neutral country in the world. Climate change policy has identified transport as a key contributor resulting in the goal to halve per capita domestic greenhouse gas emissions by 2040. In order to reduce CO_2 emissions whilst achieving core land transport outcomes, this study focuses on the Wellington region and explores the available frameworks for integrated planning in land transport and transport-related land use. Legislation and regional policy is reviewed and international best practice in integrated planning is identified. Perspectives from practitioners in land transport and land use planning in New Zealand are given. Integrated planning in urban transport and design is well established in many developed countries but is not prevalent in New Zealand. Recent and proposed legislation and policy in land transport management and climate change aim to rectify this but the policy and planning landscape remains complex. Transit oriented development aligns well with regional policy outcomes and could contribute to CO_2 emissions reductions in the long term. A reprioritisation of land transport investment away from fossil fuel dependency to support low carbon transport via active travel modes and freight movement by rail and sea is recommended.

ACKNOWLEDGEMENTS

CONTENTS

List of Figures

List of Tables

List of Abbreviations

ARC   Auckland Regional Council

ARLTS   Auckland Regional Land Transport Strategy

ARTA   Auckland Regional Transport Authority

ASF   Auckland Sustainability Framework

ATSAP   Auckland Transport Strategic Alignment Project

BAU   Business As Usual

BCR   Benefit-Cost Ratio

CBD   Central Business District

CCP – NZ   Communities for Climate Protection – New Zealand

CO   Carbon monoxide

CO_2 Carbon dioxide

EECA   Energy Efficiency and Conservation Authority

FAR   Financial Assistance Rate

g/km   Grams per kilometre

GDP   Gross Domestic Product

GHG   Greenhouse Gas

HOV   High Occupancy Vehicles

ICLEI   International Council for Local Environmental Initiatives

ITM   Individualised Travel Marketing

Kph   Kilometres per hour

l/100km   Litres per 100 kilometres

LTA   Land Transport Act 1998

LTCCP   Long Term Council Community Plan

LTMA   Land Transport Management Act 2003

NGO   Non-Government Organisation

NZ ETS	New Zealand Emissions Trading Scheme
PJ	Peta Joules
PT	Public Transport
RLTS	Regional Land Transport Strategy
RMA	Resource Management Act 1991
RPS	Regional Policy Statement
SOV	Single Occupancy Vehicles
SPARC	Sport & Recreation New Zealand
SUV	Sports Utility Vehicle
TDM	Travel Demand Management
TOD	Transit Oriented Development
UNFCCC	United Nations Framework Convention on Climate Change
VKT	Vehicle Kilometres Travelled
WRLTS	Wellington Regional Land Transport Strategy
WRS	Wellington Regional Strategy

Author's Note

During the writing of this thesis, the status of some draft policy documents and pending legislation has changed.

The second reading of the Land Transport Management Amendment Bill to the Transport & Industrial Relations Select Committee occurred on 20 May 2008. Changes to the Bill at this time have not been included in this research.

Announcements regarding changes to the New Zealand Emissions Trading Scheme were made by the Government in May 2008. Of note is an extension of the date for inclusion of land transport into the Scheme from 2009 to 2011.

The Government has also announced an agreement with Toll New Zealand to repurchase the rail and ferry network and operations. The details of this transaction are under negotiation.

1. Introduction

"Because of our deeper understanding of the need to build a sustainable nation, we have established an ambition to be the first carbon neutral country in the world. To achieve this, we must put sustainability at the centre of all our thinking and decision-making. The government's recent in-principle decision to halve per capita domestic transport greenhouse gas emissions by 2040 demonstrates this commitment to creating a sustainable nation."

(Ministry of Transport, 2007b).

The transport sector accounts for approximately 45% of New Zealand's carbon dioxide (CO_2) emissions (Greater Wellington Regional Council, 2008a). About 86% of the country's oil consumption is used within the transport sector (Ministry of Transport, 2007b) and transport is New Zealand's single largest energy consumer. Transport sector energy use continues to grow and accounted for 44% of all consumer energy use within New Zealand in 2006 (Ministry of Economic Development, 2007).

The International Energy Agency (IEA) expects the global demand for oil to grow by 41% by 2030 (Ministry of Transport, 2007b). The resulting greenhouse gas (GHG) emissions from transportation-related energy use threaten the global environment, public health, economic growth and overall quality of life (Burwell & Sperling, 2007). Transportation activity is growing rapidly in both the developed and developing regions around the world resulting in traffic congestion, greater fuel consumption and a general degradation of the environment by pollution, especially in urban settings (Tyndall Centre for Climate Change Research, 2005).

Transportation accounts for over 20% of global GHG emissions and is the fastest growing source (Burwell & Sperling, 2007). A significant proportion of CO_2 emissions are associated with the production and transportation of goods and services as well as people. Internationally between 1990 and 1996, the volume of goods transported by road increased by 50% (Tyndall Centre for Climate Change Research, 2005).

The concentration of CO_2 in the atmosphere has increased by over 30% during the last 250 years, mainly due to human activity (Socolow, Hotinski, Greenblatt, & Pacala, 2004). If significant action on

global carbon is delayed and the world continues on its currently predicted path for the next 50 years, many models have shown that CO_2 emissions from human activities approximately double by 2054 (Pacala & Socolow, 2004). Maintaining global emissions at their current level will require enormous effort involving the implementation of low and no-carbon energy strategies across all sectors of the economy and by countries at all stages of economic development (Socolow et al., 2004).

Landmark collaboration at the international level was achieved when delegates from 150 countries met in Kyoto in 1997 to agree the Protocol on Climate Change. New Zealand ratified the Kyoto Protocol in 2002 and it came into force in February 2005. New Zealand's target is to reduce GHG emissions to the 1990 level or take responsibility for excess emissions (Greater Wellington Regional Council, 2006a).

From a global perspective New Zealand's GHG emissions are small at 0.2-0.3% of global emissions. However, New Zealand has the 12th highest per capita emissions in the developed world. Despite the small population, primary export industries (the main drivers of economic growth) are emissions intensive as is a heavy reliance on private transport (Ministry for the Environment and The Treasury, 2007).

By 2020, New Zealand's gross GHG emissions are estimated to be about 48% above 1990 levels. New Zealand's Kyoto Protocol obligation in the shorter term is to reduce emissions to 1990 levels or take responsibility for emissions over these levels during the first commitment period (from 2008 to 2012). Over this period a "most likely" emissions scenario forecasts a net deficit of approximately 45 million units[1] taking into account policies in place as of April 2007 (Ministry for the Environment, 2007, in Ministry for the Environment and The Treasury, 2007).

To enable the alignment of opportunities to reduce CO_2 emissions, climate change mitigation policy in the urban transport sector calls for a better integration of land transport and urban design planning.

---

[1] One emission unit equals one metric tonne of CO_2 equivalent emissions under the Kyoto Protocol (Ministry for the Environment and The Treasury, 2007).

Transit Oriented Development (TOD) is a planning concept primarily designed to optimise the use of high quality public transport and provide a dense, mixed use of land. It also seems capable of delivering the cross sector integration sought in climate change mitigation policy. This study explores the degree to which TOD could be employed in urban transport planning for the reduction of CO_2 emissions in the Wellington region.

1.1 Purpose

The purpose of this research is to provide policy relevant information on options to reduce CO_2 emissions from land transport in a regional New Zealand setting. This information is to be presented in a planning context with land use decisions integral to the problem. The research purposes to inform policy across both the land use and land transport planning sectors with the intention of creating more integration between the two sectors.

1.2 Scope

This research focuses on the integration of policy for land use and land transport in New Zealand with regard to addressing the need to reduce CO_2 emissions. The role of regional policy is the basis of this research; however, direction from the national level is paramount in developing policy at any local government level. For this reason the national context features strongly in the policy analysis and in the results from primary research interviews.

The Wellington region is the main focus of this research. As an employee of a regional council in the area of transport strategy development, I had a strong interest in this field, and saw a gap that could be filled by research of this form. Some analysis of the Auckland regional policy setting is also given as a comparison although not in the same detail as that for the Wellington region. The resulting integrated planning guidance of the research is primarily suggested for the Wellington region but may be appropriate in a regional setting elsewhere in New Zealand.

1.3 Research Outline

Chapter One introduces the issue of CO_2 emissions globally and in New Zealand and outlines the contribution that the transport sector makes to current GHG and CO_2 levels. TOD as a planning option for CO_2 reduction is suggested. The purpose and scope of the research are included.

The main research question and the objectives formulated to answer this are given in Chapter Two.

Chapter Three outlines my positionality and introduces concepts of particular relevance as part of the conceptual framework of this research. These include Travel Demand Management (TDM), New Urbanism, smart growth, TOD and the concept of the transit metropolis. The methods undertaken for each objective are also explained.

Chapter Four describes the physical form of the Wellington region relative to its transport network. Relevant transport sector statistics and background information on the following topics are given: the rail network; freight; light vehicle travel and fuel economy; CO_2 emissions from road transport and public transport usage.

The findings from Objectives One, Two and Three are given in Chapter Five. Objective One required a detailed review of relevant legislation and national policies and strategies. Wellington regional policy documents are also reviewed in detail and an overview of the Auckland legislative and policy setting is given. The research findings for Objective Two present best practice in international integrated transport policy. Objective Three results describe land transport and land use practitioner perspectives from the twelve research interviews.

Chapter Six analyses the research findings for each of the objectives featured in Chapter Five. A synthesis of the results for Objectives One and Two is given. Objective Three results are not summarised further in this chapter but inform the discussion. This analysis is discussed in light of the conceptual framework as outlined in Chapter Three.

Chapter Seven presents conclusions drawn as a result of the analysis and discussion, in the form of policy guidance for integrated planning.

2. Aim and Objectives

2.1 Aim

The key target outcome for this research is to provide evidence-based policy guidance in integrated planning for reducing CO_2 emissions from land transport and land use activities for the Wellington region. This task needs to provide a planning context for the delivery of regional transport outcomes whilst effectively reducing avoidable land transport CO_2 emissions.

Accordingly, this research aims to answer the following question:

> *What integrated planning frameworks are available for New Zealand regional planning in land transport and transport-related land use that are capable of reducing CO_2 emissions whilst delivering on core transport planning goals?*

2.2 Objectives

The following research objectives were developed to answer this research question:

Objective 1: Policy analysis

To identify the options currently offered by national, and regional land transport and land use policy to reduce CO_2 emissions in New Zealand.

Objective 2: Literature-based analysis

To gain an understanding of current international best practice for CO_2 emissions reduction via land transport and land use planning, and to identify integrated planning concepts for CO_2 emissions reduction that are currently practiced in the land transport and land use planning sectors.

Objective 3: Interviews

To gain a land transport practitioner perspective on the key issues, barriers, and opportunities for reducing CO_2 emissions from land transport in New Zealand.

3. Methodology

3.1 Conceptual Framework

The following sections offer an explanation of some concepts in sustainable planning and design. These concepts facilitate urban development in a more inclusive and holistic way than some traditional planning methods. They are people and community-based concepts, demonstrating a strong social ethic, while minimising the impacts of transport and development on the urban, undeveloped and natural landscape. These are presented as a means of defining the conceptual framework for this research, which in turn will form the lens through which the literature and empirical data will be evaluated.

3.1.1 Positionality

The view through which I am approaching this research is based on these existing sustainable planning and design concepts with a particular focus on 'demand side' planning interventions. For example, making the best use of existing resources and minimising the need to build new infrastructure is not only financially efficient, but creates less waste. The provision of a choice of less energy intensive modes for travel and reducing the need to travel presents opportunities for people to make travel decisions that will lead to a reduction of GHG emissions.

My position is one of participant observation as an 'insider' in this planning community. This is a research position whereby the researcher is socially accepted as being 'inside' or part of the group involved in the study (Hay, 2005).

3.1.2 Travel Demand Management

TDM encompasses a range of interventions that reduce the need for travel, influence travel choices and improve the efficiency of the transport system. TDM interventions have wide ranging potential benefits which contribute to environmental sustainability, reduced traffic congestion, network reliability, economic development, public health, road safety and others (Greater Wellington Regional Council, 2007a).

A wide range of methods exist to suppress the demand for travel and achieve TDM outcomes including 'soft' measures such as travel behaviour change programmes (travel plans, awareness campaigns and ridesharing or carpooling). 'Hard' methods include road pricing tools, e.g. congestion

pricing, parking charges and tolls. TDM mechanisms which seek to improve travel efficiency also include: the provision for and promotion of passenger transport, cycling and walking; provision for road network efficiency improvements (use of traffic management tools); and integrating land use development with transport (high density housing around transport nodes, locating businesses and facilities close to the workforce) (Greater Wellington Regional Council, 2007a, 2008a).

3.1.3 New Urbanism

The functional isolation of transport planning in its modernist phase tended to result in the following view of transport:

> " isolated patterns of origins and destinations which were floating entities to be joined up by a straight line and be as fast moving as possible." (Newman & Kenworthy, 1996: 1).

'The New Urbanism' is a postmodern expression in city planning which seeks to reassert the fundamentals of the land use-transport connection (Calthorpe, 1993; Katz, 1994 in Newman & Kenworthy, 1996). New Urbanism began in 1993 as a movement that represents the interests of a diverse group from environmentalists to inner city advocates, and a design ethic which spans from region to building. New Urbanism sees physical design (architecture; regional, urban, environmental and landscape design) as critical to the future of our communities and playing a role in solving problems that money and governmental programmes cannot do alone. It attempts to update the principles of traditional urbanism (street life, diversity and human scale) to fit modern economies and lifestyles (Calthorpe & Fulton, 2001).

New Urbanism asserts that the three scales of region, neighbourhood and building are interconnected and interdependent. The Charter of the New Urbanism organises its 27 principles by these scales. Clarity is given to the unsteady relationship between the appropriate siting of greenfield development, suburban redevelopment and inner city investments (Calthorpe & Fulton, 2001).

New Urbanism outlines a set of policy and design principles that provide a means to reintegrate the segregated geography of suburbs and cities (Calthorpe & Fulton, 2001). It seeks to create transit[2] supportive and pedestrian friendly communities from suburbia. Details such as prominent public spaces that draw people together, pleasant vistas, generous open space and narrow tree-lined streets in a walkable grid pattern are all part of the New Urbanist design approach along with compact, mixed use development. Designing communities as they used to be to reduce car dependence and generate more pleasant places to cycle and walk is a transportation objective of New Urbanism. Rather than people being confined to homes and cars, instilling a sense of community in culturally diverse suburbs and cities where people regularly come face-to-face, is also important (Cervero, 1998).

3.1.4 Smart Growth

Smart growth recommends a balanced approach to municipal development by supporting economic development, strong communities and a healthy environment (The City of Calgary, 2004). Smart growth is defined as land use and development practices that enhance the quality of life in communities, save money over time and preserve the natural environment. Smart growth can be achieved via the comprehensive use of alternative development strategies and standards that reduce the impact of urban growth on the natural environment and integrate infrastructure into ecosystems. In this way costs are reduced and more liveable communities are created that increase the enjoyment of the places people live (Smart Growth BC, 2001 in The Canadian Urban Transit Association, 2004).

Ten principles of smart growth:

- *Mix land uses*

- *Take advantage of compact building design*

- *Create housing opportunities and choices for a range of household types, family sizes and incomes*

- *Create walkable neighbourhoods*

- *Foster distinctive, attractive communities with a strong sense of place*

---

[2] In North America 'transit' refers to public transport, as it is known in New Zealand.

- *Preserve open space, farmland, natural beauty and critical environmental areas*

- *Strengthen and direct development towards existing communities*

- *Provide a variety of transportation choices*

- *Make development decisions predictable, fair and cost-effective*

- *Encourage community and stakeholder collaboration in development decisions.*

(United States Environmental Protection Agency, 2006: 2).

When practiced, smart growth principles develop opportunities by increasing community stewardship and civic engagement. Public transport and community services are improved, heritage preservation is encouraged and barriers to affordable housing production are removed (United States Environmental Protection Agency, 2006).

Smart growth focuses on how growth occurs (Calthorpe & Fulton, 2001). A fundamental issue tackled by smart growth is "where growth goes" which can be addressed by progressive growth management strategies. The links between urban sprawl and declining quality of life are leading regional planning authorities, municipalities and provincial governments to encourage urban intensification through infill and redevelopment (The Canadian Urban Transit Association, 2004).

Another major smart growth issue is "what growth looks like". Intensification projects can increase urban densities determining a mix of land uses which also makes them more complex. Infill projects necessitate care to meet zoning requirements and satisfy the concerns of sensitive neighbours (The Canadian Urban Transit Association, 2004).

3.1.5 Transit Oriented Development

A great example of smart growth in action and one answer to the growth issues of "where" and "what" is TOD (The Canadian Urban Transit Association, 2004). TOD seeks to implement a sustainable approach to urban planning and land use by optimising the use of land around transit stations (The City of Calgary, 2005). TOD can be described as a pattern of dense, diverse, pedestrian friendly land uses near transit nodes that can translate to higher transit patronage (Transportation Research Board, 2004 in The Canadian Urban Transit Association, 2004).

A TOD is a walkable, mixed use form of area development which is typically focused within a 600 metre radius of a transit station (The City of Calgary, 2008). Raad (2006) describes a TOD or 'transit village' as a combination of places to live, work, play and shop within 800 metres of high quality transit. A transit village integrates a pedestrian oriented street network and human scaled buildings of sufficient interest, density and mix with high quality transit facilities, resulting in the irresistibility to walk, cycle or take transit (Raad, 2006).

However, these descriptive definitions of TOD can lead to a focus on creating a particular physical form rather than places that function differently from conventional development – the main goal of TOD. A performance-based definition of TOD has the following benchmarks:

- **Location efficiency** – the conscious placement of residences in proximity to transit systems; especially affordable housing within an easy walk of transit, negating the need to own a car. This results in equity and efficiency.

- **Rich mix of choices** – offering a wide range of housing, mobility and shopping choices. Choice is the defining feature of a well-designed neighbourhood offering many activities within walking distance and therefore convenience and affordability.

- **Value capture** – capturing economic value accrued to either the household (allowing individuals to lead affordable lifestyles) or community (letting communities reinvest the profits derived from good work). Value capture for local government can mean increased tax revenues from higher property values and sales; and for the transit agency – increased revenue from fares and lease revenue from joint development.

- **Place making** – high quality urban design with attractive, pedestrian friendly, interconnected streets served by convenient, frequent transit which is linked with destinations desired by local passengers.

- **Resolution of the tension between node and place** – tension exists between the roles of a transit station as a 'node' or stop in a regional transportation network and that of a 'place' in a neighbourhood.

These goals represent liveability; TOD offers many potential benefits of a desirable quality of life (Dittmar & Poticha, 2004).

TOD must operate within the constraints of the market and realistic expectations of behaviour and lifestyle patterns. It should not be a utopian vision. TOD can reach its full potential if it is seen as a

new paradigm of development rather than a series of marginal improvements. Motor vehicle dominance and suburban living were not always the lifestyle of choice but were cultivated partly by government policy and also by sociocultural trends. These preferences are not permanent however, and legislation is changing to direct government investment priorities towards alternatives to the car. TOD can be a component of this response by producing social benefits while still being viable in the market place (Dittmar, Belzer, & Autler, 2004).

3.1.6 The Transit Metropolis

The transit system and the metropolitan area or city it serves co-exist in harmony in a transit metropolis. It is a region where an effective match exists between urban form and transit services. This can mean a network of flexible, fleet-footed buses servicing development which is spread out, or compact mixed use development well suited to rail services. The transit metropolis can be employed as a concept for regional development. A sustainable and functional transit metropolis represents a mobility environment and built form where transit is a respectable alternative to travel by private car. It does not however, equate with a region where transit replaces or captures the majority of motorised trips. While car travel may still predominate in a transit metropolis, transit ridership or patronage is high enough due to the fit of transit and land use, that the region is placed on a sustainable course (Cervero, 1998).

The initiatives and practices described above set the conceptual scene for the ensuing chapters of this research. The following sections describe the specific methods used to achieve the research objectives.

3.2 Objective 1: Policy Analysis

To identify the options currently offered by national, and regional land transport and land use policy to reduce CO_2 emissions in New Zealand.

To address this objective, current national and regional policy documents most relevant to the research topic were reviewed. Some of the policy documents are currently in the development stage and have been released for public comment in draft form or as discussion papers. The newer or proposed policy documents are reviewed in more detail than the existing ones. Key statutes are introduced to set the legislative context for regional land transport planning.

The main New Zealand Government strategies, protocols and other policy documents with particular relevance to CO_2 emissions were then examined including the recently released (2007) New Zealand Energy Strategy and New Zealand Energy Efficiency and Conservation Strategy which set out the Government's response to climate change. Relevant aspects of the New Zealand Emissions Trading Scheme are also briefly reviewed.

Regional policy documents for the Wellington case study and the Auckland region are then summarised or reviewed with regard to the research topic. Statutory and voluntary planning strategies for transport, resource management and economic growth are included.

The following statutes and policy documents were reviewed for content relevant to this study:

3.2.1 Legislation

- Land Transport Act 1998 and Land Transport Management Act 2003

- Land Transport Management Amendment Bill 2007

- Resource Management Act 1991

- Energy Efficiency and Conservation Act 2001

- Local Government Act 2002

- Local Government (Auckland) Amendment Act 2004

3.2.2 New Zealand Policy

3.2.2.1 Key policies for land transport planning and CO_2 emissions

- New Zealand Transport Strategy (2002)

- Sustainable Transport: Update of the New Zealand Transport Strategy - Discussion paper (December 2007)

- New Zealand Energy Strategy to 2050: Powering Our Future - Towards a sustainable low emissions energy system (October 2007)

- New Zealand Energy Efficiency and Conservation Strategy: Making It Happen - Action plan to maximise energy efficiency and renewable energy (October 2007)

- National Rail Strategy to 2015 (2005)

- Sea Change: Domestic Sea Freight Strategy (May 2008)

- New Zealand Freight Study (underway, for completion in June 2008)

- New Zealand Emissions Trading Scheme (September 2007).

3.2.2.2 Policies related to land transport, transport-related land use and CO_2 emissions

- New Zealand Urban Design Protocol 2005

- Transport Sector Strategic Directions (TSSD) 2006 – 2009 (Ministry of Transport, Update 2006)

- Better Integration of Land Use and Transport: Integrated Approach to Planning DRAFT Phase One Report (TSSD Document 2006-09, July 2007)

- Getting there – on foot, by cycle: A strategy to advance walking and cycling in New Zealand transport (Ministry of Transport, 2005)

- Improving the fuel economy of vehicles entering the NZ fleet – A discussion paper for public comment (Ministry of Transport, January 2008).

3.2.3 Regional Policy: Wellington

- Wellington Regional Land Transport Strategy 2007 – 2016

- Regional Policy Statement for the Wellington Region (under development)

- Wellington Regional Strategy 2007

- Long Term Council Community Plan 2006 – 2016 (Greater Wellington Regional Council, 2006).

3.2.4 Regional Policy: Auckland

- Auckland Regional Land Transport Strategy 2050 (under development, due for completion in 2008)

- Auckland Regional Growth Strategy (1999)

- Auckland Sustainability Framework (September 2007)

- Regional Sustainable Development Forum (September 2007).

3.3 Objective 2: Literature-Based Analysis

To gain an understanding of current international best practice for CO_2 emissions reduction via land transport and land use planning, and to identify integrated planning concepts for CO_2 emissions reduction that are currently practiced in the land transport and land use planning sectors.

A literature-based analysis was conducted to gain an understanding of transport and land use planning issues and current planning concepts. A search was undertaken to locate relevant international best practice in CO_2 emissions reduction via land transport and transport-related land use planning. This search and review focused on countries with similar regional and local governance and planning contexts including the UK, Canada and Brazil.

Recent domestic conference proceedings with themes relevant to the research topic were investigated. Published work by specific authors known to be experts in the areas of sustainable land transport and urban planning were sought out. These include the works of Robert Cervero, Peter Calthorpe, Hank Dittmar, Peter Newman and Jeffrey Kenworthy. Domestic and international transport industry magazines, websites and other print media were examined for relevant content to gain an understanding of a cross-section of issues and perspectives facing the land transport sector.

This literature-based analysis is presented under three main themes: firstly components of travel behaviour and mechanisms of travel behaviour change are described; some ideas and methods of best practice in CO_2 emissions mitigation via integrated transport policy are given (including TOD); and a number of examples of international strategies to achieve these are then presented.

3.4 Objective 3: Interviews

To gain a land transport practitioner perspective on the key issues, barriers, and opportunities for reducing CO_2 emissions from land transport in New Zealand.

3.4.1 Preliminary Discussions

Initial discussions were undertaken with a range of key informants to gain a broader understanding of practitioner views of the transport planning sector and the historical context of transport and transport-related land use planning in the Wellington region.

Participants in the discussions included: a former regional council senior resource policy advisor; an advisor from the Ministry of Transport; an architect; an independent consultant; a project manager in the motoring trade; and an urban advisor from the Ministry for the Environment. Some participants were known to the researcher due to previous professional contact. Individual discussions were held with six people and hand written notes were taken in all cases.

Of particular interest to me was the policy development process underlying the previous Wellington Regional Land Transport Strategy (1999) and Wellington Regional Policy Statement (1995), viewed from a climate change policy perspective. Both policy documents were under review at the time of this research (2007/08). This enabled an understanding of the historical context of the process and content of these documents.

These informal discussions were also designed to gain an understanding of the relatively recent evolution of issues relating to climate change, land transport, transport-related land use and regional policy.

3.4.2 Interviews

3.4.2.1 Sampling

Interviews were conducted with a sample of practitioners selected from the land transport and transport-related land use stakeholder community. Purposive sampling was used whereby a small group of experts were identified for the specific expertise and experience they possess. This sampling method aims to uncover information-rich participants that can offer points of view of central

importance to the study. An element of the 'snowball' or 'chain' sampling technique was also utilised when searching for research participants. This method involves asking existing informants in the research project to recommend others who may be interested in participating (Hay, 2005).

The interview schedule (presented in Appendix 5) consisted of six questions focusing on key issues, barriers, opportunities and potential solutions to reducing CO_2 emissions from land transport whilst delivering on core land transport planning goals. The last question explored roles and responsibilities for CO_2 emissions reduction. This schedule was sent to interviewees in advance of the interviews. Using the schedule as a guide, interviews were conducted in a semi-structured manner. All interviews were recorded using a digital recorder and varied in length between approximately 45 and 85 minutes.

All participants have a reputation in this relatively small and specialised field for their leadership roles and long experience and were selected on this basis. Participants' specific areas of responsibility included: land transport planning; environmental sustainability; strategic planning; urban development; climate change; public policy; and energy. The participants are employed in a variety of sectors including all levels of government (central, regional and local), non-government, academia and the private sector. Twelve people participated in individual interviews for this research. The interviewees did not include any of the key informants mentioned but were selected as a result of discussions with the key informants.

3.4.2.2 Ethics approval and consent

As the research involved human subjects, approval from the Victoria University of Wellington Human Ethics Committee was required (Ethics Approval: 32/2007, 17 April 2007). Refer to Appendix 6 for the approval memorandum.

The research was designed so that by default, confidentiality of the research participants was maintained. Participants were provided with an information sheet prior to the interview (see 'Information for research participants' in Appendix 2) at the time it was arranged. All participants were required to read the information sheet and sign the 'Research Participant Consent' form, which can be seen in Appendix 3. Along with the right of withdrawal, the declaration of consent included two options under 'Confidentiality and use of data'. Option a) declared that confidentiality was required and that the identity of the participant would be kept confidential to the researcher,

supervisor and transcriber. Option b) stated that confidentiality would not be maintained and a separate 'Waiver of Confidentiality' form (refer to Appendix 4) was required to be signed. Either option a) or b) was deleted on the consent form by the participant.

In the latter case, participants were sent an electronic copy of the written transcript of the interview and requested to review, correct, edit or withdraw any comments or information as they saw necessary. Participants who wished to maintain confidentiality were not sent a transcript of the interview.

The interviews were transcribed by the researcher and no transcriber was engaged. Two of the twelve participants indicated that they wished confidentiality to be maintained. They are identified as 'Participant X' and 'Participant Y' in the list of interviewees in Appendix 1.

3.4.2.3 Analysis

Data consisted of interview recordings, transcriptions and notes taken during the interviews. Interview data was sorted using initial codes which were pre-determined by the question themes. Data was then coded or categorised based on commonality of themes that became apparent. In this way the data was reduced in complexity and volume but an increasing level of understanding of important themes emerged. These steps allowed organisation and analysis of the data (Hay, 2005).

3.4.2.4 Scope

This research probed deeply into the issues, barriers, opportunities and potential solutions offered by integrated land transport and land use planning. It was not possible to reach widely in scope (gaining a wide set of views) and deeply (by focusing on a specialised group) at the same time for research of this nature.

4. Background

It is estimated that 2.6 tonnes of CO_2 per person is emitted from road transport each year, totalling nearly 11 million tonnes annually. Should current trends continue, by 2030 road transport CO_2 emissions will increase to 14.2 million tonnes per year (Ministry of Transport, 2007b).

4.1 Wellington Region's Compact Form

The Wellington region has a compact corridor form extending north from central Wellington City and branching out into a 'Y' shape. The western corridor passes through northern Wellington, Porirua, Pukerua Bay and up the Kapiti Coast to Otaki. The other arm runs through the Hutt Valley to the east of the Western Hutt hills and is known as the Hutt corridor. It then climbs over the Rimutaka range into Wairarapa to become the Wairarapa corridor (refer to Figure 5.4 for a map of the region).

This compact corridor form supports the public transport (PT) network and consequently reduces GHG emissions, energy and other costs associated with private transport. Access to services and centres is also made easier by this corridor form. A range of adverse effects can be created by ad hoc development outside the main corridor, or poorly designed or poorly managed development within it. Effects include increased traffic congestion, increased storm water run-off into sensitive environments, inefficient use of land and resources, and unexpected (and therefore unplanned) demands for new or extended infrastructure (Greater Wellington Regional Council, 2006a).

4.2 Public Transport Trips

Residents in the Wellington region make approximately 35 million trips annually using PT services, an average of 75 trips per person per year. Over 11 million of these trips a year are made by passenger rail services, with a yearly average of 24 trips for each resident of the Wellington region (Ministry of Transport, 2007b).

 Auckland region residents use PT for about 51 million trips per year with each person on average making approximately 38 trips a year. Passenger rail services are used for 3.7 trips on average per year for each Auckland resident making the annual total of over five million trips (Ministry of Transport, 2007b).

4.3 Freight

Within the Auckland region approximately 250 million tonnes of freight is moved by road every year which equates to about one tonne of freight moved each day for every Auckland region household. Throughout New Zealand in 2006, about two-thirds of all domestic freight tonne-kilometres were moved by heavy vehicles on the road network (approximately 18.5 billion tonne-kilometres). Rail and coastal shipping carried the remainder (Ministry of Transport, 2007b).

The rail network moves about four billion tonne-kilometres of freight (approximately 18% of the total) nationally a year. By 2031, over twice this amount will need to be moved by rail if the mode is to maintain its current share of total domestic freight carriage. Overall, more than twice the current freight volumes will need to be moved by 2031 if the freight and GDP growth relationship continues as currently, with the road network carrying 44 billion tonne-kilometres (Ministry of Transport, 2007b).

4.4 Transport Sector Evolution

4.4.1 Deregulation and Mergers

Deregulation of the transport sector commenced systematically from 1983 with partial privatisation or the sale of both central and local government interests in the maritime, rail and aviation sectors. Economic efficiency increased during the period of change in the 1980s and 1990s but expected links between transport and regional development, along with social cohesion and urban form, did not result (The Office of the Minister of Transport, 2002).

In 2004 the Land Transport Safety Authority was merged with the transport funding agency (Transfund New Zealand) to form Land Transport New Zealand. One of the outcomes of the current Land Transport Management Amendment Bill (2007) should be the New Zealand Transport Agency. This new Agency is to replace the existing Crown entities, Land Transport New Zealand and Transit New Zealand (King, 2007).

4.4.2 National Rail Network Ownership

Until 1993 the Government was the owner and operator of virtually all of New Zealand's rail infrastructure, passenger and freight operations. The rail network and operations were sold to Tranz

Rail Holdings Limited which was renamed Toll NZ in 2003. Ownership of the land on which the rail assets were situated was retained by the Government and the land was leased to the rail operator.

The Government repurchased the Auckland rail infrastructure in 2001 and the rest of the national rail network in 2004 including rail tracks, structures such as tunnels and bridges, signalling, train control, and track maintenance operations. This secured a vital part of New Zealand's transport infrastructure in the national interest. The New Zealand Railways Corporation (trading as ONTRACK) is responsible for managing and operating the national rail network and has held these assets since 1 September 2004.

Prior to the Government's repurchase, investment in the rail network had been at low and declining levels over a number of years. This led to deferred maintenance, declining service capability and concerns about safety (Ministry of Transport, 2005b).

4.5 Light Vehicles

For each day of travel as drivers or passengers in light vehicles, New Zealanders average approximately 39 kilometres. Light vehicle passengers and drivers travel 58 billion kilometres each year and this total is predicted to reach 78 billion kilometres per year by 2031 (Ministry of Transport, 2007b).

4.5.1 Fleet Composition and Fuel Economy

New Zealand has traditionally had a large stock of cheap, older used vehicles and a slow vehicle replacement rate (Ministry of Economic Development, 2007). The average light vehicle in the fleet is over 12 years old (Energy Efficiency and Conservation Authority, 2007). Higher fuel prices over recent years have led to some consumer demand for smaller, more fuel-efficient vehicles. However, the average carbon footprint of vehicles entering the fleet needs to decline in order to reduce transport emissions. There are significant CO_2 reduction benefits to targeting vehicles entering the fleet for the first time, due to the length of time New Zealand drivers keep their vehicles (Ministry of Economic Development, 2007).
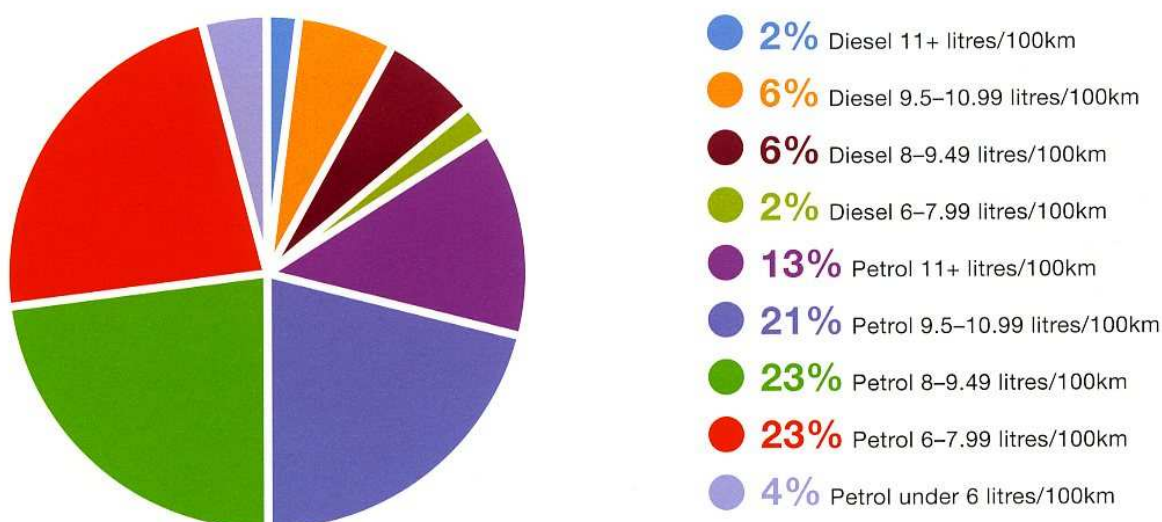
Figure 4.1: Light motor vehicles entering the fleet in 2006 (new and used). (Ministry of Transport, in Ministry of Economic Development, 2007: 54).

Making New Zealand's vehicle fleet more fuel efficient can substantially reduce CO_2 emissions. Vehicle technology and the composition of the vehicle fleet can improve fuel efficiency. Figure 4.1 shows a breakdown of the fuel type and fuel economy of new and used vehicles entering the New Zealand fleet in 2006. Currently the average fuel economy for light petrol vehicles entering the fleet is approximately 8.8 litres/100km (Ministry of Economic Development, 2007). The average light vehicle already in the New Zealand fleet has a poor fuel economy of around 10.2 litres/100km (Energy Efficiency and Conservation Authority, 2007). By comparison, light vehicles currently available in New Zealand that provide substantial reductions in greenhouse gas emissions (Toyota Prius and Citroën C3) have fuel economies of just over 4 litres/100 km (Ministry of Economic Development, 2007).

4.5.2 Engine Size

The growth in the average engine size of New Zealand's light vehicle fleet for the period 2000 – 2006 can be seen in Figure 4.2. A vehicle with a smaller engine size will use less fuel on average (and emit less CO_2). The size of the engine is therefore an approximate indicator of fuel economy.
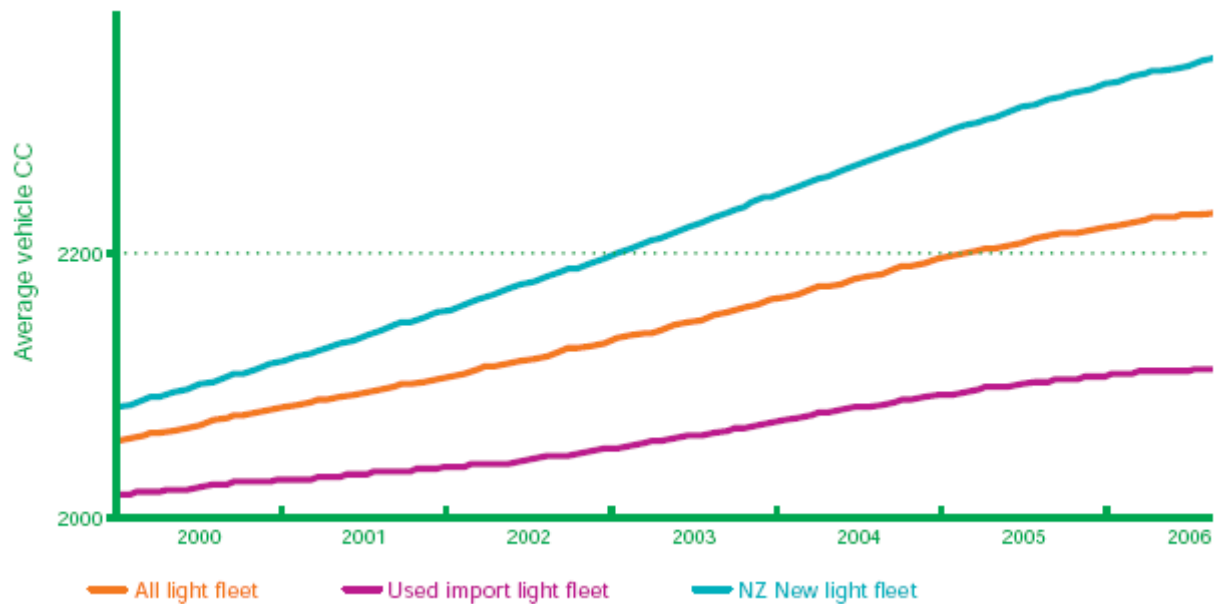
Figure 4.2: Light fleet average engine capacity (Energy Efficiency and Conservation Authority, 2007: 56)

Engine technology is improving however, so increasing average fuel consumption is not automatically the result of an increase in the average engine sizes of vehicles entering the fleet. A reduction in average engine size of new or used vehicles entering the fleet does imply improved average fuel economy. Data collection on New Zealand light vehicle fuel economy only commenced in March 2005, and no significant change in fuel consumption has been shown up to July 2007. This is despite an increasing trend in engine size during the same period (Energy Efficiency and Conservation Authority, 2007).

This chapter provided background information with relevance to the research topic to set the scene for the research findings which are presented in Chapter Five.

5. Research Findings

The purpose of the research findings is: to gain an understanding of the planning setting within which practitioners in land transport and land use planning must operate; to explore best practice options in CO_2 mitigation from international integrated planning; and to present the perspectives of New Zealand planning practitioners regarding key issues, barriers and opportunities for CO_2 reduction.

5.1 Policy analysis

The purpose of this section is to describe the legislative framework and policy landscape for planning in land use and land transport in New Zealand. In order to better understand the existing situation and integrate policy in these areas to achieve CO_2 reduction, gaining an awareness of both the statutory requirements and voluntary agreements in the real world of planning is vital.

Objective One of this research is addressed in this section:

> ***To identify the options currently offered by national and regional land transport and land use policy to reduce CO_2 emissions in New Zealand.***

The following statutes, national, Wellington and Auckland regional policy documents are reviewed or acknowledged:

Legislation (current and pending)

- Land Transport Act 1998 and Land Transport Management Act 2003
- Land Transport Management Amendment Bill 2007
- Resource Management Act 1991
- Energy Efficiency and Conservation Act 2001
- Local Government Act 2002
- Local Government (Auckland) Amendment Act 2004.

New Zealand policy (current and under development)

Key policies for land transport planning and CO$_2$ emissions

- New Zealand Transport Strategy (2002)

- Sustainable Transport: Update of the New Zealand Transport Strategy - Discussion paper (December 2007)

- New Zealand Energy Strategy to 2050: Powering Our Future - Towards a sustainable low emissions energy system (October 2007)

- New Zealand Energy Efficiency and Conservation Strategy: Making It Happen - Action plan to maximise energy efficiency and renewable energy (October 2007)

- National Rail Strategy to 2015 (2005)

- Sea Change: Domestic Sea Freight Strategy (May 2008)

- New Zealand Freight Study (underway, for completion in June 2008)

- New Zealand Emissions Trading Scheme (September 2007).

Policies related to land transport, land use and CO$_2$ emissions (current and under development)

- New Zealand Urban Design Protocol 2006

- Transport Sector Strategic Directions (TSSD) 2006 – 2009 (Ministry of Transport, Update 2006)

- Better Integration of Land Use and Transport: Integrated Approach to Planning DRAFT Phase One Report (TSSD Document 2006-09, July 2007)

- Getting there – on foot, by cycle: A strategy to advance walking and cycling in New Zealand transport (Ministry of Transport, 2005)

- Improving the fuel economy of vehicles entering the NZ fleet – A discussion paper for public comment (Ministry of Transport, January 2008).

Regional policy: Wellington (current and under development)

- Wellington Regional Land Transport Strategy 2007 – 2016

- Regional Policy Statement for the Wellington Region (under development)

- Wellington Regional Strategy 2007

- Long Term Council Community Plan 2006 – 2016 (Greater Wellington Regional Council, 2006).

Regional policy: Auckland (current and under development)

An overview of recent developments in policy and governance in the Auckland region relating to land transport, land use and growth management is given. This includes the following:

- Auckland Regional Land Transport Strategy 2050 (under development, due for completion in 2008)

- Auckland Regional Growth Strategy (1999)

- Auckland Sustainability Framework (September 2007)

- Regional Sustainable Development Forum (September 2007).

5.1.1 Legislation

5.1.1.1 Land Transport Act 1998 and Land Transport Management Act 2003

The Land Transport Act (LTA) 1998 was amended by the Land Transport Management Act (LTMA) 2003. The LTMA 2003 was designed to reform the land transport funding system and changed the purposes, roles and funding framework of land transport agencies. The purpose of the Act is to contribute to achieving an integrated, safe, responsive and sustainable land transport system (Greater Wellington Regional Council, 2006a).

The LTMA 2003 included the five objectives of the New Zealand Transport Strategy (NZTS) 2002. The requirements of a regional council to produce a Regional Land Transport Strategy were amended by the LTMA 2003 to better reflect the vision, principles and objectives of the NZTS. This ensures the integration of national, regional and local transport policy (Greater Wellington Regional Council, 2007a).

Regional land transport strategies must now take into account a number of new matters, including how they will ensure environmental sustainability (Greater Wellington Regional Council, 2006a). The LTMA 2003 also introduced the new requirement that every Regional Land Transport Strategy must take into account the National Energy Efficiency and Conservation Strategy (Greater Wellington Regional Council, 2007a).

5.1.1.2 Land Transport Management Amendment Bill 2007

The Land Transport Management Amendment Bill 2007 is a proposed amendment to the Land Transport Management Act and associated legislation, consolidating all land transport planning provisions into one Act. The Bill arose from a number of reviews including the "Next Steps" review of the New Zealand land transport sector. The Bill addresses the issues raised in the reviews and proposes a new land transport planning and funding system (King, 2007). The first reading of the Bill to the Transport & Industrial Relations Select Committee was on 25 October 2007.

Figure 5.1 illustrates the proposed transport planning system and shows the relationship between strategic documents and their timeframes. The main changes are described in the following paragraphs.

Government Policy Statement

The Government Policy Statement (GPS) will provide additional strategic guidance to the land transport sector. The GPS will assist in ensuring accountability of the New Zealand Transport Agency and will "establish the amount of funding available to be allocated to all activity classes" (King, 2007). The GPS will manage the National Land Transport Programme and will need to be incorporated into decision making by other land transport stakeholders. National priorities such as enhancing public transport and preserving the state highway network will be ensured by the GPS (King, 2007).

National Land Transport Programme

Currently the National Land Transport Programme (land transport planning and funding) is produced annually. A three yearly renewal of the Programme is proposed (King, 2007).

The New Zealand Transport Agency

A new agency will be created by bringing together Transit New Zealand and Land Transport New Zealand. The resulting New Zealand Transport Agency will be a Crown Agent and retain all the functions that the current Crown entities have (with the exception of the power to declare and revoke state highways). The Agency will give effect to the GPS and integrate decision making. The Agency will also both fund the projects and services of other agencies while delivering its own, requiring robust accountability (King, 2007).

Regional Land Transport Committees

> Due to the current size of some Regional Land Transport Committees, membership will be limited to the following under the Bill:

- Two regional council representatives

- One representative from each territorial authority in the region

- One representative from the New Zealand Transport Agency

- (As currently), one member to represent each of the five New Zealand Transport Strategy objectives (economic development, safety and personal security, access and mobility, public health, and environmental sustainability)

- (As currently), one member to represent cultural interests.

(King, 2007).

Voting rights will be limited to those members that have direct accountability to rate payers and for project delivery (Wilde, 2007).

Regional Land Transport Committee – Auckland region

Regional Land Transport Committee membership requirements will remain unchanged under the Bill, while governance proposals for the Auckland region are developed (King, 2007).

Regional Land Transport Programmes

Regional Land Transport Committees will be responsible for developing new Regional Land Transport Programmes requiring prioritisation of land transport activities, including state highways (King, 2007). The Bill requires the first Regional Land Transport Programmes to be in place by 1 July 2009 (Wilde, 2007).

Regional Land Transport Programmes – Auckland region

The Auckland Regional Transport Authority (ARTA) will develop the Regional Land Transport Programme for Auckland (King, 2007).

Regional Land Transport Strategies

The planning horizon of Regional Land Transport Strategies will be extended to 30 years and a review will only be required every six years, compared with three yearly reviews as is the current requisite (King, 2007). Annual monitoring on progress in RLTS implementation will change to a three yearly reporting cycle under the Bill (Wilde, 2007).

Fuel excise duty

All fuel excise duty (petrol excise duty and road user charges) currently obtained from motorists will be reserved for land transport purposes (King, 2007).

Regional fuel tax

Regions will be allowed to levy a regional fuel tax under the Bill, with some limitations. The revenue is to be used for advancing capital projects only with a limit of five cents per litre to be spent on roading. The tax will be capped at ten cents per litre of petrol or diesel (King, 2007).

Regional Land Transport Committees will be responsible for the preparation of proposed regional fuel tax schemes including public consultation. The scheme will then require the approval of the Ministers of Transport and Finance and the Governor General (the making of an Order in Council for scheme approval). Following the introduction of a regional fuel tax, wholesale distributors would make payments to the New Zealand Transport Agency who would then be responsible for the distribution of net revenue for projects to the agencies concerned. Non-road fuel users would also be reimbursed (King, 2007).

Regional fuel tax – Auckland region

Project expenditure of up to five cents per litre will be able to be identified by the Auckland region. The remaining five cents per litre, up to the ten cent regional limit could be allocated to regional land transport projects by the Ministers of Transport and Finance (King, 2007).
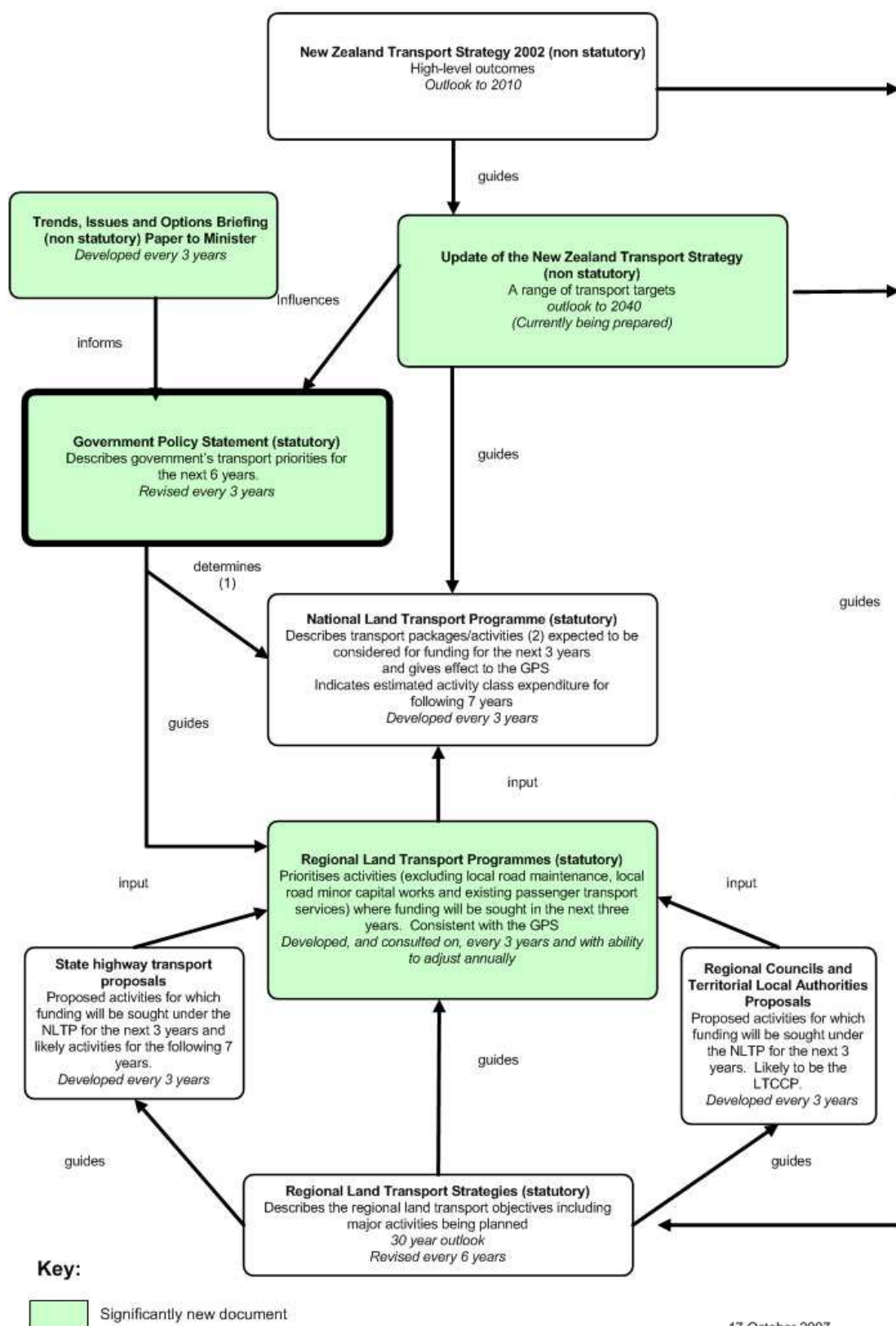
Figure 5.1: Next Steps Review of the Land Transport Sector (Ministry of Transport, 2007a).

5.1.1.3 Resource Management Act 1991

The Resource Management Act (RMA) 1991 is the primary legislation governing land use in New Zealand. The Act deals with the management of land, water, air, soil resources, the coast, subdivision and control of pollution including noise. It determines the rights and responsibilities of individuals, local authorities and central government regarding these resources or environmental effects. The Act provides a system of policy and plan preparation which allows the consideration of a wide range of values and interests.

The single, overarching purpose of the Act is:

> *To promote the sustainable management of natural and physical resources.*

The purpose encompasses the themes of use, development and protection (Ministry for the Environment, 1998).

Sustainable management is defined in the RMA as:

> *Managing the use, development , and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while:*

> *Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*

> *Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and*

> *Avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

(Greater Wellington Regional Council, 2008a: 9).

Addressing the effects of climate change and the related matters of the efficient use of energy and energy production have been mandated by RMA amendments. All persons exercising functions and powers under the Act must "have particular regard to" the following three related matters under Section 7 of the RMA:

- the effects of climate change

- the benefits to be derived from the use and development of renewable energy

- efficiency of the end use of energy.

(Greater Wellington Regional Council, 2006a).

However, section 104E of the RMA also states that a consent authority must not consider the effects of a discharge on climate change as central government would provide the necessary controls for GHG emissions (Greater Wellington Regional Council, 2006a).

5.1.1.4 Energy Efficiency and Conservation Act 2001

Within the context of a sustainable energy future the Energy Efficiency and Conservation Act promotes renewable energy, energy conservation and energy efficiency. The Act established the Energy Efficiency and Conservation Authority (EECA) and charged it with the responsibility for preparing the National Energy Efficiency and Conservation Strategy 2001 (Greater Wellington Regional Council, 2006a).

5.1.1.5 Local Government Act 2002

New obligations and broader powers were acquired by local authorities under the Local Government Act 2002. A strong commitment to the principles of sustainable development is signalled by the Act and local authorities are to take leading roles in the promotion of the social, economic, environmental and cultural wellbeing of their communities. This adjusted accountability means that regional and district councils are required to identify community outcomes and to monitor and report progress in achieving these outcomes back to the community (Greater Wellington Regional Council, 2006a).

5.1.1.6 Local Government (Auckland) Amendment Act 2004

This Act has the purpose of improving the integration of the Auckland regional land transport system and the management of land transport funding and assets for the Auckland region. Auckland local authorities are required under the Act to integrate the land transport and land use provisions of the Regional Policy Statement and plans prepared under the RMA and ensure those provisions are consistent with the Auckland Regional Growth Strategy. Section 7 of the Act also established the Auckland Regional Land Transport Authority (ARTA) ("Local Government (Auckland) Amendment Act," 2004).

The objective of ARTA is:

To plan, fund, and develop the Auckland regional land transport system in a way that contributes to an integrated, safe, responsive, and sustainable land transport system for the Auckland Region

("Local Government (Auckland) Amendment Act," 2004: 6).

5.1.2 New Zealand Policy

The following are key national policies relating to land transport planning and CO_2 emissions. The Update of the New Zealand Transport Strategy is a discussion paper and the updated Strategy is in progress at the time of writing.

5.1.2.1 New Zealand Transport Strategy

The New Zealand Transport Strategy (NZTS) 2002 is non-statutory and describes the government's vision for the New Zealand transport system to 2010. It outlines the response of the transport system to the economic, social and environmental needs of New Zealand and acknowledges that transport decisions impact on every dimension of life in New Zealand (Ministry of Transport, 2007b).

NZTS principles and objectives

The four principles of the Strategy are:

- Sustainability

- Integration

- Safety

- Responsiveness.

(The Office of the Minister of Transport, 2002).

Five key objectives which feature in the Strategy are as follows:

- Assisting economic development

- Assisting safety and personal security

- Improving access and mobility

- Protecting and promoting public health

- Ensuring environmental sustainability.

(The Office of the Minister of Transport, 2002).

Figure 5.2 illustrates the relationship between the NZTS and other national level strategies.

Figure 5.2: The NZTS and links to other major government strategies (Ministry of Transport, in Ministry of Economic Development, 2007: 48).

5.1.2.2 Sustainable Transport: Update of the New Zealand Transport Strategy

(Discussion paper, December 2007)

The Update of the New Zealand Transport Strategy (UNZTS) is to implement the key aspects of the New Zealand Transport Strategy 2002 (Ministry of Transport, 2007b). Public feedback on the discussion paper was invited on its release in December 2007 and submissions closed in February

2008. The Update of the New Zealand Transport Strategy is expected to be published in July 2008 (Ministry of Transport, 2007b).

The Update intends to:

- *Provide direction for the transport sector until 2040 in the context of the government's sustainability agenda and other government strategies in the areas of energy and energy efficiency*

- *Translate that direction into high-level targets for the transport sector and intermediate targets for sub-sectors (air, sea, road, vehicle fleet, rail freight, public transport, walking and cycling) to help achieve the high-level targets*

- *Provide clearer guidelines for decisions about funding allocations*

- *Contain an action plan, including accountabilities for actions, reflecting how we intend to reach the transport targets.*

(Ministry of Transport, 2007b: 10).

The fifth objective of the NZTS (2002) is 'Ensuring environmental sustainability'. Relevant associated targets proposed by the UNZTS particularly those with a focus on CO_2 emissions from land transport are summarised below (with some detail omitted).

Government agreed high-level target for ensuring environmental sustainability for 2040:

- Halve per capita domestic transport greenhouse gas emissions (relative to 2007 emissions per capita).

Government agreed intermediate or detailed targets for 2040:

- One of the first countries to widely deploy electric vehicles (powered by renewable electricity)

- Introduce a biofuels sales obligation from 2008, increasing in percentage by 2012

- Reduce vehicle kilometres travelled (VKT) by single occupancy vehicles (SOV)

- Reduce the rated CO_2 emissions per kilometre (combined average, new and used light vehicles) and the average fuel used per kilometre

- Ensure the capability of the fleet to use biofuels or that it is electric-powered (80 % by 2015).

Relevant proposed intermediate or detailed targets for 2040:

- Identify and remove barriers to the uptake of plug-in hybrid and full electric vehicles

- Real-time information systems to minimise delay and fuel wastage by enabling journey planning by road

- Increase inter-regional coastal shipping freight share

- Increase domestic rail freight share

- Increase the public transport mode share during peak hour in Auckland, Wellington and Christchurch

- At least double the overall public transport mode share

- Increase walking, cycling and other active modes.

(Ministry of Transport, 2007b).

5.1.2.3 New Zealand Energy Strategy

New Zealand Energy Strategy to 2050: Powering Our Future - Towards a sustainable low emissions energy system (October 2007)

The New Zealand Energy Strategy (NZES) sets out the government's vision to 2050 and an action plan to deliver sustainable, low emissions energy for New Zealand with an emphasis on reliability and resilience of energy supply (Ministry of Transport, 2007b).

The NZES acknowledges the NZTS (2002) as the main transport strategy it links with (see Figure 5.2). The NZES objectives for transport focus on transport GHG emissions, quality of life and ensuring support for a strong, competitive economy via New Zealand's transport systems. These align with the NZTS objectives of assisting economic development and ensuring environmental sustainability. The transport energy and climate change objectives of the NZES will inform the update of the NZTS (Ministry of Economic Development, 2007).

Five areas to reduce the growth of GHG emissions from the land transport sector (to complement the Emissions Trading Scheme) are detailed in Appendix 8 and listed as follows:

- Managing demand for travel

- Shifting to more efficient and/or lower impact means of transport

- Improving the fuel efficiency of the vehicle fleet

- Developing and adopting future fuels

- Ensuring the security of short-term oil supplies and a diverse supply of transport fuels.

(Ministry of Economic Development, 2007).

Looking to the future, the NZES acknowledges that emerging technologies will play an important part in transport sector GHG emissions reduction but that technological improvements alone will not be sufficient. Integrating policies across a range of options will be required to cover a greater use of alternative modes, improved urban design and urban form, and travel demand management (Ministry of Economic Development, 2007).

Figure 5.3 shows a variety of interrelated measures to reduce GHG emissions from land transport (which are complementary to Emissions Trading Scheme broad-based measures).
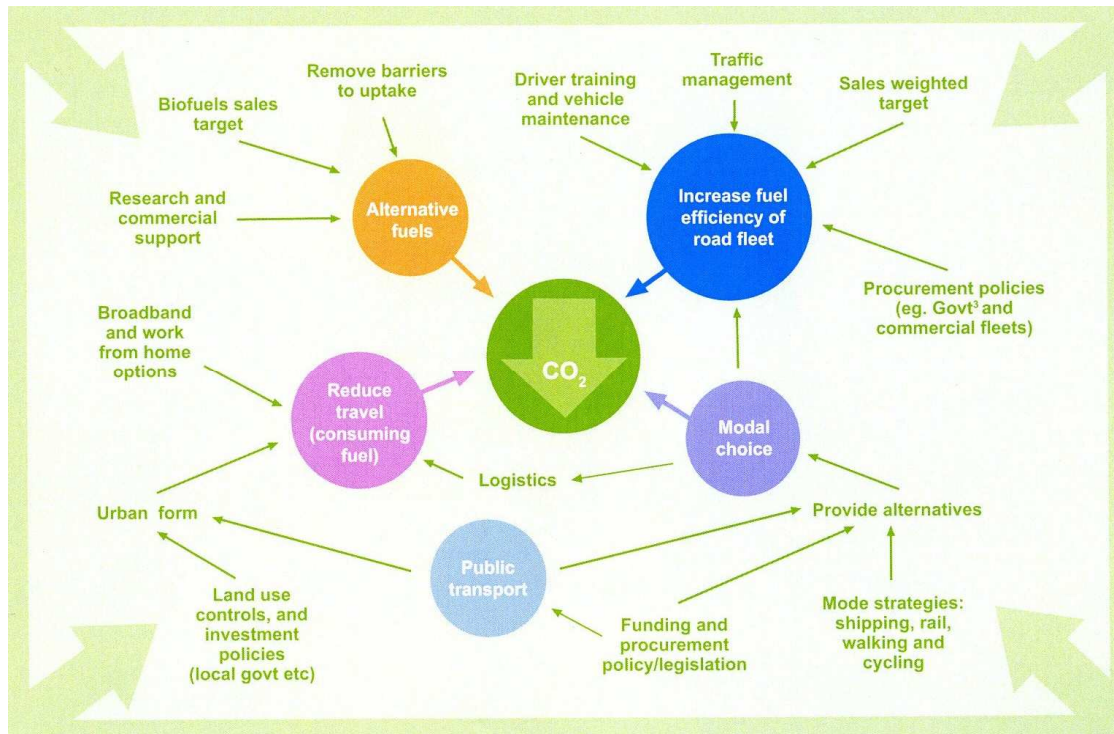
Figure 5.3: Measures to reduce land transport GHG emissions (Ministry of Transport, in Ministry of Economic Development, 2007: 50).

5.1.2.4 New Zealand Energy Efficiency and Conservation Strategy

New Zealand Energy Efficiency and Conservation Strategy: Making It Happen - Action plan to maximise energy efficiency and renewable energy, October 2007

The New Zealand Energy Efficiency and Conservation Strategy (NZEECS) replaces the National Energy Efficiency and Conservation Strategy (2001) and has been written in accordance with section 10(2) of the Energy Efficiency and Conservation Act 2000 (Energy Efficiency and Conservation Authority, 2007).

The Ministry of Economic Development (MED) is responsible for the overall monitoring of the strategy and reporting on progress with responsibility and contribution to programmes and implementation assigned to other agencies. Then NZEECS states that it is a strategy for all New Zealanders, not just the government, and in order to be effective all sectors of the economy must act to develop a sustainable energy future (Energy Efficiency and Conservation Authority, 2007).

The NZEECS promotes the use of renewable energy sources, and ways to increase energy efficiency and conserve energy. Reducing the demand for electricity and energy use in transport, industry and buildings are addressed. Enhanced utilisation of sustainable energy in land and settlement development and the production of energy is also promoted (Ministry of Transport, 2007b).

'Energywise Transport' is one of five target areas of the action plan. The Energywise programme will support the achievement of the following high-level targets:

- to reduce the overall energy use and GHG emissions from New Zealand's transport system

- reduce per capita transport greenhouse gas emissions by half by 2040

- for New Zealand to be one of the first countries in the world to widely deploy electric vehicles

- to have an average emissions performance of 170g/km of CO_2 (approximately 7 l/100km) for light vehicles entering the fleet by 2015

- cut kilometres travelled by single occupancy vehicles (SOV) in major urban areas on weekdays, by 10% per capita by 2015 (compared to 2007)

- for 80% of the vehicles to be capable of using 10% biofuel blends or to be electric powered by 2015

- investigate options for improving the efficiency of the North Island main trunk line, including electrification, by 2010.

The objective of Energywise Transport is: to reduce the overall energy use and GHG emissions from New Zealand's transport system. The actions set out to achieve this objective (detailed in Appendix 9) are aligned with those of the NZES. The actions are listed as follows:

- Managing demand for travel

- More efficient transport modes

- Improving the efficiency of the transport fleet

- Developing and adopting renewable fuels.

(Energy Efficiency and Conservation Authority, 2007: 51).

As a result of the programmes outlined in the strategy, energy savings of 20 PJ in the transport sector are expected to be delivered by 2015 (Energy Efficiency and Conservation Authority, 2007).

A further action area targeted by the action plan is that of 'Government leading the way'.

The objective is: to lead by example in energy efficiency and emissions reduction. A summary of actions is shown in Table 5.1 (urban form and design), Table 5.2 (central government) and Table 5.3 (local government).

Table 5.1: Urban form and design summary of actions (Energy Efficiency and Conservation Authority, 2007: 72).

Action	Outcome	Delivery
6.1 Urban form and design		
New Zealand Urban Design Protocol implementation	11 case studies published in 2008; monitoring report by June 2009	MfE (Funded)
Integrated Approach to Planning project	Recommendations by the end of 2008	MoT (Funded)
Urban Design national guidance	Investigate the role for greater national guidance and make recommendations by November 2007	MfE (Funded)
Enhanced travel demand management planning	Enhanced planning capacity	Land Transport NZ (Funded)
Traffic system design and management tools	Recommendations for implementation by the end of 2009	EECA (Under consideration)

Table 5.2: Central government summary of actions (Energy Efficiency and Conservation Authority, 2007: 72).

Action	Outcome	Delivery
6.2 Central government		
Carbon neutral public service	Six lead core public service agencies to be carbon neutral by mid-2012. Remaining 28 public service departments to be on the path to carbon neutrality by mid-2012	MfE (Funded)
Public service procurement policies	Incorporate sustainability into a single procurement policy and make recommendations for the application to the wider state sector by November 2007	MED (Funded)
Departments to adopt a minimum five-star Green Star New Zealand rating for the construction of all new Grade A office buildings and refurbishments	Improved performance of public service accommodation	MfE (Funded)
Reduction in public sector energy use	10 per cent reduction in energy use, per full-time staff equivalent (FTE), by the end of 2012 compared with 2006/07	EECA (Under consideration)
Public service departments to have a workplace travel plan in place	15 per cent aggregate reduction in kilometres travelled by the end of 2010	MoT / Land Transport NZ (Funded)
Public service departments to reduce their average CO_2 emissions by 25 per cent per vehicle in their fleets by the end of 2012	0.20 PJ pa 13,000 tonnes CO_2 pa	MoT (Funded)
Public service departments to reduce their consumption of energy-intensive consumables such as paper	Reduction of 10 per cent by the end of 2010 from 2006 baseline	MfE (Funded)
Crown loans for government sector investment in sustainable energy	Provision of financial assistance	EECA (Funded)
Energy Domain Plan	A comprehensive database by December 2009	EECA (Under consideration)

Table 5.3: Local government summary of actions (Energy Efficiency and Conservation Authority, 2007: 73).

Action	Outcome	Delivery
6.3 Local government		
The NZES/NZEECS engagement and partnership framework	Establish framework by the end of 2008	MED (Funded)
Support the development of energy strategies and RMA policy and plan making	Support programmes established by the end of 2008	EECA / MED (Under consideration)
Support local authorities to implement the Building Code energy efficiency amendments	Ongoing support	DBH/MfE (Funded)
Develop best practice tools and information for sustainable procurement for all agencies to use (including local government)	Tools and information available by December 2007	MED (Funded)
Advice and support on energy efficiency through the Sustainable Households Programme	Programme established in 2007	MfE (Funded)

5.1.2.5 National Rail Strategy to 2015 (2005)

Under the umbrella of the NZTS the National Rail Strategy provides a framework for strategic planning across the government rail sector. The Strategy recognises the Government's focus on shifting commuter and freight traffic from road onto rail (where appropriate). The Government's rail policy objectives (aligned with the five NZTS objectives), priorities and key initiatives to achieve outcomes sought over the 10 years to 2015 are set out in the Strategy. Two key areas of growth are focussed on: urban passenger transport; and bulk and containerised freight (Ministry of Transport, 2005b).

Table 5.4 sets out key results and indicative performance indicators. These will allow progress towards achieving the Strategy's national rail objectives and key priorities to be assessed.

Table 5.4: National Rail Strategy: Key results sought (Ministry of Transport, 2005: 29).

Key results	Indicative performance indicators
More freight carried by rail	• Increased tonnage • Increased tonne kilometres • Increase in rail's modal share
More passengers carried on urban rail services	• Increased passenger trips • Increased passenger kilometres • Increase in modal share of trips and passenger kilometres relative to private car use
Improved level of rail safety	• Reduction in injury accidents (note that the Rail Safety Strategy will develop specific indicators for each category of rail accident)

Regarding rail funding all regional councils are noted to contribute towards the subsidy cost for contracted urban passenger rail services through rates and other revenue (Ministry of Transport, 2005b).

5.1.2.6 Sea Freight Strategy

Sea Change: Domestic Sea Freight Strategy (May 2008)

The domestic sea freight strategy, 'Sea Change' was launched on 20 May 2008. The aim of the Strategy is for a major contribution from coastal shipping towards the management of future freight growth. By 2040, the total amount of freight movements around New Zealand is expected to more than double exerting pressure on the existing transportation system and network.

Currently about 15% of domestic inter-regional freight in New Zealand is carried by sea. The Strategy's target is to at least double this by 2040. An interim target of 20% of domestic sea freight has been set.

By reaching 30% of the share of inter-regional freight carriage by 2040, transport GHG emissions could be reduced by 7% (New Zealand Government, 2008). Achieving this target is also expected to result in a per capita CO_2 emissions reduction of approximately 3.5% (Ministry of Transport, 2008c).

5.1.2.7 New Zealand Freight Study (underway)

The New Zealand Freight Study is due for completion in June 2008. The Study is being undertaken by the Ministry of Transport in conjunction with the Ministry of Economic Development and Land Transport New Zealand due to an information gap on freight movements in New Zealand. An understanding of the following matters is expected to result from the Study:

- *The current volumes and distribution of import, export and domestic freight movements in New Zealand*

- *The likely future volumes and distribution of import, export and domestic freight movements in New Zealand*

- *Any significant modal, national, regional and industry trends, and any imbalance of directional freight flows.*

Information generated by the Study on the likely future transport network will also:

- *Identify any barriers to achieving improved efficiency in the transport components of our supply chains*

- *Identify the drivers of current freight movement and how these might change over time (e.g. business requirements and logistic methods)*

- *Identify domestic and international trends, issues and opportunities related to the freight transport and logistics sectors.*

(Ministry of Transport, 2008b).

5.1.2.8 New Zealand Emissions Trading Scheme (September 2007)

The Framework for a New Zealand Emissions Trading Scheme (NZ ETS) was released in September 2007 and is a market-based approach to reduce GHG emissions. The NZ ETS will operate alongside other government policies and measures to reduce domestic GHG emissions to meet international obligations and achieve New Zealand's broader sustainability objectives.

The NZ ETS is a 'cap and trade' price-based trading scheme which allows the trading of a limited number of emission units, whose price would be determined by supply and demand (Ministry for the Environment and The Treasury, 2007; New Zealand Government, 2007).

The NZ ETS will be implemented via a transitional pathway providing gradual adjustment to emissions pricing across the economy with provisions varying by sector. By integrating a price for GHG emissions into decision making by producers and consumers, the NZ ETS intends to change investment and consumption behaviours. The desired result will be a shift over time in our lifestyle and economy towards using, consuming and investing in goods and services with lower GHG emissions (Ministry for the Environment and The Treasury, 2007).

The following policy documents are related to land transport, land use and CO_2 emissions with some documents under development at the time of writing.

5.1.2.9 New Zealand Urban Design Protocol 2005

The Urban Design Protocol was launched by the Ministry for the Environment in March 2005 as part of the Government's Sustainable Development Programme of Action around sustainable cities. The Protocol is a voluntary commitment by signatory organisations that include central and local government, the property sector, design professionals, professional institutes and other groups.

By using quality urban design the Protocol aims to make our towns and cities more successful to help them become:

- Competitive places that facilitate creativity and innovation and thrive economically

- Liveable places providing a choice of housing, work and lifestyle options

- Environmentally responsible places that sustainably manage all aspects of the environment

- Inclusive places offering opportunities for all citizens

- Distinctive places with a strong identity and sense of place

- Well-governed places with a shared vision and sense of direction.

(Greater Wellington Regional Council, 2006a).

The seven essential design qualities of the Protocol are as follows:

- **Context**: *seeing that buildings, places and spaces are part of the whole town or city*

- **Character**: *reflecting and enhancing the distinctive character, heritage and identity of our urban environment*

- **Choice**: *ensuring diversity and choice for people*

- **Connections**: *enhancing how different networks link together for people*

- **Creativity**: *encouraging innovative and imaginative solutions*

- **Custodianship**: *ensuring design is environmentally sustainable, safe and healthy*

- **Collaboration**: *communicating and sharing knowledge across sectors, professions and with communities.*

(Ministry for the Environment, 2005).

5.1.2.10 Transport Sector Strategic Directions 2006 – 2009 (Update 2006)

This document is the first of the annual progress reports on the Transport Sector Strategic Directions document (TSSD) which outlined the government transport agencies' strategic priorities for the period 2006 – 2009. The TSSD identifies the following strategic principles:

- *An integrated approach to planning*

- *Research and information*

- *Cross-modal approach to safety*

- *Influencing demand for transport services*

- *Managing environmental and public health impacts.*

(Ministry of Transport, 2006: 2).

Where sector-wide action is not required the TSSD is intended to complement existing individual work programmes of government transport agencies (delivering the NZTS objectives) and not impinge on their statutory roles (Ministry of Transport, 2006).

The Integrated Approach to Planning project (IAP) focuses on building a more integrated and systematic approach to transport and land use planning across business, government and the

community. The first action of the project was to identify barriers to successfully integrating land use and multi-modal transport planning (Ministry of Transport, 2006).

A smoother and more rapid resolution of transport and land use planning issues is an expected result of the project in addition to the valuable knowledge gained and associated environmental and social benefits. The project is led by Transit New Zealand and is a collaborative effort between the Ministry for the Environment, Local Government New Zealand and the transport sector agencies. The IAP project is one of several strategic work streams sponsored by the Transport Sector Chief Executives' Group and is managed by the TSD Planning Task Force (Transit New Zealand, 2007).

5.1.2.11 Better Integration of Land Use and Transport: Integrated Approach to Planning

DRAFT Phase One Report (July 2007)

The IAP Phase One Report represents six months of background work to identify issues, gaps and barriers in achieving better integration of land use and transport systems. The report presents information, ideas and issues under the six main themes highlighted by the IAP project: legislation, policy, institutional frameworks, funding, planning practice (implementation) and capability and capacity. The themes are summarised and recommended actions are given (Allan, 2007).

5.1.2.12 Getting there – on foot, by cycle (2005)

'Getting there – on foot, by cycle' is the Government's strategy to advance walking and cycling in New Zealand. The vision of the strategy is for a New Zealand where people from all sectors of the community walk and cycle for transport and enjoyment. The three goals of the strategy are:

- *Community environments and transport systems that support walking and cycling*

- *More people choosing to walk and cycle, more often*

- *Improved safety for pedestrians and cyclists.*

(Ministry of Transport, 2005a: 10).

The strategy incorporates four focus areas:

- *Strengthening foundations for effective action*

- *Providing supportive environments and systems*

- *Influencing individual travel choices*

- *Improving safety and security.*

(Ministry of Transport, 2005a: 14).

'Getting there' acknowledges the contribution of walking and cycling to achieving the NZTS vision and objectives. The Ministry of Transport is responsible for implementing the Strategy but other sectors are also expected to resource walking and cycling initiatives. Funding from local government is specifically indicated along with further central government investment in strategy implementation from the transport, health, sport and recreation and the environment sectors (Ministry of Transport, 2005a).

5.1.2.13 Improving the fuel economy of vehicles entering the New Zealand fleet

A discussion paper for public comment (January 2008)

This discussion document focuses on the improvement of the fuel economy of the vehicle fleet and puts forward the Government's preferred option of legislating for a vehicle fuel economy standard. The document was released in January 2008 and public submissions closed on 28 March 2008 (Ministry of Transport, 2008a).

The objective is to improve the fuel economy of light vehicles entering New Zealand and reduce CO_2 emissions. The options to achieve the NZEECS fuel economy target of 170g of CO_2/km on average by 2015 for light vehicles entering the fleet are considered. This represents a 20% reduction from current levels (about 210g of CO_2/km) and the aim is to achieve the target in three transitional steps. The proposed fuel economy standard would apply to all light goods and light passenger motor vehicles of 3.5 tonnes gross vehicle mass or less and would not apply to cycles, mopeds or motorcycles (Ministry of Transport, 2008a).

The options considered in the discussion document are as follows:

- Status quo

- Additional education and information for consumers

- Differential first registration

- A voluntary standard

- Regulate a minimum fuel economy standard

- Regulate a fuel economy standard (the preferred option).

(Ministry of Transport, 2008a).

Other government measures that will contribute to vehicles with better fuel economy entering the New Zealand fleet include:

- the NZ ETS – by ensuring the costs of carbon emissions from fossil fuel consumption are met

- the fuel economy labelling scheme – providing star-ratings for consumers who wish to purchase vehicles with good fuel economy.

(Ministry of Transport, 2008a).

5.1.3 Regional policy: Wellington

The following regional policy documents are either current or under development.

5.1.3.1 Wellington Regional Land Transport Strategy 2007 – 2016

All regional councils are required to produce a Regional Land Transport Strategy (RLTS) under section 175 of the Land Transport Act 1998 (as amended by the Land Transport Amendment Act 2003. Refer to section 5.1.1.1 of this chapter for a description of this legislation). Under the current Act, a RLTS must be renewed every three years and kept current for at least three years but not more than 10 years. Every RLTS must include a demand management strategy that has targets and timetables appropriate for the region. Every RLTS must also include any regional passenger transport plan and may be amended at any time to include a plan which is prepared after the strategy is adopted (Greater Wellington Regional Council, 2007a).

The Wellington Regional Land Transport Strategy 2007 - 2016 (WRLTS) was adopted in July 2007.

WRLTS Vision and Objectives

The Strategy's vision is:

> *To deliver, through significant achievements in each period[3], an integrated land transport system that supports the region's people and prosperity in a way that is economically, environmentally and socially sustainable.*

(Greater Wellington Regional Council, 2007a: 6).

The LTA 1998 requires integration with the national policy framework which predetermined five of the objectives in the WRLTS (those established by the NZTS 2002) (Greater Wellington Regional Council, 2007a). Refer to section 5.1.2.1 of this chapter for a list of the objectives.

A sixth objective was developed following analysis of issues specific to the Wellington region:

> *Ensure that the Regional Transport Programme is affordable for the regional community.*

(Greater Wellington Regional Council, 2007a: 23).

The strategic transport network of the greater Wellington region can be seen in Figure 5.4.

---

[3] Short term 0 – 3 years; medium term 4 – 10 years; long term beyond 10 years
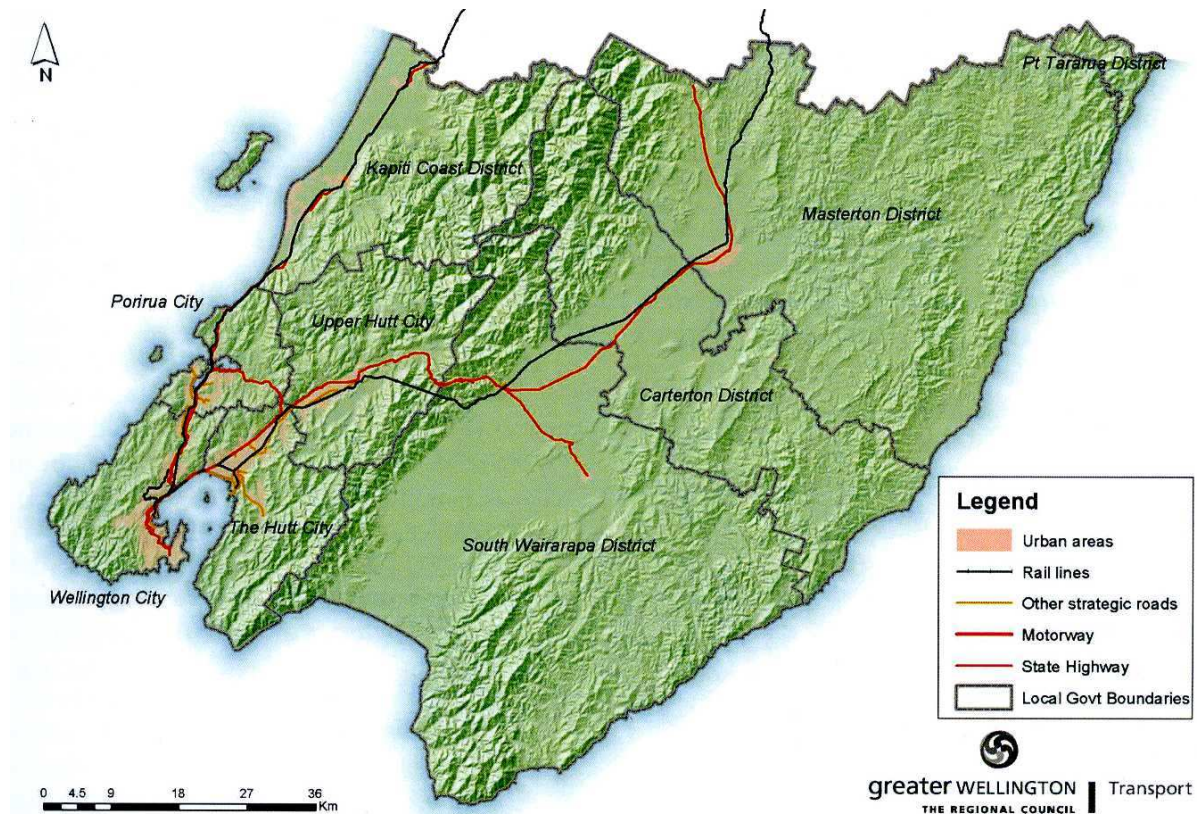
Figure 5.4: Strategic Transport Network of the Wellington region (Greater Wellington Regional Council, 2007a: 7).

Regional pressures and issues

The WRLTS identifies the following key issues and pressures which challenge the land transport network in the Wellington region:

- *Access to goods and services, employment and amenities*

- *Transport-related greenhouse gas emissions*

- *Public transport capacity and mode share*

- *Reliability of the transport network*

- *Severe traffic congestion, particularly at peak times*

- *East-west connections between key transport corridors and regional centres.*

(Greater Wellington Regional Council, 2007a: 3).

WRLTS Outcomes and Targets

Tables 5.5 and 5.6 list the outcomes and associated targets which the WRLTS seeks for the region's land transport network. All outcomes are to be considered together (not in isolation) as part of an integrated strategic view of the transport system for the region. Outcomes are ranked as "key" and "related" outcomes to indicate priority over the period from 2007 – 2016 (Greater Wellington Regional Council, 2007a).

Table 5.5: WRLTS key outcomes and targets to 2016 (Greater Wellington Regional Council, 2007a: 26).

Key outcome	2016 Stretch target
1.1 Increased peak period passenger transport mode share	Passenger transport accounts for at least 25 million peak period trips per annum. (18.3 million in 2005/06)
	Passenger transport accounts for at least 21% of all region wide journey to work trips. (17% in 2006)
2.1 Increased mode share for pedestrians and cyclists	Active modes account for at least 15% of region wide journey to work trips. (13% in 2006)
3.1 Reduced greenhouse gas emissions	Transport generated CO_2 emissions will remain below 1,065 kilotonnes per annum. (1,118 in 2005/06)
4.1 Reduced severe road congestion	Average congestion on selected roads will remain below 20 seconds delay per km travelled despite traffic growth. (21 seconds in 2006)
5.1 Improved regional road safety	There are no road crash fatalities attributable to roading network deficiencies.
6.1 Improved land use and transport integration (in line with the WRS and local authority urban development strategies)	All large subdivisions and developments include appropriate provision for walking, cycling and public transport.
7.1 Improved regional freight efficiency	Improved road journey times for freight traffic between key destinations.

Table 5.6: WRLTS related outcomes and targets to 2016 (Greater Wellington Regional Council, 2007a: 28).

Related outcome	2016 Target
1.2 Increased off-peak passenger transport use and community connectedness	Passenger transport accounts for at least 25 million off peak period trips per annum. (16.7 million trips in 2005/06)
1.3 Improved passenger transport accessibility for all, including disabled people or from low income groups	80% of passenger transport services are guaranteed to be wheelchair accessible. (11.8% in 2005/06) Most of the region's residents live within 400 metres (5 minutes walk) of a bus stop or train station with a service frequency of at least 30 minutes. Passenger transport services in the highest deprivation areas are more affordable.
1.4 Reduced passenger transport journey times compared to travel by private car	Peak period passenger transport journey times are equal to or better than a similar journey undertaken by a private car for key selected corridors.
1.5 Increased passenger transport reliability	Nearly all bus and train services run on time.
2.2 Improved level of service for pedestrians and cyclists	All of the strategic cycle network provides an acceptable level of service. Nearly all urban road frontages are served by a footpath.
2.3 Increased safety for pedestrians and cyclists	Fewer than 100 pedestrians injured in the region per annum. (150 injured in 2005) Fewer than 75 cyclists injured in the region per annum. (112 injured in 2005)
3.2 Reduced private car mode share	Private vehicles account for no more than 62% of region wide journey to work trips. (68% in 2006)
3.3 Reduced fuel consumption	No more than 442 mega litres of petrol and diesel per annum will be used for transport purposes. (464 mega litres in 2005)
3.4 Increased private vehicle occupancy	Vehicles entering the Wellington CBD during the 2 hour AM peak contain on average at least 1.5 people per vehicle. (1.37 people in 2006)
4.2 Maintained vehicle travel times between communities and regional destinations	No decrease in average vehicle journey "speeds" shown in travel time surveys for selected key routes. (55km/h in 2006)
4.3 Improved reliability of the strategic roading network	Key routes are very rarely affected by closure.
6.2 Improved integration between transport modes	The majority of passenger transport services covered by integrated ticketing.
6.3 Sustainable economic development supported (in line with the WRS)	Reduced vehicle kilometres travelled per GDP.
6.4 Improved transport efficiency	Reduced passenger transport expenditure per passenger. Reduced roading expenditure per GDP.
7.2 Improved inter-regional freight efficiency	All infrastructure constraints to rail freight movements are removed.

The targets set in the WRLTS intend to signal the magnitude of change required to achieve each of the Strategy's outcomes. The targets set a benchmark against which progress in realising the outcomes can be monitored.

Key outcome ('stretch') targets are noted to be ambitious requiring all involved agencies (including central government) to take a strong lead to meet the challenge of achievement of these targets. Although challenging, achieving the key outcome targets should be possible if all potential measures are implemented and they are given adequate weight. More than one target has been set for some

related outcomes due to the differing components of the outcomes (Greater Wellington Regional Council, 2007a).

WRLTS Policies

The following policies were developed in direct response to the pressures and issues that the land transport network of the Wellington region faces.

- *Network management*

- *Travel demand management*

- *Safety*

- *Environment and public health*

- *Planning and integration*

- *Securing transport funds*

- *Implementation policies*

- *Programme prioritisation and funding policies*

(Greater Wellington Regional Council, 2007a: 29-32).

A comprehensive tabular cross reference of the contribution these policies make to the WRLTS's objectives is given in Appendix 10.

Wellington Regional Transport Programme 2006/07 – 2016

The Regional Transport Programme (RTP) is a single document which sets out the region's expectations over the next 10 years for new capital expenditure on strategic roading and funding for demand management, travel by active modes and passenger transport. The RTP is divided into two parts: the 10-Year Strategic Roading Programme and the 10-Year Passenger Transport Programme (including all non-roading projects and activities). The RTP is reviewed annually and provides the reference necessary for prioritisation, sequencing and funding allocation decisions (Greater Wellington Regional Council, 2007a).

Other Strategic Policy

The WRLTS is required to be consistent with the outcomes of the Long Term Council Community Plan (LTCCP) for the Wellington region. The LTCCP 2006 – 2016 outcomes related to transport are as follows:

- *Connected community* – key transport related outcome

- *Healthy environment*

- *Prepared community*

- *Essential services*

- *Healthy community*

(Greater Wellington Regional Council, 2007a: 68).

Transport outcomes identified in the WRLTS are expected to play a significant role in facilitating the sustainable economic growth sought by the Wellington Regional Strategy. The WRLTS is not required to take account of the National Rail Strategy but it has been considered due to its relevance in identifying regional rail issues. Transit New Zealand's 10-year State Highway Forecast was also considered in the development of the WRTLS (Greater Wellington Regional Council, 2007a).

Implementation plans

Implementation plans facilitate the translation of WRLTS objectives and policies into specific project interventions. The plans give a region wide perspective of each transport mode or specific interest area. This allows interventions for each mode or area of interest to be given relative priority (Greater Wellington Regional Council, 2007a).

The following plans implement the WRLTS:

- Wellington Regional Road Safety Plan – adopted August 2004

- Wellington Regional Cycling Plan – adopted February 2004, currently under review

- Wellington Regional Pedestrian Plan – adopted May 2004, currently under review

- Wellington Regional Travel Demand Management Plan – adopted December 2005

- Wellington Regional Freight Plan – adopted July 2007

- Wellington Regional Passenger Transport Plan and Operational Plan – adopted August 2007.

Each implementation plan is a stand-alone document and is reviewed independently of the WRLTS (Greater Wellington Regional Council, 2007a).

Wellington Regional Travel Demand Management Plan

Managing the demand for travel, especially travel by private car plays an important role in meeting the desired outcomes of the WRLTS. Regionally significant demand management issues are sought to be addressed by the TDM Plan including: a growing demand for travel (especially during peak periods); low vehicle occupancy; inefficient trips and increasing emissions (Greater Wellington Regional Council, 2007a).

The action programme of the TDM Plan for the Wellington region includes:

- *a comprehensive Travel Plan Programme for workplaces, schools and communities*

- *development and implementation of network management tools*

- *support and advocacy for integrated land use and transport planning*

- *investigation of and advocacy for road pricing.*

(Greater Wellington Regional Council, 2007a: 46).

These action areas can be seen within the scope of the overall Plan in Figure 5.5. The provision of travel choices and viable alternatives to the private car support the TDM Plan and are addressed through the other modal implementation plans which support the WRLTS (passenger transport, cycling and walking).
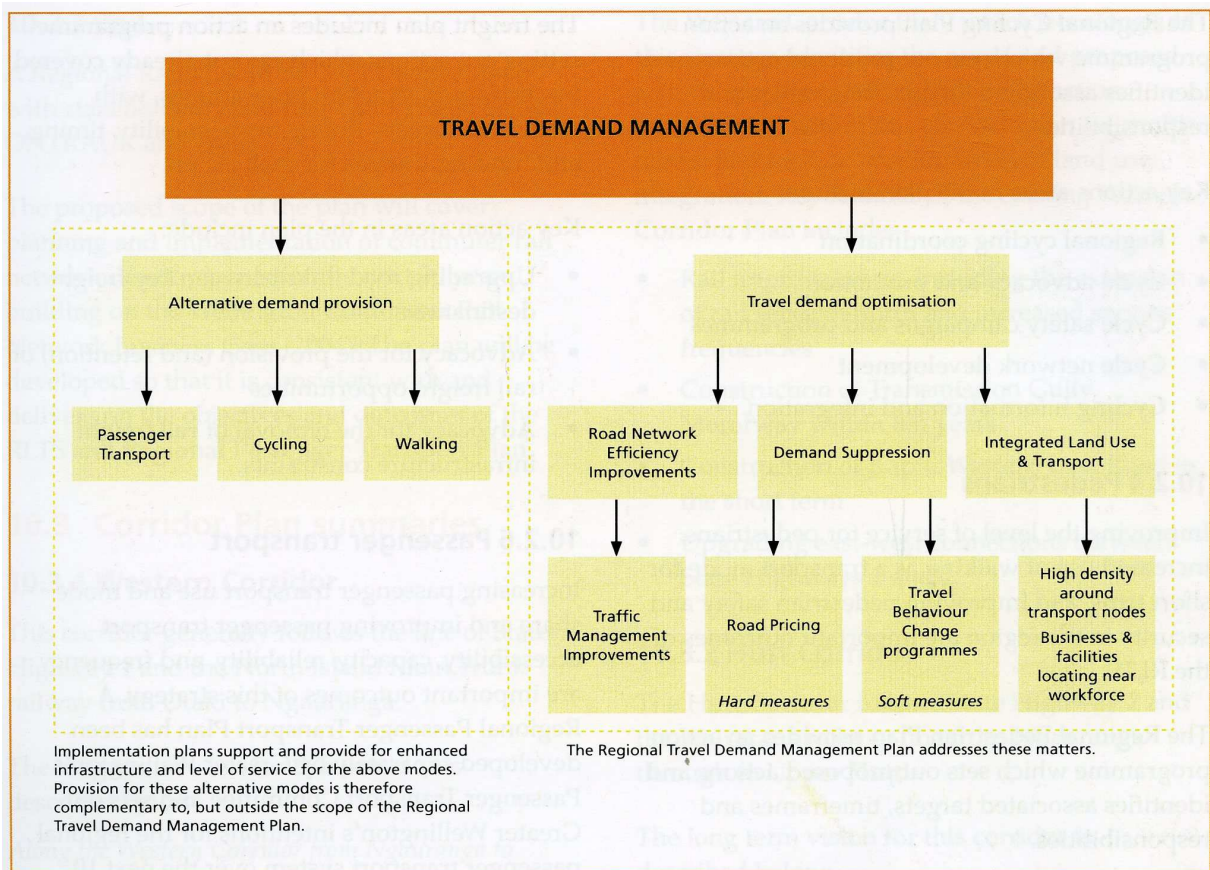
Figure 5.5: Scope of the Regional Travel Demand Management Plan (Greater Wellington Regional Council, 2007a: 47).

Wellington Regional Passenger Transport Plan 2007 – 2016

The Wellington Regional Passenger Transport Plan 2007 -2016 was adopted in August 2007 and sits alongside the WRLTS. The Plan is considered to form part of the Strategy and will be renewed at least every three years in line with the Strategy. The Plan provides a framework for the funding and provision of the passenger transport system and includes a separate non-statutory Regional Passenger Transport Operational Plan (Greater Wellington Regional Council, 2007a).

Corridor plans

The Wellington region has four principal transport corridors. Within a transport corridor transport infrastructure is aligned and links activity centres. The plans identify the needs and desired outcomes specific to that corridor and identify responsibilities, targets and timeframes in comprehensive action programmes. Three of the four corridor plans have been developed and adopted following extensive development studies and consultation processes. The Ngauranga to Airport corridor is the subject of a

strategic study currently underway by Greater Wellington Regional Council, Wellington City Council and Transit New Zealand (Greater Wellington Regional Council, 2007a).

The corridors and associated plans are listed as follows:

- Western Corridor Plan (Otaki to Ngauranga merge) – adopted April 2006

- Hutt Corridor Plan (Upper Hutt to Ngauranga merge) – adopted December 2003

- Wairarapa Corridor Plan (Masterton to Upper Hutt) – adopted December 2003

- Ngauranga to Wellington Airport Corridor Plan – under development.

Ngauranga to Airport Strategic Transport Study

This study is a partnership between Greater Wellington Regional Council, Wellington City Council and Transit New Zealand. The strategic study area can be seen in Figure 5.6 and follows State Highway 1 from the Ngauranga merge (bottom of the Ngauranga Gorge), through Wellington City CBD to Wellington International Airport and includes Wellington Hospital. See Appendix 11 for details of the study.
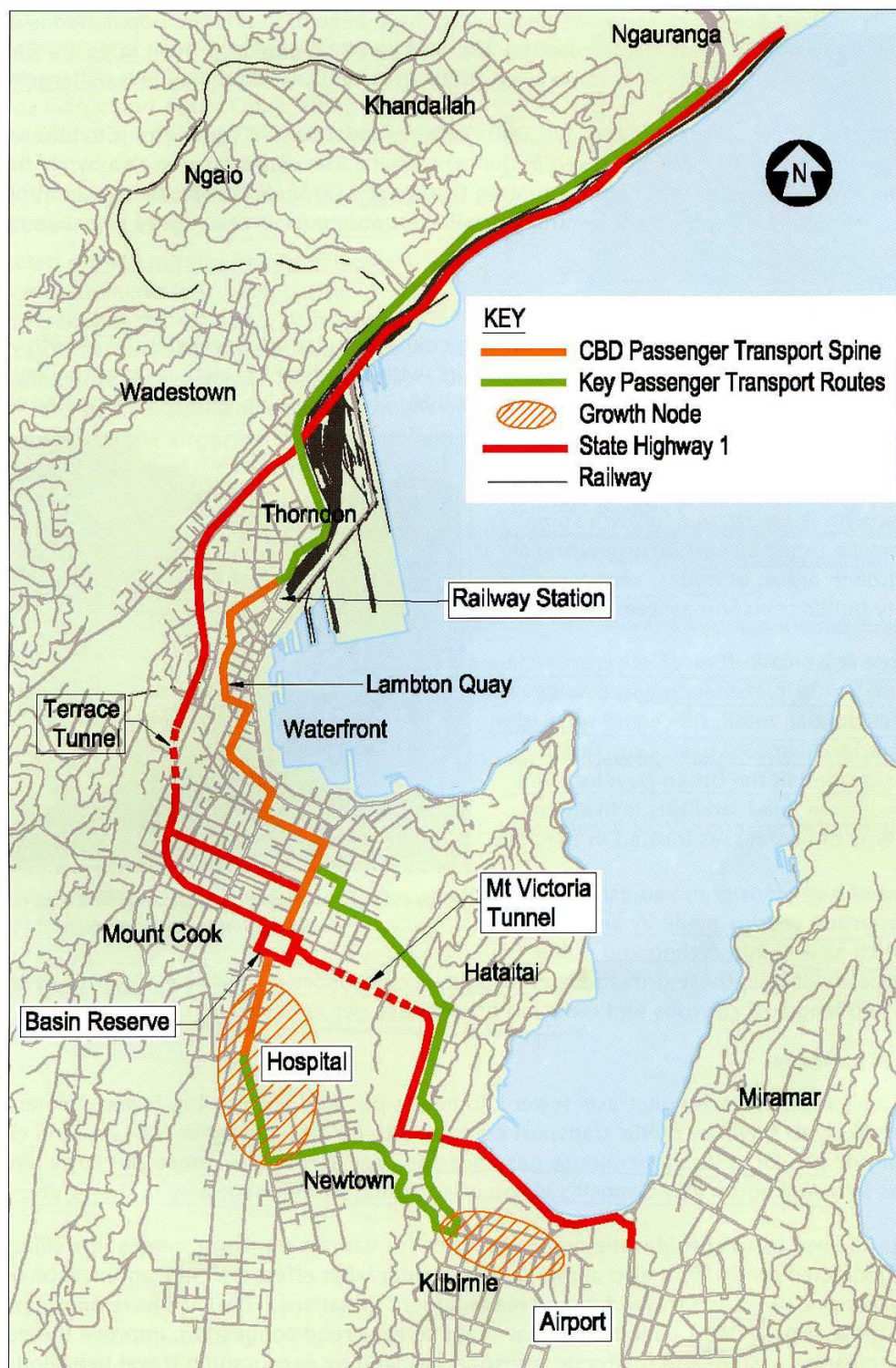
Figure 5.6: Map of the Ngauranga to Airport Strategic Transport Study area (Ngauranga to Airport Strategic Transport Study, 2007: 5).

5.1.3.2 Regional Policy Statement

Regional councils are required under the RMA to prepare and review regional policy statements (RPS) every 10 years. The Draft Regional Policy Statement for the Wellington region 2008 was released in March 2008 and remained open for public consultation until 16 May 2008. The draft has no statutory effect but is a way to gain feedback and input from councils, businesses and the people of the region before the proposed Statement is publicly notified in late 2008. A more formal submissions and hearings process will then take place prior to the RPS becoming operative (Greater Wellington Regional Council, 2008b).

> *The Regional Policy Statement is the most important mechanism at the regional level for directing land use planning in a way that supports sustainable community outcomes* (Greater Wellington Regional Council, 2007a: 66).

The RPS:

> *helps build sustainability by identifying the significant resource management issues of the region, then setting out objectives, policies and methods to address these issues using the means available under the Resource Management Act* (Greater Wellington Regional Council, 2008a: 3).

The Statement acknowledges that many factors influence the journey towards sustainability for a region including political, social, economic, cultural and environmental issues. The RPS recognises that other national and regional policy documents also contribute significantly to sustainability and addressing these issues, identifying the Wellington Regional Strategy, the Wellington Regional Land Transport Strategy and the Long Term Council Community Plans (prepared by all local authorities) as key documents (Greater Wellington Regional Council, 2008a).

The key qualities identified by the draft RPS for a sustainable Wellington region that relate to land transport and land use are:

- *Carbon neutrality*

- *Well structured, designed, functioning and connected cities and towns that optimise people's sense of place and enhance their economic, social and cultural activities.*

(Greater Wellington Regional Council, 2008a: 4).

The RPS ultimately focuses on the matters that it can influence in making a more sustainable region (Greater Wellington Regional Council, 2008a).

Carbon neutrality

The RPS recognises that central government is responsible for the development of policies in response to many issues such as carbon trading and emissions control but also that individuals, households and businesses must take responsibility to reduce their own emissions. Regarding climate change, Regional Policy Statements are limited in their ability to direct but this draft RPS contains policies which encourage emissions reduction by reducing fossil fuel use for transport. The Statement identifies that this can be achieved by more integrated land use, reducing the need for travel, encouraging more cycling and walking, and by investing in better public transport. The need to plan for climate change consequences and adaptation to the likely changes is also identified (Greater Wellington Regional Council, 2008a).

Well structured, designed, functioning and connected cities and towns

The draft RPS points out the importance of appropriately dense towns and cities and basing urban expansion on existing or planned transport services. If this does not occur, scattered communities with fewer local amenities and work opportunities will be created. Trips by private vehicles will increase in turn, placing more pressure on regional transport networks and causing associated costs to the environment, society and the economy (Greater Wellington Regional Council, 2008a).

Energy, infrastructure and regional form

The RPS topics of energy, infrastructure and regional form most closely relate to the aim of this research. The issues arising under these topics, associated objectives (see Table 5.7), policies and methods to achieve the objectives of the RPS are listed or defined in Appendix 12.

Table 5.7 identifies anticipated environmental results of the RPS as 10-year targets against which to monitor achievement of the objectives (Greater Wellington Regional Council, 2008a).

Table 5.7: Objectives and the anticipated environmental results from implementing policies and methods in the RPS – Objectives 9, 10 & 27 (Greater Wellington Regional Council, 2008a: 120-122, 126).

Topic: Energy and Infrastructure	
Objectives	**Anticipated environmental results**
Objective 9: Energy The region's energy needs are met in ways that: (a) Reduce GHG emissions from transportation; (b) Reduce dependency of fossil fuels; (c) Maximise the use of the region's renewable energy resources; (d) Diversify the type and scale of renewable energy development in the region; (e) Improve the efficiency of energy use.	Regional and district plans will contain policies that recognise the social, economic, cultural and environmental benefits derived from the generation and transmission of renewable energy.
	The number and diversity of renewable energy sources being utilised within the region will be significantly greater than in 2007.
	By 2016, transport related CO_2 emissions for the region will be below 1,065 kilotonnes per annum (2001 equivalent).
	By 2016, at least 15 % of the region's commuters will walk or cycle to work.
	By 2016, at least 21 % of the region's commuters will take passenger transport to work.
	TDM programmes will have been put in place by a significant number of schools, business and other workplaces in the region.
	The number of energy efficient subdivisions and developments will be substantially greater than in 2007.
	20% of businesses in the region will have adopted sustainable business practices.

	All district plans will contain policies to promote energy efficient subdivision or development, small scale renewable energy generation and provide for energy efficient alterations.
Objective 10: Regionally significant infrastructure The social, economic and cultural benefits of regionally significant infrastructure are recognised.	All regional and district plans will contain: (a) policies that recognise the social, economic and cultural benefits of regionally significant infrastructure; and (b) policies that protect regionally significant infrastructure from incompatible land uses under, over, or alongside.
Topic: Regional Form	
Objectives	**Anticipated environmental results**
Objective 27: Compact, well designed and sustainable regional form A compact, well designed and sustainable regional form, served by an integrated, safe and responsive transport network that delivers: (a) viable and vibrant regional CBD in Wellington city; (b) viable and vibrant regional centres[4];	Wellington Regional Council and all the region's city and district councils will have signed the New Zealand Urban Design Protocol.
	The average population density of land zoned for urban purposes will not have declined.
	90% of all building development (by number of building consents) will have occurred within land zoned for urban purposes.
	A regional action plan on urban design will have been jointly prepared by Wellington Regional Council and the region's city and district councils.

---

[4] *Masterton town centre, Upper Hutt city centre, Hutt city centre, Petone, Kilburnie, Johnsonville, Porirua city centre, Paraparaumu town centre* (Greater Wellington Regional Council, 2008a: 126).

(c) higher density and mixed use activities within and around key centres and public transport links;	People's satisfaction with the look and feel of the Wellington CBD and the key regional centres will have increased.
(d) sufficient industrial-based employment locations to meet the region's needs;	The range of land use activities within the Wellington central business district and the key regional centres will have increased.
(e) sustainable management of the regionally significant Regional Focus Areas;	The number of people living within a reasonable walking distance of key local centres and public transport links in the region will have increased.
(f) strategically planned rural residential development;	Sufficient industrial-based employment areas will be available to meet the region's needs.
(g) an integrated open space network that reinforces the region's form;	
(h) a range of housing (including increased opportunity for affordable housing) that meets the needs of the region's communities;	Principles to guide identification and release of areas for sustainable rural residential will have been developed and implemented.
(i) land use patterns that assist the region to achieve the WRLTS 2007-2016 key outcomes;	The range of housing choices (including affordable housing) will have increased.
(j) improved east -.west transport linkages;	
(k) efficient use of existing infrastructure (including transport network infrastructure).	

5.1.3.3 Wellington Regional Strategy

Wellington Regional Strategy: Internationally Competitive Wellington – A Sustainable Economic Growth Strategy for our Region (June 2007)

The Wellington Regional Strategy (WRS) 2007 is a joint project between Greater Wellington Regional Council and the nine territorial authorities in the region[5] (Greater Wellington Regional Council, 2007a). The WRS has an outlook to 2025 and is a sustainable growth strategy which has been developed in conjunction with central government and the region's business, research, education and voluntary sectors. It intends to build an internationally competitive Wellington (Greater Wellington Regional Council, 2007b). The WRS is aimed at sustainable economic and population growth which will build competitiveness, protect the region's sense of place, increase our quality of life and protect the values and communities that contribute to making the Wellington region different from anywhere else (Greater Wellington Regional Council, 2007a).

The WRS is not a detailed work plan but provides an overview of the opportunities that exist to lift the region's economic performance. Improvement in the environmental, cultural and social performance of the region is also sought by the WRS. Some new economic initiatives will be the responsibility of a region wide Economic Development Agency (Greater Wellington Regional Council, 2007b) "Grow Wellington".

The strategy outlines three focus areas: effective leadership and partnerships; investment in growing the region's economy, especially its exports; and good regional form. The first and third of these focus areas relate to this research topic.

---

[5] Kapiti Coast District, Porirua City, Wellington City, Hutt City, Upper Hutt City, South Wairarapa District, Carterton District, Masterton District and Tararua District.

Investment in leadership and partnerships

The WRS committee is the formal 'keeper' of the WRS and operates under the legal structure of Greater Wellington Regional Council on behalf of all the councils of the region. The committee membership includes the region's local government leaders and five highly respected individuals. The WRS committee has an overview role in terms of the various strands of the strategy. Figure 5.7 depicts the structure and relationships between the WRS Committee, government and other sectors of the Wellington region.
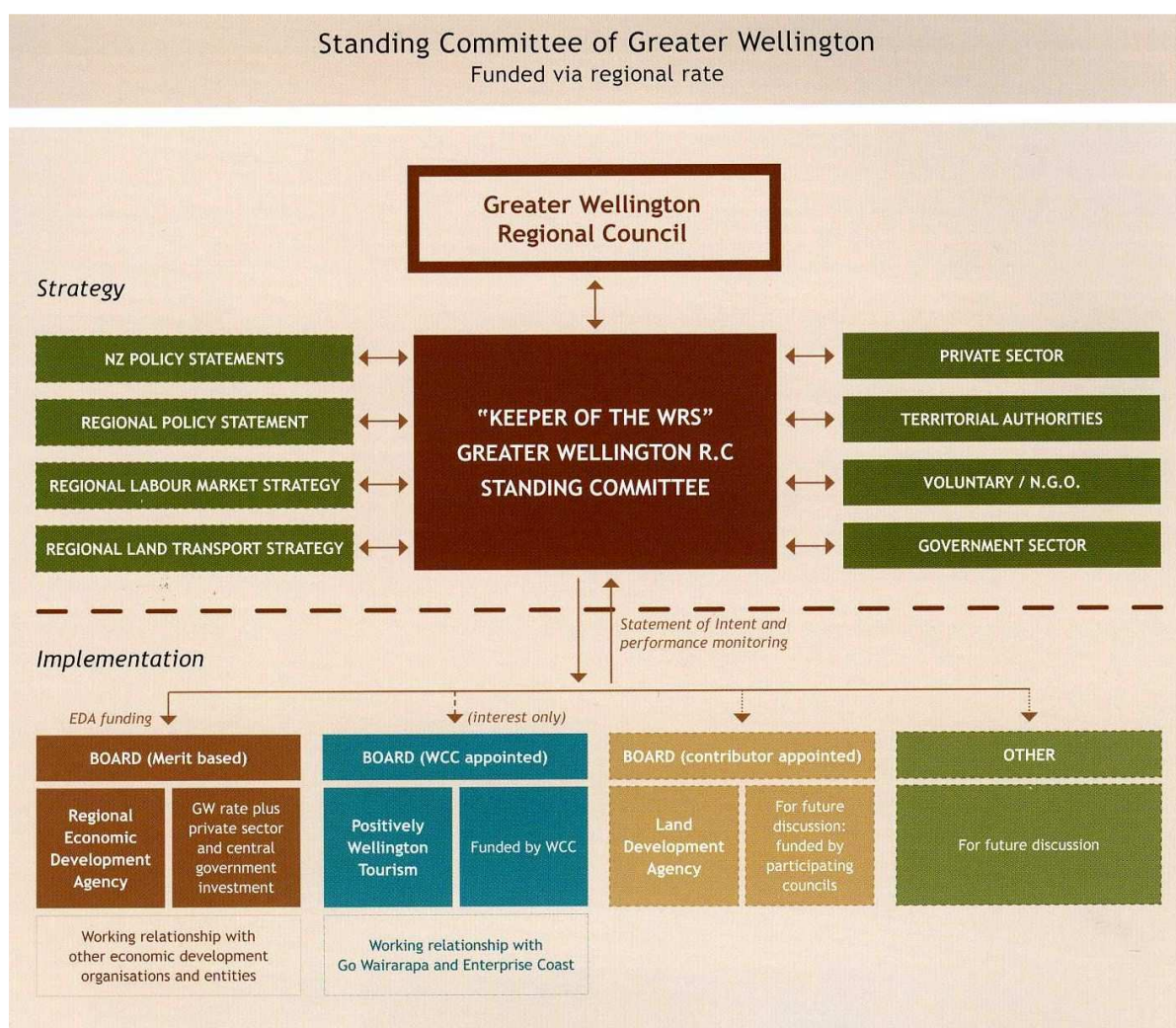
Figure 5.7: WRS Committee relationships (Greater Wellington Regional Council, 2007b: 13).

Implementing the WRS through the RPS is a significant step towards a common approach to regional land use management for the region's councils. Land development agencies (LDA) have the purpose of economic and/or urban regeneration and are common in most OECD countries except New Zealand. The agencies develop sites where private sector development is unlikely, or where desirable

change will not occur in time to meet economic development aims. A Wellington regional LDA is being considered for participating councils who wish to collaborate on specific land development opportunities and this will be subject to a separate public consultation process if it is pursued (Greater Wellington Regional Council, 2007b).

Investment in good regional form

Good regional form is fundamental to a successful, sustainable economic growth strategy. It is about the physical arrangement of urban and rural communities and includes effective management of the environment. A compact and well configured community enhances the quality of life for businesses and residents. Transport costs are lower and it's easier to get around; with less time spent travelling more time is available for work and leisure activities. Good transport connections are an investment priority and an essential ingredient of successful business (Greater Wellington Regional Council, 2007b).

Actions in the following regional form areas are defined by the WRS:

- Strong CBD and sub-regional centres*

- Quality urban design

- Integrate transport with urban and rural needs

- Land for business growth

- Housing close to work and transport

- Affordable housing

- Rural lifestyles

- Open spaces

- Regional Focus Areas*

* WRS priority areas.

Cities and towns with quality urban design look good, are easy to get around and feel safe. All the Wellington region's councils are committing to be a joint signatory to the New Zealand Urban Design Protocol and as such, will prepare an action plan to give effect to it. The region may potentially be

able to provide national leadership in sustainable development standards and urban design (Greater Wellington Regional Council, 2007b).

The strategy proposes a strengthened regional transport and land use group to help ensure that land use and transport decisions will be better integrated. The WRS acknowledges that investment in land transport, especially the roading network is addressed via the WRLTS. An agreed transport investment programme in relation to each of the region's centres is to be developed and land use planning advice will be provided to the Regional Land Transport Committee. The implications of transport decisions on surrounding areas needs to have a stronger focus ensuring that the Wellington CBD and sub-regional centres are properly supported and that the economic potential of some areas is also unlocked.

Achieving more employment close to where people live reduces pressure on transport and strengthens communities. Encouraging medium and higher density housing close to the Wellington CBD, sub-regional centres and transport links is needed. More residents close to public transport links makes good sense and creates vibrancy of those centres. Research has shown gaps in the types of housing available in the region. Successful cities place a strong emphasis on good urban design and achieving balance in housing choice. There is a need to manage infill housing carefully to protect the character of traditional low density suburbs (Greater Wellington Regional Council, 2007b).

The eight Regional Focus Areas for the Wellington region are listed in Appendix 12 under Policy 55 of the RPS ('Management of Regional Focus Areas'). These are areas which are likely to come under development pressure or which represent an opportunity where the region's local authorities could work together. Not all areas are to be promoted for development as some present environmental sensitivity and sustainability issues. Decisions on the specific outcomes for each area will be subject to public processes under the RMA and LGA and will be informed by the principles of the New Zealand Urban Design Protocol (Greater Wellington Regional Council, 2007b).

Climate change

The WRS states that the Wellington region cannot prevent the impacts from current and past GHG emissions but that it can contribute to limiting future effects and ensuring adaptation to effects beyond its control by:

- *Adopting programmes to reduce emissions. (The region is in a good position to do so, with the transport/urban form structure that currently exists).*

- *Contributing to the development of renewable energy*

- *Encouraging communities to identify local effects and adapt*

- *Encouraging local centres of employment*

- *Supporting passenger transport.*

(Greater Wellington Regional Council, 2007b: 49).

Genuine Progress Indicator

The Genuine Progress Indicator (GPI) is a leading edge measurement system distinguished from traditional economic measurement systems as it focuses on a wider range of indicators. The GPI measures progress across economic, environmental, social and cultural sectors and will be used to monitor WRS performance. The measurement system is currently under development and of note under the environmental indicators of the GPI framework is a "carbon neutral region".

Sustainable transport system principles

Table 5.8 lists the sustainable transport system principles which are part of the overarching principles for promoting sustainable prosperity for the Wellington region, as identified in the WRS. The five NZTS objectives associated with these principles are also shown.

Table 5.8: Sustainable transport system principles of the WRS (Greater Wellington Regional Council, 2007b: 56) and NZTS objectives (The Office of the Minister of Transport, 2002: 8).

WRS Sustainable Transport System Principles		NZTS Objectives
1. Creates an integrated land transport system	Transport infrastructure provides greater transport choice, integration and flexibility.	
2. Provides equitable access for all sectors of the community	People have access to social, economic, educational and recreational activities and freight moves around efficiently.	Improving access and mobility
3. Supports a thriving economy	The transport system maximises the efficient movement of people, goods and services.	Assisting economic development
4. Copes easily with change	The transport system is responsive to changing demands and technologies and provides a range of opportunities and alternatives.	
5. Assists safety and personal security	The transport system provides for a social environment that is safe.	Assisting safety and personal security
6. Is environmentally sustainable	The transport system is managed in a way that optimises allocation and use of resources, including non-renewable energy sources.	Ensuring environmental sustainability
7. Protects and promotes public health	Allows for social participation and interaction and healthy communities and increases the uptake of physical activity (sport, walking and cycling).	Protecting and promoting public health

5.1.3.4 Long Term Council Community Plan 2006 – 2016

In accordance with the Local Government Act 2002, long term council community plans (LTCCP) provide a 10 year focus for local authority activities and describe how these activities contribute to the achievement of the community outcomes (Greater Wellington Regional Council, 2006a). Greater Wellington Regional Council's LTCCP for 2006-16 has the following community outcomes:

- healthy environment

- quality lifestyle

- sense of place

- prosperous community

- prepared community

- connected community

- entrepreneurial and innovative region

- essential services

- healthy community

- strong and tolerant community.

(Greater Wellington Regional Council, 2006b).

The principal contribution of Greater Wellington's transport activities is providing funding for contracted public transport services (bus, rail and harbour ferry), funding for public transport infrastructure and the provision of high quality information about public transport. Special transport programmes are provided for people with disabilities and the WRLTS promotes public transport use and encourages cycling and walking. The provision of these services results in fewer private car trips and therefore lower levels of congestion and reduced environmental impacts (Greater Wellington Regional Council, 2006b).

Each city and district council in the Wellington region has a LTCCP containing their own community outcomes. These further describe the region's outcomes in the context of local desires and management (Greater Wellington Regional Council, 2006a).

5.1.4 Developments in Auckland Regional Policy

Regional land transport policy and policy associated with land use for the Auckland region (such as growth management policy) continue to be developed under a frequently changing policy setting. This section provides a brief overview of some of the developments in recent years and those currently underway.

The Local Government (Auckland) Amendment Act 2004 established the **Auckland Regional Transport Authority (ARTA)** on 1 July 2004 ("Local Government (Auckland) Amendment Act," 2004). ARTA's role is to develop and implement a Regional Land Transport Programme that gives effect to the Auckland Regional Land Transport Strategy (ARLTS) prepared under the LTMA 2003 (Ministry of Economic Development, 2005).

The **Auckland Transport Investment Package** (confirmed on 30 March 2004) allocated additional funding to improving public transport (particularly rail), TDM measures and key strategic roading projects for the Auckland region. All additional funds were dedicated to land transport and allocated under the National Land Transport Programme administered by Transfund New Zealand (now Land Transport New Zealand). The package also provided for the establishment of ARTA (Ministry of Economic Development, 2005).

The Auckland Regional Council (ARC) role focuses on development of the ARLTS and the governance and monitoring of ARTA and Auckland Regional Holdings (ARH). ARH was established on 1 July 2004 to take over the ownership and management of regional assets from Infrastructure Auckland (Ministry of Economic Development, 2005).

The **Auckland Regional Economic Development Strategy** was developed in 2002 and the **Metro Action Plan** was launched in 2006. The Strategy aims to make the Auckland region internationally competitive, an innovative place to live and conduct business, with a dynamic and inclusive economy. The Metro Project was created to address the region's economic future via the Regional Economic Development Strategy. Implementation progress of the Metro Project Action Plan is reported to the Regional Economic Development Forum (Hill & Houghton, 2007b).

The **Auckland Transport Strategic Alignment Project (ATSAP)** commenced in 2006 and the first deliverable was a statement that the ARLTS be extended to cover a 30 year period and be updated to include Transit New Zealand's 10 Year State Highway Forecast. The ATSAP also identifies areas of agreement or disagreement between the Government and the region regarding strategic transport, and actions to ensure continued alignment in these areas (Hill & Houghton, 2007b).

The Auckland region has two broad strategies specifically focused on providing direction on regional growth, land use and transport: the Auckland Regional Growth Strategy and the ARLTS. The region's key statutory document, the **Auckland Regional Policy Statement** also recognises the importance of integrating transport and land use, to achieve a compact, well designed, sustainable urban form and having well located and functioning infrastructure (Auckland Regional Council, 2007a).

The current ARLTS was published in December 2005 and a statutory review commenced in February 2007. The **ARLTS 2050** is currently under development and was to be completed in December 2008 (Hill & Houghton, 2007b). The ARLTS review timetable has been altered in line with the review of the Auckland Regional Growth Strategy, the Long Term Sustainability Framework (a collaborative sustainability project with the eight Auckland region councils and central government; now called the 'Auckland Sustainability Framework') and central government transport legislation and strategy development processes. This has resulted in a delay to the planned ARLTS review (Hill & Houghton, 2007a, 2007b).

The **Auckland Regional Growth Strategy** was developed by the **Regional Growth Forum** and adopted in 1999. It sets a vision for how the region can manage growth sustainably for the next 50 years and aims to improve liveability, protect the environment and put appropriate infrastructure in place (Auckland Regional Council, 2007b). The Strategy is currently being reviewed focussing on evaluating progress and identifying ways to improve implementation (Auckland Regional Council, 2007a). The review is expected to highlight growth focussed on high density, mixed use centres especially those centres well serviced by public transport (Hill & Houghton, 2007a).

The **Auckland Sustainability Framework (ASF)** was endorsed by the Regional Growth Forum on 5 September 2007 as the overarching sustainability framework for the Auckland region. The ASF aims to help the Auckland region secure a better quality of life, and create a sustainable future socially, culturally, economically and environmentally. It takes a 100+ year view and provides direction so that

local authorities and central government agencies can work together with a common purpose to embrace the opportunities and face the challenges associated with developing a truly sustainable region.

The key environmental sustainability challenges identified in the ASF are:

- Climate change

- Unsustainable natural resource use (energy).

(Kuschel, 2008).

The ARC is establishing a dedicated work programme enabling more effective integration of regional thinking, planning, and investment and accelerated actions in the areas of climate change and energy. The Environmental Sustainability programme has been split into two distinct but interdependent sub-programmes: climate change and energy. Under the climate change work programme a Regional Climate Change Working Group will be established involving officers from regional and local councils and relevant stakeholders. A draft **Regional Response to Climate Change** will be prepared by late 2008 which will:

- define the role of the ARC and other stakeholders in leading, accelerating and addressing key regional actions in adaptation, mitigation, and reporting/accounting; and

- provide input to key regional planning and strategy documents.

The energy work programme will develop a draft **Regional Energy Strategy** by late 2008 which:

- defines the role of the ARC and other stakeholders in leading and addressing key regional actions in efficiency/renewables, security of supply, and affordability/equity; and

- provides input to key regional planning and strategy documents.

A Regional Energy Working Group is proposed, led by the ARC, and will be involved in drafting this strategy. Both working groups are to be established in 2008 (Kuschel, 2008).

The **Regional Sustainable Development Forum (RSDF)** was founded on 24 September 2007 as a standing committee of the ARC to continue the work of the Regional Growth Forum. The RSDF is the successor of that forum and was established in response to the **Strengthening Auckland's Regional**

Governance Project undertaken in 2007 and to take responsibility for the ongoing stewardship and development of the ASF. The main focus for the RSDF in 2008 will be the development of the first version of "One Plan" for Auckland, in particular a set of priority actions of regional significance (Winder, 2008).

Membership of the RSDF includes: all local government for the Auckland region (ARC and the seven city and district councils); central government organisations (Department of Internal Affairs, Ministry of Economic Development, Ministry of Social Development, Ministry for the Environment and the Department of the Prime Minister and Cabinet); Tangata Whenua and neighbouring regional councils (Environment Waikato and Northland Regional Council). Success of the forum depends on a collective approach to decision making with a common purpose and the long term interests of the Auckland region as a whole (Winder, 2008).

The Auckland region is the subject of a current **Royal Commission of Inquiry** into regional governance. The Commission is to investigate and make recommendations on, future local and regional government arrangements for the Auckland region. Recommendations are to be made to the Governor-General on 1 December 2008 (Royal Commission on Auckland Governance, 2007).

5.1.4.1 Summary

Changes specific to the Auckland region that will come under the new Land Transport Management Amendment legislation have been described in section 5.1.1 of this chapter. These relate to the Auckland Regional Land Transport Committee membership, development of the Auckland Regional Land Transport Programme and the proposed Auckland Regional fuel tax.

The Auckland region has recently faced and continues to address a fast paced and continually changing central and regional policy environment in which to develop and implement initiatives in land transport and land use management. Much effort is being made at the regional level to integrate both the complex nature of the policy setting and the input from stakeholders across the region (and beyond) who each have specific requirements, into a regionally focused outcome.

Further detail from this section will be discussed in Chapter Six and a summary of the policy analysis will be presented.

5.2 International Best Practice in Integrated Transport Policy

The purpose of this section is to introduce principles and examples of best practice in CO_2 emissions reduction via integrated transport and land use planning so as to learn from them. By using the urban planning and design experiences of other cities and regions as they have responded to pressure from development, valuable comparisons may be able to be drawn for the New Zealand context. It may also be possible to set some practical or aspirational goals for our own regions based on these international examples.

Objective Two of this research is addressed in this section:

> *To gain an understanding of current international best practice for CO_2 emissions reduction via land transport and land use planning, and to identify integrated planning concepts for CO_2 emissions reduction that are currently practiced in the land transport and land use planning sectors.*

To establish an insight of the integration of planning in land use and land transport, literature from various sources has been reviewed. The following sections include: an explanation of some specific elements of travel behaviour (as it is important in this context to understand some of the reasons why we choose to travel, how and when we do) and mechanisms to change that behaviour; relevant planning concepts are described and some international examples of successful integrated developments are given.

5.2.1 Travel Behaviour

> *"Since virtually every citizen is a transportation planner and decision maker in meeting his or her transportation needs, the challenge of climate change can only be addressed by broad public participation in changing energy use and travel behaviour"* (Burwell & Sperling, 2007: 266).

As the private car is the most resource intensive of all modes of land transport many efforts to change travel behaviour focus on reducing car use. Common messages to achieve travel behaviour change include: more careful driving; higher vehicle occupancy; downsizing cars; a shift from the private car

to public transport; a shift from motorised to non-motorised modes; and minimising travel by replacing it with electronic communication (Karlik-Neale, 2005).

5.2.1.1 Private car travel

The private car is so prevalent when compared with other modes of travel as it is the most convenient (Karlik-Neale, 2005). It allows the luxury of not having to plan ahead, makes us feel in control and offers privacy and security (Sloman, 2006). A high value is placed on the freedom of movement and mobility conferred by the car (Cervero, 1998). The car satisfies our *need* to travel, e.g. for work or to acquire goods and services, as well as our *desire* to travel (to gain a feeling of freedom and for social interaction). Walking and cycling provide a level of independence and allow us to travel individually but they are energy demanding modes and we tend to prefer the easiest option. Public transport provides mobility but cannot replace the feelings that are associated with cars (Karlik-Neale, 2005).

Cars have become ingrained in society providing also a means to express ourselves. The psychological associations people often make with car use are listed as follows:

- *"auto" regulation: freedom of movement and autonomy (man as nomad/hunter)*

- *archetypal meaning: chivalrous/macho/heroic/superior (King-of-the-Road)*

- *power motive: dichotomy of the desire for power and community spirit*

- *territorial/possessive aspects (car as a mobile territory)*

- *individualism/status/communication: I am what I drive*

- *anthropomorphisation: the personification of the car, identification*

- *emotional/relational aspects: the car as an object of desire or love (car as a toy)*

- *social cohesion function: the car as a common interest*

- *neuronic stimulation: speed and neurobiochemistry (narcotic effect, speedaholism)*

- *pilot or engineer function: the skill and fun of handling a complex machine*

- *structuring the day: the car as a time-filler*

- *protective function: the car as a second skin, womb or friend.*

(Diekstra & Kroon, 2004 in Karlik-Neale, 2005: 9).

5.2.1.2 Travel decision making

Successful marketing strategies strongly influence the decision making process of the consumer. The car manufacturing industries have become masters of this with half of all media advertising in the United States (US) focusing on cars. Car ownership has reached over 700 cars per 1,000 people in the US (Sloman, 2006). This level of car ownership is very similar to that in New Zealand of 615 for every 1,000 people (Lee, 2007). Attempts to change travel behaviour towards more sustainable transport use 'soft' marketing measures such as promotional campaigns encouraging the uptake of walking, cycling and public transport (Sloman, 2006).

Social marketing in travel behaviour change can be described as a top-down approach which benefits society as a whole (Ampt, 2007). The social marketing process uses commercial marketing techniques to promote the adoption of social behaviours, and benefits those people or society as a result of that behaviour adoption. Social marketing appeals to core values and utilises emotion (heart) to appeal to the part of the brain that determines what people actually do, rather than what they think (head) they should do (Weinreich, 2006 in Ampt, 2007). This lies somewhere between the two most common social change methods of education (using rational facts to persuade people to change their behaviour) and coercion in which, under threat of penalty, people are forced to adopt behaviour (Ampt, 2007).

A community development-based approach is a bottom-up behaviour change method whereby people work through the process of change themselves. In this way the principles of change are learnt and the change is long term. It is a collaborative approach and links individual or community energy and aspiration with external support and vision. This approach has been used in voluntary travel behaviour change and has shown results of less vehicle kilometres travelled and therefore a reduction in CO_2 emissions (Ampt, 2007).

Most daily travel decisions are either habitual or intuitive (a perception of need leads straight to a pre-decided action with no evaluation or decision making). For example, regarding how to get to work or to the shop is not a comprehensive decision making exercise if the car is just outside (Karlik-Neale, 2005).

> *"Driving has become the normal, habitual, expected means of transport and other options are not even considered"* (Sloman, 2006: 15).

Travel behaviours are mainly triggered mindlessly with no consideration of the impacts of that behaviour such as environmental effects, health benefits or improved public transport. These concepts have important consequences for sustainable transport campaigns (Karlik-Neale, 2005).

Most sustainable transport strategies target car usage and not car ownership. Car usage could be reduced significantly with improved options for access to cars without owning them by way of car pools, public cars or rentals. This could have the added advantage of avoiding the formation of unsustainable habits. Developing new habits involves experimental behaviour and evaluation. The new behaviour becomes habitual only if the evaluation is positive and the behaviour is repeated a sufficient number of times. Awareness and the availability of options precede this process and all steps need to be addressed in order to encourage the formation of new sustainable travel habits (Karlik-Neale, 2005).

Reference to negative impacts of travel on moral grounds is common to many sustainable transport campaigns, i.e. communicating a moral obligation to change travel behaviour. However, a closer look at the moral decision making process shows that these campaigns need to focus on more than moral reasons to be effective. A conflict between a feeling of obligation and a decision not to act on it causes a re-evaluation of pre-existing values and results in a denial of any responsibility (Matthies, 2004 in Karlik-Neale, 2005).

An educational campaign encouraging travel behaviour change must also be combined with infrastructural changes offering attractive alternatives to car use. Otherwise people will justify existing behaviour (Karlik-Neale, 2005).

5.2.1.3 Traveltime budget

Yakov Zahavi (1926 – 1983) pioneered the concept of the 'traveltime budget', i.e. the time an individual spends travelling per day by any travel mode (University of Minnesota, 2007). The average household or tripmaker has a stable traveltime budget which can be related to their residential location and modes of travel used during the day (Zahavi, 1974). Zahavi's research established that the traveltime budget is both stable and predictable but not necessarily constant as it can change over time or vary from one place to another. The budget needs to be measured by the traveller before being used and in urban areas is estimated to be about one hour per day on average (University of Minnesota, 2007).

Zahavi (1974) realised that travellers do not save time as a result of increased travel speed; rather they appear to trade traveltime savings for more trips. This explains the resistance to change modes from the private car to public transport which may be slower. Attachment to the car was described by Zahavi as unwillingness to lose trips due to the activities associated with those trips. Only by increasing the door-to-door speed can public transport attract significant numbers of passengers away from the private car as it does for example, in London, Paris and New York (University of Minnesota, 2007). Travel budget theory suggests that reduced waiting time is the key challenge for public transport (Karlik-Neale, 2005).

In denser cities people make fewer trips on average and incorporate more purposes into their trips whereas single purpose trips are more common in lower density cities. The overall distance is longer and speed is higher in less dense environments (Zeibot, 2003 in Karlik-Neale, 2005). The connection between urban structure and transport was recognised by Zahavi with trip lengths being associated with city and population size. Cities were small when walking was the main mode of transport (University of Minnesota, 2007). Traditional walking cities are rarely more than 5km across allowing all destinations to be reached within half an hour on foot. Typical high density is 100 – 200 people per hectare (Newman & Kenworthy, 1996). A purpose-built urban environment (as in historic cities) is necessary to increase the efficiency of walking and cycling as they are much slower modes (Karlik-Neale, 2005).

The effectiveness of remote/home working strategies as a means to reduce travel could be questioned due to the resulting drastic reduction in social interaction. This unfulfilled need for social interaction causes people to travel more; the amount of travel does not change but only its purpose (Harvey and Taylor, 2000 in Karlik-Neale, 2005). The development of new social spaces such as cafes, streets and parks which are easily accessible from home by alternative modes to the car will enable social interaction. Mini town centres around Greater London within easy reach of public transport are providing opportunity for community interaction for higher density housing dwellers. These 'villages' typically incorporate a green, corner store, cafes with kerbside furniture and sport or activity centres (Karlik-Neale, 2005).

5.2.2 International Best Practice in CO$_2$ Emissions Mitigation via Integrated Transport Policy

5.2.2.1 Governance leading to action

Governance of climate change issues must occur at many levels. For example, in the United Kingdom (UK) the Government has a major role in negotiating international climate agreements. The international context informs policy targets, and national policy frameworks then define the rules within which the next levels of government must operate (Tyndall Centre for Climate Change Research, 2005).

Central governments play an essential role in GHG emissions mitigation through policy, legislation, funding and lobbying. At the local government level effective reductions via the creation and implementation of local solutions add to cumulative global efforts (ICLEI Oceania, 2006).

5.2.2.2 International networks

Many international networks facilitating cooperation and information sharing on issues related to climate change are operating. The Association of European Local Authorities for Promotion of Local Sustainable Energy Policies (Energie-Cités) is founded on the belief that local authorities have a fundamental role in the transition towards a sustainable energy future. Local level action can: reduce energy consumption; stimulate local growth by supporting local resources; and promote recognition of the town or city as a place of innovation (Tyndall Centre for Climate Change Research, 2005).

The association's main objectives are:

- to develop local initiatives through experience exchange, knowledge transfer and joint projects

- to provide expertise in local energy strategies

- to up-skill members in energy efficiency and the promotion of renewable and decentralised energy sources

- to influence European Union institution policies and proposals in the areas of urban policy, energy and environmental protection.

(Tyndall Centre for Climate Change Research, 2005).

Taking a strategic approach to addressing climate change is assisted by the International Council for Local Environmental Initiatives (ICLEI). Through the Cities for Climate Protection Programme (founded in 1993) local governments are provided with an innovative performance framework, technical training, and regionally specific tools to undertake the following five performance milestones:

- conduct an energy and emissions inventory and forecast

- establish emissions targets

- develop and adopt a Local Action Plan

- implement policies and measures

- monitor and verify results.

(ICLEI Local Governments for Sustainability, 2007; Tyndall Centre for Climate Change Research, 2005).

Through a commitment to the milestones local governments gain an understanding of how municipal decisions affect energy use and how these decisions can be used to mitigate GHG emissions while improving community quality of life. Actions taken to reduce GHG emissions benefit participating communities through:

- reduced utility and fuel costs resulting in financial savings for the local government, businesses and households

- improved local air quality and therefore enhanced community health and well being

- development of the local economy via new local jobs and investments in locally produced energy products and services.

Over 800 local governments participate in the Cities for Climate Protection Programme. ICLEI reports these local government actions to the global community via international events such as the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties (ICLEI Local Governments for Sustainability, 2007).

In New Zealand, 31 local and regional councils are members of CCP - NZ (Communities for Climate Protection – New Zealand) representing 80 % of the New Zealand population. CCP – NZ is part of the international Cities for Climate Protection Programme and is the fastest growing programme

internationally. The programme is a New Zealand government initiative delivered by ICLEI Oceania. CCP – NZ is customised for New Zealand and assists councils to identify actions to reduce GHG emissions by increasing sustainable transport, enhancing urban design, supporting the adoption of low carbon technology, energy conservation and the promotion of renewable energy (ICLEI Oceania, 2006).

5.2.2.3 Transit Oriented Development

Transit oriented development refers to commercial and residential areas which are designed to maximise access by non-motorised transport and transit. A TOD neighbourhood has a bus or rail station at its centre, relatively high density development surrounding this and progressively lower density spreading outwards. Stations are typically spaced from a half to one mile apart in a TOD neighbourhood which represents a distance of pedestrian scale (Victoria Transport Policy Institute, 2002).

Transit oriented development optimises the use of the transit network by utilising existing infrastructure and creating mobility options for transit users and the local community. By concentrating higher density development near stations (bus or rail) transit is made more convenient for more people and this encourages patronage. Successful TOD also provides a mix of land uses and densities that create a vibrant and interesting community for both local residents and visitors (The City of Calgary, 2008).

Cevero (1998) describes three important features of transit supportive cities and suburbs, namely: density (compact); diversity (made up of a variety of land uses); and design (attractive to pedestrians as all transit trips require some travel by foot). The built environments of some successful cities such as Munich and Stockholm make travel by transit much more pleasant and convenient than by car (Cervero, 1998).

TOD can help achieve virtually all TDM objectives and reduces transportation costs and externalities (Smith, 2001 in Victoria Transport Policy Institute, 2002). The cost of transportation can be reduced and productivity increased by the efficiencies of accessibility and agglomeration (when many activities are physically closely located) that TOD provides (Voith, 1998 in Victoria Transport Policy Institute, 2002). Average vehicle travel, ownership and expenditure per household all decline with

increasing residential density and proximity to public transit (Holtzclaw, 1994 in Victoria Transport Policy Institute, 2002).

The City of Calgary published a Best Practices Handbook (2005) and Transit Oriented Development Policy Guidelines(2004) for the development or redevelopment of properties within the area of a transit station (The City of Calgary, 2008). A key tool for encouraging TOD is to establish a clear city-wide vision for TOD setting out development policies and design expectations of a municipality. A common base of knowledge and understanding can then be established amongst stakeholder groups with clear goals and procedures for more detailed TOD planning at specific stations (The City of Calgary, 2005). TOD requires coordinated support from local governments, transit agencies and private developers (Victoria Transport Policy Institute, 2002).

Best practices in TOD which have been adopted as policies in Calgary (Alberta, Canada) are as follows:

- **Ensure transit supportive land uses**: limit motor vehicle oriented development and promote land use supporting the pedestrian and transit user; encourage a mix of residential, employment and supporting retail and service uses; mixed land uses may be integrated vertically (within a particular building) or horizontally (incorporating multiple buildings).

- **Increase density around transit stations**: locate the highest density with best access to transit; establish a minimum density on adjacent land parcels; create transition between higher and lower density development to minimise the impacts of density.

- **Create pedestrian friendly design:** provide quality pedestrian connections which are short, continuous, safe, easily navigable and designed for the climate; identify primary (direct) and secondary (feeder) pedestrian routes; provide a compact development form (group buildings together to frame pedestrian spaces); provide integrated public systems (full integration with elements such as bicycle routes, roads, sidewalks, local walkways, underpasses, overpasses and public open space); locate pedestrian focused services at ground level; use human scaled architecture (orient doorways and windows to street level to provide ease of entrance and increased security via sightlines) and architectural variety to provide visual interest.

- **Make each station area a "place":** emphasise landmark buildings; create vistas using street and building configuration; orientate street layout to the transit station; use open space creatively; create a local community focus (destination).

- **Manage parking, bus and vehicular traffic:** consider reduced parking requirements; appropriately locate parking at the rear or side of buildings and minimise crossings over

primary pedestrian routes; design safe surface parking to allow for future redevelopment, and break into smaller cells with landscaping and walkways; encourage TDM strategies (reducing the need for onsite parking); integrate design to include bus access to station, Park & Ride and 'Kiss & Ride' (passenger drop off or pick up by motor vehicle).

- **Plan in context with the local communities:** work with local communities and landowners through consultation and encourage participation in planning processes; prove supporting benefits for communities such as services and amenities; ensure the built form complements the local context.

(The City of Calgary, 2004, 2005).

The Victoria Transport Policy Institute (2002) also suggests as best practices the provision of high quality cycling facilities around transit stations and the encouragement of carsharing which reduces the need for car ownership. When located in outlying areas, stations accessed primarily by cars can generate sprawl. Rather than stations surrounded by car parking, TOD can increase ridership and control these growth effects (Calthorpe & Fulton, 2001).

There are barriers to be overcome for full implementation of TOD. To allow and encourage higher density development and lower parking requirements around transit stations may require changes in zoning codes and development practices (Victoria Transport Policy Institute, 2002). The reigning in of urban sprawl can also come up against public, political and industrial sector opinion that favours greenfield development on city margins (The Canadian Urban Transit Association, 2004).

TOD is a means of getting more out of transit investments by increasing ridership on transit corridors through lower density suburban areas. TOD can only succeed however, when decision makers, developers, tenants and consumers all believe it will work. A planning approach from top to bottom is required with major transit investments and regional growth management strategies creating the market and motivation for new developments around transit nodes. TOD plans need to be nurtured by local level planning and community building processes allowing the plans to be guided through the various approvals required to accomplish the TOD. Public or political controversy leading to prevention of TOD projects at the site planning level can be avoided by consultation, compromise and attention to detail (The Canadian Urban Transit Association, 2004).

A wide range of potential benefits make TODs highly attractive to both the public and private sectors and these are listed in Figure 5.8.
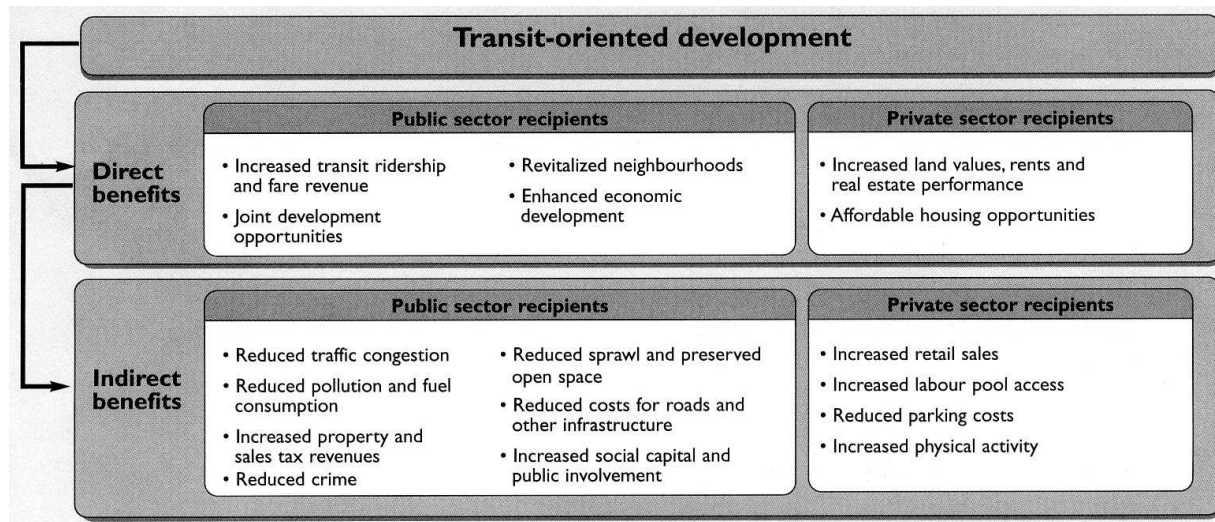
Figure 5.8: Potential benefits of transit oriented development (Transportation Research Board, 2004 in The Canadian Urban Transit Association, 2004: 2).

TODs located in series along a transit corridor have been shown to produce efficient bi-directional flows of passengers. This contrasts with commuter flows in one direction which are prevalent in North American (The Canadian Urban Transit Association, 2004) and New Zealand cities. Balanced directional splits (passenger travel in both directions) of 55%-45% are achieved in Copenhagen, Stockholm and Curitiba due to TODs arranged in series (Cervero, 1998).

5.2.3 International Examples of CO$_2$ Reduction Strategies via Integrated Transport Policy

5.2.3.1 True costs of car use

Attempts to ensure that car users pay the true cost of that use are being made by policy makers to reduce car dependence. The equity impacts of for example, increasing fuel costs or parking charges make these mechanisms difficult to introduce however. Some individuals and companies are willing to pay more regardless, which can cause inflation and hardship. The provision of other travel choices needs to be made concurrently with the phasing in of true costs. An example of this type of pricing strategy is in Singapore where severe restrictions on car ownership and use were introduced along with radically improved public transport and enhancement of the walking environment (Newman & Kenworthy, 1996).

The congestion charge in London is a good example of a pricing mechanism. Vehicles travelling into central London pay a daily fee to do so with a heavy financial penalty if they don't pay the charge. The scheme was widely predicted to fail but instead achieved a reasonable level of acceptance by the public. It has been successful in reducing traffic (and therefore vehicle-produced CO$_2$) and increasing patronage of public transport. The congestion charge is alleged to be one of the best examples of innovative policy at a city level (Tyndall Centre for Climate Change Research, 2005).

5.2.3.2 Sustainable transport in London

A 2004 study of London's ecological footprint established that if everybody on Earth consumed the same amount of resources as Londoners, three planets would be needed to sustain ourselves. The study showed that the use of resources for transportation was substantial with personal mobility accounting for 93% of environmental resources used for transport in London (Karlik-Neale, 2005).

Improving the sustainability of transport is present in all recent London development strategies including social policies, environmental plans and the London Plan. London First, a network of London businesses launched the study "Towards a Sustainable London: Reducing the Capital's Ecological Footprint" to establish the components of the footprint and the most effective and widely acceptable strategies to reduce it (Karlik-Neale, 2005).

Personal mobility includes travel by car, bus, motorcycle, river boats, air, rail and underground. Transport by car was the highest contributor to the footprint at 66% of all travel. One third of the personal mobility footprint was attributed to building and maintaining roading infrastructure. A consultation programme led by London First resulted in suggested long and short term initiatives to potentially halve the footprint for London, with personal mobility footprint reduction focussing on car travel (Karlik-Neale, 2005). The study's proposed strategies can be seen in Table 5.9.

Table 5.9: Strategies for reduction of personal mobility footprint (London First, 2005 in Karlik-Neale, 2005).

Agent	Actions
Business	1. Produce Travel Management Plans. 2. Provide financial incentives to organisations that introduce working methods that enable people to work at home, and other means of reducing travel. 3. Use of new vehicle technologies with low or zero CO_2 emissions, as long as the original source of energy does not release further CO_2. 4. Lobby for a system of emissions trading in air travel, to encourage use of lower emission planes.
London public authorities	1. Plan London and its region around denser developments with 'high bandwidth' public transport connections between them. 2. Promote high-density, mixed-use developments on all sites accessible to public transport. 3. Plan for new housing to be of high-density and high quality, and accessible to public transport. 4. Plan to locate all new centres of education, shopping, employment and health with good links to transport. 5. Make funding available to help reduce car usage for journeys to school, e.g. for school buses and 'walking buses'. Take the opportunity presented by reduced car usage to create more attractive pedestrian environments and facilities for cycling.

	6. Establish more 20mph zones, Homezones, car-free environments, and traffic calming in residential areas, while allowing for the needs of the emergency services.
	7. Change the balance of cost between car and public transport and examine, in the long term, using a sophisticated road pricing system across London.
Central government	1. Continue to improve London's modern 'high-bandwidth' telecommunications infrastructure.
	2. Lobby for additional investment in public transport.
	3. Lobby for increased capacity of the rail network.
	4. Expand UK and European long-distance express rail services.
	5. Extend government programmes to improve fleet fuel efficiency and reduce fuel mileage.

Case studies were used to test the proposed strategies. Footprint analysis of a Convoys Wharf development illustrated that the compact urban development produced a decreased footprint when compared with suburban lifestyle. Density of housing and proximity to public transport services were shown to reduce car dependence while transport choice was maintained. The Beddington Zero Energy Development (BedZED, the UK's largest eco-village) produced similar conclusions (Karlik-Neale, 2005).

5.2.3.3 Smarter Travel Choices in Darlington, Peterborough and Worcester, UK

The three UK local authorities of Darlington, Peterborough and Worcester are the Sustainable Travel Towns project. The project is running from 2004 – 2009 and the Department for Transport is providing £2 million per year between the three authorities. Each local authority is also improving existing facilities and infrastructure (Merron, n.d.).

The programme involves Smarter Travel Choices which include school and workplace travel planning, increased walking and cycling, improved public transport provision, car sharing schemes and marketing. A key smarter travel component implemented by each authority is individualised travel marketing (ITM) whereby households were visited or offered the opportunity to receive personalised travel advice and information packs. Results for the three authorities for a two – three month period

in 2006 showed the following significant changes when compared to a three month period in 2004: a decrease in car trips of around 12%; an increase in trips by public transport ranging from 13% – 22 %; walking trips increased by between 17% and 29 %; and cycling trip increases showed a wide range of 25 – 79 %. These modal shifts can be attributed to the provision of free, high quality, tailored information along with the other smarter travel choices provided (Merron, n.d.).

5.2.3.4 TOD in Greater Vancouver

The Transport Canada's Urban Transportation Showcase Program (UTSP) aims to reduce transportation related GHG emissions through the implementation of innovative sustainable transportation projects. Despite Greater Vancouver's first rail rapid transit line being over 20 years old TOD has not emerged due to a lack of integration between transportation and land use planning. The Greater Vancouver Transportation Authority 'TransLink' has launched a unique pilot project which is jointly-funded in partnership with local municipalities and the region to grow transit stations into TODs or 'transit villages' (Raad, 2006).

The project focuses on established stations in the region's rail network which were designed with a one-size-fits-all approach despite differing community contexts and are now facing capacity issues. Land use surrounding the stations is vehicle oriented with abundant surface parking, big roads and intersections, and large, low density block structures which are difficult to navigate (Raad, 2006).

Joint planning is critical as all agencies are required to work toward consensus on station area plans to achieve TOD. Transit Village Plans will recommend policies, infrastructure, urban design and land use changes with the intention of increasing ridership at each station. This type of planning partnership can facilitate creative solutions to aid the transformation of existing transit stations into TODs (Raad, 2006).

5.2.3.5 Systems thinking and planned growth in Curitiba

During the 1970s Curitiba was the fastest growing city in Brazil (Rabinovitch, 1996). Rapid growth occurred from 0.5 million people in 1965 to a population of 1.6 million in 2002, in a city of 432 square kilometres with a further one million people living in the surrounding metropolitan districts (Parliamentary Commissioner for the Environment, 2002).

The current development phase began in the 1960s and in 1971 the appointment of Mayor Jaime Lerner and successive leaders has led to a transformation from sprawling urban development to the well managed, socially inclusive, comprehensive and integrated approach that has seen the city receive worldwide praise for innovation (Parliamentary Commissioner for the Environment, 2002).

Land use planning, an economic development policy, the road network hierarchy and public transport have been used to coordinate the location and density of housing, employment, commerce, services and recreation. While contributing to sound environmental management this approach has been an effective and successful instrument to control and direct rapid urban growth. Curitiba developed a small number of long term goals which then served as guidelines for pragmatic change over three decades, backed by committed political will (Rabinovitch, 1996).

Transport is viewed as part of an integrated system linked to land use, the roading network, housing, commercial development, and public spaces. Along with a desire to limit costs, land use and community development objectives determined the type of transit technologies selected and services delivered (Cervero, 1998). Priority was placed on an effective transport system rather than on the vehicles themselves. Because Curitiba had buses, it began with buses and made a series of small improvements. A modest express route system with dedicated bus lanes was added and over the next 20 years the system was improved and extended resulting in a comparable service to an underground system at much lower capital cost. The bus system is entirely funded by passenger fares (Rabinovitch, 1996).

Most cities locate busways on freeways, leaving arterial roads for cars. This does little to overcome car dependence, whereas to locate public transport right in the midst of where people are, maintains dense human activity on the streets. Giving public transport priority in the main streets (as in Curitiba) makes it a powerful urban policy instrument. It enhances land use by facilitating the concentration and variety of activities (Rabinovitch, 1996).

Many cities around the world have experienced spontaneous urban growth along public transport routes. Curitiba used this tendency as a deliberate planning tool to alleviate growth pressure on the central area while helping to control urban sprawl and retain open areas. Peripheral districts were also integrated and low income housing subsidised (Rabinovitch, 1996). Growth corridors or radial centres, developed along transport corridors extending to the outskirts of the city while expansion of

the existing city centre as a compact form was restricted. Land zoning running in contours parallel to the main transport corridors varies in density and depends on available transportation. Urban growth planning for high density development around transport corridors is integrated with transport planning and traffic management (Parliamentary Commissioner for the Environment, 2002).

From an urban form perspective a high value is placed on amenity in Curitiba with many green, open spaces and meeting places for people offering opportunities for reflection, recreation and leisure. 'Citizen Streets', each featuring its own architectural innovation are located next to transport terminals and are landmarks of the suburban landscape. Pedestrians reign supreme with low inner city traffic densities and a comprehensive pedestrian network in the downtown area. The pleasant pedestrian zones are popular with both customers and retailers and there is easy access to and from the city centre via the bus exchanges. Three types of bus service operate on roads without priority lanes as feeder services, orbital inter-district links, and direct links without stops between highly travelled destinations (Parliamentary Commissioner for the Environment, 2002).

The fourth main bus service runs high capacity vehicles on 60 kilometres of dedicated bus lanes on the growth corridors to the north, south, east and west. Passengers pay a flat fare at the turnstile on entering, wait less than three minutes for a bus and are entitled to four bus changes enabling them to travel right across the city on a single fare. In 2002 this service was moving 28,000 people an hour and was at capacity. All bus services interconnect at integration terminals. There are no Park & Ride facilities and the intention is that all citizens should live within 500 metres of a bus stop with a service frequency of less than five minutes. Transport needs are well integrated with the location of housing, employment, schools and services such as hospitals and child care (Parliamentary Commissioner for the Environment, 2002).

The bus system is one of the lowest cost and heavily used public transport systems in the world (Cervero, 1998; Parliamentary Commissioner for the Environment, 2002). In 2002, the system carried 2.1 million trips a day which represented 75% of all passenger trips despite car ownership of one per 2.5 people (the highest per capita in Brazil). There is little evidence of traffic congestion at peak times which is likely to be assisted by the staggered start times for schools (7.00 am), businesses (8.00 am) and retail (9.00 am). There are plans for a high capacity monorail system for Curitiba (Parliamentary Commissioner for the Environment, 2002).

The urban research institute IPPUC in Curitiba has generated ideas and solutions to support the city since 1965. The planning agency has been pivotal in maintaining consistency and commitment for the city through different administrations and mayors. Civic and business leaders have held a common vision for the city's development despite a politically and economically unstable period of transition for the nation. Curitiba's leaders had and have the ability to weave together complex social and technical needs and to stimulate the city and its people with opportunities when they are discovered. A systems thinking focus on balancing the needs of now and the opportunities for the future is practiced with both being advanced together. Curitibanos think strategically and holistically about the relationships of plans, their implementation and outcomes (Parliamentary Commissioner for the Environment, 2002).

5.2.3.6 Investing in transit and pricing the car in Singapore

Efficient growth has been achieved through heavy handed centralised planning in Singapore. As mentioned earlier in this section, the car is priced heftily via ownership and motoring fees which are passed on to the motorist. A move towards TOD was prompted partly by land scarcity but also by a mind-set that TOD is inherently efficient and also delivers on social objectives (Cervero, 1998).

More provision has been made for transit than the car in Singapore resulting in a low private car mode share. Substantial increases in income which occurred in the decade prior to 1996 led to a large increase in the use of the high quality transit system while car usage remained low. High density urban development is closely integrated around the transit system which is central to this success. Electric rail is supplemented by the flexibility of buses and minibuses and high levels of walking and cycling in the dense mixed use settings (Newman & Kenworthy, 1996).

International consultants and the World Bank advised Singapore against investing in fixed rail in the 1970s and to update its buses instead. Singapore realised that implementing its transit oriented city plan would not be possible without a high capacity rail service providing linkages across the city and between the centre and sub-centres. Buses alone were also not able to compete with the level of service the car offered. The rail service opened in 1987 and has been extremely successful both economically and environmentally (Newman & Kenworthy, 1996).

5.2.3.7 A European perspective: Zurich and Freiburg

Like Singapore, Zurich (Switzerland) has controlled growth in car use despite substantial per capita income increases and has achieved impressive transit service usage. Again, in the 1970s the decision was made to expand and upgrade the existing tram system by giving them (and buses) right of way at traffic signals. Trams became very fashionable as passengers waited six minutes maximum and amenities such as outdoor cafes and pedestrian malls were allowed to take up road and parking space (Newman & Kenworthy, 1996).

An S-Bahn (above ground rail) system was developed in the 1980s which was fully coordinated with other transit modes. Transit authorities also developed large shopping centres under and around major stations. A coordinated transit campaign via high quality information systems and effective marketing resulted in the mode share of journey to work car trips dropping by 10% between 1980 and 1990 (Newman & Kenworthy, 1996).

Even though car ownership was growing in Freiburg (Germany), car use was curbed via a combination of physical planning and transportation strategies. While mobility during the 1980s grew rapidly (attributed mainly to increases in public transport use and cycling) actual trips by car remained fairly static. Car use in Freiburg was sharply restricted through expensive parking, traffic calming and pedestrianisation of the central city. Improvements to transit included the upgrading and extension of light rail and buses used as feeders into this system providing convenient, safe and affordable alternatives to the private car. Freiburg had been totally destroyed in the Second World War and was subsequently rebuilt on the old model which was not a car oriented model. Land use has been strictly regulated to ensure compact development which supports walking, cycling and public transport (Pucher & Clorer, 1992 in Newman & Kenworthy, 1996).

Analysis and discussion of some of the international best practices presented here will feature in Chapter Six.

5.3 Practitioner Perspectives

The purpose of this section is to communicate the ideas of expert practitioners experienced in the fields of: policy studies, energy and climate change; and land transport, urban development and environmental sustainability policy. These practitioners are from central, regional and local government, non-government organisations, and the academic and private sectors. Perspectives given here are based on practice and a depth and breadth of knowledge of these sectors and the research topic. A list of the research participants can be seen in Appendix 1.

This section addresses Objective Three of this research:

> ***To gain a land transport practitioner perspective on the key issues, barriers, and opportunities for reducing CO_2 emissions from land transport in New Zealand.***

Results from the 12 research interviews are summarised in Table 5.10 under the main question themes of key issues, barriers, opportunities and potential solutions. In the following sections some of the main topics identified by the research participants within these themes, are described in more detail.

All interviews express the view of the participant and are not representative of the organisation they are employed by, with one exception. Tim Jones' views represent his position as Convenor of the Transport and Oil Working Group, The Sustainable Energy Forum (SEF).

Table 5.10: Interview Results Summary.

	QUESTION THEME			
Participant	Key Issues	Barriers	Opportunities	Potential Solutions
Kathy Perreau	Oil has always been cheap Number of SOVs LT infrastructure for sea freight export	Problem too big to comprehend No silver bullet, no one answer Can't easily legislate/regulate CO_2 emissions	Influence behaviour & attitude More home grown electricity into transport Develop biological fuel industry	TDM initiatives Target energy efficiency Fund freight networks: ports, roads, rail
Paul Kos	Urban form PT provision & promotion Amenity	PT funding method Regional policy disconnection Bus rolling stock: Wgtn City	Integration: RPS & WRS WCC Urban Development Strategy PT & walking: Wgtn City	Factoring real costs of land use
Anna Percy	PT based RLTS versus SH Forecast Land area dedicated to the car Reliance on fuel	Funding disparity: roads versus PT & active modes Unwillingness to accept that no technical fix Status of car & attitude to driving	Redeployment of transport skills Local leaders to listen to peoples' wishes	Learn from indigenous societies Work with people, bring them with you Implement social structures
Gerda Kuschel	Engine size & fuel efficiency NZ: too much consumption Value of time affects mode choice	Scepticism of seriousness of CO2 issue Inertia is inherent in the system Significant behaviour change is required	Match employment & housing Go local: shopping, school, work Electrify rail (freight), PT, electric cars	Energy efficiency & conservation: best gains Collaboration across all government levels Investment reallocation for PT infrastructure

Participant	Key Issues	Barriers	Opportunities	Potential Solutions
Kevin Wright	Car based transport system Awaiting central government guidance on CO_2 Economic growth leads to traffic growth	Politicians' desire for re-election Government lead: small steps & direction Funding criteria: BCR	Local & regional level innovation Buy local: support local businesses Plan changes: develop around transport	Commit to a compact urban form Longer planning horizons: 30 years + Funding prioritisation: PT, active, TDM
Tim Jones	Fossil fuel dependency Link: transport & GDP growth Fuel supply: price & future	Investment: financial, social, psychological Political dominance of the car Time lag for fleet turnover	Alternatives to private transport Better use of existing infrastructure Cross department integration	Policy: funding inequity Fleet regulation Long term investment decisions
David Lee	Personal freedom & independence Cheap motor vehicles & fuel LT & LU planning in silos	Attitudes towards motor vehicles Investment in road versus rail No NZ Freight Strategy	Synergy: legislation & policies Pricing mechanisms Set vehicle emissions standards	Use legislation to full effect Focus on TOD Bring rail back into LT system
Terry McDavitt	Fossil fuel supply & demand Global nature of CO_2 issue Political nature of CO_2 issue	Inertia of the system Investment assessment system Lack of central government action	Fuel & fleet specifications Use tools: SEA & TIA Carbon trading scheme	Fossil fuel use reduction targets Action leadership
Jonathan Boston	Existing land use, urban design & infrastructure Age of NZ vehicle fleet NZ's car dependency	Building externalities into transport cost NZ's dependence on international solutions Changing peoples' behaviour	R & D: low carbon technologies Create new funding streams Incentivise significant behaviour change	Improve urban development New emissions standards now Maximise freight efficiency

Participant	Key Issues	Barriers	Opportunities	Potential Solutions
Diana Shand	Investment priority in road transport Car dependency Lack of attractive alternatives	Urban planning & sprawl Image of private versus public & active transport Freight delivery: centralised versus local supply	Planning to reduce settlement spread Invest in rail upgrade Community & social capital building	Consistency in RMA decision making New LT Agency: reduce car dependency
Participant X	Behaviour: travel budget & speed of travel Land use intensification Vehicle fuel efficiency	Lack of interest in CO_2 issue Perception: high density = low quality living Outdated vehicle technology	Education: CO_2 issue Promoting higher density living Plan urban growth areas well	Vehicle size & weight: fiscal incentives Improve the competitiveness of PT HOV lanes: promote carpooling
Participant Y	Level of difficulty Legacy of transport infrastructure Behavioural shift is required	No way to transparently target revenue Lack of courage from politicians No new ideas: more of the same	Innovate & experiment: pilots Better use of existing infrastructure Price signals for behaviour change	Flexibility planning for changing demands Integrated policy drivers Individual capped carbon allowance

LEGEND			
BCR = benefit cost ratio	GDP = gross domestic product	HOV = high occupancy vehicle	LT = land transport
LU = land use	PT = public transport	R & D = research & design	SEA = Strategic Environmental Assessment
RPS = Regional Policy Statement	SH = state highway	SOV = single occupancy vehicle	TDM = Travel demand management
TIA = Transport Impact Assessment	TOD = Transit-Oriented Design	WCC = Wellington City Council	Wgtn = Wellington
WRS = Wellington Regional Strategy			

5.3.1 Key Issues in CO_2 Emissions Reduction

"Addressing CO_2 emissions from land transport and land use is the biggest challenge society has faced for a long time" (Percy, 2007).

5.3.1.1 A legacy of cheap fuel and cars

Oil has always been cheap (Perreau, 2007). As a result there is a strong reliance on imported fossil fuel, especially in New Zealand cities which are very energy intensive (Percy, 2007). Land transport in New Zealand depends almost exclusively on fossil fuel although the future price and supply of oil will impact on demand (Jones, 2007; McDavitt, 2007). Recent[6] prices at the pump of around $1.70 per litre for petrol are very cheap and do not represent the true value of this resource (Lee, 2007).

Access to a motor vehicle is widespread and New Zealand has the second highest per capita car ownership rates in the world (Lee, 2007; Shand, 2007). Cars are cheap to buy and operate due to the used car import market and low costs of registration and fuel (Lee, 2007). New Zealand needs to reduce its car dependency (Boston, 2007; Shand, 2007; Wright, 2007) and an adjustment to a low carbon future is required (Boston, 2007).

5.3.1.2 Transport choice

Wright (2007) suggests that New Zealand is challenged with moving away from a car based transport system to a multi modal one. The provision and promotion of a choice of transport modes, especially public transport is supported by Kos (2007). However, the lack of attractive alternatives to the motor vehicle is a key issue associated with CO_2 emissions from land transport (Shand, 2007).

5.3.1.3 Travel time and speed

We live in a time-deprived society where money is less important and time is valued very highly. This has an effect on the choice of transport mode. For example, people know that using public transport is good but the flexibility that the private car gives will influence the decision of how to travel (Kuschel, 2007).

---

[6] November 2007

People like to travel for between 45 minutes and one hour per day. This is known as a 'traveltime budget' and travel can be by any mode. The commute to and from work often addresses the traveltime budget but if for example, someone works from home, they will make alternative trips to other destinations at other times to meet this need (Participant X, 2007).

The speed of travel is crucial in influencing CO_2 emissions from transport. To remain within the traveltime budget less distance is travelled when travel is at a slower speed. With vehicular travel, less vehicle kilometres travelled (VKT) leads to a reduction in CO_2 emissions (Participant X, 2007).

5.3.1.4 Behaviour and attitude

A shift in peoples' behaviour is required to reduce CO_2 emissions (Participant Y, 2007). New Zealanders live in a privileged society centred on personal freedom and independence, where this freedom and our needs override the public or community good. As a product of our culture and affluence, we have or demand more choice with respect to where we live, work, play and send children to school. These decisions increase the demand for travel (Lee, 2007).

New Zealanders consume far too much (Kuschel, 2007). There is a mismatch between what is regarded to be necessary and what is actually needed. Consequently, the expectations people have of vehicles and the land transport system are higher than necessary (Kuschel, 2007).

> *"New Zealanders need to adopt more realistic expectations of an increased quality of life"* (Kuschel, 2007).

Much travel is undertaken by individuals in private cars. The number of single occupancy vehicles on New Zealand roads is a key issue (Perreau, 2007).

5.3.1.5 Existing infrastructure, land use and urban design

New Zealand is an exporting nation located at the bottom of the South Pacific which exports 90% of goods by sea freight (Perreau, 2007). The land transport infrastructure to support this industry is lacking with freight being held up by pinch points on rail and at congested ports (Perreau, 2007).

The existing use of land and the cost to change that use (e.g. extending the rail network in Auckland) is a major constraint. New Zealand is faced with a particular set of path dependencies (with huge sunk costs) related to the nature of the roading and public transport networks (Boston, 2007). So much land area is dedicated to the car, especially in Auckland (Percy, 2007).

The nature of urban form can either encourage or discourage the use of the private car. Bad settlement patterns lead to increased CO_2 emissions whereas a compact urban form reduces travel demand (Kos, 2007).

Transport infrastructure is geared around roads and to cars making New Zealand a petroleum-dependent economy. Public transport services are lacking in many New Zealand cities (Kuschel, 2007).

5.3.1.6 The vehicle fleet and fuel efficiency

Boston (2007) points out that the age of the vehicle fleet in New Zealand has a major impact on CO_2 emissions from land transport. Improving the fuel efficiency of the vehicle fleet will have the most influence on CO_2 emissions (Participant X, 2007). In New Zealand the engine size of vehicles has increased while fuel consumption has been retained. If the size of engines was kept the same but fuel efficiency was improved then vehicles could be producing much less CO_2 emissions or using much less fuel for the same power output (Kuschel, 2007).

5.3.1.7 The economic development and traffic growth link

Traditionally growth in the economy has resulted in even greater growth in traffic and therefore in CO_2 emissions (Wright, 2007). This clear relationship between Gross Domestic Product (GDP) and transport growth is a result of the dependency of land transport on fossil fuels (Jones, 2007). There is a real need to decouple economic growth from vehicle traffic growth (Wright, 2007) although Jones (2007) questions whether this is possible. It may be that one or the other has to be chosen which will not be popular politically (Jones, 2007).

5.3.2 Barriers to Reducing CO_2 Emissions

5.3.2.1 The funding and investment disparity

The method of making public transport funding decisions works against addressing CO_2 emissions (Kos, 2007). Regional government must fund public transport as the Financial Assistance Rate (FAR) is

50% while pedestrian ways do not qualify for financial assistance. Roading is funded at a FAR of 100% so is essentially 'free' (Percy, 2007).

Environmental benefits are one component of a transport project funding application but they are not part of the numerical benefit-cost calculation. The Benefit-Cost Ratio (BCR) is an important tool to assess value for money. However, it has led to a car based land transport system and a change in criteria is needed to shift away from this (Wright, 2007). The BCR and FAR systems are still all about cars, roads and moving vehicles. A change in mindset away from roads and vehicles to the whole land transport system is required (McDavitt, 2007). Jones (2007) also views the financial investment system in transport to be a barrier to CO_2 emissions reduction.

The historic lack of investment in rail has resulted in freight movement by road being far more viable than by rail. Investments in roading by way of Ministry of Economic Development (MED) grants are also available to assist with the road transport of freight generated by forestry harvesting (Lee, 2007).

5.3.2.2 Inertia in the system

Recognition is required that inertia is inherent in the system we are dealing with (Kuschel, 2007; McDavitt, 2007). Whole generations of infrastructure and services are in place around a system which basically devalued CO_2 impacts. This will take time to turn around especially regarding turnover of the vehicle fleet (McDavitt, 2007). Jones (2007) acknowledges that transport fleets don't refresh overnight.

If fleet renewal at five percent per annum was introduced tomorrow, it would be 20 years before turnover of the entire vehicle fleet was achieved. Regarding the Government's target for the introduction of electric vehicles,[7] how will it be possible to achieve a certain percentage of the fleet by a particular date if electric vehicles are not commercially available in sufficient numbers (Kuschel, 2007)?

---

[7] *for New Zealand to be one of the first countries to widely deploy electric vehicles* (Ministry of Economic Development, 2007: 44).

5.3.2.3 Central government lead

McDavitt (2007) suggests that central government are not playing their part to tackle the inertia in the system. Rather than more rhetoric or policy, action leadership by way of practical examples is required especially in relation to vehicle fleet and fuel efficiency specifications (McDavitt, 2007).

Regarding target setting and the policies and regulatory steps that the government takes, a barrier exists in terms of the direction and size of these steps. Currently the government is taking smaller steps as these are supported by the public (Wright, 2007).

Perreau (2007) points out that it is difficult to legislate for CO_2 from transport as the situation is unlike that of harmful emissions such as carbon monoxide (CO) or particulates, for which minimum standards for vehicles can be set. For example, a big car may meet regulated harmful emission standards but can have high fuel consumption (Perreau, 2007).

5.3.2.4 Attitude to status and behaviour change

For a small group of people views about status are very important regarding vehicle travel versus other modes. They have a "need for speed" and believe "you are what you drive". Cost and the environment are not considered and these attitudes are not income or gender dependent (Percy, 2007). Lee (2007) states that our attitude towards the motor vehicle is the biggest barrier to reducing CO_2 emissions. Public transport is viewed as a second rate transport choice (Lee, 2007).

There is a demand for big, powerful cars – people like them (Jones, 2007). Shand (2007) suggests that image is a barrier with some people associating a bigger car with higher status. The provision of company cars and free car parks by organisations (including councils) gives people the message that they are important and that they don't need to walk or use public transport (Percy, 2007). The decision makers are in this group. As decision makers, they will look at a plan and say: "you'll never get people out of their cars" (this is not true); when they actually mean: "you'll never get *me* out of *my* car" (which is true) (Percy, 2007).

Boston (2007) acknowledges that psychological barriers such as changing peoples' behaviour are very difficult to address. People have preferences as to how they move around and develop habits based

on convenience – they become locked into certain ways of doing things. There is also a strong fixation where people "worship the car" (Boston, 2007).

A significant behaviour change is required and New Zealanders need to think about the consequences of their actions. The oil shocks of the late 1970s led to the introduction of carless days in New Zealand and people started to think about what they were doing (Kuschel, 2007).

5.3.2.5 Difficulty of the issue

The CO_2 problem may be too big to comprehend. People think they are not going to make a difference if the government states that New Zealand only produces 0.2% of global GHG emissions (Perreau, 2007). Under Kyoto Protocol obligations, New Zealand is responsible for its own CO_2 emissions irrespective of what happens in developing countries. However scepticism remains amongst the New Zealand public regarding how serious the CO_2 issue is (Kuschel, 2007). Some people just have no interest – "it's not on their radar" (Participant X, 2007).

There is no silver bullet (Participant Y, 2007; Perreau, 2007). Politicians cannot be provided with two or three things which will solve all the problems. This creates a very difficult political environment (Perreau, 2007). Percy (2007) suggests that there is an unwillingness to accept that there is no technical fix for the CO_2 issue and that we need to work with the technology we already have. Participant Y (2007) states that addressing CO_2 emissions from land transport is difficult, that there are no "low hanging fruit" and that new ideas are lacking. The issue of CO_2 emissions is still a recent concept for transport planners so to expect the public to fully understand the impacts, policies can't go too far ahead (Wright, 2007).

5.3.3 Opportunities for CO_2 Reduction

5.3.3.1 Urban design and land use

There is a real disparity between where people live and work especially in Auckland, which increases the demand for travel. In addressing this there is scope for matching employment and housing opportunities. Some territorial authorities are making good progress in addressing this (Kuschel, 2007).

Integrating transport and land use by encouraging intensification of housing and growth of employment along the major transport routes is the main concept of the 'Growth Spine' urban planning initiative currently underway in Wellington City. Intensification by way of targeting specific residential areas for infill housing is also being considered. Both are opportunities to improve the city and are part of the Wellington City Council Urban Development Strategy (Kos, 2007).

In Waitakere City, changes to the District Plan have allowed unlimited height for development around transport interchanges and the relocation of council offices adjacent to rail stations. This has stimulated town centres and provides an opportunity to concentrate business locally which can reduce travel demand (Wright, 2007).

A refocusing on smaller centres rather than on the large metropolitan areas may provide the encouragement required to 'go local' for shopping, schooling and employment. This presents an opportunity to instil a sense of community, as in our parents' generation, when people didn't travel long distances to work (Kuschel, 2007). If people drive less, live close to the public transport system, buy locally, and don't purchase products sourced from the other side of world, this will lead to more profitable local businesses (Wright, 2007).

An opportunity to promote higher density living exists as there is a perception in New Zealand that high density equates to low quality living. There are many good examples around the world of high density living environments providing neighbourhoods with a known identity, for example with walking and cycling (Participant X, 2007).

Areas of high urban growth must be well planned. There is opportunity to improve the land use and transport match for new residential areas by providing good connectivity. Investing in the central city will make it a desirable area to live (Participant X, 2007).

Planning directives to reduce settlement spread present an opportunity to discourage the development of subdivisions away from main public transport routes. They otherwise become car dependent as with some remotely located settlements in Canterbury (Shand, 2007).

5.3.3.2 Existing infrastructure

There is an opportunity to make better use of existing infrastructure, especially for freight by rail and sea (Jones, 2007). Participant Y (2007) agrees and also suggests that current infrastructure can be retrofitted or renovated. Urban renovations of systems and structures can be compared with removing a few walls when renovating a house (Participant Y, 2007).

5.3.3.3 Innovation

There are real opportunities at a local and regional level for innovation and trying different ways of doing things to achieve reductions on CO_2 emissions (Wright, 2007). Government seeks to get it 100% right, so that by the time it does, things have changed. The "problems move faster than the policy to address them" (Participant Y, 2007). Instead, a more experimental approach could be taken such as pilot studies with smaller, more frequent steps and evaluation of gains or adverse effects. In this way initiatives could be further implemented or the process halted, allowing flexibility and decision making (Participant Y, 2007).

5.3.3.4 Renewable energy, alternative fuel and low carbon technology

New Zealand has the opportunity to develop an industry to produce biological products for engine fuel, with investment and innovation of this kind good for the economy (Perreau, 2007). Processes are improving regarding the energy used in the production of biofuels and Perruau (2007) acknowledges that:

> *"Biofuel is needed as part of the picture but is not a replacement".*

More home grown electricity could be put into the New Zealand transport system and there is opportunity for electric vehicles and trams. These vehicles must run on renewable electricity to achieve a gain in the GHG emissions issue (Perreau, 2007). New Zealand is in a very privileged position regarding renewable energy production and there are opportunities to electrify rail (especially for freight), electrify public transport and introduce electric cars (Kuschel, 2007).

There is scope for New Zealand to become a world leader in building low carbon, lightweight vehicles. The design capability exists within the engineering workforce and the opportunity relies on investment in research and development in low carbon technologies relating to land transport (Boston, 2007).

5.3.3.5 Revenue and pricing

Strict adherence to the speed limit would have a significant impact on CO_2 emissions reduction of possibly 10% or more. This would require rigorous enforcement of the speed limit at 100 kph (Lee, 2007).

Differential licensing (per engine size) at vehicle registration could be an appropriate pricing mechanism for introduction in New Zealand (Lee, 2007). Differential pricing on first registration or at annual licensing may create a disincentive for larger vehicles and incentives for more efficient vehicles. This type of price signal wouldn't "hurt too much" and would generate significant revenue which could then be targeted to encouraging walking and cycling, for example. People will see where the money is going and communities will reap the benefits (Participant Y, 2007).

To be able to seize some opportunities such as research, upgraded public transport, or new transport networks (which are dependent on money for delivery) requires new funding streams. Funding could be raised through taxes although a better method would be to build externalities into pricing structures so that people actually pay the true costs of their transport and land use activities (Boston, 2007).

5.3.4 Potential Solutions to Reduce CO_2 Emissions

5.3.4.1 Social solutions

Work with people to achieve a decrease in energy consumption and then celebrate this success. Through the implementation of social structures the next saving of 10% may be made more easily and greater savings reached in the longer term (Percy, 2007). Building social capital by working with communities is very valuable. Neighbourhoods and communities are for example, where children learn to safely walk to the shop or learn to cycle, rather than to go shopping by car (Shand, 2007).

5.3.4.2 Travel Demand Management

In order to reduce the number of private cars on the road (especially SOVs) the travel needs of the car occupants must be met by other means such as telecommuting, carpooling or car sharing, or by walking, cycling or public transport (Perreau, 2007). High occupancy vehicle (HOV) lanes are useful

from a CO_2 reduction perspective as they stimulate carpooling resulting in fewer cars on the road (Participant X, 2007).

5.3.4.3 Funding: inequity, reallocation and prioritisation

A major investment reallocation is required to put in place the public transport infrastructure necessary for Auckland (Kuschel, 2007). Prioritisation of the funding available for transport towards public transport, walking, cycling and TDM is needed. While the vehicle fleet in New Zealand is emitting high levels of CO_2 there is a good case to refocus funding on these modes (Wright, 2007). Jones (2007) suggests that a policy change to address this funding inequity (between roading and public transport and the active travel modes) would be quicker and easier to achieve than vehicle fleet replacement. Investment decisions could be made more predictably rather than based on the fluctuating price of oil. There is a reluctance to consider the long term (Jones, 2007).

New Zealand freight networks require funding especially to address pinch points which are due to rail infrastructure inadequacies (Perreau, 2007). Shand (2007) states that a significant investment in the rail system (including light rail) is required while Lee (2007) suggests that it is necessary to bring rail back as part of land transport. This would facilitate true integration between transport modes (Lee, 2007).

5.3.4.4 Fleet regulation

Fiscal incentives would encourage an improvement in vehicle fleet technology. This could be achieved by the payment of a higher tax on larger or older cars and smaller, lighter weight and more fuel efficient vehicles being taxed less (Boston, 2007; Participant X, 2007). Jones (2007) and McDavitt (2007) also advocate for regulation of the vehicle fleet via minimum standards for engine efficiency and fuel economy, or "fuel/fleet fitness" (McDavitt, 2007). The Government is using a gradual approach to introduce new emissions standards; more haste would be beneficial (Boston, 2007). Lee (2007) agrees that the New Zealand Government should be more aggressive regarding CO_2 emissions from vehicles and that they should be controlled at source. Although politically sensitive, prescriptive standards are required (Lee, 2007).

5.3.4.5 Land use planning and urban form

A more consistent approach is needed to RMA decision making regarding land use. A lack of understanding of evidence presented may be a reason for inconsistencies which have occurred across councils and the judiciary (Shand, 2007).

The proposal of new growth areas requires factoring in of real costs. Understanding the real costs of inappropriate roading provision or development is vital. For example, with a new subdivision the developer pays a contribution towards the cost of building a new road but the long term maintenance costs associated with that asset are not included (Kos, 2007). Prevention of urban development which adds to congestion and CO_2 emissions can be achieved with better planning. This requires a commitment to increasing the density of urban housing and ensuring that urban planning and transport are closely linked (Boston, 2007).

Committing to a compact urban form with good provision for public transport, walking and cycling also results in a more active society and reduces health costs. A compact city plays an important role in reducing the amount of travel and therefore, CO_2 emissions (Wright, 2007). A focus on transit oriented design will allow a more strategic, longer term approach to be taken in terms of land use and land transport planning (Lee, 2007).

5.3.4.6 Planning horizons

Planning for now or with a 10 year outlook has been related to funding cycles in the past (Participant Y, 2007). Longer planning horizons such as a 30 year or longer outlook are needed (e.g. the ARLTS 2050) (Wright, 2007). There is a need for flexibility planning to accommodate the different demands on infrastructure that societal and technological changes create (Participant Y, 2007).

5.3.4.7 Integration and collaboration

Collaboration across all levels of government (Kuschel, 2007) and cross department integration (Jones, 2007) may better facilitate the provision of solutions to the CO_2 issue. A greater level of integration between regional policies is needed (Kos, 2007) as is an improved alignment between key land transport and land use legislation (Lee, 2007). There are many strategies, plans and targets but no real means of implementation to make changes – the 'doing' part of achieving targets. Legislative

change is unnecessary as the mechanisms are there; "*they are just not being used to their full effect*" (Lee, 2007).

The practitioner perspectives presented in this section inform the analysis and discussion in the next chapter but are not restated. The views contain important guidance for planning and policy in land use and land transport and need to be taken into consideration in future policy development.

6. Analysis and Discussion

6.1 Introduction

The view through which this research was approached encompassed integrated planning concepts in urban design and transport planning with a particular focus on demand side planning interventions. These included TDM, smart growth and TOD. These concepts and associated initiatives and practices are fundamental to sustainable urban transport planning and represent the conceptual framework for this research.

In order to address the research objectives I have undertaken an analysis of the existing policy landscape, identified international best practice in integrated urban design and transport planning, and presented the perspectives of expert planning practitioners in the fields of land transport and land use.

The core messages arising from the research findings in Chapter Five relate to:

A.   The scale of complexity of the policy and planning setting in land use and land transport in New Zealand; and the current rate of change as new policy and legislation are introduced in these sectors

B.   The possibilities that TOD presents for integrated development in urban New Zealand; and the need for a widely collaborative approach across the public and private sectors and communities to plan, fund and realise TOD over an extended timeframe

C.   A current lack of the integration necessary to reduce CO_2 emissions from land use and land transport across policy, funding and investment, levels of government, the land transport system (including freight) and between transport modes.

The purpose of this chapter is to merge these findings with a view to offering regional policy guidance in integrated land use and land transport planning.

6.2 Synthesis of Policy Analysis

Section 5.1 described the legislative and policy setting for planning and the management of land transport and land use, particularly for the Wellington region. An overview of the Auckland regional situation was also given to provide some context for the perspectives offered by Auckland

practitioners in section 5.3. Direct comparison between the two regions is difficult however, due to legislation specific to the Auckland region regulating policy which differs from that in other New Zealand regions. The current revision of governance means that the Auckland region may be poised for more changes in the near future.

The complexity of the policy and planning landscape in urban transport and design is vast and may in itself pose a barrier to strategic integration of land transport and land use. Many of the policy documents reviewed are linked and must 'give effect to' (mandated by the RMA for example) or 'take into account' (e.g. LTMA requirement of regional land transport strategies) particular matters or other policy. This shows that some top-down effort is being made to integrate policy across the land transport and land use sectors. Legislative amendments in recent years have focused on the introduction of environmental sustainability matters and more recently, consideration of the impact of activities on GHG emissions.

Key legislation, the Land Transport Management Act, is in the process of amendment and the proposed result will substantially change the New Zealand land transport system by introducing additional strategic guidance from the Government (the GPS, which also provides funding prioritisation) and a new agency to oversee and give effect to it (the New Zealand Transport Agency). The new agency is tasked with integrating decision making under the Land Transport Management Amendment Bill 2007 and becomes the funding agent. King (2007) states that the new requirement under the proposed Bill, that the National Land Transport Programme is only produced three yearly will increase certainty and reduce compliance costs (King, 2007). The proposed change in review period for regional land transport programmes (every three years) and strategies (every six years) gives a longer timeframe for the achievement of projects, targets and outcomes. A 30 year outlook for an RLTS also provides the opportunity for longer term planning which a 10 year focus (as current) does not facilitate.

The Discussion Paper, 'Sustainable Transport' (2007) states that GHG emissions from transport are growing unsustainably. This is one of the reasons given for the review of the NZTS and "perhaps to think differently about how we should allocate resources in the future" (Ministry of Transport, 2007b: 51). In developing actions to address transport emissions, the discussion paper notes that the following must be taken into account: New Zealand's relatively high car ownership level; the low (but

increasing) level of public transport use; the limited rail network; and the rugged terrain and dispersed cities of New Zealand (Ministry of Transport, 2007b).

Greater Wellington Regional Council's Draft Submission on 'Sustainable Transport' acknowledges the need for clear policy to be provided by the Government due to the complexity of transport planning. However, according to the draft submission, this clarity is not apparent in the discussion paper noting specifically government's priorities for investment in transport. The submission suggests that the Government should possibly be developing a National Land Transport Strategy instead, as a NZTS is non-statutory. The (proposed) targets would then be required to be taken into account by transport agencies when developing their strategies under the LTA (Wild & Hayes, 2008).

Prioritisation of the NZTS targets is also called for in the submission, to more clearly signal the government's expectation for the transport sector. It is suggested that the paramount NZTS objectives from a strategic transport point of view should be 'assisting economic development' and 'improving access and mobility'. The remaining three objectives must be taken into account when implementing these, i.e. to minimise environmental impacts and support public health and safety (Wild & Hayes, 2008).

While generally supporting the 65 proposed targets, the draft submission of Greater Wellington Regional Council raises the issue that rates and fares are already under pressure to meet increasing operating and renewal costs. These are the key local funding sources for achievement of the proposed passenger transport, pedestrian and cycle mode share targets (Wild & Hayes, 2008).

Collaboration across central government is apparent in some of the initiatives identified in section 5.1 such as the current Freight Study involving the Ministry of Transport, Ministry of Economic Development and Land Transport New Zealand. The IAP project is a collaborative effort between the Ministry for the Environment, Local Government New Zealand and all transport agencies, led by Transit New Zealand. At the regional level, the WRS represents all local government of the Wellington region and is the result of a combined effort from central government, the education and research, business and voluntary sectors. Auckland's RSDF has a very wide membership including all local government in the region and the two neighbouring regional councils, Tangata Whenua and representatives from several central government organisations.

The importance of the role of domestic freight and its contribution to CO_2 emissions has been highlighted by this research. As was stated in Chapter Four, the vast majority of freight is transported by heavy vehicles on New Zealand's roads. The transportation of goods by sea and rail is more energy efficient and therefore produces fewer CO_2 emissions than by road. This is now recognised throughout the central government policies reviewed in Chapter Five, namely the NZES and NZEECS (climate change policy); the Update of the NZTS (transport policy); and specifically the National Rail Strategy and Domestic Sea Freight Strategy.

The Sea Freight Strategy claims that by doubling the share of inter-regional freight carried by sea to 30% by 2040 (target), CO_2 emissions reduction of 3.5% per capita can be achieved (Ministry of Transport, 2008c). This represents significant potential emissions savings and would contribute to New Zealand's Kyoto Protocol commitments beyond 2012. The New Zealand Freight Study outcomes are intended to fill a current information gap and identify existing and likely future freight volumes and distribution, along with trends and imbalances in freight flow. A better understanding of our freight networks and needs is vital if we are to capitalise on the emissions savings inherent in this very important sector of New Zealand's economy.

6.3 Synthesis of International Best Practice in Integrated Transport Policy

A combined investment effort from central and local government levels has resulted in significant shifts in travel behaviour in the Sustainable Travel Towns of Darlington, Peterborough and Worcester. To achieve a lasting change in travel behaviour to sustainable modes, promotional campaigns must be timed with the implementation of infrastructure providing attractive alternatives to the private car (Karlik-Neale, 2005). Similarly, the introduction of a fiscal incentive to change behaviour such as congestion charging, requires the availability of alternative travel modes. The London congestion charge both reduced car use and commanded public support due to simultaneous investment in new bus services[8] (Sloman, 2006). Innovative approaches to addressing transport CO_2 emissions such as

---

[8] The new Mayor of London has recently signalled an intention to remove the congestion charge.

the London congestion charge could be replicated and adopted elsewhere (Tyndall Centre for Climate Change Research, 2005).

Learning from others via the sharing of information and experiences can accelerate implementation rates of successful emissions reduction initiatives and solutions (Tyndall Centre for Climate Change Research, 2005). Collaborative networks which facilitate knowledge and skill transfer and the provision of tools and expertise to achieve local solutions are invaluable. Local government, through its own decision making and activities can achieve substantial GHG emissions reductions. Via spending policies, planning powers and links to business and the community, households and businesses can be influenced to reduce emissions from land use change, transport and energy use (ICLEI Oceania, 2006).

Targeting car ownership (e.g. car sharing) rather than car usage could result in sustainable travel habits as well as reduced VKT. People tend to travel for about one hour per day and will find other destinations or reasons to travel if this 'budget' is not met. Social interaction has been shown as a reason that people travel. The availability of locally accessible (by public transport, cycle or on foot) places to socialise negates that need to travel by car. People tend to make fewer trips in denser urban environments. A compact urban form with easy access to public transport services has been shown to decrease the energy intensiveness (and therefore CO_2 emissions) of London communities. Walking is more likely in compact, high density cities especially if appropriate infrastructure is in place; this is also vital to encourage cycling. TOD offers compact density, diversity of land uses and is attractively designed for pedestrians.

Optimising transport and land use infrastructure investment requires thoughtful urban and facility design with attention to detail and long term vision. Consideration of both the development's fit to the community and the community's fit to the development is needed. TOD requires cooperative planning partnerships between all the agencies and stakeholders responsible for various aspects of the project, as in Greater Vancouver (Raad, 2006).

Urban form has always configured itself around transportation systems and innovations with cities scaling themselves to available technology as much as to culture. The rediscovery of some qualities of older urban forms which are then updated to contemporary situations may also apply to transit in that its future may not be high-tech. The future opportunity may be existing rail which has been

upgraded to meet high environmental standards and rescaled to suit the modern city or region (Calthorpe & Fulton, 2001).

Incremental change by investing whenever possible but over a long term has proven very successful in both Curitiba and Copenhagen. Curitiba's bus system was improved and extended in many stages over a 20 year period to become a very successful transit system. Similarly, a deliberate move was made each year for 20 years by authorities in Copenhagen (Denmark) to reclaim the streets for people and make travel by car more difficult. By implementing such changes as reducing parking, pedestrianising streets and introducing street furniture, markets and festivals traffic was reduced and the vitality of the city area grew with increased social and recreational activity (Gehl, 1992 in Newman & Kenworthy, 1996).

Transit metropolises are adaptable which ensures self-survival in a world of tight budgets, limited resources, and continually changing technology, lifestyles, cultural norms and personal values. Adaptability is well established in the private sector and is becoming more of an expectation of the public sector. Curitiba has adapted its urban landscape to become more transit supportive while also adapting its transit services to deliver customers closer to their destinations, minimising wait times and making speedy transfers. This workable partnership between urban settlement patterns and transit services earn Curitiba the status of a hybrid transit metropolis (Cervero, 1998).

6.4 Integrating Transport Planning for Emissions Reduction

Learning from the Curitiba experience, if development potential is to be realised in New Zealand, then a major expansion of urban research capacity tied into local government responsibilities is required. A better understanding of the relationship between urban growth and transport and a strategic approach to urban planning is essential. The integration of local government plans under the LGA and RMA is critical. Leadership based on experience of complex systems would be an advantage in local government politics and facilitate a systems thinking approach (Parliamentary Commissioner for the Environment, 2002).

The freedom and power that the car gives comes at significant cost spanning the environmental, economic and social spheres. Urban sprawl and dispersed, low density suburbs are facilitated by dominance of the car in a city. Automobile dependence occurs when an assumption that the car will

predominate develops, and a city (or region) therefore gives priority to it regarding infrastructure and urban form (Newman & Kenworthy, 1996). This seems to have been the prerogative in transport planning for the Auckland region over previous decades. Cities or regions which do not have the political capacity to price vehicle use according to true cost are required to plan innovatively to achieve a reduction in CO_2 emissions via minimised car use (Newman & Kenworthy, 1996).

As suggested by Newman and Kenworthy (1996) heavily automobile-dependent cities will decline in the 21st century as people will not want to invest, work and live in congested, polluted cities with unattractive and dangerous streets. Transit oriented planning offers simultaneous improvement in the economy and environment of cities along with high profile solutions to the social problems associated with car dependence. For example, electric rail not only reduces energy use, emissions and noise but also frees up urban space. Fifty times less urban space is occupied by a double-track light rail system than the roading and parking infrastructure needed for cars. When combined with urban design programmes this city space previously lost to the car can be renewed (Trancik, 1989 in Newman & Kenworthy, 1996). Progressive cities and regions (as aspired to in the WRS) require sustainable solutions to car dependence, as offered by TOD. Transit oriented planning has been shown to give a competitive advantage in some European and Asian cities. (Newman & Kenworthy, 1996).

TOD creates vibrant communities and neighbourhoods and increases public transport patronage. It generates affordable housing, retail and business opportunities, and sustainably encourages economic development. Successful TOD reduces fuel consumption, pollution and traffic congestion. Costs are also reduced by way of avoiding expenditure on roading infrastructure, agglomeration benefits and decreased household spending on travel. TODs can also return revenue.

All of these results are consistent with the desired outcomes of Wellington regional policy (the WRS, RPS, WRLTS and LTCCP) and policy at the national level. This indicates that TOD is a highly beneficial planning approach for New Zealand regions. For example, a key outcome of the WRLTS is: improved integration of land use and transport (in line with the WRS and local authority urban development strategies). The RPS contains policies which encourage emissions reduction via less transport fossil fuel use, which it suggests can be achieved by: better public transport investment, more walking and cycling, travel demand reduction and more integrated land use. The RPS also draws attention to the

importance of urban growth being based on existing or planned transport services, and striving for an appropriately dense urban environment (a good fit with TOD).

Regional growth management strategies can provide encouragement to develop around public transport nodes. The WRS highlights the significance of a common approach to regional land use management by implementation of the Strategy through the RPS. Regional form actions in the WRS which are well aligned with TOD include: quality urban design; transport integrated with urban needs; and the proximity of housing to employment and public transport links. The need for medium and higher density housing close to transport links, sub-regional centres and the Wellington CBD is also identified under the WRS focus area of investment in good regional form.

The WRS proposes a strengthened regional transport and land use group which is tasked with better integrating land use and transport decisions for the Wellington region. The WRS Regional Focus Areas (listed in Appendix 12) which are a strategy priority may provide an opportunity for TOD, particularly along the growth spine of Johnsonville to Wellington International Airport. As described in Chapter Five and Appendix 11, transportation in the Ngauranga to Airport section of this spine is currently undergoing public consultation. Wellington City Council is also proposing targeted growth in these areas consistent with and presenting further opportunity for transit oriented planning.

A region wide alliance is necessary to achieve long term transit oriented planning solutions and to meet the expectations of all involved. The establishment of a clear long term vision and goals for development using transit oriented planning is required so that all stakeholders (local government, developers, public transport operators and the community) have an understanding of design expectations and specific outcomes. Local level political and community engagement can assist with approvals processes and final accomplishment of TOD.

The final chapter of this research offers conclusions for integrated regional planning based on the research findings and the analysis and discussion of those results.

7. Conclusion

7.1 Introduction

This research aimed to propose guidance in integrated planning for reducing CO_2 emissions from land transport and land use activities for the Wellington region. This task was required to provide a planning context for the delivery of regional transport outcomes whilst effectively reducing avoidable land transport CO_2 emissions.

The purpose of this study has been to answer the research question:

> ***What integrated planning frameworks are available for New Zealand regional planning in land transport and transport-related land use that are capable of reducing CO_2 emissions whilst delivering on core transport planning goals?***

The following information is presented to answer this question. It informs policy across the sectors of land transport and land use with the intent to create integration in planning between these sectors.

7.2 Conclusions

The Update of the NZTS aspires to New Zealand being the first carbon neutral country in the world. If this and the Government's goal to halve domestic transport GHG emissions per capita by 2040 are to be achieved, fundamental change is needed. Significant modification of planning and implementation in land transport is required which means a major shift in investment priorities.

Future investment in low carbon transport modes and the compact urban form which supports these is vital to achieve reduced CO_2 emissions. Current funding arrangements actually invest in the problem by promoting roading over the infrastructure which supports walking, cycling and public transport. This represents a disparity between transport policy and climate change policy. Meeting core land transport outcomes whilst ignoring the emissions produced in doing so, will not comply with New Zealand's obligations on international carbon emissions reduction agreements.

The dependence of the New Zealand economy on fossil fuels is unsustainable in the face of an oil constrained future. Less reliance on petroleum based transport by directing investment into alternatives to the car and the road may address the current link between economic growth and increased emissions. Current rapidly escalating fuel prices and a future binding cap on carbon emissions for developed countries provide a major wake-up call to the way the land transport system has operated in New Zealand.

The conditions to enable a low carbon future for New Zealand regions need to be established. These conditions must allow the sustainable delivery of strategic land transport and land use planning outcomes. This will involve a greater understanding of the contexts and needs of different levels of government and of the practicalities of actual delivery to the rate-paying public. Central government expectations of local government capability must be realistic and aligned with regional perspectives.

Strong and well informed leadership is required to guide the processes necessary for delivery on substantially reduced regional emissions. Due to the intergenerational timeframe of GHG impacts and resulting climate change manifestations, this leadership requires vision well beyond the current term of political office. Cross party dialogue is necessary so that the issues can be addressed in an integrated way and not be influenced by party specific politics. This is applicable to all levels of New Zealand government. To encourage an understanding of the issues courageous and ambitious discussion with constituents, rate-payers and businesses that mandate this leadership and invest in solutions, needs to occur. In this way, community and consensus building can facilitate public and private support and investment for sustainable planning options in transport and urban design.

Planning timeframes need to extend well beyond the 10 year outlook that much government policy has focussed on. Proposed outlooks of 30 years plus show improved approaches to planning in land transport and urban design. The resulting infrastructure, housing and other aspects of the built environment will outlast that timeframe so are required to be future-proofed to meet the needs of future generations.

TOD fits closely with regional planning outcomes in land transport and land use and has multiple co-benefits. It provides improved accessibility and mobility to communities while promoting and providing for low carbon transport and design options. Travel demand is also addressed by TOD with

the inclusion of retail and other services. Amenity, housing choice, neighbourhood identity and other social solutions are also offered by TOD along with reduction in emissions inherent to this type of development.

Capacity in terms of research and people skilled in the field of integrating urban design and transport needs to be addressed. Developing and retaining this capacity within New Zealand will require targeted investment and collaboration between sectors such as academic, business and local government.

International best practice provides guidance in integrated planning for transport and urban design as presented in Chapter Five of this research. In the same chapter, the experience based perspectives of New Zealand practitioners in these fields are also a valuable resource for future planning guidance at both a regional and national level. These insights can facilitate a systems thinking approach and allow progress towards the achievement of some examples of international best practice in integrated land use and land transport planning.

Implementing a range of initiatives as suggested by this research will go a long way towards achieving reductions in CO_2 emissions. Improvement of the fuel economy of the vehicle fleet (as currently proposed by government) and the future implementation of a robust NZ ETS provide opportunities for regulated emissions reduction. Achieving mode shifts by reassigning freight movement from road to rail and sea and utilising existing technologies such as cycles, trains and buses require targeted investment and prioritisation. Stand alone programmes will not accomplish the cuts in emissions which are necessary to meet our current and future emissions reduction targets but a combined and collaborative effort across all sectors and at the community and individual levels could achieve these.

Top-down approaches are guided by international agreements such as the Kyoto Protocol but need to be carefully customised for the New Zealand situation in order to achieve optimum reduction outcomes whilst still protecting the economy and livelihood of the nation. Efforts to reduce the demand for travel are paramount to addressing CO_2 emissions from the land transport sector with behaviour change integral to the solutions. Bottom-up initiatives enable small, frequent and ongoing changes to occur. The cumulative effect of these changes can contribute greatly to the regional, national and in turn, international effort. By ensuring that the many components of these two

directional approaches share common ground and ideals, the resulting integrated effort will produce CO_2 emissions reduction strategies that work. Only by working together at multiple levels can this be achieved.

Reference List

Allan, S. (2007). *Draft Better Integration of Land Use and Transport: Integrated Approach to Planning Phase One Report*. TSSD Planning Task Force, Wellington.

Ampt, E. (2007, 21-23 February). *The Role of Behaviour Change in Reducing CO2 Emissions.* Paper presented at the 2nd International Conference on Sustainability Engineering and Science: Talking and walking sustainability, Auckland, New Zealand.

Auckland Regional Council. (2007a). *Auckland Regional Council Annual Plan 2007-08, Chapter 2 - Built Environment*. Auckland Regional Council, Auckland. Retrieved 7 June 2008, from http://www.arc.govt.nz/albany/fms/main/Documents/Plans/Annual%20plans%20and%20report/Annual%20plan%202007-08/Chapter%20Two%20-%20Built%20Environment.pdf

Auckland Regional Council. (2007b). Regional Growth Strategy. Retrieved 8 June, 2008, from http://www.arc.govt.nz/plans/regional-strategies/regional-growth-strategy.cfm

Boston, J. (2007). Personal communication, Wellington, New Zealand.

Burwell, D., & Sperling, D. (2007). Towards a Transportation Policy Agenda for Climate Change. In D. Sperling & J. S. Cannon (Eds.), *Driving Climate Change: Cutting Carbon from Transportation*. Burlington, MA: Academic Press.

Calthorpe & Fulton, P. W. (2001). *The Regional City: planning for the end of sprawl*. Washington, DC 20009, U.S.A.: Island Press.

Cervero, R. (1998). *The transit metropolis: a global inquiry*. Washington, DC 20009, U.S.A.: Island Press.

Dittmar, H., Belzer, D., & Autler, G. (2004). An Introduction to Transit-Oriented Development. In H. Dittmar & G. Ohland (Eds.), *The New Transit Town: Best Practices in Transit-Oriented Development* (pp. 1-18). Washington, DC: Island Press.

Dittmar, H., & Poticha, S. (2004). Defining Transit-Oriented Development: The New Regional Building Block. In H. Dittmar & G. Ohland (Eds.), *The New Transit Town: Best Practices in Transit-Oriented Development* (pp. 19-40). Washington, DC: Island Press.

Energy Efficiency and Conservation Authority. (2007). *New Zealand Energy Efficiency and Conservation Strategy: Making It Happen - Action plan to maximise energy efficiency and renewable energy*. Energy Efficiency and Conservation Authority, Wellington.

Greater Wellington Regional Council. (2006a). *Our region – their future: A discussion document on the review of the Regional Policy Statement for the Wellington Region*. Greater Wellington Regional Council, Wellington. Retrieved 15 October 2006, from http://www.gw.govt.nz/story_images/3016_RPSOurregionthei_s6017.pdf

Greater Wellington Regional Council. (2006b). *A sustainable region: Amended 2006–16 Ten-Year Plan (incorporating the 2006/07 Annual Plan)*. Greater Wellington Regional Council, Wellington.

Greater Wellington Regional Council. (2007a). *Wellington Regional Land Transport Strategy 2007 – 2016*. Greater Wellington Regional Council, Wellington.

Greater Wellington Regional Council. (2007b). *Wellington Regional Strategy: Internationally Competitive Wellington - A Sustainable Economic Growth Strategy for our Region*. Greater Wellington Regional Council, Wellington.

Greater Wellington Regional Council. (2008a). *Draft Regional Policy Statement for the Wellington region 2008*. Greater Wellington Regional Council, Wellington.

Greater Wellington Regional Council. (2008b). *Regional Policy Statement Review Newsletter No. 4: March 2008*. Greater Wellington Regional Council, Wellington.

Hay, I. (Ed.). (2005). *Qualitative research methods in human geography* (2nd ed.). Melbourne: Oxford University Press.

Hill, G., & Houghton, D. (2007a). *RLTS Review 2007/08 Revised Timetable, Regional Land Transport Committee Report*: Auckland Regional Council, Auckland

Hill, G., & Houghton, D. (2007b). *Update on Regional Growth Strategy and Long Term Sustainability Framework, Regional Land Transport Committee Report*: Auckland Regional Council, Auckland

ICLEI Local Governments for Sustainability. (2007). Cities for Climate Protection (CCP) Retrieved 24 May, 2008, from http://www.iclei.org/index.php?id=800

ICLEI Oceania. (2006). Communities for Climate Protection - New Zealand. Retrieved 24 May, 2008, from http://www.iclei.org/index.php?id=3922

Jones, T. (2007). Personal communication, Wellington, New Zealand.

Karlik-Neale, M. (2005, 6-8 November). *Sustainable Transport in London, One-Planet-Mobility and Travel Behaviour.* Paper presented at the Planning for Certainty in Transport: NZHIT & Transit NZ 7th Annual Conference, Christchurch.

King, A. (2007). Land Transport Management Amendment Bill 2007. Retrieved 20 February 2008, from http://www.beehive.govt.nz/speech/land+transport+management+amendment+bill+2007

Kos, P. (2007). Personal communication, Wellington, New Zealand.

Kuschel, G. (2007). Personal communication, Auckland, New Zealand.

Kuschel, G. (2008). *Regional Responses to Climate Change and Energy, Draft Regional Strategy & Planning Committee Report*: Auckland Regional Council, Auckland

Lee, D. L. (2007). Personal communication, Wellington, New Zealand.

Local Government (Auckland) Amendment Act, (2004).

McDavitt, T. (2007). Personal communication, Wellington, New Zealand.

Merron, G. (n.d.). Smarter Travel Choices, Individualised Travel Marketing and Sustainable Travel Towns. Retrieved 7 December, 2007, from http://www.dft.gov.uk/pgr/sustainable/demonstrationtowns/lettersustainabletraveltowns

Ministry for the Environment. (1998). *Updated Guide to the Resource Management Act*. Ministry for the Environment, Wellington.

Ministry for the Environment. (2005). The New Zealand Urban Design Protocol. Retrieved 4 June, 2008, from http://www.mfe.govt.nz/issues/urban/design-protocol/index.html

Ministry for the Environment and The Treasury. (2007). *The Framework for a New Zealand Emissions Trading Scheme: Executive Summary*. Ministry for the Environment and The Treasury. Retrieved 26 May 2008, from http://www.climatechange.govt.nz/files/ets-executive-summary-complete.pdf

Ministry of Economic Development. (2005). Addressing the Buildability Constraints of the Auckland Transport Package: Report. Retrieved 20 February, 2008, from http://www.med.govt.nz/templates/ContentTopicSummary___3504.aspx

Ministry of Economic Development. (2007). *New Zealand Energy Strategy to 2050: Powering Our Future - Towards a sustainable low emissions energy system*. Ministry of Economic Development, Wellington.

Ministry of Transport. (2005a). *Getting there – on foot, by cycle: A strategy to advance walking and cycling in New Zealand transport*. Ministry of Transport, Wellington.

Ministry of Transport. (2005b). *National Rail Strategy to 2015*. Ministry of Transport. Retrieved 26 May 2008, from http://www.mot.govt.nz/assets/NewPDFs/nrs.pdf

Ministry of Transport. (2006). *Transport Sector Strategic Directions 2006-09: Update 2006*. Ministry of Transport, Wellington.

Ministry of Transport. (2007a). Next Steps Review of the Land Transport Sector. Retrieved 6 April, 2008, from http://www.transport.govt.nz/next-steps-review-of-the-land-transport-sector-1/

Ministry of Transport. (2007b). *Sustainable Transport: Update of the New Zealand Transport Strategy - Discussion paper*. Ministry of Transport, Wellington.

Ministry of Transport. (2008a). *Improving the fuel economy of vehicles entering the New Zealand fleet: A discussion paper for public comment*. Ministry of Transport, Wellington.

Ministry of Transport. (2008b). National Demands Freight Study. Retrieved 26 May, 2008, from http://www.mot.govt.nz/national-demands-freight-study-1/

Ministry of Transport. (2008c). *Sea Change: Transforming Coastal Shipping in New Zealand. A Strategy for Domestic Sea Freight: May 2008*. Ministry of Transport. Retrieved 26 May 2008, from http://www.mot.govt.nz/assets/Images/NewFolder-2/Sea-Change-2008.pdf

New Zealand Government. (2007). *New Zealand emissions trading scheme: Questions and answers*. New Zealand Government. Retrieved 26 May 2008, from http://www.mfe.govt.nz/publications/climate/ets-questions-answers-oct07/ets-questions-answers-oct07.pdf

New Zealand Government. (2008). King: Sea Change funding will revitalise coastal shipping. Retrieved 26 May, 2008, from

http://www.beehive.govt.nz/release/king+sea+change+funding+will+revitalise+coastal+shipping

Newman, P. W. G., & Kenworthy, J. R. (1996). The land use-transport connection: An overview. *Land Use Policy, 13*(1), 1-22.

Ngauranga to Airport Strategic Transport Study. (2007). *Help us keep Wellington on the move*. Ngauranga to Airport Strategic Transport Study, Wellington.

Pacala, S., & Socolow, R. (2004). Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies. *Science, 305*(5686), 968-972.

Parliamentary Commissioner for the Environment. (2002). *Showing the way: Curitiba: Citizen City*. Parliamentary Commissioner for the Environment, Wellington.

Participant X. (2007). Personal communication, Wellington, New Zealand.

Participant Y. (2007). Personal communication, Wellington, New Zealand.

Percy, A. (2007). Personal communication, Auckland, New Zealand.

Perreau, K. (2007). Personal communication, Wellington, New Zealand.

Raad, T. (2006). Turning Transit Stations into Transit Villages: Examples from Greater Vancouver. *Plan Canada, Summer 2006, 46*(2), 25-28.

Rabinovitch, J. (1996). Innovative land use and public transport policy - The case of Curitiba, Brazil *Land Use Policy, 13* (1), 51-67(17).

Royal Commission on Auckland Governance. (2007). Royal Commission on Auckland Governance. Retrieved 7 June, 2008, from http://www.royalcommission.govt.nz/rccms.nsf/CONTENTPAGES/$first?open

Shand, D. (2007). Personal communication, Wellington, New Zealand.

Sloman, L. (2006). *Car Sick. Solutions for our Car-addicted Culture*. Dartington, Devon: Green Books Ltd.

Socolow, R., Hotinski, R., Greenblatt, J. B., & Pacala, S. (2004). Solving the climate problem - Technologies available to curb CO2 emissions. *Environment, 46*(10), 8-19.

The Canadian Urban Transit Association. (2004, October). Transit-Oriented Development: Smart Growth in Action. *Public Transit, Issue paper 9*.

The City of Calgary. (2004). *Transit Oriented Development - Best Practices Handbook*. The City of Calgary, Calgary. Retrieved 15 May 2008, from http://www.calgary.ca/DocGallery/BU/planning/pdf/tod/tod_handbook.pdf

The City of Calgary. (2005). *Transit Oriented Development Policy Guidelines*. The City of Calgary, Calgary. Retrieved 15 May 2008, from http://www.calgary.ca/DocGallery/BU/planning/pdf/tod/tod_policy_guidelines.pdf

The City of Calgary. (2008). Transit Oriented Development. Retrieved 15 May 2008, from http://www.calgary.ca/portal/server.pt/gateway/PTARGS_0_2_527219_0_0_18/Transit+Oriented+Development+.htm

The Office of the Minister of Transport. (2002). *New Zealand Transport Strategy*. The Office of the Minister of Transport, Wellington.

Transit New Zealand. (2007). Integrated Approach to Planning (IAP) Project. Retrieved 19 November, 2007, from http://www.transit.govt.nz/planning/iap.jsp

Tyndall Centre for Climate Change Research. (2005). ZeroCarbonCity: Reacting to Climate Change. Increasing awareness, reducing emissions. *Climate change and cities: a brief look at the issues, Briefing Sheet 30*.

United States Environmental Protection Agency. (2006). *National Award for Smart Growth Achievement 2006*. United States Environmental Protection Agency, Washington, DC.

University of Minnesota. (2007). Metropolitan Travel Survey Archive: Yacov Zahavi. Retrieved 17 August, 2007, from http://www.surveyarchive.org/zahavi.html

Victoria Transport Policy Institute (Ed.) (2002) TDM Encyclopedia. Victoria, BC: Victoria Transport Policy Institute.

Wild, G., & Hayes, N. (2008). *Draft submission on Sustainable Transport, Update of the New Zealand Transport Strategy Discussion Paper, Regional Land Transport Committee Report*: Greater Wellington Regional Council, Wellington. Retrieved 1 May 2008, from http://www.gw.govt.nz/council-reports/pdfs/reportdocs/2007_789_2_Attachment.pdf

Wilde, F. (2007). *Draft submission to the Transport and Industrial Relations Committee in the matter of the Land Transport Management Amendment Bill 2007* Greater Wellington Regional Council, Wellington. Retrieved 1 May 2008, from http://www.gw.govt.nz/council-reports/pdfs/reportdocs/2007_789_2_Attachment.pdf

Winder, P. (2008). *Regional Sustainable Development Forum - Protocols, Regional Sustainable Development Forum Report*: Auckland Regional Council, Auckland. Retrieved 7 June 2008, from http://www.arc.govt.nz/albany/fms/main/Documents/Council/Agendas%20and%20minutes/RSDF%20Forum/Web%20Version%20-%2022%20Feb%2008%20-%20Agenda.pdf

Wright, K. (2007). Personal communication, Auckland, New Zealand.

Zahavi, Y. (1974). Traveltime Budgets and Mobility in Urban Areas [Electronic Version]. Retrieved 17 August 2007 from http://www.surveyarchive.org/zahavi/TravelTime_Budgets.pdf

Appendix 1: List of Research Participants (Interviews)

CONFIDENTIALITY WAIVED				
Name	**Position**	**Organisation**	**Sector**	**Date**
Kathy Perreau	Manager Environmental Sustainability, Environment	Ministry of Transport	Central government	17 July 2007
Paul Kos	Senior Strategic Advisor, Urban Development & Transport Directorate	Wellington City Council	Territorial authority (local government)	10 August 2007
Anna Percy	Organisational Strategy Manager	Auckland Regional Transport Authority	Regional authority	26 October 2007
Gerda Kuschel	Manager - Environmental Sustainability, Policy & Planning Department	Auckland Regional Council	Regional council (local government)	29 October 2007
Kevin Wright	Manager Transport Strategy	Waitakere City Council	Territorial authority (local government)	29 October 2007
Tim Jones	Convenor, Transport & Oil Working Group	The Sustainable Energy Forum (SEF)	Non government organisation (NGO)	15 November 2007
David Lee	Senior Planning Policy Advisor	Transit New Zealand	Central government agency	19 November 2007
Terry McDavitt	Consultant (former Regional Councillor & Regional Land Transport Committee Chair)	Independent (formerly Greater Wellington Regional Council)	Private (formerly local government)	20 November 2007
Jonathan Boston	Professor of Public Policy, Deputy Director of the Institute of Policy Studies	Victoria University of Wellington	Academic	28 November 2007
Diana Shand	Communities for Climate Protection - New Zealand (CCP-NZ), National Programme Manager (& former Regional Councillor)	ICLEI - Local Governments for Sustainability - Oceania	International NGO (programme funded by central government)	11 December 2007
CONFIDENTIALITY MAINTAINED				
Name	**Position**	**Organisation**	**Sector**	**Date**
Participant X	Analyst	-	Central government agency	17 August 2007
Participant Y	Specialist	Energy company	Private	20 November 2007

Appendix 2: Information for Research Participants

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

Project Title:

The role of regional (transport and land use) policy in addressing carbon dioxide emissions from land transport

Principal Researcher:	Leonie Waayer	Environmental Studies Programme
Telephone:	04 803 0366	School of Geography, Environment
Email:	waayerleon@student.vuw.ac.nz	and Earth Sciences
		Victoria University of Wellington
Supervisor:	Dr. Sean Weaver	PO Box 600, Wellington, NZ
Telephone:	04 463 5392	Telephone: 04 463 6108
Email:	Sean.Weaver@vuw.ac.nz	

Information for Research Participants

Introduction

I am a Master's student in Environmental Studies at Victoria University of Wellington and this research is being undertaken as part of a Master's thesis. I anticipate that my thesis will be completed in March 2008. I study part-time while working fulltime for Greater Wellington Regional Council as a Transport Analyst in the Transport Policy & Strategy Division. While I hope my research findings will be useful in a regional transport planning context, I am undertaking this study independently from my employer.

Purpose of research

The study aims to identify issues, barriers, opportunities and potential solutions to address carbon dioxide emissions from land transport. Information gathered will inform a regional transport planning framework with the intention of engaging planning processes across sectors.

Research format

Initial policy analysis of relevant regional and national transport and land use policy will be undertaken. A literature review will also be conducted to gain an understanding of transport and land use issues and current planning concepts.

Initial discussions with transport policy and other practitioners will aim to set the historical context. I wish to establish the (relatively) recent evolution of issues relating to climate change, land transport/ land use and regional policy. I am particularly interested in the development of the previous Wellington Regional Land Transport Strategy (1999) and Wellington Regional Policy Statement (1995) from a climate change perspective.

My intention is to record all discussions and interviews using a digital recording device. The interviews will be transcribed soon afterwards and I may employ someone to do this.

I will then conduct two rounds of interviews with a sample of research participants taken from the land transport and land use stakeholder community. The research participants will be a different

group to those taking part in the discussion described above, but may be referred by them. I anticipate that both interview rounds will be conducted with the same group of research participants.

The first round of interviews will consist of approximately five questions about key issues, barriers, opportunities and potential solutions to carbon dioxide emissions from land transport. Questions can be made available prior to the interviews and I anticipate that the interviews will require about 30 minutes of participants' time. After analysis of the ideas identified in Round 1 interviews, a planning framework addressing potential solutions to issues and barriers will be drawn up and research participants will be asked to evaluate the framework in the second round of interviews. This information can also be made available for prior review to save participants' time during second interviews.

Further analysis of the contribution from research participants will follow and I will make comparisons with other transport-related planning concepts.

Confidentiality and use of data
Participation in the research project is entirely voluntary. Research participants will be asked to sign a consent form. Your identity will be kept confidential and no information will be attributed to you unless a separate 'Waiver of Confidentiality' form is also signed. If you do not require your identity to remain confidential, you will have the opportunity to review and edit or withdraw the transcript of our discussion/ interview(s).

All data will be kept secure with access restricted to the researcher, supervisor and a data transcriber (the latter will be required to sign a non-disclosure statement). All data will be destroyed two years after the project is complete. During the research project and this two year period it is anticipated that research findings will be used in publications such as academic journals, industry or local government publications and/or presented at professional or academic conferences.
Right of withdrawal

Should a participant feel the need to withdraw from the project, you may do so at any time before the data is analysed. Please let me know at the time.

Access to research results
Research findings will form the basis of a Master's thesis which will be submitted to the School of Geography, Environment and Earth Science with copies deposited in Victoria University of Wellington libraries. At the completion of my thesis a research summary can be made available to you on request.

If you have any questions or would like further information about the project, please contact either myself or my supervisor, Dr Sean Weaver, as above.

Thank you,

Leonie Waayer

Masters of Environmental Studies Candidate
School of Geography, Environment and Earth Sciences
Victoria University of Wellington

Appendix 3: Research Participant Consent Form

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

Project Title:

The role of regional (transport and land use) policy in addressing carbon dioxide emissions from land transport

Principal Researcher:	Leonie Waayer	Environmental Studies Programme
Telephone:	04 803 0366	School of Geography, Environment
Email:	waayerleon@student.vuw.ac.nz	and Earth Sciences
		Victoria University of Wellington
Supervisor:	Dr. Sean Weaver	PO Box 600, Wellington, NZ
Telephone:	04 463 5392	Telephone: 04 463 6108
Email:	Sean.Weaver@vuw.ac.nz	

Research Participant Consent

Introduction
The researcher is a Master's student in Environmental Studies at Victoria University of Wellington and this research is being undertaken as part of a Master's thesis. Victoria University requires that ethical approval is obtained when research involves human subjects. Participation in the research must be voluntary and obtained through informed consent. This consent form is part of that process.

Purpose of research
The study aims to identify issues, barriers, opportunities and potential solutions to address carbon dioxide emissions from land transport. Information gathered will inform a transport policy design with the intention of engaging planning processes across sectors.

Research format
Initial discussions and two rounds of interviews will be conducted with research participants. It is intended that all discussions and interviews will be recorded using a digital recording device. The interviews will be transcribed soon afterwards and someone may be employed to do this.

Declaration of consent

Information
I have been given, have read and understood the 'Information for research participants' pertaining to this research project. I have had an opportunity to ask questions and have them answered to my satisfaction.

Right of withdrawal
I understand that participation in the research project is entirely voluntary and that I may withdraw myself and any information I have provided from this project (before analysis of data) without having

to give an explanation or without disadvantaging myself in any way. I will need to inform the researcher at the time.

Confidentiality and use of data (delete one)

a) Confidentiality required
I understand that my identity will be kept confidential to the researcher, the supervisor and the person who transcribes the recordings of our interviews. I understand that the published results will not use my name and that no opinions will be attributed to me in any way that will identify me.

b) Confidentiality not required
I consent to information or opinions which I have given, being attributed to me in any reports on this research and have signed the separate 'Waiver of Confidentiality' form. I understand that I will have the opportunity to check the transcripts of the interviews before publication. If I do not reply to the researcher within 30 days of receiving the transcripts, they may be used as stated in this consent.

Access to research results
I understand that the information I provide will be published in a Master's thesis at Victoria University of Wellington. The information may also feature in academic, industry or local government publications and/or be presented at academic or professional conferences. I understand that the data I provide will not be used for any other purpose or released to others without my further written consent.

Declaration

I consent to participating in this research project.
| Name | Signed | Date |

Research participant: …………………………………………………………………………..

Researcher: ………………..……………………………………………………………………….

Appendix 4: Waiver of Confidentiality Form

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

**Research Project: "The role of regional (transport and land use) policy
in addressing carbon dioxide emissions from land transport"**

<u>Waiver of Confidentiality</u>

I, _____, have been interviewed by Leonie Waayer as part of the "Role of regional (transport and land use) policy in addressing carbon dioxide emissions from land transport" research project. I have chosen that my identity will *not* remain confidential.

Leonie Waayer, Victoria University of Wellington, and any publications which use material from this research project have my permission to publicly identify me by name and use the transcript of the interview with me (after I have had the opportunity to review and modify it) as an accurate representation of what I have said.

Signature: _____

Name: _____

Date: _____

Appendix 5: Interview Schedule

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

Project Title:

The role of regional (transport and land use) policy in addressing carbon dioxide emissions from land transport

Principal Researcher:	Leonie Waayer	Environmental Studies Programme
Telephone:	04 803 0366	School of Geography, Environment
Email:	waayerleon@student.vuw.ac.nz	and Earth Sciences
		Victoria University of Wellington
Supervisor:	Dr. Sean Weaver	PO Box 600, Wellington, NZ
Telephone:	04 463 5392	Telephone: 04 463 6108

Interview Schedule

1.   What are some of the broad issues associated with land transport and land use in New Zealand?

2.   What are some of the key issues you associate with carbon dioxide emissions from land transport?
     - (top three issues)

3.   Are there any barriers to addressing carbon dioxide emissions from land transport?
     - (three examples)

4.   Are there any opportunities in addressing carbon dioxide emissions from land transport?
     - (three examples)

5.   a) Can you suggest any potential ways of addressing the key issues you identified in Q. 2?
     b) Can you suggest any potential ways of overcoming the barriers you identified in Q. 3?

6.   a) Do you think it is the role of central or local government to address the issues (or perhaps on-government or the public)?
     b) Do you think it is the role of central or local government to address the potential solutions (or perhaps non-government or the public)?

Leonie Waayer
Masters of Environmental Studies Candidate

Appendix 6: Human Ethics Committee Approval

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI

VICTORIA
UNIVERSITY OF WELLINGTON

MEMORANDUM

Phone   04-463 5676

Fax   04-463 5209

TO	Leonie Waayer
COPY TO	Dr Sean Weaver
FROM	Dr Allison Kirkman, Convener, Human Ethics Committee

DATE	17 April 2007
PAGES	1

SUBJECT	**Ethics Approval: No 32/2007, The role of regional (transport and land use) policy in addressing cardon dioxide emissions from land transport.**

Thank you for your application for ethical approval, which has now been considered by the Standing Committee of the Human Ethics Committee.

Your application has been approved and this approval continues until 31 March 2008. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.
Best wishes with the research.

Allison Kirkman
Convener

Appendix 7: Regional Urban Design Principles

The region's urban design principles are adapted from the New Zealand Urban Design Protocol and are as follows:

1. Context

Quality urban design sees buildings, places and spaces not as isolated elements but as part of the whole town or city.

In this regard quality urban design:

(a) takes a long-term view

(b) recognises and builds on landscape context and character

(c) results in buildings and places that are adapted to local climatic conditions

(d) provides for public transport, roading, cycling and walking networks that are integrated with each other and the land uses they serve

(e) examines each project in relation to its setting and ensures that each development fits in with and enhances its surroundings

(f) understands the social, cultural and economic context as well as physical elements and relationships

(g) considers the impact on the health of the population who live and work there

(h) celebrates cultural identity and recognises the heritage values of a place

(i) ensures incremental development contributes to an agreed and coherent overall result.

2. Character

Quality urban design reflects and enhances the distinctive character and culture of our urban environment, and recognises that character is dynamic and evolving, not static.

In this regard quality urban design:

(a) reflects the unique identity of each town, city and neighbourhood and strengthens the positive characteristics that make each place distinctive

(b) protects and manages our heritage, including buildings, places and landscapes

(c) protects public open space, and improves the quality, quantity and distribution of local open space over the long term

(d) protects and enhances distinctive landforms, water bodies and indigenous plants and animals

(e) provides a positive contribution to the environmental health of urban streams, the harbours, beaches and their catchments

(f) creates locally appropriate, and where relevant, inspiring, architecture, spaces and places

(g) reflects and celebrates our unique New Zealand culture and identity and celebrates our multicultural society.

3. Choice

Quality urban design fosters diversity and offers people choice in the urban form of our towns and cities, and choice in densities, building types, transport options, and activities. Flexible and adaptable design provides for unforeseen uses, and creates resilient and robust towns and cities.

In this regard quality urban design:

(a) ensures urban environments provide opportunities for all, especially the disadvantaged

(b) allows people to choose different sustainable lifestyle options, locations, modes of transport, types of buildings and forms of tenure

(c) encourages a diversity of activities within mixed use developments and neighbourhoods

(d) supports designs which are flexible and adaptable and which will remain useful over the long term

(e) ensures public spaces are accessible by everybody, including people with disabilities.

4. Connections

Good connections enhance choice, support social cohesion, make places lively and safe, and facilitate contact among people. Quality urban design recognises how all networks — streets, railways, walking and cycling routes, services, infrastructure, and communication networks — connect and support healthy neighbourhoods, towns and cities. Places with good connections between activities and with careful placement of facilities benefit from reduced travel times and lower environmental impacts. Where physical layouts and activity patterns are easily understood, residents and visitors can navigate around the city easily.

In this regard quality urban design:

(a) creates safe, attractive and secure pathways and links between centres and landmarks and neighbourhoods

(b) facilitates green networks that link public and private open space

(c) places a high priority on walking, cycling and public transport

(d) anticipates travel demands and provides a sustainable choice of integrated transport modes

(e) improves accessibility to public services and facilities

(f) treats streets and other thoroughfares as positive spaces with multiple functions

(g) provides formal and informal opportunities for social and cultural interaction

(h) facilitates access to services and efficient movement of goods and people

(i) provides environments that encourage people to become more physically active.

5. Creativity

Quality urban design encourages creative and innovative approaches. Creativity adds richness and diversity, and turns a functional place into a memorable place. Creativity facilitates new ways of thinking, and willingness to think through problems afresh, to experiment and rewrite rules, to harness new technology, and to visualise new futures. Creative urban design supports a dynamic urban cultural life and fosters strong urban identities.

In this regard quality urban design:

(a) emphasises innovative and imaginative solutions

(b) combines processes and design responses that enhance the experience we have of urban environments

(c) incorporates art and artists in the design process at an early stage to contribute to creative approaches

(d) values public art that is integrated into a building, space or place

(e) builds a strong and distinctive local identity

(f) utilises new technology

(g) incorporates different cultural perspectives.

6. Custodianship

Quality urban design reduces the environmental impacts of our towns and cities through environmentally sustainable and responsive design solutions. Custodianship recognises the lifetime costs of buildings and infrastructure, and aims to hand on places to the next generation in as good or better condition. Stewardship of our towns includes the concept of kaitiakitanga. It creates enjoyable, safe public spaces, a quality environment that is cared for, and a sense of ownership and responsibility in all residents and visitors.

In this regard quality urban design:

(a) protects landscapes, ecological systems and cultural heritage values

(b) manages the use of resources carefully, through environmentally responsive and sustainable design solutions

(c) manages land wisely

(d) utilises 'green' technology in the design and construction of buildings and infrastructure

(e) incorporates renewable energy sources and passive solar gain

(f) creates buildings, spaces, places and transport networks that are safer, with less crime and fear of crime

(g) avoids or mitigates the effects of natural and man-made hazards

(h) considers the ongoing care and maintenance of buildings, spaces, places and networks

(i) uses design to improve the environmental performance of infrastructure

(j) considers the impact of design on people's health.

7. Collaboration

Towns and cities are designed incrementally as we make decisions on individual projects. Quality urban design requires good communication and coordinated actions from all decision-makers: central government, local government, professionals, transport operators, developers and users. To improve our urban design capability we need integrated training, adequately funded research and shared examples of best practice.

In this regard quality urban design:

(a) supports a common vision that can be achieved over time

(b) depends on leadership at many levels

(c) uses a collaborative approach to design that acknowledges the contributions of many different disciplines and perspectives

(d) involves communities in meaningful decision-making processes

(e) acknowledges and celebrates examples of good practice

(f) recognises the importance of training in urban design and research at national, regional and local levels.

(Greater Wellington Regional Council, 2008a: 172-174).

Appendix 8: Land Transport GHG Emissions Reduction Actions - NZES

Five areas to reduce the growth of GHG emissions from the land transport sector (to complement the Emissions Trading Scheme) associated actions, lead agency and timing:

- **Managing demand for travel**

  - *Action: The government will continue to support local government on quality urban design, including investigating the role for greater national guidance (lead agency: Ministry for the Environment; timing: November 2007).*

- **Shifting to more efficient and/or lower impact means of transport**

  - *Action: The government will continue to develop policies, including policies on funding, to encourage greater provision of public transport, walking and cycling (lead agency: Ministry of Transport; timing: 2008).*

  - *Action: The government will encourage the deployment of low carbon bus fleets, including hybrid and electric buses, into the suburban passenger fleet (lead agency: Ministry of Transport; timing: ongoing).*

  - *Action: The government will work with those involved in the shipping industry, including associated rail and road operators, to develop a 'New Zealand Domestic Sea Freight Strategy' (lead agency: Ministry of Transport; timing: now).*

- **Improving the fuel efficiency of the vehicle fleet**

  - *Action: Through the New Zealand Energy Efficiency and Conservation Strategy, the government will work with industry to develop average fuel economy standards for light vehicles entering the fleet by the end of 2007[9] (lead agency: Ministry of Transport; timing: end 2007).*

- **Developing and adopting future fuels**

  - *Action: The government will establish an expert advisory group to look at future vehicle and energy technologies such as biofuels and electric vehicles, including barriers to adoption (lead agency: Ministry of Transport; timing: end 2007).*

---

[9] There may be different mechanisms for new and used imports.

- *Action: The government will introduce a 'Biofuels Sales Obligation' from 1 April 2008 (lead agency: Ministry of Economic Development; timing: 1 April 2008).*

- *Action: The government will review the 'Biofuels Sales Obligation' in 2010 to establish all aspects of the obligation after 2012, including obligation levels (lead agency: Ministry of Economic Development; timing: December 2010).*

- *Action: The government will continue to participate in international dialogue on the role and potential for alternative fuels (lead agency: Ministry of Economic Development; timing: ongoing).*

- *Action: The government will work towards positioning New Zealand to be a world leader in the deployment of new vehicle technologies, including plug-in hybrids and electric vehicles (lead agency: Ministry of Transport; timing: ongoing).*

- *Action: The government will continue to support opportunities to develop and commercialise niche applications of hydrogen. It will also strengthen opportunities for international collaboration to ensure New Zealand can be a fast adopter if use of hydrogen as an energy carrier becomes commercially viable (lead agency: Ministry of Economic Development/Foundation for Research Science and Technology; timing: ongoing).*

- **Ensuring the security of short-term oil supplies and a diverse supply of transport fuels**

  - *Action: New Zealand will have access to at least 90 days' of oil stocks, in line with international obligations (lead agency: Ministry of Economic Development; timing: ongoing).*

  - *Action: The government will produce an updated 'Oil Emergency Response Strategy' by June 2008 (lead agency: Ministry of Economic Development; timing: June 2008).*

(Ministry of Economic Development, 2007: 45).

Appendix 9: Energywise Transport Actions - NZEECS

Managing demand for travel

The NZEECS lists travel demand measures in order of effectiveness as: pricing; mode quality improvements (better services, networks and facilities); then social marketing to promote behaviour change. These methods are in addition to improving urban design. Actions include working with local government to develop TDM strategies, and assisting with workplace and school travel plans (Energy Efficiency and Conservation Authority, 2007).

More efficient transport modes

For personal travel the NZEECS puts forward the following actions:

- Funding policy review – in line with the NZES

- Regional public transport mode share targets by the end of 2012

- Complete the electrification of the Auckland passenger rail system by the end of 2013

- Complete the $500 million Wellington regional rail upgrade by the end of 2013

- A programme to increase the uptake of low carbon and fuel-efficient buses

- Bus infrastructure improvements

- Getting there – on foot, by cycle: implement the initiatives outlined in the Walking and Cycling Strategy's strategic implementation plan

- Implement Bikewise week annually to promote cycling

- Neighbourhood accessibility plans – community-based programmes to improve safety and access at the community level

- Active Living Programme (SPARC) – a programme to encourage active travel modes such as walking and cycling to encourage less car use.

Regarding land freight and maritime transport, policy development for efficient freight movement will be assisted by a better understanding of the true costs of moving a tonne of freight. These costs include environmental externalities and apply to freight by different modes. Encouraging businesses to work together to make more efficient use of existing infrastructure to move freight, for example moving from road to rail freight, is also supported by the NZEECS. Proposed actions include: a Freight

Efficiency Study; the New Zealand Domestic Sea Freight Strategy; heavy-vehicle weight limits; and a North Island main trunk line electrification feasibility study (Energy Efficiency and Conservation Authority, 2007).

Improving the efficiency of the transport fleet

Commuter rail electrification (Auckland and Wellington) and the fuel efficiency of the light road vehicle fleet are two areas of improvement the NZEECS will focus on. Focus areas for private cars include:

- Average fuel economy standards – set a target to reduce the rated CO_2 emissions per kilometre of combined average new and used vehicles entering the light vehicle fleet

- Vehicle fuel economy labelling

- Energy-efficient tyres

- Facilitate the collection of fuel economy data on vehicles entering the fleet

- Continue to provide the fuel$aver website and update information on vehicle fuel economy in response to changing technologies

- Launch the rightcar website by December 2007 to provide car buyers with safety and sustainability information

- Driver training - develop a fleet driver behaviour training package to improve fuel economy, by the end of 2008

- Develop a Vehicle Fleet Strategy to enable the co-ordination and focus of policies promoting the purchase of more fuel-efficient vehicles by June 2008

- Vehicle retirement (scrappage) scheme

(Energy Efficiency and Conservation Authority, 2007).

Developing and adopting renewable fuels

Actions to increase the production and uptake of renewable transport fuels include information, research, an advisory group and funding for low carbon energy technology. The Biolfuels Sales Obligation (as described in the previous section) and the acceleration of plug-in electric and hybrid electric deployment also feature (Energy Efficiency and Conservation Authority, 2007).

Appendix 10: Links Between WRLTS Objectives and Policies

RLTS policies	Assist economic and regional development	Assist safety and personal security	Improve access, mobility and reliability	Protect and promote public health	Ensure environmental sustainability	Ensure that the RTP is affordable to the regional community
Network management						
Ensure the critical role of the regional transport network in providing national and regional accessibility is protected.	✔		✔			
Ensure the regional transport network provides effective connections to Wellington's Port and International Airport.	✔		✔			
Ensure that the level of service of the regional transport network is continuously monitored and, where necessary, improved.	✔	✔	✔	✔	✔	✔
Ensure best use is made of network management techniques to optimise the performance of the transport network.	✔		✔		✔	✔
Ensure continuous identification and mitigation of network security risks including, where appropriate, the development of alternative routes for use in emergencies.	✔	✔	✔			
Ensure the role of the urban passenger rail network is maintained as the key long to medium distance and high volume service.	✔	✔	✔	✔	✔	✔
Increase rail capacity and coverage in line with current and future demand, and complement rail services with bus services.	✔	✔	✔	✔	✔	✔
Ensure a high level of service for passenger rail with regard to rolling stock and rail infrastructure reliability.	✔	✔	✔	✔	✔	✔
Support enhanced accessibility to rail services including, where appropriate, new stations and extending electrification of commuter rail lines (in particular north of Paraparaumu and Upper Hutt).	✔	✔	✔	✔	✔	✔
Support the ongoing development of new and existing park and ride facilities.	✔		✔		✔	✔
Ensure the continuous review and improvement of bus services.	✔	✔	✔	✔	✔	✔
Support the use of bus priority measures in congested areas.	✔	✔	✔	✔	✔	✔
Support trolley buses in Wellington City and their ongoing upgrade.			✔	✔	✔	
Ensure the provision of public transport services and concessions that recognise the needs of the transport disadvantaged (e.g., people on low incomes and people with disabilities) to enhance equity.		✔	✔	✔		✔
Support continuous development of the cycling network and integration with other modes.			✔	✔	✔	✔
Support continuous development of the pedestrian network and integration with other modes.	✔	✔	✔	✔	✔	✔
Support road and rail maintenance expenditure to achieve appropriate service levels.	✔	✔	✔	✔	✔	✔
Ensure the proposed Transmission Gully Motorway is developed as the long term solution to address access reliability for State Highway 1 between Kapiti and Wellington.	✔	✔	✔	✔	✔	
Ensure the existing State Highway 1, between MacKays Crossing in the north and Mungavin Interchange in the south, is managed in a way that is consistent with its long term purpose of a scenic access route once TGM is built.		✔		✔	✔	

RLTS policies \ RLTS objectives	Assist economic and regional development	Assist safety and personal security	Improve access, mobility and reliability	Protect and promote public health	Ensure environmental sustainability	Ensure that the RTP is affordable to the regional community
Support improved east-west transport links between the Western and Hutt Corridors.	✔	✔	✔	✔	✔	✔
Encourage the separation of arterial and local road traffic where practicable.	✔	✔	✔	✔	✔	
Ensure the transport network provides for freight and commercial needs.	✔		✔		✔	✔
Travel demand management						
Ensure the availability of reliable information on the transport system and the choices available.	✔	✔	✔	✔	✔	✔
Support reduced reliance on private motor vehicles, particularly single occupancy vehicle use (excluding motorcycles) and use for short trips.	✔	✔	✔	✔	✔	✔
Support the increased use of passenger transport.	✔	✔	✔	✔	✔	✔
Support the uptake of cycling and pedestrian travel, particularly for short trips.	✔	✔	✔	✔	✔	✔
Encourage appropriately located land development and ensure integration with transport infrastructure.	✔	✔	✔	✔	✔	✔
Encourage the development of travel plans.	✔	✔	✔	✔	✔	✔
Advocate for government policy to enable road pricing.	✔		✔		✔	✔
Support start-up funding for viable 'alternative to road' initiatives.	✔		✔		✔	✔
Support beneficial rail freight initiatives where net benefits exceed those of road freight.	✔	✔	✔		✔	✔
Safety						
Ensure continuous improvement of regional road safety based on a firmly established safety culture.	✔	✔	✔	✔		
Support improved safety (perceived and real) of pedestrians from risks posed by traffic, the physical environment and crime.	✔	✔	✔	✔		✔
Support improved safety of cyclists from risks posed by traffic and other hazards.		✔	✔	✔		✔
Support improved safety and personal security (perceived and real) of passenger transport users.		✔	✔	✔		✔
Environment and public health						
Support best practice in design, construction and maintenance of transport projects to avoid, to the extent reasonable in the circumstances, adverse impacts on the environment.				✔	✔	
Support continuous improvement in air quality through reduction in and exposure to harmful vehicle emissions.				✔	✔	
Support the reduction of greenhouse gas emissions arising from the operation of the regional transport network.	✔				✔	✔
Support government investigations into alternative fuel options and eco-efficient vehicles.	✔				✔	
Ensure the transport network is developed in a way that minimises the use of non-renewable resources.				✔	✔	✔

144

RLTS policies	Assist economic and regional development	Assist safety and personal security	Improve access, mobility and reliability	Protect and promote public health	Ensure environmental sustainability	Ensure that the RTP is affordable to the regional community
Support the use of transport modes that are not dependent on fossil fuels, including active transport modes.	✔			✔	✔	✔
Ensure location and design of new transport infrastructure enhance access, minimise community severance issues and take account of the special values of the local area including, but not limited to, environmental matters and community concerns.	✔	✔	✔	✔	✔	
Support ongoing installation of stock truck effluent disposal sites at key localities in the region.	✔			✔	✔	
Planning and integration						
Support the growth and land use aspirations of the Wellington Regional Strategy and the Regional Policy Statement, particularly in relation to compact regional form, supporting a strong Wellington City CBD and regional centres, and densification around passenger transport nodes.	✔	✔	✔	✔	✔	✔
Ensure new transport infrastructure is consistent with the region's urban design principles as set out in the Regional Policy Statement.	✔	✔	✔	✔	✔	✔
Support land use principles that minimise dependence on the private car.	✔	✔	✔	✔	✔	✔
Ensure the current and future regional transport network is identified and protected in TA planning documents.	✔	✔	✔	✔	✔	✔
Support better integration of transport and land use planning by identifying roading hierarchies and advocating for appropriate access controls in district plans.	✔	✔	✔	✔	✔	✔
Ensure that land use and transport decisions take into account the diverse transport needs and views of the region's community.	✔	✔	✔	✔	✔	✔
Ensure major recreational and tourist traffic flows are taken into account during planning processes.	✔		✔			
Ensure investment in national transport routes is coordinated with other regions.	✔		✔		✔	✔
Securing transport funds						
Advocate to government for increased funding and appropriate funding instruments.	✔					✔
Support investigation of mechanisms for addressing funding gaps in the Regional Transport Programme, including but not limited to: -Local fuel taxes -Tolling of new roads -Road pricing of existing roads -Public/private partnerships -Development contributions (under the LGA) and financial contributions (under the RMA).	✔					✔

RLTS policies \ RLTS objectives	Assist economic and regional development	Assist safety and personal security	Improve access, mobility and reliability	Protect and promote public health	Ensure environmental sustainability	Ensure that the RTP is affordable to the regional community
Implementation						
To prepare and review corridor plans for each of the following, in accordance with the regional framework provided by this strategy, that identify the needs and proposed actions specific to each corridor: -Western Corridor -Hutt Corridor -Wairarapa Corridor -Ngauranga to Airport Corridor.	✔	✔	✔	✔	✔	✔
To prepare and review implementation plans for pedestrians, cycling, road safety, travel demand management, passenger transport and freight, in accordance with the regional framework provided by this strategy, that identify the needs and proposed actions specific to each mode.	✔	✔	✔	✔	✔	✔
To prepare a Regional Rail Plan that identifies the needs and proposed actions for development of the rail network over the next 30 years.	✔	✔	✔	✔	✔	✔
Programme prioritisation & funding						
Develop an agreed prioritisation process and methodology to be applied when carrying out review of the Regional Transport Programme.	✔	✔	✔	✔	✔	✔
Ensure that priority is given to projects or packages that contribute significantly to key national or regional outcomes in each planning period.	✔	✔	✔	✔	✔	✔
Ensure that prioritisation decisions in the Regional Transport Programme take account of a project or package's effectiveness, including its potential risks and its contribution towards the achievement of the Regional Land Transport Strategy's objectives and outcomes.	✔	✔	✔	✔	✔	✔
Ensure that prioritisation decisions for each project or package includes consideration of: seriousness; urgency; economic efficiency; volumes; affordability; practicality and readiness; and perceived safety benefits.	✔	✔	✔	✔	✔	✔
Ensure that, once a project or package is committed, and construction or implementation has been approved, then that project or package's funding is deemed to be committed and will not be reallocated to another purpose unless significant new information comes to light.	✔					✔
Ensure that Western Corridor passenger rail infrastructure and other improvements are in place prior to the opening of the Transmission Gully Motorway.			✔		✔	

RLTS policies	RLTS objectives	Assist economic and regional development	Assist safety and personal security	Improve access, mobility and reliability	Protect and promote public health	Ensure environmental sustainability	Ensure that the RTP is affordable to the regional community
Ensure the following applies to the allocation of Crown "C" funds: - The use of "C" funds should be used early to maximise buying power as these funds are not indexed against inflation. - The highest priority for the use of C funds for assisting local share will be passenger rail improvement projects. - The Kapiti Western Link Road Stage 1 design and construction is the second priority for assistance with the local share. - C1 and C2 funds will be used to achieve an effective FAR of 90% for passenger rail improvement projects. - C1 funds will be used to achieve an effective FAR of 90% for Stage 1 of the Western Link Road, but will not be available to assist the local share of Stages 2 and 3 of this project. - Up to $45 million of C1 funds are available to assist the local share of the Grenada to Gracefield Stage 1 project (assistance to the level of half the local share), noting that this project is still subject to further investigations. - All C3 funds will be used to develop the proposed Transmission Gully Motorway as the long term solution to address access reliability for State Highway 1 between Kapiti and Wellington.		✔	✔	✔	✔	✔	✔
Ensure the following applies to the allocation of Regional "R" funds: - To accelerate otherwise unfunded projects or packages that bring an identified regional benefit. - May be used to offset local financial assistance rates. - May be used for either passenger transport or roading projects or packages.		✔	✔	✔	✔	✔	✔

(Greater Wellington Regional Council, 2007a: 33-37).

Appendix 11: Ngauranga to Airport Strategic Transport Study

Phase 1 of the study was completed in May 2006 and identified the key transport issues along the route via the first stage of public consultation. Phase 2 proposed transport initiatives to address the issues and was released for public feedback in December 2007, closing in February 2008 (Greater Wellington Regional Council, 2007a; Ngauranga to Airport Strategic Transport Study, 2007).

The key transport needs and issues for Wellington were identified by the community during the first stage of consultation as follows:

- *Public transport options, including bus services and bus priority measures, the possible introduction of light rail or tram service and improvements to the existing 'heavy rail' system*

- *Walking and cycling opportunities including pedestrian access to the waterfront*

- *Connectivity between the CBD and waterfront*

- *Access to the hospital, Victoria University, CentrePort and airport including the surrounding commercial area*

- *The movement of goods to and through the city*

- *Access to and through the city including linkages with the railway station*

- *Inner city speed limits*

- *The availability and cost of parking*

- *The protection of heritage and urban form*

- *Energy efficiency and environmental impacts*

- *Removing the congestion points at the Terrace Tunnel and Mount Victoria Tunnel*

- *Linkages with the Inner City Bypass and other roads*

- *Rail capacity through the Kaiwharawhara 'throat' on the approach to Wellington Station (being addressed by ONTRACK)*

- *Funding availability.*

(Ngauranga to Airport Strategic Transport Study, 2007: 4).

Proposed transport initiatives are split into two parts, the first of which are projects with "affordable early benefits". These projects are considered by the study to be relatively straightforward to improve the transport network of Wellington City and are termed "base case". The initiatives are as follows:

- Bus priority measures – including bus lanes and signal pre-emption

- Ngauranga to Aotea off-ramp traffic management – providing an extra traffic lane during peak travel periods by using the shoulder of the existing motorway

- Adelaide Road Boulevard – an upgrade of the road to provide for public transport and other vehicles. Wellington City Council is also developing a plan to manage future growth in this area

- Basin Reserve improvements – options range from a flyover to various intersection upgrades

- Cobham Drive roundabouts – provision of additional lanes at two roundabouts.

(Ngauranga to Airport Strategic Transport Study, 2007).

The second group of projects proposed by the study are for future development of the Ngauranga to Airport transport corridor. These initiatives concentrate on the inner city and access to the eastern suburbs, supporting Wellington City Council's Urban Development Strategy and the growth areas of Wellington CBD, Johnsonville, Adelaide Road and Kilbirnie. The study suggests that growth along this spine will concentrate dwellings and employment between Wellington Railway Station and the suburb of Newtown causing "further medium and high density redevelopment". Increased travel resulting from higher density in this area will see more trips being made by public transport, cycling and walking, according to the study.

The transport initiatives for future development proposed by the study include:

- Enhanced public transport system

  o segregated busway

  o light rail – from Wellington Railway Station to Adelaide Road and Wellington Hospital

- The Terrace Tunnel

  o Terrace Tunnel tidal flow – a 'reversible' traffic lane to be used in either direction depending on the time of day

  o Terrace Tunnel duplication

- Mt Victoria Tunnel duplication

- Ruahine Street and Wellington Road – widening the existing road to four lanes and improving intersections.

(Ngauranga to Airport Strategic Transport Study, 2007).

Other options considered in the study but that were deemed to be unviable include:

- Extension of the public transport spine to Kilbirnie and Wellington International Airport

- Extension of heavy rail to Courtenay Place – below ground along the waterfront

- Provision of four lanes along Wallace Street

- Pirie Street Tunnel – a new two-lane tunnel linking Vivian Street and Ruahine Street as an alternative to the Mt Victoria Tunnel.

(Ngauranga to Airport Strategic Transport Study, 2007).

Capital costs, operating costs of public transport and a description of how funding costs are currently met is given in the Phase 2 study consultation document (Ngauranga to Airport Strategic Transport Study, 2007). Phase 3 of the strategic study involves the release of the proposed corridor plan which will comprise a preferred package of options (Greater Wellington Regional Council, 2007a). The affordability of the plan will be considered at the next stage of consultation (Ngauranga to Airport Strategic Transport Study, 2007).

Appendix 12: Issues, Objectives, Policies and Methods to Achieve the Objectives of the RPS

The following issues identified in the draft RPS relate to CO_2 emissions from both land transport and land use activities. The associated objectives are listed here and are defined in Table 5.7 in section 5.1.3.2 of chapter five. The policies, which are the mechanisms to address the objectives, are given and the methods to achieve these policies (which state when this needs to occur and/or how) are also listed.

Energy and infrastructure issues, objectives and summary of the policies and methods to achieve the objectives

***Issue 1: Sources of energy vulnerable to supply disruptions and contribution to climate change** – Current sources of energy are vulnerable to supply disruptions. In addition, fossil fuels used to meet increasing demand for energy are contributing to climate change.*

***Issue 2: Regionally significant infrastructure** – Infrastructure is a physical resource that enables people and communities to provide for their social, economic and cultural wellbeing. The use and operation of infrastructure can be adversely affected when incompatible land uses occur under, over, on, or alongside.*

(Greater Wellington Regional Council, 2008a: 22).

Objective 9: Energy

Objective 10: Regionally significant infrastructure

Objective 27: Compact, well designed and sustainable regional form.

(See Table 5.7 for a description of the objectives).

The following policies relating to energy and infrastructure instruct district plans, regional plans and the WRLTS to include specific elements (except Policy 37, which is an interim policy requiring matters to be given particular regard prior to implementation of Policies 8 and 9).

Policies 8, 9 and 37: Require district and regional plans to recognise the benefits from regionally significant infrastructure (and protect it) and renewable energy. Policy 37 requires in the interim that particular regard is given and sets out interim matters to be considered in resource consents and designations. **Method: 1, 2, 4.**

Among other infrastructure noted, regionally significant infrastructure includes: the Strategic Transport Network (as defined in the Wellington Regional Land Transport Strategy 2007 – 2016); Wellington City bus terminal and Wellington Railway Station terminus; Port of Wellington, Port Howard and Burnham Wharf (Greater Wellington Regional Council, 2008a).

Policy 10: *Reduce the consumption of non-renewable transport fuels and emission of carbon dioxide from transportation.* **Method: 3**.

This policy directs the WRLTS to include objectives and policies which promote a reduction in non-renewable transport fuel consumption and CO_2 emissions from transport. Suggested ways to achieve this include improving the passenger transport network (especially electric trains and buses), continued promotion of walking and cycling, travel demand management and increasing the efficiency of travel (Greater Wellington Regional Council, 2008a).

Policy 11: *Promote the implementation of travel demand management mechanisms.* **Method: 1, 3, 10**.

This policy directs district plans and the WRLTS to include policies which promote TDM mechanisms (providing alternatives to vehicle travel, especially SOVs and addressing congestion) (Greater Wellington Regional Council, 2008a).

Regional form issues, objective and summary of the policies and methods to achieve the objective

Issue 1: Poor quality urban design – Poor quality urban design in the region can reduce peoples' connection with places where they live, work and play and their 'sense of place'.

Issue 2: Sporadic and uncoordinated development – Uncoordinated and sporadic development (including infrastructure) can adversely affect the region's compact corridor form. In the Wellington region this can, among other things, result in:

(a) *Development that is poorly located in relation to infrastructure (such as roads, sewage and stormwater systems) and is costly to service:*

(b) *The loss of rural open space land valued for its productive, ecological and aesthetic qualities;*

(c) *Insufficient population densities to support public transport and other public services; and*

(d) *New infrastructure that can encourage new development in locations which undermine existing centres, industrial employment areas.*

Issue 3: Integration of land use and transportation – A lack of integration between land use and the region's transportation network can create patterns of development that increase the need for travel, the length of journeys and reliance on motor vehicles, resulting in:

(a) *increased emissions to the air from a variety of pollutants, including greenhouse gases;*

(b) *increased use of energy and reliance on non-renewable resources;*

(c) *reduced opportunities for alternate means of travel, e.g. walking and cycling; and*

(d) *increased road congestion, restricting movement of goods and services across and within the region, and compromising the efficient operation of the transport network.*

(Greater Wellington Regional Council, 2008a: 51-52).

Objective 27: Compact, well designed and sustainable regional form

Objective 10: Regionally significant infrastructure.

(See Table 5.7 for a description of the objectives).

The following policies relating to regional form instruct district plans, regional plans and the WRLTS to include specific elements.

Policy 27: *Structure planning for major developments.* **Method: 1, 20.**

This policy directs district plans to achieve integrated and high quality development by defining major development proposals for their district and to include policies and rules requiring structure plans for those proposals. Structure planning land use with infrastructure including transport networks and should deliver high quality design. Structure plan content will vary but should address: connections to existing and proposed transportation systems; provision of appropriately mixed land uses and land use densities; and how to implement urban design principles for the region (Greater Wellington Regional Council, 2008a).

Policy 28: *Maintain and enhance the viability and vibrancy of the regional central business district and regional centres.* **Method: 1, 40, 41.**

Via the district plan this policy requires the district and city councils of the region to determine the range of land uses to be encouraged, which will maintain and enhance vibrancy and viability. The appropriate land use activities will vary for each regional centre and the regional CBD (Greater Wellington Regional Council, 2008a).

Policy 29: I*dentification and promotion of higher density and mixed use development in and around key local centres and public transport links.* **Method: 1, 18.**

The maintenance and enhancement of a compact, well designed and sustainable regional form is encouraged via the district plan by this policy. Higher density and mixed use activities are to be encouraged in key local centres and around public transport links (Greater Wellington Regional Council, 2008a).

Policy 30: *Identification and protection of key industrial-based employment locations (directing district plans).* **Method: 1, 42.**

Improved regional freight efficiency, a key outcome of the WRLTS is acknowledged as an important activity associated with the areas which this policy addresses (Greater Wellington Regional Council, 2008a).

Policy 31: *Regional land transport to support a compact, well designed and sustainable regional form.* **Method: 3.**

This policy directs the WRLTS to include objectives and policies that maintain and enhance a compact, well designed and sustainable regional form. Efficient use of existing infrastructure and improved east-west transport links are identified as particularly important (Greater Wellington Regional Council, 2008a).

The following policies relating to regional form need to be given particular regard when assessing and deciding on resource consents, notices of requirement or when changing, varying or reviewing district or regional plans (Greater Wellington Regional Council, 2008a).

Policy 51: *Regional urban design principles for urban development.* **Method: 4, 38.**

The policy requires local authorities to have particular regard to the region's urban design principles. The five regional principles are adapted from the seven design qualities of the New Zealand Urban Design Protocol and are detailed in Appendix 7.

Policy 52: *Development to support a compact, well designed and sustainable regional form.* **Method: 4.**

District and city councils are required to have particular regard to the maintenance and enhancement of a compact, well designed and sustainable regional form. The policy acknowledges the strong corridor pattern (following transport corridors) and generally compact form of the region (Greater Wellington Regional Council, 2008a).

Policy 53: *Development that integrates land use with transportation.* **Method: 4.**

This policy requires that land use and development decisions consider impacts on the key outcomes of the WRLTS. City and district councils need to have particular regard to the following matters:

   (a) *whether the proposal will generate traffic at levels inappropriate for the existing character of the surrounding area and the transport network;*

   (b) *connectivity with, or provision of access to, public services or activities, open spaces or recreational areas;*

   (c) *whether it can be effectively served by public transport;*

   (d) *provision of safe and attractive environments for walking and cycling;*

(e) *not compromising the efficiency, reliability or safety of the existing transport network; not creating unsustainable demands for new, or upgrades to existing, transport network infrastructure;*

(f) *whether the development will encourage uncoordinated urban growth beyond urban areas; or whether the development will encourage industrial-based employment beyond existing industrial-based employment sites.*

(Greater Wellington Regional Council, 2008a: 94).

Policy 54: *Sequencing of land use and coordination with funding.* **Method: 4.**

City and district councils are to consider the impact on infrastructure and the Strategic Transport Network resulting from decisions on land use and development. These decisions have a direct bearing on the funding, sequencing and development of new infrastructure, including transport infrastructure (Greater Wellington Regional Council, 2008a).

Policy 55: *Management of Regional Focus Areas.* **Method: 4, 44.**

This policy requires district and city councils to have particular regard to the significance of the Regional Focus Areas when processing resource consents or designations. These areas are of critical importance in achieving a compact, well designed and sustainable regional form. They have been identified as areas which may experience significant pressure from development or as areas of opportunity for a range of land use activities. The Regional Focus Areas are as follows:

- Northern Waikanae edge
- Pauatahanui
- Grenada to Gracefield
- Johnsonville to Wellington International Airport (the growth spine)
- Paraparaumu town to Paraparaumu beach
- Porirua to Linden
- State Highway 2/State Highway 58 interchange to Upper Hutt city centre
- Waingawa (Wairarapa).

(Greater Wellington Regional Council, 2007b, 2008a).

The methods for implementing the policies identified above are listed below. Methods are regulatory or non-regulatory as indicated.

Regulatory methods (which set the timeframe for policy implementation):

- Method 1: District plan implementation

- Method 2: Regional plan implementation

- Method 3: WRLTS implementation

- Method 4: requires consideration through resource consents, notices of requirement and variations or reviews of plans.

Methods 1 – 3 refer to the requirement to incorporate the policy into the plan or strategy at the time of next review.

Non-regulatory methods – information and guidance:

- Method 10: Information and guidance on travel demand management mechanisms

- Method 11: Information and guidance on energy efficient subdivision design and building development

- Method 18: Information on key public transport links

- Method 20: Regional structure planning guide

Non-regulatory methods – integrating management

- Method 38: Sign the New Zealand Urban Design Protocol

- Method 40: Development of centre visions for the CBD and regional centres and an overall regional vision

- Method 41: Regional principles for managing the location of retail activities

- Method 42: Information on supply and demand of industrial employment locations

- Method 44: Planning frameworks for each Regional Focus Area.

(Greater Wellington Regional Council, 2008a)