

MOTIVATING PUBLIC TRANSPORT USE:  
TRAVEL BEHAVIOUR AND INTEGRATED TICKETING FOR  
GREATER WELLINGTON

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ABSTRACT

Car use is engrained in our culture. Changing behaviour towards using more sustainable travel modes such as public transport is notoriously difficult, despite the increasing awareness of environmental problems caused by car use. Integrated ticketing is a policy measure more recently used in strategies towards achieving integrated and sustainable transport systems. It allows a passenger to travel with one public transport ticket throughout a region. This research uses a mixed method approach to assess how integrated ticketing may affect public transport use in Greater Wellington. The psychological constructs determining decisions to use public transport are tested using an integrated environmental behaviour model proposed by Bamberg and Möser (2007). The results support the integrated modelling approach. Intentions to use public transport are indirectly affected by awareness of environmental problems caused by car use mediated through social norms, guilt, perceived behavioural control and attitude. The intention to use public transport explains 56% of the variance in public transport behaviour. Integrated ticketing presents an opportunity to increase the ease and convenience of travel, shown to be important in the model. The majority of survey respondents perceived that they would use integrated ticketing in Greater Wellington and that it was important both on a regional and national scale. Achieving an effective integrated ticketing system in Greater Wellington will be conditional on firstly improving public transport service reliability and stakeholder communication. Integrating fares across the region and across modes will also be crucial to the success of the system.

**Key words:** integrated ticketing, public transport, pro-environmental behaviour, modal shift

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## **List of abbreviations**

AIFS – Auckland Integrated Fares System
ARTA – Auckland Regional Transport Authority
BCA – Bus and Coach Association
GWRC – Greater Wellington Regional Council
NAM – Norm activation model
NITP – National Integrated Ticketing Programme
NZTA – New Zealand Transport Agency
PTMA – Public Transport Management Act (1998)
RLTS – Regional Land Transport Strategy
TPB – Theory of planned behaviour
TSLA – Transport Services Licensing Act (1991)
VBN – Value-belief-norm theory

## Chapter 1 – Introduction

The car is a dominant transport mode in urban areas, which is recognised worldwide as a complex policy problem and poses a theoretical social dilemma (Joireman, Van Lange, & Van Vugt, 2004). A social dilemma arises when a person is confronted with a choice between doing something that will immediately benefit themselves but will lead towards negative consequences for a group of others, or doing something that removes the immediate advantages for the individual but will produce a collective common good (Ostrom, 2000; discussed further in Chapter 4). Driving provides social and economic benefits including, mobility, comfort and independence. Yet there are also negative consequences of driving for both the environment and society, each with individual costs which threaten the sustainability of the transport sector and are exacerbated as road user numbers increase. Costs may be direct or indirect and include noise, accidents, pollution, health problems and threatening long-term oil availability and climate change. Each year in New Zealand about the same number of deaths are attributed to air pollution (through cardiovascular problems and respiratory diseases such as asthma and chronic bronchitis) as to road accidents (Fisher et al., 2002).

There is considerable potential for the road transport sector to become more sustainable. This means providing for the needs of current generations without jeopardizing the needs of future generations, and considering the wider effects of transport on the environment, society and economy (Han, 2010; Richardson, 2005; Steg & Gifford, 2005). Sustainable transport strategies include integrating transport and land-use, such as through using existing infrastructure, and focusing on measures to contain travel demand. Travel demand measures encourage modal shift rather than increasing travel capacity. Travel demand measures include improving the efficiency and effectiveness of transportation modes through technological improvements and pricing strategies, such as the London congestion charge, aimed at reducing car use (Burwell & Sperling, 2007; Greene & Wegener, 1997).

Reducing car use or the number of vehicle kilometres travelled (VKT) reduces the negative impacts of driving on society and the environment through reduced

emissions. It also contributes to safer and cleaner streets. Public transport can play an important role in reducing these negative impacts whilst maintaining the access and mobility needs necessary for social and economic developments (Shapiro, Hassett, & Arnold, 2002). However, public transport is often not the most popular mode of choice amongst policy makers or transport users (Han, 2010). Understanding what motivates the use of public transport, and other mode choices, is a key problem in social-environmental research (Bamberg, Hunecke, & Blöbaum, 2007).

## **1.1 The New Zealand situation**

Trends in New Zealand show continued growth in passenger car numbers and increasing trip distances (MfE, 2009b). Time spent travelling by car has increased since 1990 to 80% of total travel time, whilst other travel modes, including walking, cycling and public transport, have decreased (MoT, 2008). As a result national road transport emissions have increased 68.5% since 1990 (MfE, 2009a) and vehicle kilometres travelled (VKT) per person increased almost 3% from 2001 – 2007 (MfE, 2009b).

Distance travelled, or VKT, is commonly used to estimate the effects of transport on the surrounding environment where higher VKT figures indicate higher environmental damages (MfE, 2009b). New Zealand is ranked second, behind the United States, for the highest VKT per capita from the thirty OECD countries (OECD, 2007). Traditionally increases in VKT are contributed to increasing population and economic growth. Although the relationship between VKT and economic growth in New Zealand is decoupling (the growth rate of VKT is less than its economic driving force), actual VKT growth is not showing signs of slowing. New Zealand has a low population density compared with land mass. Often therefore, longer distances need to be travelled. However, similar OECD countries such as Finland and Norway have lower VKT per capita measurements than New Zealand, suggesting that New Zealanders could do more to reduce their driving distances.

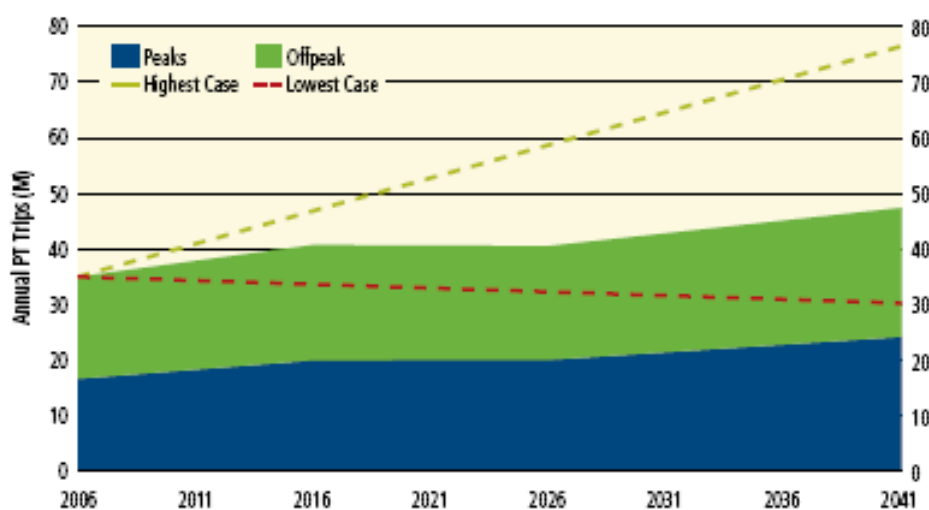
Policy responses in New Zealand have been weak compared with other countries (Chapman, 2008; Norman, 2010; Trafanz, 2009). The New Zealand Transport Strategy 2008 (NZTS) provides strategic direction for the New Zealand transport sector until 2040 and emphasises modal shift towards public transport, walking and cycling as key components towards a sustainable transport future. The Government Policy Statement (GPS), which sets out government funding ranges for transport, has since diverged from the NZTS allocating 86% of funding to state highways and road projects, compared with 11% to public transport and alternative modes. It states “that moving too quickly on modal shift will have a negative impact on environmental and economic efficiency”, but also that “[t]he government expects carbon mitigation primarily to occur via new fuels (such as biofuels and electric cars) encouraged via an emissions trading scheme, plus some modal shift actions particularly in our major cities of Wellington, Auckland and Christchurch” (MoT, 2009, p11). In light of delays in the implementation of the emission trading scheme, and removals of the biofuels sales obligation and fuel efficiency standards for imported motor vehicles (Chapman, 2008), modal shift should be at the forefront of sustainable transport policy in New Zealand.

‘Win-win’ solutions are most likely to be achieved through integrated transport policies (OECD, 2002). The provision of an integrated and high quality public transport system is a key element in the development of sustainable transport solutions (Santos, Behrendt & Teytelboym, 2010). Public transport provides opportunities for modal shift decreasing car use and its associated costs to society and the environment (May, Kelly, & Shepherd, 2006; Shapiro, et al., 2002). Reversing the long-term trends of increasing car use and influencing social behaviour and attitudes towards public transport use is complex and challenging (Bamberg & Schmidt, 2003). Often structural (physical, institutional and cultural) and psychological barriers reduce opportunities for behaviour change (Swim et al., 2009). An understanding of what attitudes, intentions and behaviours exist, and how they can be influenced, is therefore an important consideration in the development of sustainable transport policies. Attitudes, intentions and behaviours towards public transport are likely to be similar on a national scale. However regional differences in transport behaviour should be expected due to structural differences,

such as size and infrastructure, or local culture. These differences may impact on how sustainable transport policies can be implemented and how they are responded to. Regions should be understood individually before collaborating on national policy and transport changes.

## 1.2 The Greater Wellington region

The Greater Wellington region has a high use of public transport compared with other regions; yet driving remains the dominant form of transport with 68% of trips to work taken by car (GWRC, 2010). Figure 1.1 illustrates the current trends in public transport growth and the projected patronage increases. Clearly there is potential to grow levels of public transport use, but, as stressed in the Regional Land Transport Strategy 2010-2040 (RLTS), investment in the system will be necessary. The lowest case scenario shown in Figure 1.1 follows a projected lack of investment coupled with low population growth and low petrol prices, of which the latter two are more likely to rise than fall (GWRC, 2010).



**Figure 1.1** – Forecast growth in daily public transport trips for Greater Wellington.  
Source: (GWRC, 2010)

The RLTS vision is ultimately “To deliver an integrated land transport network that supports the region’s people and prosperity in a way that is economically, environmentally and socially sustainable” (GWRC, 2010, pii). A key component towards achieving the vision is the target to increase public transport trips at peak

times to 23 million per annum by 2020 (was 17.4 million 2009/10), including the development of integrated ticketing for public transport (GWRC, 2010). The 2010 targets are weaker than the RLTS 2007 – 2016 which specified targets to increase public transport trips at peak times to 25 million per annum, and to develop integrated ticketing by 2016 (GWRC, 2007). The differences are likely to be due to funding issues which are frequently mentioned in the RLTS 2010 – 2040. This issue is considered further in relation to integrated ticketing in Chapter 3, section 3.2.

The problems caused by car use and the contribution public transport can make in reducing them are acknowledged in the RLTS 2010 – 2040. However the targets to encourage patronage have decreased. Recent public perception surveys show that trust in the public transport system is currently very low (Premium Research, 2010). Poor levels of trust in the system coupled with the difficulties of changing travel mode choices makes implementing policies to encourage public transport use extremely challenging. Therefore, it seems inane to delay improvement measures, such as integrated ticketing, so as not to discourage public transport use further.

### **1.3 Purpose**

The purpose of this research is to evaluate one element of land-use and transport integration, integrated ticketing, for public transport in Greater Wellington. The research considers ways of motivating people to use public transport rather than drive for everyday trips in Greater Wellington and assesses the possible impacts of integrated ticketing on public transport uptake.

### **1.4 Scope**

There are multiple definitions of integrated ticketing and so the following research adopts Greater Wellington Regional Council's (GWRC) definition. GWRC defines integrated ticketing as a system "where the passengers have the ability to use a single ticket regardless of the service used. Thus this single ticket could be used on all trains, buses and ferries in the region" (Kole & Baxter, 2007, p1). The multi-modal component in this definition is important when considering a fully integrated transport system where there is more than one mode of public transport available.

Other elements to integrated ticketing, including free transfers and daily price caps, are explored further in the literature review in Chapter 3.

Integrated ticketing systems are increasingly used in modern transport networks. Yet, there is limited research on the impacts they have. Interest in this area is growing in New Zealand as Auckland develops the first multi-modal integrated ticketing system in New Zealand, the Auckland Integrated Fares System (AIFS). The development of GWRC's system is likely to be influenced by developments in Auckland as well as a national approach being considered by the New Zealand Transport Agency (NZTA). The NZTA, which funds public transport through the National Land Transport Programme, has recently developed a National Integrated Ticketing Programme to improve the efficiency and effectiveness of public transport for major regions in New Zealand. This research therefore explores some of the national policy which is likely to affect regional decisions and focuses on public perceptions specifically for Greater Wellington. The research is timely for GWRC as developments in integrated ticketing continue.

## **1.5 Aim and research questions**

The main aim of the research is to assess opportunities for, and barriers to, integrated ticketing within Greater Wellington as part of a strategy to reduce personal car use and encourage public transport uptake.

The central question of this research is 'How might an integrated ticketing system affect public transport use in the Greater Wellington region?'

Seven sub-questions have been compiled to identify what currently motivates public transport use and to gauge perceptions of integrated ticketing. The sub-questions are shown in Table 1.1 below.



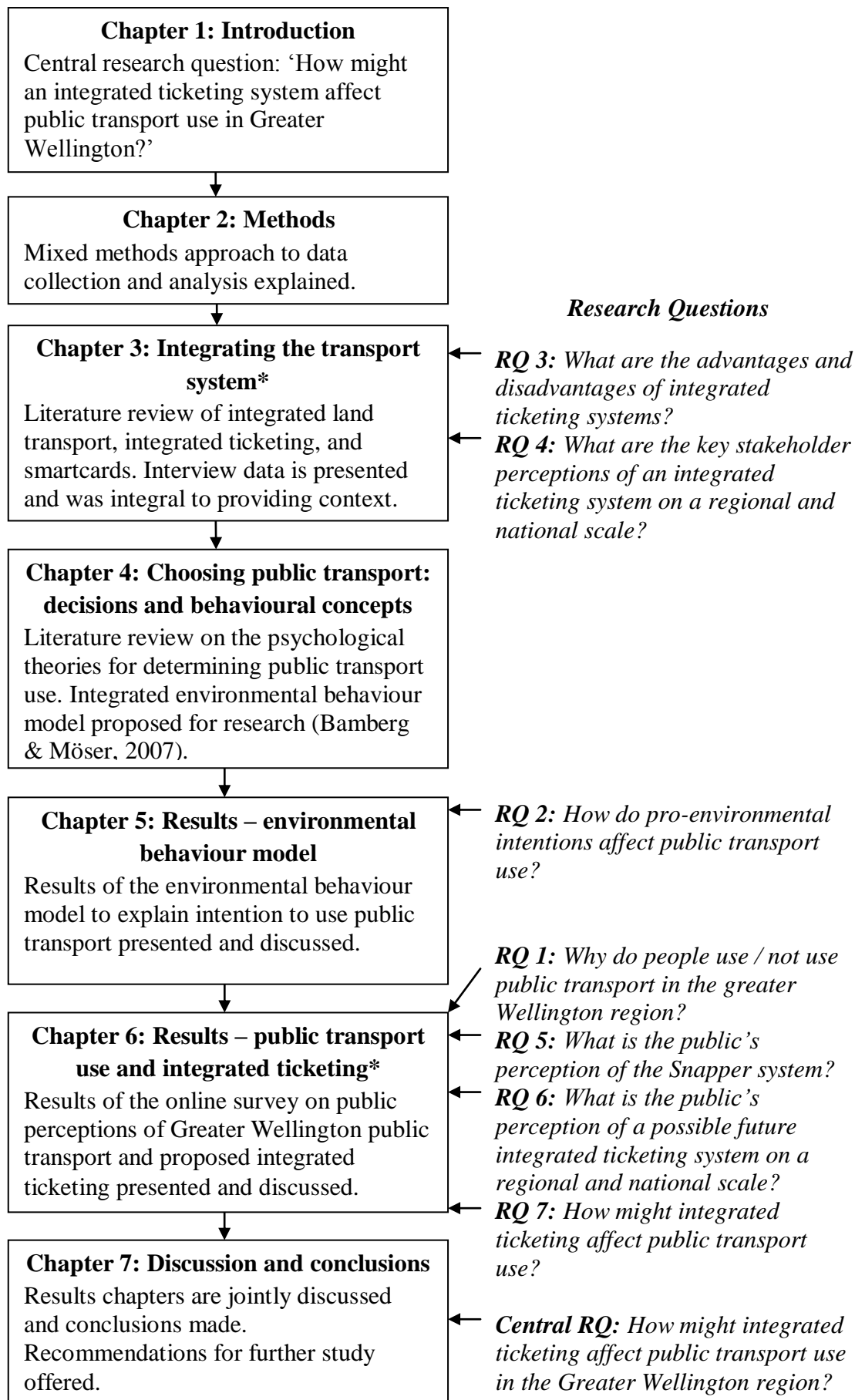
**Table 1.1** - The seven research sub-questions and their objectives that are addressed in this thesis to answer the central research question.

<b>Sub-question</b>		<b>Objective</b>
<b>1.</b>	Why do people use / not use public transport in the Greater Wellington region?	To understand factors influencing public transport use decisions.
<b>2.</b>	How do pro-environmental intentions affect public transport use?	To better understand the relationship of psychological constructs leading towards environmental intention and behaviour.
<b>3.</b>	What are the advantages and disadvantages of integrated ticketing systems?	To gain insight into the opportunities and barriers for integrated ticketing that have existed world-wide, and for Greater Wellington and New Zealand.
<b>4.</b>	What are the key stakeholder perceptions of an integrated ticketing system on a regional and national scale?	To learn from practitioners in the field what opportunities and barriers they perceive for integrated ticketing in New Zealand.
<b>5.</b>	What is the public's perception of the Snapper system?	To find out how the Wellington public perceive the existing electronic smart card ticketing system.
<b>6.</b>	What is the public's perception of a possible future integrated ticketing system on a regional and national scale?	To discover how Greater Wellington residents feel about integrated ticketing for Greater Wellington and for New Zealand.
<b>7.</b>	How might integrated ticketing affect public transport use?	To find out if Greater Wellington residents would accept integrated ticketing and would use public transport more as a result.

A mixed method approach was used to collect quantitative and qualitative data and answer the seven sub-research questions. Data was collected through an online survey and semi-structured interviews which are explained in detail in Chapter 2. This approach was used because it allows data collection and analysis from multiple sources, with the aim of researching a single element, thereby resulting in a richer and more complete depiction of reality (Berg, 2007).

## **1.6 Thesis outline**

Figure 1.2 below details the structure of the thesis and gives a brief outline of each chapter including where each research sub-question is answered. The following chapter presents the methods.



**Figure 1.2** – Thesis structure and chapter outlines. \*Note: Chapters 3 and 6 are intentionally longer than other chapters because they address at least two sub-research questions.

## Chapter 2 – Methods

To answer the central question ‘How might an integrated ticketing system affect public transport use in Greater Wellington?’ a series of sub-questions were formulated (presented in Chapter 1) around which this thesis is structured. A mixed method approach was used combining the use of qualitative data from interviews and qualitative and quantitative data from an online survey to inform each sub-question. Increasingly researchers are seeing the value of combining quantitative and qualitative data, adding value and insight to research, and leading to various mixed method approaches (Gomez & Jones, 2010; Hay, 2005).

A two-pronged approach was applied to the methods in this research including elements from environmental psychology and conventional policy research. The environmental psychology approach was used to gain a deeper understanding of the perception of public transport in Greater Wellington from those who also have the option to drive and was assessed in the online survey (addressing sub-question 2). The more traditional policy approach was used to collect qualitative and quantitative data on stakeholder and public perceptions of public transport and integrated ticketing from interviews and the online survey (addressing sub-questions 1, and 3 to 7). Triangulation, where more than one method, analytical procedure and theory is drawn upon (Denscombe, 1998), provided a more complete picture of integrated ticketing perceptions in New Zealand. The original term ‘triangulation’ was used for nautical navigation where two known points are used to locate a third point. In research triangulation enhances the validity of findings by providing a means of checking each method against the other. In this study, the open ended responses validated responses to closed ended questions on perceptions of public transport and integrated ticketing. In addition, the environmental psychology approach verified the general public perception of what contextual factors influence public transport use decisions.

This chapter provides details of the rationale for using each research method, how the methods were carried out, and the data collected was analysed. The research

methods complied with the Victoria University of Wellington Human Ethics Policy (VUW, 2007) and ethical consent was granted on May 19<sup>th</sup> 2010 before the research was carried out<sup>1</sup>.

## **2.1 Interviews**

### **2.1.1 Rationale**

Interviews were conducted to answer research sub-questions 3 and 4 concerning the practicability of integrated ticketing systems for Greater Wellington. The interviews were necessary to provide important context (presented in Chapter 3) because of the absence of New Zealand based academic research on integrated ticketing for public transport. The interviews were semi-structured, where an interview schedule (see below) was used but not strictly adhered to, which allowed interviewees to expand on topics of significance to them and on topics of which they have more knowledge (Bryman, 2008). There was some sensitivity on the subject at the time of interviewing, concerning government and commercial operator relationships, therefore the semi-structured nature of the interview presented participants with a more relaxed and flexible setting in which to discuss issues.

### **2.1.2 Interview schedules**

Interview schedules were prepared separately for the nine interviews. They consisted of four or five headings with key points bulleted under each one. An example is shown in Appendix A2. Broad themes remained consistent across the schedules and included:

- the interviewee's experience with integrated ticketing systems;
- effects on the public transport system;
- government and commercial influences;
- barriers;
- opportunities for the future of integrated ticketing.

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<sup>1</sup> See appendix A1 for Ethics Approval

The headings were formulated after an extensive literature review. Preliminary interviews were also carried out with employees of Snapper and GWRC to inform the development of the final interview questions, as well as the online survey.

### 2.1.3 Recruitment method

Contacts in the field of integrated ticketing and public transport were first made at the New Zealand Transport Agency (NZTA). The ‘snowball technique’ where one person recommends another (Secor, 2010) was a successful recruitment method where the transport industry seemed close-knit and everyone contacted was open to being interviewed. Preliminary interviews with Snapper and GWRC also provided a platform for making further contacts. Semi-structured interviews were conducted with nine transport experts from New Zealand and the UK, indicated in Table 2.1. Interviewees were selected in relation to their relevance towards the research.

**Table 2.1** - Interviewees information.

<b>Name</b>	<b>Position</b>	<b>Organisation</b>	<b>Experience</b>
Peter Lewis	Oyster Development Manager	Transport for London (TfL) (UK)	Managed the implementation and development of the Oyster card in London
Jeremy Meal	Director of Smartcard and Ticketing Strategies	MVA Consultants (UK)	Consulted on numerous integrated ticketing projects in the UK, Singapore, Australia and New Zealand
Greg Ellis	Programme Director - Auckland Integrated Fares project (AIFS)	Auckland Regional Transport Authority (ARTA)	Oversees all ‘change activities’ happening as a result of AIFS from business operations to civil works.
David Lewry	Major Projects Team Leader	Greater Wellington Regional Council (GWRC)	Scoping an integrated ticketing project for Greater Wellington and leads other major public transport projects.
Miki Szikszai	Chief Executive	Snapper Services Ltd	Introduced the Snapper smartcard on GoWellington buses and continues to grow the market.
Dave Brash	Group Manager - Regional Partnerships and Planning	New Zealand Transport Agency (NZTA)	Oversees developments in the public transport sector, especially government funding projects and the National Integrated Ticketing Programme.
Graeme Mowday	Marketing Manager	Tranz Metro	Experience with public perceptions and patronage on rail.
Raewyn Bleakly	Chief Executive	Bus and Coach Association (BCA)	Acts as an advocate for the bus industry on issues with central government.
Craig Forret	Legal Advisor and Operations Coordinator		Knowledge of legal and policy systems.

#### **2.1.4 Interview structure**

Most interviews took place face-to-face in Wellington with the exception of ARTA which was conducted by phone, and TfL and MVA Consultants which took place face-to-face in the UK. The interviews took between thirty minutes and one hour each and were recorded and fully transcribed for analysis. An information sheet was sent to all participants prior to the interview with an opportunity for interviewees to request confidentiality. A consent form was also sent prior to the interview and was signed by the research participant preceding, or after, the interview<sup>2</sup>. All participants consented to their full name being presented in this research.

#### **2.1.5 Interview data analysis**

The interview data was used to answer research sub-questions 3 and 4 which guided an exploration of the advantages and disadvantages of integrated ticketing systems worldwide. The experience of practitioners also provided insights into the opportunities for, and barriers to, smartcard integrated ticketing for New Zealand. A thematic analysis was carried out under the broad interview headings first.

Thematic analysis allows the researcher to think about how the data may be linked and reduce large amounts of data into common themes (Bryman, 2008). Significant interview statements were then used to corroborate findings from the literature review to provide a comprehensive and up to date picture of issues surrounding public transport integration and integrated ticketing. Although it is unconventional to present interview results with a review of the literature it was deemed necessary in this research because of the continuous development of integrated ticketing in Auckland and lack of New Zealand based literature. The UK interviews supplemented international government reports on the advantages of integrated ticketing. The literature review and interview results are presented in Chapter 3.

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<sup>2</sup> See Appendix A3 for examples of the consent form and A4 for the information sheet used.

## **2.2 Online survey**

### **2.2.1 Rationale**

An online survey was used to answer research sub-questions 1, 2 and 5 to 7, relating to public perceptions of Greater Wellington public transport and integrated ticketing (see Figure 1.2, Chapter 1). Online surveys are increasingly used to collect data in a variety of academic, corporate and political fields (Manfreda & Vehovar, 2008). Reviews on the effectiveness of online surveys compared with traditional paper or telephone surveys are mixed and will differ from study to study (Parsons, 2007). Nevertheless, a benefit over paper surveys is the ability to cover a large geographic area with little to no cost. This was crucial to the current research which covered the entire Greater Wellington region.

An obvious disadvantage of online surveys includes limiting the sample to only computer literate members of the public who have access to the internet and may therefore exclude some low income households or older generations (Statistics NZ, 2004). It is estimated that 69% of households in Wellington have broadband access (Statistics NZ, 2010) although this figure is to be treated with caution due to the ever-evolving nature of the internet, and it does not take into account the large number of business users in the corporate network (MED, 2005). The effects of this ‘digital divide’ are recognised as a limitation and further discussed in Chapter 7.

### **2.2.2 Survey design**

The survey included both closed-ended and open-ended questions. Closed-ended questions included ‘tick the box’ methods and ranking attitudinal questions on a scale. Open-ended questions were used for the collection of supporting qualitative data. Qualtrics survey software was used to design and launch the survey<sup>3</sup>. Not everyone views web pages in the same way due to computer differences (such as screen size, colour, and web browsers). The methodological implications of respondents viewing the survey in different forms are however unknown (Dillman, 2009). To minimise major differences the survey was designed as simply as

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<sup>3</sup> A copy of the online survey can be viewed in Appendix A5.

possible without excessive use of colour or distractive pictures (Parsons, 2007) and followed the general design principles suggested for paper surveys, which is to keep questions and design simple, regular and in symmetry where possible (Dillman, 2009). The survey was designed to be confidential and anonymous at all times.

### **2.2.3 Survey questions**

The literature reviewed in Chapters 3 and 4 and preliminary interviews with stakeholders helped to define the survey questions. There were two types of closed-ended questions. The first set of closed-ended questions were designed to gauge perceptions of public transport and integrated ticketing for Greater Wellington and were written using examples from previous transport studies (Currie & Wallis, 2008; Johansson, Heldt, & Johansson, 2006; Premium Research, 2009).

The second set of questions specifically addressed how pro-environmental intentions affect public transport use (sub-question 2). The group of questions related to two theoretical models proposed by Bamberg and Möser (2007) and used by Bamberg, Hunecke & Blöbaum, (2007) to assess the influencing factors on environmental intentions and public transport use. They tested the models using structural equation modelling (SEM), which is a statistical approach often used in psychology to test and analyse a structural theory (Byrne, 2001). SEM is especially useful when measuring latent constructs, such as attitudes and perceptions, which cannot be directly observed but are identified using several questions. SEM can be used with latent and observed variables and is increasingly used in travel behaviour research (Golob, 2001). In this research SEM is used to test and analyse the theoretical models proposed by Bamberg and Möser (2007) and used by Bamberg et al., (2007). The models are based on the theory that seven psychological constructs lead to intention to use public transport, a pro-environmental intention, which consequently leads to actual public transport use. The behaviour theory and model rationale is discussed in Chapter 4.

Open ended questions in the survey were used to allow participants to give qualitative information and expand on some of their answers. As part of



triangulation, the qualitative data provided a means for validating and interpreting the behaviour reported in the quantitative sections (Hay, 2005).

Participants consented to taking the survey by indicating they had read and understood the 'Information for Participants' sheet which was provided online (see Appendix A6). The first question controlled for participants living within the Greater Wellington region. Those who indicated they did not live in the region were redirected to an end of survey message.

#### **2.2.4 Pilot study**

The questions were piloted two months before the final survey was launched amongst post-graduate university students in the Environmental Studies Department of Victoria University of Wellington and staff from GWRC. A total of 49 participants started the survey with 41 fully completing the survey. Feedback provided was fundamental to the redesign of the final survey which was simplified and shortened.

The pilot was crucial to ensure the reliability of the questions for the SEM analysis. A screening question was not included in the pilot, as used by Bamberg et al., (2007), so that all participants answered the psychological questions, regardless of whether they had access to, or drove a car for everyday trips in Wellington. This caused confusion for several walkers, cyclists and car passengers to whom the questions were not relevant because they did not drive. To reduce the risk of similar issues arising in the final survey a screening question near the beginning of the survey was added, asking survey participants what mode of transport they usually use for everyday trips (to work/study, to go food shopping, to get to leisure, and sport activities). If 'driver in a car' was clicked for any one activity they were deemed eligible to answer the environmental behaviour questions and were placed in a sub-group for separate analysis. Of the 559 complete responses from the survey, 370 participants were placed in the sub-group and 359 completed at least three quarters of the questions which measured the psychological constructs used in the model. The final questions used in the SEM are presented in Chapter 5, section 5.2.

### **2.2.5 Recruitment methods**

A self-selection recruitment method was used whereby the invitation to complete the survey was open (Manfreda & Vehovar, 2008). E-mail invitations were sent to colleagues, friends and family; flyers were handed out at Wellington train station; and a link was provided on several websites including GWRC, Snapper, and the Centre for Sustainable Cities. The independent nature of the research and the anonymity and confidentiality of responses was stressed in all invitations.

A dedicated website is thought to encourage participation in online surveys (Madge & O'Connor, 2004). A website was developed for the survey ([www.gwtransport.co.nz](http://www.gwtransport.co.nz)), providing information to participants, web-links to relevant organisations such as the city and regional councils, and a link for participants to contact the researcher anonymously.

Incentives have also been shown to motivate responses (Manfreda & Vehovar, 2008) regardless of the size of the prize, or the length of the survey (Göriz, 2006). Participants were offered the chance to win a \$100 voucher at the end of the survey. To reduce bias, the information supplied beforehand did not specify what the voucher was for. At the end of the survey participants had the option to enter into a prize draw for a \$100 public transport voucher. These responses were also used as a measure of public transport use in the SEM<sup>4</sup>. The participants were transferred to a separate window to enter their details for the prize draw so that there was no connection between their details and the answers given and the survey remained anonymous.

### **2.2.6 Responses**

Although the self-selection method does not guarantee representativeness across the population of Greater Wellington and cannot identify an exact response rate<sup>5</sup>, for practical purposes it was deemed the most efficient method to use under time-constraints. The length of the survey (20 minutes) and the mix of closed and open

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<sup>4</sup> Refer to Chapter 5, section 5.2 for the SEM measures.

<sup>5</sup> Response rate is the number of people who viewed the website or e-mail invitation versus the number of actual participants (Parsons, 2007).

ended questions reduce the probability that participants would enter more than once. The same IP addresses were checked for similar responses or doubled entries to the competition but no duplicates were found. All IP addresses were deleted to maintain participant confidentiality.

In comparison to paper surveys where the response rate is given (usually the total number of invitations sent divided by the total number of responses), a report of those who start and complete the survey is suggested as being more useful to the researcher for online surveys (Eysenbach, 2004). A total of 630 participants entered the online survey via the link provided on the website, e-mail or flyer. Two people were identified as living outside of the Greater Wellington Region and 69 people did not complete half or more of the survey questions and were therefore deleted for a more complete analysis. A total of 559 responses were used in the analysis.

### **2.2.7 Analysis of online survey data**

Data from the online survey were analysed in three parts according to: closed-ended responses, open-ended responses and responses to the environmental psychology questions. A codebook including all the variables was created in the statistical programme SPSS. Firstly responses to the closed-ended questions were re-coded where necessary, such as where a respondent typed a separate answer in an ‘other’ category, or where categories were not used by any respondents. Some open-ended questions were coded into categories for content analysis, such as the factors that contribute towards public transport use. The coded responses were also used for descriptive analysis, including some cross-tabulation of variables such as ‘public transport use’ and ‘importance of integrated ticketing’. Missing data was excluded pairwise in the analysis. Therefore cases with missing data are only excluded for the specific pairs of analyses they have missing data for. This is preferred to the listwise<sup>6</sup> technique where all cases listed with missing data are excluded from analysis, including data that is present for the variable being tested, which severely limits the sample size (Pallant, 2010).

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<sup>6</sup> See Byrne (2001) for further explanation on dealing with missing data including details on pairwise and listwise deletion.

Open ended responses from the online survey were used for thematic analysis where quotes or sections of quotes, from responses were used to illustrate perceptions of public transport in Greater Wellington. Minor spelling and grammatical errors have been changed for legibility, however where a change would affect the meaning of the sentence, errors have been left and are indicated by [sic] after the word. The results of the closed and open-ended questions on public transport and integrated ticketing are presented in Chapter 5.

Responses to the 27 environmental psychology questions were checked for missing data before analysis. Missing data was imputed using the ‘pattern-matching imputation’ method where the missing value is replaced by an observed value from another case which has a similar response pattern and is common in SEM analysis (Byrne, 2001). The validity and reliability of the models were checked using SPSS. A covariance matrix calculated from the responses to the environmental psychology questions was used as input into the SEM programme LISREL 8.80 (Jöreskog & Sörbom, 1993). The SEM analysis techniques are described in full in Chapter 5 with the model results.

## **2.3 Methods summary**

In summary, a mixed method approach was used to collect qualitative and quantitative data to gauge perceptions of public transport and integrated ticketing. Information from interviews with practitioners and key stakeholders in the transport industry provided data for thematic analysis which is included in the literature review, Chapter 3, following. Data collected in the online survey from members of the Greater Wellington public allowed for descriptive analysis of quantitative data on public transport use patterns and SEM analysis of intention to use public transport. Qualitative data from the online survey added depth to the quantitative analysis and was analysed by content and general themes.

The following chapter is a literature review on integrated land transport, integrated ticketing and smartcards, with results of the interviews incorporated. Chapter 4 reviews the literature on the psychology behind environmental behaviour and public

transport use. Results from the analysis follow in Chapters 5 and 6, and are discussed and concluded in Chapter 7.

## Chapter 3 – Integrating the transport system

The New Zealand transport system, like many overseas, has gone through a series of changes in recently past decades which have had an impact on the development of land transport networks. However, unlike many countries overseas New Zealand has continued to favour building roads and highways rather than invest in public transport systems, or walking and cycling paths (Harris, 2010). The result is that we are now trying to play ‘catch up’ with the rest of the world (MoT, 2008).

Public transport peaked in most New Zealand cities before 1950 and has generally been in decline since. The demise of public transport is largely due to the policy and regulatory environment surrounding transport planning. Planning decisions in the 1950s and 60s focused on building a road network rather than a public transport system, and fostered car-centric populations. We are now paying for the legacy today, in Auckland especially (Mees & Dodson, 2002). Since the 1960s a series of deregulation, privatisation and the fluctuation of state-owned enterprises has affected progressive developments of bus and in particular rail systems (Lee & Rivasplata, 2001). Policy decisions, such as easing car import restrictions in the 1980s and lifting motor vehicle import tariffs in the 1990s, coupled with increasing wealth and socio-economic status of the population, further contributed to the demand for motor vehicles. New Zealand’s low population density and geographically diverse landscape in some ways necessitates car travel. However this is rarely the case in major cities such as Wellington and Auckland and does not justify the amount of money spent on city roads (Harris, 2010). Government funding of the transport sector has increased with demand over the decades. Yet the proportion given to roads and the state highway network overshadows that given to public transport or demand management measures (Chapman, 2008; Jakob, Craig, & Fisher, 2006). If this trend continues, instead of ‘catching up’ New Zealand is in danger of being “becoming a dinosaur” (Trafanz, 2009, p1).

There is wide consensus that it is not sustainable to continue developing roads as a means of meeting the demands for travel and that change is required in the

technology, design, operation and funding of transport systems (Johnston, Gao, & Clay, 2005; Krumdieck, 2010; Smith, 2008). It is beyond the scope of this study to detail all aspects of sustainable transport. However, the defining elements of a sustainable transport system are:

- Recognising environmental sustainability, including fuel (a non-renewable resource), air pollution (the assimilative capacity of the air), greenhouse gases (contributing to climate change) and habitat destruction, whilst also acknowledging the need for socio-economic sustainability. Socio-economic considerations include congestion, health costs, and the need to provide for future generations (Black, 2000; Greene & Wegener, 1997; Himanen, Lee-Gosselin & Perrels, 2005).
- Changing the dominance of road transport use for goods and passengers to multi-modal, and non-road transport modes including rail for freight and public transport for passengers (Janic & Reggiani, 2001).
- Integrating the transport system: between transport modes; with infrastructure and services; with the environment; with land use planning; and health, education and economic policies (Hine, 2000; Santos et al., 2010).

Integrated transport is an important aspect in facilitating changes towards sustainable transport (Greene & Wegener, 1997; Hine, 2000; Santos et al., 2010). Integrating the transport system is increasingly recognised internationally and has provoked changes in transport planning and policy, especially in Europe (Janic & Reggiani, 2001).

The following section in this chapter introduces some concepts that are commonly discussed in the literature on integrated land transport and explain how integrated ticketing is an important early step in creating an integrated and sustainable transport system. Section 3.2 distinguishes the different types of ticketing products such as integrated fares, integrated tickets and electronic tickets and defines ‘integrated ticketing’ as commonly referred to today. The opportunities for

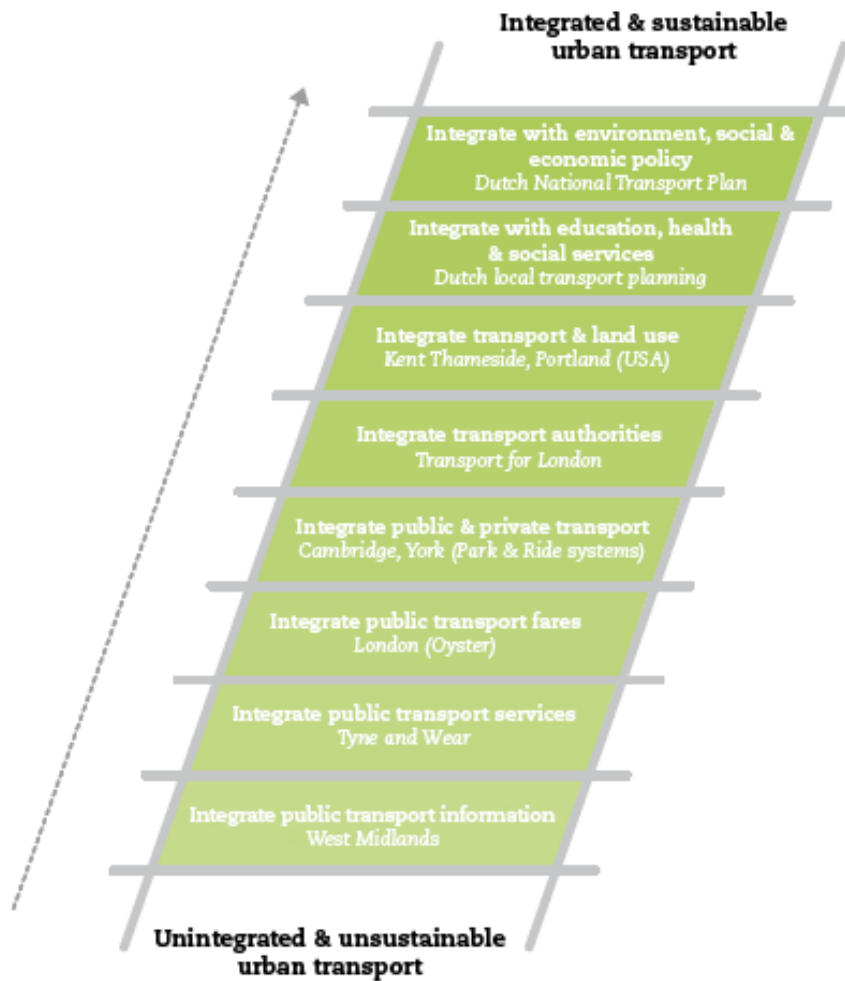
integrated ticketing are reviewed in section 3.3, followed by the barriers to integrated ticketing in section 3.4. In addition to the literature review, data collected from interviews with transport experts and key stakeholders provide important context. Sections 3.3 and 3.4 provide insights into the advantages and disadvantages of different integrated ticketing approaches abroad and in New Zealand, thereby answering research sub-question 3. Key stakeholders perceptions of integrated ticketing in New Zealand add an industry perspective to the literature in this section and address research sub-question 4.

### **3.1 Integrated land transport**

There is no unanimous definition for the term ‘integrated transport’ although its use is widespread. A UK white paper in 1997 entitled ‘A New Deal for Transport: Better for Everyone’ dedicates a significant chapter to integrated transport. The paper emphasises the integration with and between different transport modes; integration with the environment; integration with land use planning; and integration with education and welfare policies in a bid not just to calm traffic problems but also to enhance people’s quality of life (DfT, 1997).

Preston, Marshall, & Tochtermann (2008, p6) define integrated urban transport as an “organisational process” incorporating the planning and delivery of the transport sector “across modes, sectors, operators and institutions”. They developed an ‘integration ladder’ to assess the level of integrated and sustainable transport in British cities as shown in Figure 3.1 below. Ultimately, the aim is to achieve a transport system that works on economic, social and environmental levels and that is governed by a collaborative institutional framework. This aim is not unlike the defining elements of sustainable transport presented in the introduction to this chapter above. Despite the phrasing of the words “integrated” and “sustainable”, and “unintegrated” and “unsustainable” in Figure 3.1, the concepts are not mutually exclusive. As the rungs on the ladder illustrate, the more integrated the transport system, the more sustainable it will become and visa versa (for a thorough analysis of integrated public transport see NEA, OGM & TSU, 2003).





**Figure 3.1:** The Integration Ladder. Source: (Preston, et al., 2008). *Note:* West Midlands Tyne and Wear and Kent Thameside are relatively large UK metropolitan areas. Cambridge, York and London are UK cities.

The integration of public transport ticketing and fares is an important early step in the ladder. It is likely to be more successful where there is already integration of the physical transport system and its information, for example integrating timetables and realtime information (Abrate, Piacenza, & Vannoni, 2009). Large-scale integrated ticketing and fares projects have been achieved in many international cities such as London and Singapore, but other cities including Melbourne and Sydney faced massive financial and time costs. These successes and failures are reviewed in sections 3.3 and 3.4 below.

## 3.2 Integrated ticketing and fares

Smartcard integrated fares and ticketing systems are increasingly common in public transport systems worldwide. They are used in developed and developing nations to

create more effective and sustainable public transport systems (Pelletier, Trépanier, & Morency, 2011). Some common terminology is used when referring to integrated ticketing which is clarified in this section. Integrated ticketing, integrated fares and electronic ticketing, although often implemented in unison today, are not one and the same, and have not always been developed together.

### ***Integrated ticketing and integrated fares***

Integrated ticketing means that one ticket media can be used for travel on all, or most, forms of public transport within a region. The early integrated tickets appeared as travelcards in the late 1950s and became popular in Europe from the 1970s (White, 1981). The travelcard allowed passengers to travel on public transport services within a specific time period (usually per day, month or year) on one ticket. Fares between different services were integrated so that there was a single payment for the travelcard, which is valid for the time period specified. It is impracticable to introduce integrated fares without integrated ticketing (Kole & Baxter, 2007) as shown in Figure 3.2 below.

<b>‘Integrated ticketing’</b>	<b>YES</b>	Seamless travel using common ticket media (e.g. Metlink HuttPlus Monthly bus and rail ticket, Snapper card)	Supports seamless travel using common ticket media and integrated fares (e.g. travelcards and London Oyster card)
	<b>NO</b>	Does not support seamless travel (e.g. Single paper bus and rail tickets in Wellington)	Supports seamless travel using integrated fares and multiple ticket media
		<b>NO</b>	<b>YES</b>
		<b>‘Integrated fares’</b>	

**Figure 3.2** – Integrated ticketing and integrated fares matrix. Source: (adapted from, Kole & Baxter, 2007).

Integrated fares merge the cost of trips so that you can travel on more than one public transport mode (bus, train or ferry), without paying a full fare every time you change modes. The matrix in Figure 3.2 illustrates the interwoven components of integrated fares and ticketing. The matrix shows that both integrated fares and

integrated ticketing are essential components in providing a seamless and integrated public transport service.

### ***Electronic ticketing***

Public transport authorities are migrating from using paper based or magnetic strip ticketing systems to smartcards. The phase-out of magnetic strip ticketing (where a paper ticket is fed into a machine, validated and returned back to the passenger to open a gate) is largely because of equipment upgrade costs and the potential gains from rapidly improving smartcard technology (Blythe, 2004; see also section 3.3 below). A smartcard is a credit-card sized card with an electronic chip hidden from view inside the card. The card is held against an electronic card reader that calculates your fare when read on entry to, and often on exit from a public transport vehicle.

The Snapper smartcard introduced in Wellington in 2008 is an example of an electronic ticketing system. It is an integrated ticket to an extent as it can be used for travel on all NZ Bus services<sup>7</sup> in Wellington City, Lower Hutt and Upper Hutt, the East by West ferry service and taxis throughout the Greater Wellington region but not on rail or other bus services. However fares are not integrated. A full single fare is deducted from the Snapper card after each trip leg. Travel passes have been introduced but they are specific to NZ Bus services only.

#### **3.2.1 The expansion of integrated ticketing**

Modern integrated ticketing systems are commonly accepted to be smartcard based. Despite initial capital costs, the success of smartcard integrated ticketing in Asia (Hong Kong, Seoul and Korea) in the 1990s persuaded other countries including the UK, Singapore, Australia and more recently New Zealand to invest in electronic ticketing. There is growing evidence that the benefits of smartcard integrated

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<sup>7</sup> NZ Bus is the largest commercial bus company in New Zealand and is owned by the New Zealand based investment company Infratil. Mana Coach Services which runs to Johnsonville, Mana and Kapiti is the only other significant bus operator in the Greater Wellington region. Infratil also owns 26% of Mana Coach Services.

ticketing for both passengers and operators surpass that of the standard travel card and are worth investment costs (Blythe & Carr, 2005; see also sections 3.3 and 3.4).

London has successfully transferred from paper based, magnetic strip ticketing to integrated fares and integrated ticketing on smartcards. Peter Lewis, Oyster Development Manager, interviewed for this research, experienced managing the transition to smartcards in London. He summarised the development of Oyster, from conception in the mid-1990s, to full integration with bus and tube in 2003 and with rail in 2010. The timeline below outlines each development phase:

1996 - Smartcards trialled for the first time in Harrow with great success and many users showed an ‘early adopter’<sup>8</sup> mentality.

1998 - Transport for London (TfL) signed a contract to build an electronic smartcard integrated ticketing system, later called ‘Oyster’.

2003 - The Oyster card was made available for those travelling on monthly and annual tickets, covering the London tube and bus network.

2004 - ‘Pay as you go’ was introduced where the card could be used for all single and multiple journeys on bus, tube and ferry.

2005 - Fares capping was brought in. The card stores what journeys you have made and stops charging you when you reach a certain cap price, effectively the same price as if you had a day travelcard.

2010 - Oyster was introduced on the over ground rail system in London so that all public transport modes were covered by integrated ticketing.

The evolution of smartcard technology has meant that integrated ticketing systems can be built much more quickly and cities can share experiences all over the world. As four interviewees mentioned, New Zealand is in the advantageous position of learning from past mistakes and investing in systems that have already proven their success (interviews with Brash, Lewis, Lewry and Szikszai, 2010<sup>9</sup>). The first and most successful integrated ticketing system in New Zealand is the Christchurch

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<sup>8</sup> The ‘early adopters’ got used to the system quickly and wanted to continue using the smartcards after the trial period.

<sup>9</sup> A full list of interviewees who provided important contextual information on integrated ticketing in addition to the literature reviewed in this chapter can be found in Chapter 2, section 2.1.3, Table 2.1.

metrocard, which operates on all city buses and the Diamond Harbour Ferry (Bachels & Smith, 2010). The Auckland Integrated Fares System (AIFS) project, due to launch September 2011, will be the first multi-modal integrated ticketing system based on electronic smartcards in New Zealand. It is likely that Wellington will follow.

The following sections in this chapter review and analyse in detail the advantages and disadvantages of integrated ticketing systems with application to international literature and experiences in New Zealand. The literature on integrated ticketing systems commonly assumes that both integrated fares and a common integrated ticket media (paper travelcard or smartcard) are used in the systems, and that this allows the greatest set of advantages (Preston, et al., 2008). In line with the literature therefore, for the remainder of this thesis integrated ticketing refers to a smartcard based integrated fares and ticketing system unless otherwise specified.

### **3.3 The potential opportunities of integrated ticketing**

Much of the literature on integrated ticketing is focused on the effects of paper travelcards, which were the original integrated ticket media. The potential of smartcards for integrated ticketing is often documented with a focus on technology costs, although a recent paper by Pelletier et al. (2011) synthesised the literature on smartcard use in public transit focusing on the potentials for improving public transport management.

Section 3.3.1 focuses on the advantages of integrated ticketing for passengers and section 3.3.2 for local authorities and operators. The benefits that are seen are enhanced by early stages of public transport service integration, shown in Figure 3.1 above as the second rung on the ‘integration ladder’. Section 3.4 evaluates the potential barriers to integrated ticketing, where notably the early levels of integration suggested in the ‘integration ladder’ are missing. The review of opportunities and barriers are structured according to themes explored in the literature and interviews with public transport experts. The interviews provided up

to date context on integrated ticketing developments, especially in regards to the New Zealand policy context.

### **3.3.1 Passenger benefits**

#### ***Ease and convenience***

Many of the benefits to passengers from travelcards also apply to smartcards such as increased convenience from having only one ticket, easy transfers between routes and modes and “free” additional journeys such as returning home after travel around the city (White, 1981). Smartcards have the additional benefit of reducing the time getting onto public transport as there is no need to carry cash to pre-purchase a ticket or pay the driver on boarding, although the option often remains available for tourists and one-off users. Data transactions between the smartcard and card reader are a standard 0.3 seconds for public transport and 1 second for retail transactions (DfT & Detica, 2009b). Boarding times in London were reduced 2-3 seconds per passenger when the Oyster card was introduced, which was significant considering there was a flat fare policy previously in place (DfT & Detica, 2009b). Speed of boarding also enhances passenger safety where large crowds can move through quickly and reduce congestion. As Peter Lewis at Transport for London (TfL) emphasised when interviewed, safety was an important motivation for the transition to smartcards in London.

AIFS and future integrated ticketing systems in New Zealand will be likely to have a tag-on, tag-off system, whereby the passenger has to swipe the smartcard over a reader on entry to, and exit from, a public transport vehicle. It is possible there may be longer disembarking times in the introduction phase where passengers have to learn to tag-off by holding their card over a reader before leaving a vehicle or station. However, there is potential to reduce bus dwell times, which is apparent in Wellington on buses using Snapper. Three key stakeholders remarked on bus speed improvements and its importance in improving public transport flows (interviews with Lewis, Lewry and Szikszai, 2010). Szikszai, from Snapper, remarked that “the typical boarding time for cash is between 30 and 40 seconds, whereas boarding with Snapper is about 4 to 5 seconds and...most of that is actually taken up in walking time” (Interview, 2010).

Simplifying and smoothing the ticketing system is important across all modes to increase the ease and convenience of the public transport system (Preston, et al., 2008). Mowday from Tranz Metro acknowledged that Greater Wellington has a predominantly:

train-walk culture. At the other end there might be a bus-train or a car-train kind of culture and I guess the easier we can make it for them to get those transitions between modes the better, and that's where the integrated ticket comes in obviously (Interview, 2010).

### ***Security***

Smartcards may be anonymous or registered to a person. Whilst there may be some privacy issues to surpass, registered cards have similar advantages to credit cards where they can be cancelled and replaced if lost, increasing security from loss and theft (Turner & Wilson, 2010). Individual transaction details are able to be viewed online by registered users and can provide valuable information for the police in tracking criminal movements as, for example, has been increasingly used in police investigations (Dempsey, 2008). Information linking personal details with travel patterns can be separated in card holding information systems so that privacy concerns are complied with (Dinant & Keuleers, 2004).

### ***Discounted fares***

Integrated ticketing provides an opportunity for reduced travel costs. Where journeys involve multiple trips or multiple modes an integrated ticket removes much of the transfer fee, therefore reducing a significant transaction cost for the passenger (Marchese, 2006). Often, the transfer fee when changing modes is waived or discounted for a specific time period such as hours as occurs in Christchurch City (Bachels & Smith, 2010), or months. Also to encourage smart card uptake the cost of travel is often reduced compared to a paper ticket. Table 3.1 shows some examples of fare offers worldwide and demonstrates the positive effects of marketing cheaper prices on smartcard uptake and public transport use.

**Table 3.1** – Effects of marketing special fares on smartcards compared to cash.  
Source: (adapted from Pelletier et al., 2011).

City / Country	Fare offer	Effects
New York, USA (Lueck, 1998)	Free transfers between buses and subways. 10% fare bonus when \$15 or more is loaded onto a metrocard.	30% increase in bus patronage and 17% increase in subway patronage.
London, UK (DfT & Detica, 2009b)	50% fare reduction with Oyster compared to cash payment.	Over 2 million Oyster cards used. Cash payments significantly reduced, down to only 1.4% of all bus transactions in 2008.
Seoul (Park, Kim & Lim, 2008)	Fares system dependent on user (e.g. adult, child, student), mode and distance travelled. Free transfers on smartcards only.	90% smartcard use on buses and 75% use on subways.
Hong Kong (Turner & Wilson, 2010)	Octopus card offers a 10% fare reduction over paper tickets for public transport. Also for payments in taxis, car parking, retail and vending machines.	An estimated 95% of working Hong Kong residents own at least one Octopus card.
Wellington (interview with Szikszai, 2010)	20% fare reduction with Snapper compared to cash payment.	135,000 cards in use. 60% NZ Bus transactions on Snapper. Number of bus trips growing 1-2% a month <sup>10</sup> .

### 3.3.2 Operator and local authority benefits

Operators and local authorities often work closely in the management of public transport. Additional to the benefits to passengers, operator revenue and public transport management can be significantly improved with integrated ticketing.

#### *Increased patronage*

Integrated ticketing systems are often developed alongside a number of other measures aimed at increasing public transport patronage so that the direct effects are hard to define. There is a general consensus in the academic literature that paper

<sup>10</sup> Actual monthly patronage figures tend to fluctuate over a year, with more trips taken in winter months (interviews were conducted in August/September). However, annual bus patronage figures are increasing annually: 2% from 2007/8 – 2008/9; 1% from 2008/9 – 2009/10; 2% from 2009/10 – 2010/11 (Metlink, 2011).



based integrated ticketing (such as travelcards) has positive impacts on demand for public transport and is discussed below. Following, the effects of smartcard introductions are reviewed, which are more recent and comprise mostly of research by government departments.

Matas (2004) studied the effects of public transport demand in Madrid where patronage increased by over 50% from 1986 to 2001. Whilst improvements in wealth and transport infrastructure were significant determinants, the introduction of the travelcard contributed to a 7% increase in bus patronage and a 15% increase on the underground metro. The London travel card, introduced in the 1980s, was estimated to contribute to a 10% increase in travel on the underground and 16 % on buses (Gilbert & Jalilian, 1991). Similar studies link the introduction of season passes and travelcards to increased demand for public transport when introduced as part of wider integrated transport strategies to increase patronage (FitzRoy & Smith, 1998; Pucher & Kurth, 1995; White, 1981).

A study appointed by the European Commission on the integration and regulation of transport suggests that the greatest increases in public transport demand occurred in cities where there was integrated fares and ticketing alongside other integrated policies (NEA, et al., 2003). The findings are in line with the ‘integration ladder’ proposed by Preston et al. (2008), presented in section 3.1 above, where integrated fares are the third rung on the ladder after integrating public transport information and services. The study also differentiated between the long term and short term impacts of integrated policies. Hamburg, Stockholm and Vienna, for example, have had integrated transport policies for over two decades and annual increases in public transport average 1%. In the long term increase in demand was as much as 25% in Stockholm. The Metrobus integrated ticketing and fares system in Rome was estimated to increase patronage by 3% a year from 1995 to 1997 (NEA, et al., 2003). A more recent study in Italy following public transport use over a 12 year period found that the integrated ticketing system increased patronage by 2% in the short run and 12% in the long term. The extension of the region covered by the integrated ticketing system was a key factor in the success of the project (Abrate, et al., 2009).

Literature on public transport demand from smartcard integrated ticketing, in comparison to paper based integrated ticketing with travelcards, is more recent but confined to research commissioned by government departments. Nevertheless they bring forward some valuable insights. A Scottish survey revealed that passengers indicated that they would be more likely to use public transport with a smartcard integrated ticketing system. However it was uncertain whether these people were already using public transport or would be changing modes. The lack of data on public transport use was identified as a limitation of the study in identifying the effects integrated ticketing may have on public transport in Scotland (TNS Social, Transport Research Laboratory, & Transport Research Institute, 2004). This study adds to past research where data on public transport use was not collected alongside perceptions of integrated ticketing and smartcards.

Research conducted for the Department for Transport in the UK included a survey of three major urban areas outside of London identifying perceptions of smartcard integrated ticketing. Whilst there were regional differences, the smartcard was seen as favourable for between 15 to 20% of non-public transport users, and 39 to 63% of frequent and less frequent users. Interestingly, the study also found that smartcard ticketing was perceived as a natural progression from other ticket types. This has implications for new pricing with smartcards as ticket price increases were not expected or favoured (Ipsos Mori & Institute of Transport Studies, 2010).

Table 3.1 presented above (p29) demonstrates the increasing popularity of using smartcards for discounted travel compared to other ticket products for public transport. As well as encouraging passengers to use smartcards through cheaper fares, non-fare policies have been introduced to increase the usability of the card beyond transport-only functions. Singapore, for example, accepts the smartcard as a form of payment in restaurants, cinemas, schools and libraries which eased the transition from paper to smartcard ticketing (Pelletier et al., 2011). Snapper in Wellington can also be used in various cafes and shops, and for discounted cinema tickets which has boosted the number of smartcards in use. Szikszai from Snapper emphasised that:

you get some people who carry it primarily for public transport and then go into other categories, but we'll get people who carry it for other categories and then use it occasionally for public transport and all that does is that just lifts the boat basically (Interview, 2010).

Interviews with Wellington stakeholders revealed that improving customer service was a prime issue in attempting to increase public transport patronage, on rail especially (Brash, Lewry, Mowday and Szikszai, Interviews, 2010). The NZTA 'Implementation Plan for Improving Public Transport Effectiveness' includes integrated ticketing as a key part of improving customer service by reducing queues and minimising cash handling in the hope that trust in the system will be regained and patronage numbers will start to rise again (NZTA, 2010).

### ***Increased revenue***

Increased levels of patronage and regional travel would contribute to higher levels of revenue. Reduced boarding times also allow more passengers to board, speeding up route trips so that services are more efficient. This allows the operator to either reduce the number of buses or add extra services (Welde, 2009).

Smartcards reduce fraud where passengers have fewer opportunities to get away with not paying the correct fare, overriding<sup>11</sup> or using the wrong ticket and evading fare payment in a closed tag-on, tag-off system (Turner & Wilson, 2010). Reducing fare evasion formed a key part of the business case for Oyster, which now saves an estimated £40 million per year (DfT & Detica, 2009b). Electronic transactions also simplify cash handling processes at the end of each day. It reduces potential cash handling errors or scams involving cash.

The introduction of Snapper in Wellington has taken away some of the risks associated with cash. Szikszai mentioned when interviewed that "collection of revenue is just so much better... reduction of theft is pretty clear" (Interview, 2010). Major theft occurred in Wellington in 2009 when an estimated NZD\$500,000 was

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<sup>11</sup> Overriding occurs when a passenger stays on the public transport service further than their ticket allows for. For example, a passenger buys a \$1.50 Zone 1 bus ticket but stays on the bus to Zone 3 which is a \$3.00 fare, twice as expensive as what was paid for.

found to have been taken by several staff of the bus operator GoWellington, a subsidiary of NZ Bus, over three years (Williamson, 2009). However, new opportunities for passenger fare evasion may be presented on rail because the majority of the system will be not be gated. Interviewees from ARTA, GWRC and Tranz Metro all acknowledged that fare evasion happens on trains at present, although figures are hard to calculate, and that the introduction of smartcards would necessitate a new revenue protection policy. Revenue protection policy is further discussed in section 3.4.4.

### ***A more efficient public transport system***

One of the greatest benefits of smartcard ticketing is the access to an efficient set of data on the number of passengers, boarding times, route number, where the passenger boards and, depending on the system, the passenger's destination. The data reduces the need for extensive manual surveys and can be used to optimise routes leading towards more efficient and integrated journeys (Bagchi & White, 2005; DfT & Detica, 2009a; Pelletier, et al., 2011). This will contribute towards achieving local authority goals towards better integrated journeys and if modal shift is also encouraged, decreases in congestion. As highlighted by Ellis about the forthcoming AIFS, "the card won't solve all things but the card is part of the jigsaw puzzle that gives what is effectively a car-bound society, an alternative" (Interview, 2010).

The electronic data provides information that is useful in marketing the public transport service, especially as public transport passengers become increasingly diverse in terms of age, income and mobility needs (Blythe & Carr, 2005). Smartcards can also address wider issues of transport and social inclusion through concession cards for elderly or low income groups such as the National Entitlement concessionary card in Scotland (Turner & Wilson, 2010). The Snapper card introduction on taxis has been used as part of Greater Wellington's total mobility scheme so that people with disabilities have a personalised card with a concession entitlement ensuring they get the appropriate discounted fare in taxis.

The potential of smartcards go beyond integrating public transport, to integrating the transport system and the local economy. In Lyon the Télecly card can also be used to hire bikes around the city and the Chicago CardPlus/IGo card can be used to hire low emissions vehicles. Many cities in the UK which use smartcards for public transport can also be used for park and ride schemes, such as the Oxford *key*. Park and ride encourages people to use public transport main lines to get into the city rather than drive in causing congestion in the city centre (DfT & Detica, 2009b). There is also potential for smartcards to benefit employers and employees by offering cards at reduced rates to discourage staff driving and taking up parking space, as was often practised with UK travelcards (White, 1981). The OnePlus card, recently launched by Barclaycard in the UK, integrates a credit card, Oyster card and OneTouch small transaction chip for making payments of less than ten pounds. The OnePlus card further integrates spending opportunities and increases convenience for the public transport passenger in London (Monita, 2007).

As technology improves there will be future opportunities for the integration of smartcards which can be used to encourage modal shift. Mobile technology is seen as the ‘next big thing’. Trials by mobile company O<sub>2</sub> in the UK with the London Oyster scheme successfully used NFC<sup>12</sup> mobile technology so that passengers could scan their mobile instead of a card to pay for public transport, further increasing customer convenience. During the trial period of six months, 22% of participants increased their public transport use as a result (Turner & Wilson, 2010).

All stakeholders interviewed acknowledged that smartcard technology is constantly evolving. In Auckland, whilst the primary function of the AIFS card will be public transport, the system will be adaptable for future design innovations. Greater Wellington will be in the advantageous position of developing a system years later, and may be able to accommodate some extra technological features from the outset.

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<sup>12</sup> Near-field communication (NFC) technology allows you to swipe your phone over the smartcard reader in the same way that you would use a transport smartcard.

### **3.4 The potential barriers to integrated ticketing**

Integrated ticketing is not the panacea to solving all problems in the transport system and, as suggested in the integration ladder in section 3.1, should only be implemented after basic levels of transport integration (such as integrating public transport timetables and information). Examples of failures around the globe and studies in transport literature suggest certain conditions where smartcard integrated ticketing causes more problems than it does solutions. This section reviews the literature on the barriers to successful integrated ticketing as a means of improving the public transport system including evidence from interviews with international and local transport practitioners.

#### **3.4.1 Regional landscape**

Conventional paper ticketing systems may still be appropriate in some urban areas. Public transport in many developing countries is often informal (such as local combi vans bursting with passengers) and provides a clear social function in employment opportunities and mobility. Changing the ticketing arrangements would be likely to disrupt the system and create more instability and disintegration than integrating the transport system (Jakubauskas, 2006). It would also be extremely costly to implement and regulate, requiring government support, which may be better prioritised on other areas of transport development such as improving public transport services, roads or traffic safety.

Areas with low population densities and disparate transport systems are unlikely to see the benefits of integrated ticketing that a more densely populated region might. Pricing in sprawling urban areas are likely to be zone or distance-based. Therefore those in the outer urban fringe pay more under an integrated ticketing system to reach the city, whereas those in inner urban zones would be likely to have cheaper travel options within the city. Integrated ticketing could then have the negative effect of reducing the passengers' willingness to pay for public transport (Marchese, 2006). A solution to this problem is to introduce flat fares and, or, fares capping across a city as exemplified on London buses where a single £1.30 fare, capped at £4.00, is charged regardless of the distance travelled (TfL, 2011). It is also vital that

public transport services within each region, however sparsely populated, are integrated themselves. The importance of landscape, planning and basic transport services for integrated ticketing was emphasised by several interviewees shown in Table 3.2.

**Table 3.2** – Comments from interviews on the importance of fares planning, regional landscape and integrated public transport services.

<b>Name, Organisation</b>	<b>Comment</b>
Jeremy Meal, MVA Consultants	1 “Melbourne had a distorted zonal fare system because (I think it was the eastern side that had a third zone) because it was effectively invented to pay for the electrification of the railway. ... They had invented a fares system to fix the geography and the history of the network development, rather than having a fares system that had three zones equally.”
	2 “It’s this whole aspect [graduated fares setting], this end-to-end aspect and I think it’s good understood that integrated ticketing isn’t just about some sort of joined up fare, equitable fare, it actually has a huge, huge and larger impact on how you can plan the network. ... If you have an integrated fare system, you can detach your planning decisions as to how you run your bus network from any consideration about fares, because you know the fares would work. And that is just the key point that, particularly here in the UK, just isn’t fully understood, isn’t fully appreciated until this day.”
Miki Szikszai, Snapper	3 “The smart thing to do with any IT system like this is you integrate fares first and then you deploy a system that can deal with that, because otherwise what tends to happens is you build one chunk of IT base and then you change the fare structure and if you don’t have a view of what that fare structure may be, then you have to tend to re-engineer the entire system to meet with that. ... But what we’ve also seen is that defining those fares takes quite a long time.”
	4 “The number one issue in Wellington is not about integrated ticketing it’s about getting those new trains in place out there, about making that service out to the Hutt Valley and Kapiti Coast and Wairarapa super reliable. When can you move to integrating that from a ticketing perspective? Well I think it’s the same in Auckland, it’s getting the base service operating.”
Raewyn Bleakly, BCA	5 “I think that again there’s a degree of wariness about what might work for Auckland and Wellington shouldn’t be forced on smaller regions, and quite often smaller regions have that reaction to a lot of different decisions.”
Greg Ellis, ARTA	6 “So it isn’t for example that ... necessarily ticketing is reliant upon the new services line for example, but the new services line certainly rely upon ticketing. So as soon as the ticketing is in place, in terms of integrated ticketing, we can for example on the rail lines mainly, but ultimately we can also improve things on the Northern Busway. On our rapid transit network we can play around with some tuning ... tuning those particular ‘line haul’ services and also the feeding services to it, to achieve some more cost efficient outcomes.”

Comments 1 and 2 in Table 3.2 from Jeremy Meal, MVA Consultants, demonstrate the potential for integrated fares to go wrong, and the opportunity to create a flexible system when planned right, also advocated by Miki Szikszai from Snapper in comment 3. The cautious opinion of smaller urban regions towards integrated ticketing is commented upon by Raewyn Bleakly of BCA (comment 5), illustrating the importance of local planning. Greg Ellis, from ARTA, emphasises that integrated ticketing can help solve some network planning issues in Auckland (comment 6). However, as proposed in the ‘integration ladder’ and suggested by Szikszai (comment 4) getting the base services running first is critical.

### **3.4.2 Over-complicated systems**

Integrated ticketing failures are often induced by poor planning of fares. The Sydney *T-card* was an integrated ticketing system planned in 1996 with the aim to be in place by the Sydney 2000 Olympic Games. Huge delays were experienced largely due to technological difficulties and the inability of the system to cope with the number of fare products (there were over 120 rail ticket types alone).

Complaints arose in 2003 over the tendering process and the New South Wales government finally terminated the project in 2008, resulting in a further litigious process between the government and ERG-Group<sup>13</sup>, the company contracted to install and operate ‘T-card’ smartcard (Douglas, 2008). In April 2010 Sydney finally reduced the number of fare zones and launched an integrated ticketing system, based however on magnetic strip cards, “a far cry from T-card” the electronic system now planned for introduction in 2012 (Tranter, 2010, p1).

Interviewees acknowledged the need for integrated ticketing to simplify public transport fares in New Zealand, and the difficulties it may pose. Table 3.3 demonstrates three stakeholders’ views on integrated ticketing for public transport in Auckland and Wellington.

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<sup>13</sup> Now known as Vix ERG



**Table 3.3** – Comments from interviews on New Zealand approaches to reducing over-complicated integrated ticketing systems.

Name, Organisation	Comment
Dave Brash, NZTA	1 “They [NZTA Board] saw it as a high risk project, it’s a large IT project and integrated ticketing projects have a habit of going pear-shaped, so they were incredibly nervous about that.”
	2 “They [Auckland] want to go in the longer term to much clearer zoning, but they want to do that once they’ve got the proper rail network operating and ... so they’ve gone for quite a simple set of ticketing products and then with the ability to move later to a zoned system.”
Miki Szikszai, Snapper	3 “You’ve still got a fare policy that needs to be set in Auckland ... and they’re in an interesting position there. They’ve got this stage based system ... they want to move that to more of a zone based approach so I think they’re struggling with that transition from, what it means for a customer who might live, you know, 20km away from Auckland central, moving from stage based to zone based and just making sure that they bring those customers along on that journey rather than just disenfranchise a whole bunch of people.”
David Lewry, GWRC	4 “We’d like to develop integrated products as the basis of future ... integrated electronic ticketing, because there’s a definite presumption against replicating the current system electronically, you know just churning out all the same products electronically. There’s a much more of a, you know, intention to look at a more streamlined, more flexible product than what’s there now.”

Comments 1 and 4 in Table 3.2 suggest that New Zealand has already learnt from previous international failures. The NZTA sees integrated ticketing in Auckland as a big strategic project and has stepped in as the key funder for AIFS. It seems well-understood that fares reform is needed, as suggested in comments 3 and 4. However how it will happen still appears to be indefinite, adding to further uncertainties discussed below.

### 3.4.3 Cost

Integrated ticketing systems are costly, requiring upfront investment in platform and on-vehicle infrastructure and technology. It is argued that some early integrated ticketing projects, such as Sydney’s, failed and were costly because the technology was pushed onto public transport, rather than being pulled by the market (Blythe, 2004). Sydney’s system was announced by the government in 1996 but the first

contract for the installation of the system was not signed until 2003. The delay between government push and market pull was worsened after the commercial contract was contested by a rival company. Neither the government nor tendering companies in Sydney were prepared, resulting in the huge costs discussed above. Cost-effective integrated ticketing systems will be significantly more achievable where government and market outlooks are aligned.

The ability to use a smartcard for multi-modal journeys, rather than just one mode, will decrease the large implementation costs in the long run (Jakubauskas, 2006). As commented on in section 3.1, multi-modal journeys are where the greatest benefits for the customer will be seen (Preston, et al., 2008). Nevertheless, justifying the business case for investment even for large-scale projects is often difficult to prove whether in a single mode or multi-modal environment (Blythe & Carr, 2005). Additional to capital costs there are often legal, economic and technological complexities in the development process, as seen in the case of Sydney above. Although few investments in public transport are commercially profitable, multi-modal integrated ticketing presents an opportunity for cost-sharing for, and between, operators and government.

It is suggested that investments in public transport are driven by positive externalities such as user scale economics and benefits to the wider public good rather than conventional profit making motives (Welde, 2009). Governments therefore often have a large role to play in investment of the public transport system. The UK government recently published a white paper announcing a £560 million fund to support local sustainable transport initiatives, including infrastructure for integrated ticketing so that the majority of public transport has smartcard ticketing by 2014 (DfT, 2011). New Zealand's government investment in public transport is growing, although is still considerably less than funding for roads<sup>14</sup>. The New Zealand government involvement in integrated ticketing is further discussed in section 3.4.4 below.

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<sup>14</sup> New Zealand's allocated spending on state highways for the period 2009/10 – 2011/12 is \$4585 million, compared with \$770 million on public transport services (MoT, 2009). In comparison the UK's spending review for the years 2010/11 – 2014/15 include \$18 billion on rail investments compared with only \$4 billion on highways (DfT, 2010).

The cost of integrated ticketing for cities in New Zealand is likely to be interwoven with the NZTA's National Integrated Ticketing Programme (NITP) which is developing the specification of a national standard for the AIFS smartcard and future transport smartcards in New Zealand. Comments 3 and 6 from Lewry (GWRC) and Bleakly (BCA) in Table 3.4 below explain the nature of the NITP in funding integrated ticketing. The importance of cost as a potential barrier to successful implementation for regional councils and transport operators was highlighted in the interviews (comments 2, 4 and 5 below).

**Table 3.4** – Comments from interviews on cost as a potential barrier to integrated ticketing.

<b>Name, Organisation</b>	<b>Comment</b>
Dave Brash, NZTA	1 “Strategically they [NZTA Board] saw it ... that \$48 million ... in the scheme of spending \$2 billion on Waterview motorway, it’s a relatively small amount of money.”
Graeme Mowday, Tranz Metro	2 “It’s [cost] your ultimate barrier really isn’t it? But that’s a funding issue through GW [RC] and central government.”
David Lewry, GWRC	3 “I think the obvious link is the fact that any capital project we do in that respect we need NZTA funding and compliance with national standards is going to be a condition of that in the future.”
Miki Szikszai, Snapper	4 “So bus, which is 75% of the market in Auckland, is not funded. So bus operators have to buy their own equipment [for integrated ticketing] and they want to do that on a competitive basis, so you end up with this situation where you need to have the standards set before they can make their commitments. ... If you’re a bus operator in Auckland it’s a tough, tough, time because you’ve got to work out how much risk you want to take in terms of which systems you procure, or can you hope that your system won’t expire in the next year or two. Hope is a bad strategy!”
Raewyn Bleakly, BCA	5 “I think that operators generally have always been keen to see an integrated ticketing system in New Zealand, but wary of how it would work, how much it would cost, how much it would cost them specifically.”
	6 “A lot of regional councils have indicated that they [NZTA] will use compliance with the standard as a funding lever, so when you’re making a purchasing decision and the standard is as of yet uncertain it’s difficult to know how exactly you’re going to go about purchasing what equipment when you don’t know what’s compliant.”

Whilst cost may be a barrier to integrated ticketing in New Zealand, even Brash from NZTA acknowledges that it is little money compared to that spent on road projects, illustrated by comment 1 in Table 3.4. As technology improves and more players enter the market, such as banks, costs may decrease. This could benefit Greater Wellington where there has not even been any procurement for an integrated ticketing system. Importantly for bus companies, highlighted by Bleakly and Szikszai in Table 3.4 above, is that the costs are transparent upfront. The current lack of transparency indicated above has the potential to lead to government and operator conflicts, discussed below.

#### **3.4.4 Policy and operator conflict**

New Zealand's public transport system has closely followed the UK's operational patterns. Bus companies faced deregulation under the 1984 Roger Douglas reforms and the introduction of the Transport Services Licensing Act 1991 (TSLA), modelled on the UK Transport Act 1985, severely reduced subsidies to bus companies with the aim of encouraging competition. Regional councils and authorities still had control of route planning. However they could not access 'commercially sensitive information' including patronage, revenue or cost information, without which planning is extremely difficult. The TSLA also facilitated corporatisation of companies resulting in Stagecoach, later bought by Infratil and rebranded NZ Bus, buying 68% of the urban bus market (Ashmore & Mellor, 2010). Whilst not quite a monopoly, NZ Bus has a considerable market share in Wellington and Auckland limiting the participation of smaller operators in the region. Privatisation has had engrained implications on how public transport has formed and how future changes, such as integrated ticketing, may be carried out. Integration is discouraged as operators protect their territory by issuing operator own travel passes and are reluctant to share patronage.

The Public Transport Management Act 2008 (PTMA) was brought in to replace the TSLA and give more control to regional councils and authorities in procuring bus service contracts. A key part of the PTMA was to facilitate integration of public transport services and give councils the ability to mandate integrated ticketing (Ashmore & Mellor, 2010). Whilst the PTMA has proven its purpose, the National

government called it up for review almost as soon as it gained power at the end of 2008 causing uncertainty in the public transport sector. In spite of the PTMA, anecdotal evidence suggested by interviewees<sup>15</sup> implied that there is often resentment from smaller operators towards integrating their fares and products with large incumbents, such as NZ Bus, regardless of the patronage benefits it would be likely to bring. Therefore regional, and potentially central, government involvement is likely to be necessary to mediate conflict.

Similar to the UK's Integrated Transport Smartcard Organisation (ITSO), the NZTA has set up a National Integrated Ticketing Programme (NITP) to oversee smartcard developments in ticketing for public transport in New Zealand. Primarily motivated by achieving a cost-effective public transport system, a key strategic role of the NITP is to allow for interoperability and contestability in the market to avoid being locked into one technology supplier. A national card standard, as provided for the UK by ITSO, mandates a card specification which smartcard suppliers have to provide for if they wish to buy into the system. Release of the New Zealand standard has slipped from being promised in early 2010, to June 2010. At the beginning of this year "with a bit of a push from the politicians" as Brash commented (Interview, 2010), the NZTA announced that an interim standard will provide for limited function<sup>16</sup> integrated ticketing in Auckland by the Rugby World Cup, September 2011. The standard development has caused tension between operators, who want certainty to invest in new equipment, and policy makers who, given previous examples of costly failures, want to get the standard right. As advised in by Peter Lewis, TfL, "People will forgive you for being late, but they won't forgive you for being wrong" (Interview, 2010).

The main barriers or challenges that need to be overcome to achieve integrated ticketing in New Zealand that were highlighted by interviewees are exemplified in Table 3.5. They include government involvement (comments 1, 3 and 9), communication (comments 2, 4 and 5) and the standards issue (comments 6, 7 and 8). Also identified in all the New Zealand interviews was the policy gap

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<sup>15</sup> Anonymity requested

<sup>16</sup> An electronic ticketing system (not integrated, see section 3.1) for travel on buses, trains and ferries in the Auckland region with some tourist travel features.

surrounding abilities to fine passengers for fare evasion, which as Dave Brash from NZTA mentioned, may involve new legislation. As yet this remains uncertain.

**Table 3.5** – Comments from interviews on the delays posed by policy hold-ups and operator conflicts on integrated ticketing developments in New Zealand.

Name, Organisation	Comment	
Greg Ellis, ARTA	1	“The things that tend to create problems on these projects are people, principally politicians changing their minds on policy positions which have a knock on effect onto technology and its settings.”
	2	“There was an attempt in 2001-2002 by ARC [Auckland Regional Council] to get a project up and running in integrated ticketing, but they ultimately got frustrated by the operators, particularly Stagecoach at the time, because from an operator’s perspective ... integrated ticketing is basically a threat, because operators see that their customers, the ones who are catching their buses or their trains or whatever are theirs.”
	3	“Probably under the future legislation it will still be this very fragmented contractually based arrangement, which is sort of I mean, the economic rationalist. Economic rationalism works when you’ve got a real market. ... Public transport is not, no. People don’t have a choice on which bus to get really, or train for that matter.”
Raewyn Bleakly, BCA	4	“Once they [bus operators] switch to a system, they’re very vulnerable because they’re the front people with their customers and if the system isn’t working they still have to deal with that and it’s their responsibility to collect the revenue, and if a system fails there’s a lot of nervousness around, I guess they’re exposure as the front people for that.”
	5	“I’ve never really had feedback from operators that they know exactly what’s going on, exactly when things will happen and exactly what they should be expecting.”
Craig Forret, BCA	6	“I guess a lot of it [legislation changes] will hinge on the way the standards process evolves. ... but how that [standards] policy is enforced and whether that would need to be backed with legislation I guess is something that won’t be clear until that policy is actually solidified.”
Miki Szikszai, Snapper	7	“Probably our primary concern is around certification so it’s one thing to set a technical standard, then you’ve actually got to certify everyone against that, and that area hasn’t really been addressed in any material sense at the moment.”
David Lewry, GWRC	8	“...in saying why doesn’t the national standard provide for more than one media type. ... Which is interesting because most, all, other open standards in operation around the world provide for several media types, you know up to double figures in some cases.”
	9	“I think there’s a view there that until that [the NITP] has found it’s feet a bit more then you know we could be sticking our necks out really.”
	10	“What it’s come down to is ... coming with the background of the expectation that ticketing in some shape or form would be a good thing ... but that’s narrowed itself down into the regional councils current kind of political mandate, which is to investigate electronic ticketing on trains with a possible view to extension to bus, I think it says at a future date or something.”

Another potential political barrier is highlighted in comment 10 in Table 3.5 from David Lewry at GWRC. He states that the council's mandate is to look at electronic ticketing for rail "with a possible view to extension on bus". This statement contrasts with the Regional Land Transport Strategy (RLTS) target to implement a multi-modal integrated ticketing system. More recently the 'rail first, bus later' position was emphasised in a report to the GWRC Economic Wellbeing Committee (Dominion Post, 2011). If this option is followed through it is likely to cause tension between Snapper and their electronic ticketing on buses (which is being incorporated in the Auckland AIFS), the council, and especially the public who expect a full integrated ticketing system (Public Transport Voice, 2011).

### **3.5 Conclusion**

The many advantages of integrated ticketing have been shown in successful public transport projects worldwide. Travel is easier and more convenient for passengers; operators reap the benefits of increased patronage by collecting new passengers and carrying those who may have previously used a specific operator-own ticket; fraud is reduced; and the environmental benefit can be seen from more effective planning of integrated and sustainable public transport networks and fewer cars on the road from modal shift.

There are however many preconditions to achieving these wide-ranging benefits highlighted both in the literature and by transport practitioners in the interviews. First, basic levels of integration should be achieved before attempting to integrate the fares system, including information and services. Second, there should not be an attempt to replicate existing fares systems onto smartcards, or invent further complicated products. Third, regional councils and authorities, central government, and operators must be willing to share information in order to achieve the best outcome for the public transport system. Whilst the general perception of key stakeholders was that there are many opportunities for integrated ticketing improving public transport in New Zealand, this third point, the interaction between government, councils and operators, was highlighted as an area which must improve to achieve a successful integrated ticketing system.

Wellington is in the advantageous position of having international and local experience to learn and develop from. Although integrated ticketing developments in Auckland are likely to have slowed progress in Wellington, other integrated transport projects, including rail upgrades and realtime information for buses, have made head-way and will provide a solid ground from which to launch integrated ticketing. GWRC is committed to providing a sustainable integrated land transport network (GWRC, 2010). However, how can council planning decisions, such as implementing integrated ticketing, actually affect people and their mode choice? How can people's decisions be swayed to use public transport more? The following chapter presents a literature review of the psychological theories behind what influences public transport use. The integrated psychological model used for assessing the influence of intention to use public transport and actual public transport use behaviour in Greater Wellington is introduced. The results of the model are analysed in Chapter 5, followed by an assessment of public transport and integrated ticketing perceptions for Greater Wellington from the online survey results. The results are synthesised and conclusions drawn in Chapter 7.



## **Chapter 4 – Choosing public transport: decisions and behavioural concepts**

Previous chapters have outlined the need for integrated land transport and highlighted the role public transport can play in reducing car use and its associated environmental and social problems. As with many solutions to environmental problems that are caused by human behaviour, a solution to reducing car use relies in part on changing human behaviour (Staats, 2004). This chapter will identify some key psychological theories on environmental behaviour and suggest how the theories can be applied to reducing car use and encouraging public transport uptake.

Public transport systems offer a more sustainable mode of travel than car use. However, the car is often the dominant mode of travel and changing people's behaviour to favour more sustainable modes is notoriously difficult. This is in part due to a number of psychological and structural barriers. Psychological barriers attempt to explain the psychological reasons why people do not act in a pro-environmental manner, such as driving rather than using alternative modes. They are considered alongside structural barriers, which explain the physical and contextual factors which influence decision making. The existence of psychological and structural barriers can lead to non-environmental behaviours, even where a person may display pro-environmental attitudes and behaviours on other occasions. For example, a family may live in a rural area, grow their own food, compost and recycle, but have no access to public transport services and so use a car to take the children to school. Thus in assessing what motivates pro-environmental behaviour, specific behaviours should be considered separately.

Is a person's pro-environmental orientation a strong factor in decisions to use sustainable transport modes such as public transport over their car? Or, are contextual factors such as time and cost, stronger predictors of behaviour? This chapter will explore the dominant theories that have been used to explain pro-environmental behaviours and the literature on barriers to reducing car use. The rationale underlying this chapter is that once the decision making processes on

transport mode choice and barriers to reducing car use are better known, more effective decisions and policy programmes can be initiated that encourages alternative transport modes such as public transport.

Section 4.1 below will outline how the social dilemma theory, introduced in Chapter 1, relates to theories on pro-environmental behaviour. Three important behavioural theories are discussed and then applied to an integrated theoretical modelling approach which is used in this study. Following on, section 4.2 reviews other influential factors impacting on pro-environmental behaviour, from structural barriers such as access to resources, to psychological barriers like engrained habits. The section concludes suggesting implications of these theories and barriers for policy on reducing car use and encouraging alternative modes.

## **4.1 Pro-environmental behavioural theories**

Pro-environmental behaviour research seeks to explain human actions which have a negative environmental impact, and understand how these actions can be changed (Gardner & Stern, 2002). Changing behaviour can be direct, like reducing car use, or indirect by shaping the context or policies that encourage behaviour (Stern, 2000). Stern (2000) distinguishes between intent-orientated and impact-oriented pro-environmental behaviour. The intent-orientated approach recognizes intention as an independent cause of behaviour. The actor behaves in a certain way with the intention of benefiting the environment, even though effects may be minimal. Intent-orientated research focuses on the motivations behind intentions to act in a pro-environmental manner in order to understand and then change the behaviour. The impact-orientated approach identifies behaviours that have a large impact on the environment, such as household energy use and car use (Poortinga, Steg & Vlek, 2004). Both approaches are important for policy interventions attempting to encourage pro-environmental behaviours. The impact-orientated approach can be used to define what behaviours need to be changed. In conjunction, the intent-orientated approach can be used to explain why the behaviour is carried out and then used in attempts to change that behaviour (Stern, 2000; see also Steg & Vlek, 2009).

This research combines theories of pro-environmental behaviour (discussed in this section below) to understand how pro-environmental intentions motivate public transport behaviour over car use, as identified research sub-question 2 (Chapter 1, section 1.5). Also, perceptions of public transport and integrated ticketing, a policy intervention to encourage public transport use, are assessed to see how integrated ticketing may impact on public transport use.

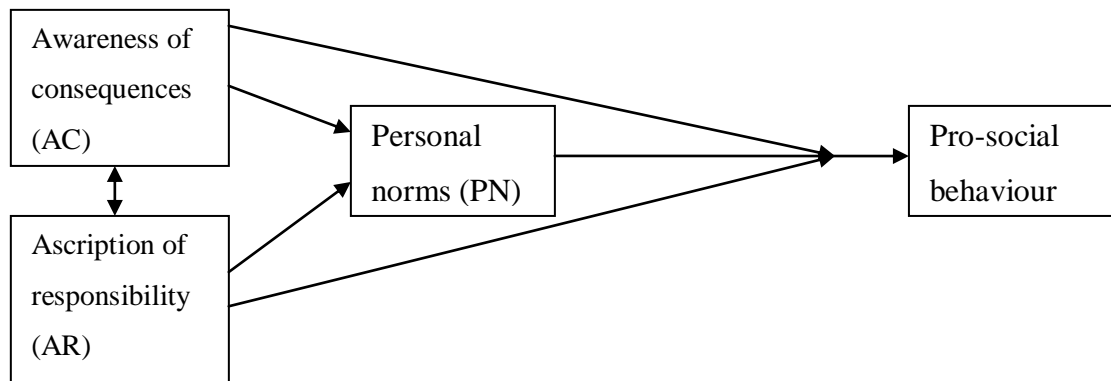
Intervention policies are often needed because pro-environmental behaviours are comparable to social dilemmas, where the interests of the individual are inconsistent with the interests of the collective (Joireman, et al., 2004; Tertoolen, van Kreveld, & Verstraten, 1998). The social dilemma problem was coined by Garrett Hardin (1968) as 'The Tragedy of the Commons'. Hardin recognised the limited resources of the Earth and the inherent nature of humans to use them up as quickly as possible for their own benefit, disregarding the negative consequences for future generations. According to the theory, this inherent nature to consume arises because rational individuals are unlikely to cooperate in situations which minimise their personal benefits over the benefit of a common interest or group, even if there are mutual gains in the long run. The social dilemma theory helps us to understand how behaviour is driven towards acting in an egoistic or altruistic manner.

In line with the social dilemma theory researchers have suggested that pro-environmental behaviour is encouraged by either pro-social interests (acting in the interests of society and the environment) (Milfont & Duckitt, 2006; Stern, Dietz, Abel, Guagano, & Kalof, 1999), or self-interests (acting to minimise personal costs and risks) (Boldero, 1995; Chan, 1998). The tension between acting for oneself, or for the community, is present in many social situations such as paying tax (Staats, 2004). However, environmental situations differ because the problems are often delayed in time and consequences spread far beyond the place where they were generated. For example, carbon dioxide emitted in a city now will contribute to warming the global atmosphere for hundreds of years (Hansen et al., 2008). Environmental behaviours are therefore affected by social and temporal issues (Milfont, 2010; Milfont & Gouveia, 2006).

There are numerous psychological theories and models that attempt to explain how a person's behaviour is determined, and what shapes behaviour and decisions to behave in a particular way. Stern (2000) suggests that four types of variables, or constructs, lead towards pro-environmental behaviour. These variables include attitudinal factors (norms, beliefs and values), contextual forces (money, incentives and resources), personal capabilities (skills and knowledge) and habit. Three dominant theories are used to explain pro-environmental behaviour and encompass the aforementioned variables, excluding habit (discussed in section 4.2). The theories also include the 'collective versus the individual' element from the social dilemma theory. The norm-activation model theory (NAM) developed by Schwartz (1977), and an adaptation the value-belief-norm theory (VBN) (Stern et al., 1999), have influenced research on pro-environmental behaviour resulting from pro-social motivations. The theory of planned behaviour (TPB) (Ajzen, 1991) models pro-environmental behaviour based on self-interest. There are other theories that have been used to explain pro-environmental behaviour, which include Triandis' 1977 theory of interpersonal behaviour and Gatersleben and Vlek's 1998 Needs-Opportunities-Abilities model (Bamberg & Schmidt, 2003). However, the NAM, VBN and TPB are the dominant theories used in recent literature (Abrahamse, Steg, Gifford, & Vlek, 2009; De Groot & Steg, 2009; Wall, Devine-Wright & Mill, 2007).

#### **4.1.1 The norm activation model (NAM) and the value-belief-norm theory (VBN)**

The NAM helps to explain all forms of altruistic behaviour. Initially it was used to explain helping behaviour, but has also been used to explain pro-environmental behaviours. Pro-environmental behaviours, such as recycling, have been shown to be a unique type of altruistic behaviour because the actions tend to benefit others with little or no direct benefit to the actor (De Groot & Steg, 2009; Ebreo, Vining, & Cristancho, 2002). In the NAM personal norms are argued to strongly influence behaviour as shown in Figure 4.1 below.



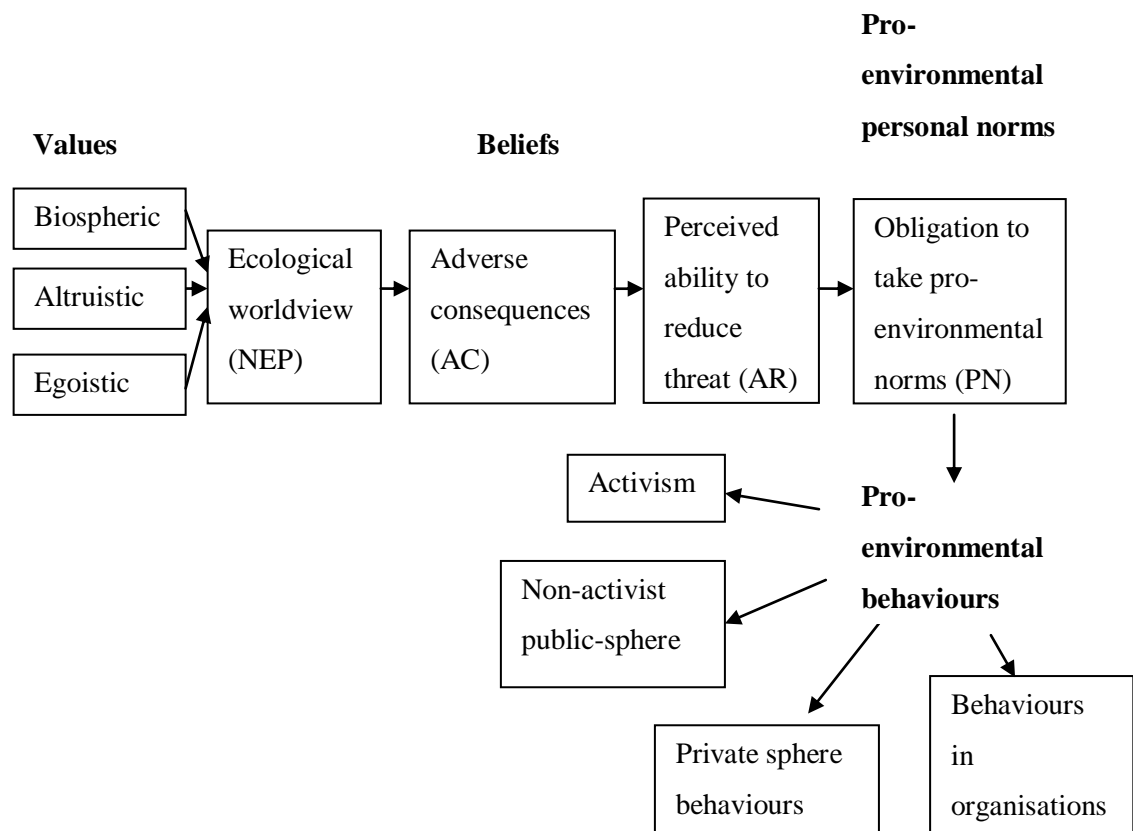
**Figure 4.1** - Schwartz's NAM showing personal norms activated by AC and AR, resulting in pro-social behaviour. Source: (adapted from Wall et al., 2007).

Personal norms structure a person's morals, contributing to acting in a certain way as right or wrong. Schwartz assumed that personal norms directly influence decisions to act in a pro-social manner. Therefore, if one acts inconsistently with one's personal norms a feeling of guilt will be experienced (Bamberg, et al., 2007). According to the NAM, two factors must be present for the person to act in a pro-social manner. To determine personal norms, whether an action is right or wrong, the person first has to perceive that there is a problem and that the problem has negative consequences for others (awareness of consequences). If pro-social action can be taken, the costs to oneself have to be weighed up against the costs of helping the other. If the costs to oneself are deemed to be too great, the actor will 'neutralize' their personal norm expressing denial, lack of ability, effectiveness or responsibility as justifications for not acting in a pro-social manner (responsibility denial). This theoretical model therefore has three main constructs: personal norm, awareness of consequences, and responsibility denial. Responsibility denial is often substituted for ascription of responsibility in studies with a focus on pro-environmental behaviour because it encompasses beliefs about personal responsibility (Bamberg & Schmidt, 2003; Wall, et al., 2007). The model can be conceptualised as shown in Figure 4.1 above.

The NAM has been effective in studies investigating pro-environmental behaviour in recycling (Guagnano, Stern, & Dietz, 1995) and in energy efficiency studies (Wilson & Dowlatabadi, 2007). In contrast, studies in the transport field have produced conflicting results on the importance of personal norms in the NAM. Bamberg and Schmidt (2003) found that personal norms were not a contributing

factor in influencing intent or behaviour to reduce car use amongst tertiary students in Germany. Conversely, personal norms were closely associated to intentions to reduce car use in a study of university commuters in England (Wall, et al., 2007). Bamberg et al. (2007) found an indirect relationship between personal norm and the use of public transport, where the personal norm was largely affected by social norms, that is, what society and people close to the actor think of the behaviour. The disparities in research findings may be due to place or context, but also highlight the role of other influencing factors on intention and behaviour. Further research is required to settle this debate (see for example Eriksson, Garvill, & Nordlund, 2008).

The NAM assumes that awareness of consequences and ascription of responsibility are the only influencing factors of personal norms. It fails to explain factors other than personal norms which influence behaviour. Schwartz developed the NAM with all altruistic behaviours in mind and not specifically pro-environmental behaviour; although outcomes that are pro-social will inherently be pro-environmental because of the value of the environment to society (Stern, et al., 1999). Due to these limitations, the NAM was adapted by Stern et al. (1999) in the value-belief-norm theory (VBN) with a focus on four pro-environmental behaviour outcomes rather than Schwartz's pro-social. The VBN is more focused than the NAM explaining the pathway of how different values influence beliefs and specific pro-environmental behaviour groups. Beliefs include an ecological worldview where human activities are inextricably linked to the fragility of the environment which is based on the 1978 New Ecological Paradigm (NEP) (Dunlap, Van Liere, Mertig, & Jones, 2000). In the VBN Schwartz's awareness of consequences affects ascription of responsibility, which influences personal norms to act in a pro-environmental manner. Pro-environmental behaviour is not generalised but distinguished as four action clusters with different levels of participation. The components of the VBN are shown in Figure 4.2 below.



**Figure 4.2** - Stern's value belief norm theory. Source: (adapted from Stern, 2000).

The VBN theory represents the development of attitudinal constructs in the link between individuals intending to act in a pro-environmental manner and acting out pro-environmental behaviours. It does not distinguish intention as independent of behaviour. However, pro-environmental intention is not the only influence on behaviour. Structural and psychological barriers (discussed in section 4.2) can explain the 'gap' between pro-environmental intention and action (Swim et al., 2009).

Pro-environmental theories should not be used without consideration of context either (Stern, 2000). Context includes time, resources, money and rewards and has been shown to affect pro-environmental attitudes and behaviour (Guagnano, et al., 1995). Where contextual factors are significant such as the high cost of insulating a home, attitudes may be sufficiently suppressed to prohibit environmental behaviour (Black, Stern, & Elworth, 1985). The theory of planned behaviour, discussed below, captures some of these contextual factors in the construct perceived behavioural control.

#### **4.1.2 The theory of planned behaviour (TPB)**

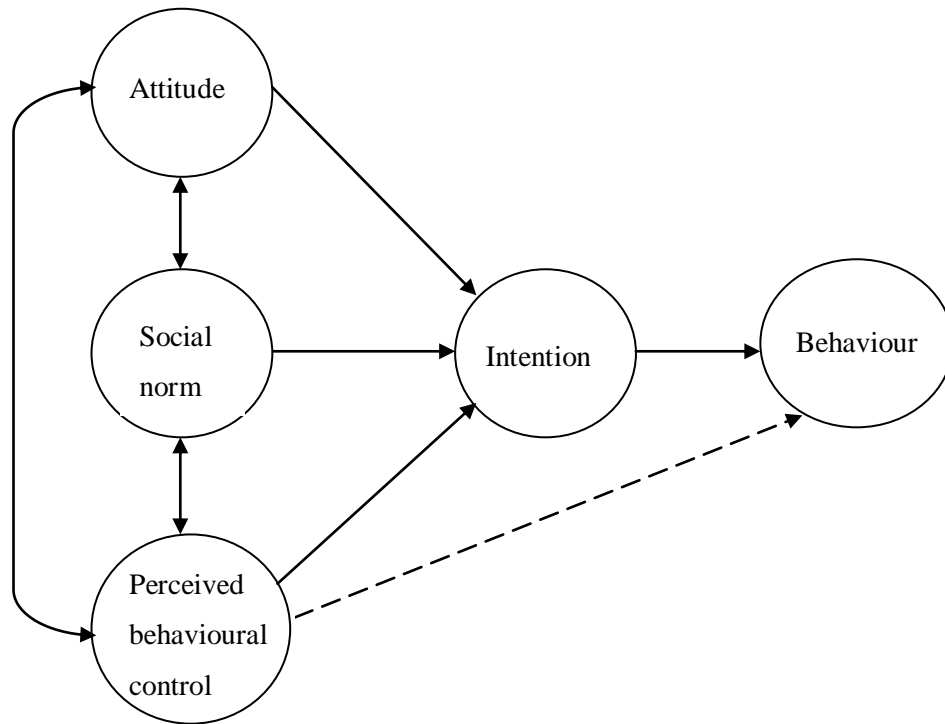
The TPB (Ajzen, 1991) differs from NAM and VBN in several ways. The purpose of the TPB is to explain and predict behaviour through intentions to act for oneself, in contrast to acting for pro-social or pro-environmental reasons in the interest of the collective. As discussed above, intentions do not necessarily lead to actual behaviour so it is important to distinguish the two components. The psychological and structural barriers prohibiting the link from intention to behaviour are discussed further in section 4.2.

The TPB stems from the theory of reasoned action (TRA) developed by Fishbein and Ajzen in 1975. The TRA assumes that behaviour is caused by three factors: attitude towards the behaviour; subjective or social norms; and behavioural intention. The TRA was extended to include perceived behavioural control, the extent to which a person perceives they have control over their behaviour, as a third predictor of intention. The inclusion of perceived behavioural control helped to generalise the TRA to be used in situations where the actor does not have complete volitional control over their behaviour (Ajzen, 1991). For example, a person may want to switch from travelling by car to public transport but this is conditional on whether they have access to public transport. For both the TRA and TPB, intentions are the focal cause of behaviour. The TPB assumes that intentions to carry out a particular behaviour encompass motivational factors such as resolve and effort. In contrast to the NAM and VBN, personal norms are not included as an influencing behavioural factor. Instead, intentions and behaviour are formed as a result of attitudes, social norms and perceived behavioural control, as shown below in Figure 4.3.

Attitude describes the person's general disposition towards the behaviour, whether it be favourable or unfavourable. Attitude encompasses a person's behavioural beliefs (about the positive or negative consequences of the action) as well as values that one would ascribe to the outcome of the action. Social norms describe the expected beliefs about what persons close to or important to the actor think about him/her carrying out the act. Perceived behavioural control is the extent to which the actor believes he/she can carry out the behaviour with all available resources



and capabilities. The model also predicts that when perceived behavioural control is closely aligned with objective behavioural control<sup>17</sup>, such as goal setting, it can directly predict behaviour, which is shown by the dashed line in Figure 4.3.



**Figure 4.3** –The theory of planned behaviour. Source: (adapted from Ajzen, 1991).

*Note:* The model also includes a measure of actual behavioural control, shown by the dashed line, which can directly predict behaviour (see footnote 17).

The TPB has been successfully used to explain a range of pro-environmental behavioural outcomes from recycling behaviour (Boldero, 1995; Chan, 1998), carpooling and energy conservation (Laudenslager, Holt, & Lofgren, 2004) and public transport use (Heath & Gifford, 2002). Despite its original design to explain behaviours of self-interest, the TPB has been shown to have value in helping to explain factors influencing pro-environmental behaviours such as social norms and perceived behavioural control. The TPB is limited in explaining the effect of personal norms, values and beliefs which have been shown in the NAM and VBN to also influence pro-environmental behaviour outcomes. It is likely therefore that

<sup>17</sup> Objective behavioural control is the level of actual behaviour control: where it is known that there are enough resources and opportunities to fulfil the behaviour it is more likely that the behaviour will be carried out (Ajzen, 1991). However, most everyday situations include an element of uncertainty. Therefore, perceived behavioural control is often used in research applying the TPB framework (Armitage & Conner, 2001).

an integrated theoretical approach may better help to explain pro-environmental behaviour changes.

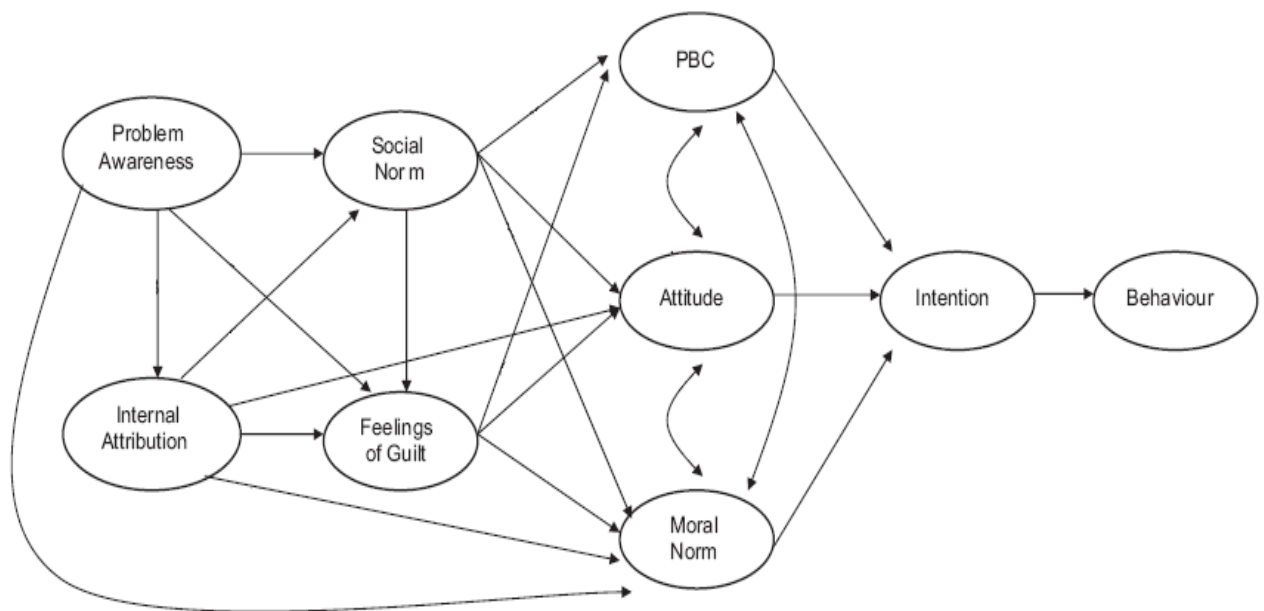
#### **4.1.3 An integrated theoretical approach**

The NAM and TPB are the most common theories used to try and explain pro-environmental behaviour in the transport domain. The theories are based on the assumption that pro-environmental behaviour takes place for pro-social or self-interest reasons, respectively. In the context of car use it would follow that people who were solely concerned in maximising their own well-being would be more likely to drive, compared to those who demonstrated pro-social attitudes who would be more likely to take public transport because it is better for the environment and society as a whole. Whilst there is some evidence to suggest this is the case (Joireman, et al., 2004), in reality motivations for pro-environmental behaviour may be for both pro-social or self-interest reasons due to the importance of context (cost, time and convenience factors). Thus, both reasons should be accounted for in an attempt to understand people's motivations for using sustainable travel modes.

It is evident from the literature that pro-environmental behaviour is a complex phenomenon and using one theory to explain behaviour patterns may not suffice (Anable & Shaw, 2007; Bamberg & Schmidt, 2003). The NAM, VBN and TPB have different constructs, each with their own strengths and weaknesses for explaining pro-environmental behaviour. Hines, Hungerford, & Tomera (1986/7) conducted a meta-analysis to identify the constructs associated with pro-environmental behaviour. The authors validated the importance of psycho-social constructs (including awareness of environmental problems, attitudes and perceived behavioural control) explaining pro-environmental behaviour mediated through intention. Situational or contextual factors were also shown to have a direct influence on behaviour bridging the intention-behaviour gap (Hines, et al., 1986/7). The paper encouraged a stream of further research. However until recently, few involved an integrative approach (Bamberg & Möser, 2007; Peters, Gutscher & Scholz, 2011).

Since the 2000s researchers have been questioning the need for separate theories that produce conflicting results and are instead calling for a synthesis of models and theories (Stern, 2000). Efforts have been made to combine constructs from different theories with the conclusive result that combinations of constructs from different theories are influential, although often to different extents, in predicting pro-environmental intention and behaviour (Hunecke, Blöbaum, Matthies, & Hoyer, 2001; Peters et al., In Press; Wall, et al., 2007)

The integrated modelling approach suggested in the meta-analysis by Hines et al., (1986/7) was updated by Bamberg and Möser (2007). A similar model, using the updated meta-analysis as a basis, was tested in research by Bamberg et al., (2007). Both integrated models use the same constructs including elements from the NAM, VBN and TPB. The models are not linear like the NAM, VBN and TPB; instead the constructs influence each other in the pathway to intention and behaviour. Intention and behaviour are the only variables which depend upon each other. Figure 4.4 depicts the model resulting from the meta-analysis by Bamberg and Möser (2007).



**Figure 4.4** – The integrated theoretical model resulting from an updated meta-analysis explaining what constructs lead towards pro-environmental intention and behaviour. PBC = perceived behavioural control and internal attribution = awareness of consequences, moral norm = personal norm. Source: (Bamberg & Möser, 2007).

The meta-analytical study (Bamberg & Möser, 2007) aimed to identify the constructs leading to pro-environmental behaviour, and the strength of the relationships between these constructs. In comparison the Bamberg et al. (2007) study focused specifically on the role of personal norms in decisions to use public transport. Therefore, the pathways linking the constructs differ slightly to the model shown in Figure 3.4. The differences are: no link between problem awareness and awareness of consequences; a link between problem awareness and guilt instead of personal norm; and no link between guilt and perceived behavioural control or attitude, but linking guilt and intention directly. Bamberg et al. (2007) also assess the effect of past behaviour to see whether public transport habits strongly influence actual behaviour as suggested in the literature (see section 4.2.2 below). Both models were tested in this research. However, the past behaviour construct used by Bamberg et al. (2007) could not be tested because of the time needed to collect a ‘before’ data set to assess public transport habits, and an ‘after’ data set to assess present public transport use (see limitations in Chapter 7). It was expected that the Bamberg and Möser (2007) model would fit the data better because the meta-analysis aim is more closely aligned with the present research (sub-question 2 concerns the relationship between pro-environmental intention and public transport behaviour). The results of both models are compared to the results of the present study in Chapter 5. An overview of the Bamberg and Möser (2007) model depicted in Figure 4.4 is outlined below.

The right hand side of the model in Figure 4.4 resembles the TPB, except that the authors have substituted social norm as a direct predictor of intention for moral or personal norm. Social norm is set further back in the process as a contributing contextual variable that influences what behaviour is seen as appropriate, contributing towards feelings of guilt, perceived behaviour control, attitude and personal norm. The use of personal norm in explaining specific environmental intentions has been tested by other researchers and found to be statistically significant (Abrahamse et al., 2009; Harland, Staats, & Wilke, 1999; Wall, et al., 2007). Reviews of the TPB also suggest that after checking for perceived behaviour control and attitude, social norm has no direct effect, or a weak effect on intention (Ajzen, 1991; Armitage & Conner, 2001). The left hand side of the model includes

variables from the NAM and VBN that are important determinants of personal norms such as problem awareness (similar to the VBN's awareness of adverse consequences), internal attribution (awareness of consequences in the NAM), and guilt (similar to the NAM/VBN ascription of responsibility).

The position of personal norm reduces the pro-social or self-interest bias implied by the NAM/VBN and TPB, respectively. The formation of personal norms is likely to be reliant on social and cultural contexts and psychological factors encompassed in social norms. An awareness of the problem and its cause or attribution are both important elements in determining pro-environmental behaviour as demonstrated in the VBN. Internal attribution can lead to feelings of guilt, which can lead towards a personal sense of obligation (moral norm) to carry out the behaviour. Guilt can also be influenced by social context and norms (Bamberg & Möser, 2007).

The integrative model includes the essential variables from the dominant models, the NAM/VBN<sup>18</sup> and TPB. The variables in the integrative model have multi-linear connections where it is recognised that pro-environmental behaviour is complex and dependant on a range of factors from general problem awareness to specific attitudes about the behaviour. The model is inclusive and not biased towards egoistic or altruistic behavioural motivations and is tested in this research to address research sub-question 2 'How do pro-environmental intentions affect public transport use?' If the model variables prove to influence intentions to use public transport, as evidenced in the Bamberg et al. (2007) study, the knowledge can be used to help facilitate behaviour changes from policy interventions. The psychological constructs attend to the decision-making processes of intentions to use public transport. For a policy intervention aiming to increase public transport use these constructs will be useful to know in order to encourage pro-environmental behaviour change responses. Also important in informing intervention responses is the gap between intention to act and actual behaviour which Hines et al. (1986/7) attribute to contextual factors such as cost. What are the barriers that cause this gap?

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<sup>18</sup> Apart from the problem awareness construct, elements included from the VBN are the same as those which make up the NAM: ascription of responsibility and personal norm. The integrated model does not consider values and therefore future reference to the model components focus on the NAM rather than the VBN.

The answer is necessary in any attempt to change behaviour to result in more pro-environmental outcomes and is covered in section 4.2 below.

## **4.2 Barriers to reducing car use and using public transport**

The theories and integrative model suggested above can provide an understanding of what psychological factors are important in decisions to use public transport. Understanding what influences these decisions will be useful in policy interventions designed to encourage public transport use. As acknowledged above, there are other effects on intentions to act in a pro-environmental manner which result in an intention-behaviour gap. The effects on this gap may be strong enough to discourage any pro-environmental behaviour. The effects include both structural and psychological barriers, which are considered below.

### **4.2.1 Structural barriers**

Structural barriers include physical, cultural and institutional means by which people are influenced in some way not to use public transport and, or, to continue habitual rates of personal car use. Some structural barriers are incorporated into the integrative model. The political and physical environment in which you live, or have experienced living in, affects how you perceive environmental problems and therefore your social norms and attitudes on how to act. Scale, location, infrastructure and resources are all examples of structural barriers which are likely to affect travel mode choices. Increasing urbanisation and urban sprawl often leads to increasing car ownership leading to decreasing public transportation use (Bresson, Dargay, Madre, & Pirotte, 2003). Integrating land-use and transport planning then becomes essential for encouraging walking, cycling and other active modes of transport including the use of public transport (Ewing, Bartholomew, Winkleman, Walters, & Chen, 2008; Johnston, et al., 2005).

#### ***Physical barriers***

Infrastructure is part of the urban environment and can be engrained in society so much so that attempts to change the physical urban layout are often met with

resistance. A recent example of resistance against change was the backlash against the proposed alterations to the pedestrianised section of Manners Mall in Wellington City into a two-way bus route with pavements either side. The alternation was proposed to optimise bus routes and reduce traffic congestion in the area. A community action group called 'The City is Ours' unsuccessfully appealed to the Environment Court against the change costing the public sector hundreds of thousands of dollars (Dominion Post, 2010). Despite consultation, other measures are obviously needed to overcome these deeply engrained barriers. This is important in light of any changes to the public transport system such as the introduction of integrated ticketing.

Social context including location and population demographics may also influence reactions to policy aimed at reducing personal car use. For example, Bamberg et al. (2007) studied the social characteristics behind attitudes towards car use versus public transport use in two urban areas of Germany, Frankfurt and Bochum/Dortmund. In Frankfurt they identified stronger feelings of guilt from car use and more positive attitudes towards, and intent to use, public transport than in Bochum/Dortmund. This socio-demographic data corresponded towards an actual public transport use of 10% of everyday trips in Frankfurt compared with only 4% in Bochum/Dortmund. The results highlight the importance of social context in framing behavioural decisions.

### ***Institutional barriers***

Institutional barriers typically involve decisions made by governments and, or, large organisations. An example is maintaining low taxes on petrol in the United States which in turn encourages car use by making it a cheap option. Similarly New Zealand has a comparatively low fuel tax which is the fourth lowest in the OECD (MED, 2010). Another large institutional barrier is the low spending on public transport against an increasing investment in road infrastructure in New Zealand (discussed in Chapter 1). Split-incentives should also be avoided (Swim, et al., 2009). For example, if a government claims to have environmental goals, such as New Zealand promoting a 'Clean and Green' image to the tourist market, these goals should be acted upon and not against. A political campaign to reduce car use

and encourage public transport should be backed up financially and in line with broader environmental policy and other political goals.

### ***Cultural barriers***

Culturally, we live in an era where the car symbolises wealth, independence and freedom (Kenyon & Lyons, 2003). Changing these perceptions, educating people about the long-term negative effects of personal car use and improving alternative mode options for travel are some of the greatest challenges developed countries face. Economic barriers are also prevalent in society. For many small businesses and individuals giving up driving is not an economically viable solution (Swim, et al., 2009) because they need to deliver goods or go food shopping at the cheapest supermarket located far from home.

Improving information and education on the environmental and social benefits of reducing car use is an essential but difficult task. It is constrained by the structural barriers briefly discussed, but also by other psychological barriers, explained below.

#### **4.2.2 Psychological barriers**

There is a gap between attitude and behaviour (Swim, et al., 2009); between the perception that ‘not driving and using public transport is a good idea’ and ‘but I drive anyway’. Some of the psychological barriers that explain this gap can be identified in the integrated model described in section 4.1.3. These include problem awareness, awareness of consequences, social norms and perceived behavioural control. Other psychological barriers, including cognitive dissonance, the effect of lack of knowledge and habit, are discussed in this section to further show how policies to encourage public transport use or reduce car use may be accepted or rejected.

### ***Cognitive dissonance***

Cognitive dissonance will arise where there is a contradiction between an attitude about something and the related behaviour. For example, most smokers know that it is bad for their health but they smoke regardless. People want conformity, and in order to stimulate it the actor will change either their attitude or their behaviour.



The result of cognitive dissonance could be either positive or negative for the environment. For example, in the case of personal car use an individual could change their attitude to take a less negative approach to driving, or change their behaviour to drive less (Tertoolen, et al., 1998). Influencing cognitive dissonance, or the intention-behaviour gap, in favour of pro-environmental behaviour is hard due to the many other barriers mentioned in this chapter. Attempts to encourage behaviour change range from: encouraging voluntary change through information campaigns or increasing convenience; or obliging change through rules and regulations. The successes and failures of these measures are considered below.

### ***Lack of information***

Lack of information about different travel mode options can be a significant barrier to public transport use (OECD, 2004). The provision of information is often used as a way to overcome a lack of knowledge and influence behavioural decisions in favour of a new policy. However, several studies indicate that whilst information provision may result in a change of attitude and knowledge about the topic, there is often little or no change in behaviour (Tertoolen, et al., 1998; Tertoolen, Verstraten, Zwerver, van Rompaey, Kok & Berk, 1995). Further, research suggests that information could result in a negative effect where participants claimed it would be futile for them to reduce their driving, if others did not (Tertoolen, et al., 1998). This is the free rider concept; a situation common in social dilemma problems where there is temptation to take advantage of a collective situation without experiencing personal costs. The free rider concept is a well-known universal problem (Ostrom, 2000). Free riders exhibit a “mental blockage” (Brög, 2004, p81) which impedes any behaviour change effects from informational campaigns unless people become convinced that others will also change their behaviour. Tertoolen et al. (1998) conclude that where attitudes and behaviour do not concur, attitudes, rather than behaviours, are more likely to change. The reasoning behind this may be cognitive dissonance, therefore changing the attitude to align with the behaviour, or psychological reactance (Tertoolen, et al., 1998).

Reactance is a person’s reaction to reinstate a behaviour if faced with it being abolished or threatened. This state of mind happens because people feel pressured

to change. Therefore, persuasion techniques are resisted and the opposite effect on attitude or behaviour that was intended ensues. Reactance can occur as a consequence of mistrust in government or policy messages, therefore gaining the affected person's trust is vital in an attempt to change their behaviour (Swim, et al., 2009). In the case of encouraging public transport uptake and reducing car use, it must be proved that alternative travel modes are available (Wall, et al., 2007). Alternative modes must be available and must deliver the promised benefits to reduce the negative perception often associated with switching from driving to other modes such as public transport (Brög, Erl & Mense, 2004; Stradling, Meadows, & Beatty, 2000). If effectively delivered, public transport can be marketed as having almost as many benefits as private car use (such as speed, comfort, reliability and coverage). Marketing can then effectively help to encourage a mode shift away from car use.

Two marketing techniques designed to overcome lack of information as a barrier to mode switching are highlighted in the OECD report 'Communicating Environmentally Sustainable Transport - the role of soft measures' (OECD, 2004). Public Awareness Strategies involve information sharing between members of the public and decision making bodies and helped with the successful implementation of traffic calming measures in Graz, Austria (Brög, 2004). Individualised Marketing techniques focus on direct localised information provision to target groups followed by a motivation campaign. The first Individualised Marketing trials in Germany saw public transport use double in two areas, mainly amongst off-peak users. Later campaigns increased public transport use by 28% in Viernheim, Germany and 21% in South Australia, whilst also decreasing car use by 12% and 14% respectively (Brög, et al., 2004). The core to success is communication, trust and delivery.

### ***Habit***

Habitual behaviour patterns are perhaps the most significant psychological barrier to change. To change habitual behaviour requires motivation, encouragement, personal rewards and sometimes even force; resulting in first an attitudinal change and then a change in behaviour (Swim, et al., 2009). Travel behaviour and travel mode choice is often automatic and forms habitual behaviour. The initial choice is

often made, influenced by social norms and perceptions of the travel mode available. Once the choice has been made, enquiring into travel mode alternatives is not frequently undertaken (Kenyon & Lyons, 2003).

People often have negative perceptions of public transport and elevate the status of travelling by car, despite their actual experiences (Brög, 2003). Public transport trips have been described as “cognitively ‘front-loaded’ and planful” (Stradling, Meadows, & Beatty, 2000, p208). So when faced with a choice of driving or taking public transport, driving is predicted to be the easiest and most likely option. Once driving has become a habitual decision, reducing car use becomes even more challenging (Bamberg & Schmidt, 2003; Verplanken, Aarts, van Knippenberg, & Moonen, 1998). Planning and goal-setting are important factors in attempts to maintain behaviour changes and change habits (Eriksson, et al., 2008).

Interestingly, a study on the effect of an intervention on the strength of car use habits, actual car use and personal norms concluded that the intervention is most likely to reduce car use amongst those with a *strong* car habit and a strong personal norm (Eriksson, et al., 2008). The explanation for this result is that those with weak car habits (i.e. those who drive occasionally but also use alternative transport modes) already engage in more decision making on travel mode choice and so are less likely to be affected by an intervention directed at changing those choices. Also those with weak personal norms lacked the motivation to change. This reinforces the complex nature of decision making, and the importance of personal norms as well as context in the formation of pro-environmental intentions and behaviours.

Often pro-environmental behaviour is not inhibited by negative attitudes towards the behaviour, but by not having a strong positive attitude towards perceived behavioural control. Therefore an incentive or extra encouragement to act in a pro-environmental manner is required. For example people are often motivated to recycle, but usually only do if they are provided with a bin and pick up facility (Staats, 2004). These research findings provide valuable insight into how suggested policies to promote pro-environmental behaviour may work. These implications are explored below for policies to reduce car use and encourage public transport.

### **4.3 Implications of barriers for reducing car use and encouraging public transport**

There are several implications of psychological findings for policy. Pro-environmental behaviour is affected by social context and individual beliefs. Overcoming lack of knowledge through information provision is not an effective intervention on its own, but is necessary in changing engrained attitudes. Habit is a barrier, but may be interrupted if the intervention is targeted at heavy car users. Trust that others will change and trust in governing institutions is important to reduce the risk of interventions causing opposite effects from those anticipated (Van Vugt, 2009). Together with the structural barriers including location, resources and infrastructure it is clear that policy interventions need to be carefully designed, or at least to consider the aforementioned influences on behaviour in predicting intervention outcomes.

In an ideal world, transport policy interventions would include cooperation and coordination between transport planners, architects, policy makers, environmental psychologists, sociologists and the general public. Attempts have been made to better integrate decision making into policy. The Wellington Regional Land Transport Strategy (RLTS) 2007 – 2016 included reviews from economic, environmental and health impact assessments, which carried through to the RLTS 2010 – 2040 (GWRC, 2010). Notably, psychological assessments were absent. There has been more success in Europe in adopting an integrated approach. For example, Brand and Boardman (2008) integrated social, economic and demographic analysis into advice on political decision making. Integrated decision making is more likely to result in a combination of suggested implementation measures, reducing the chances of failure from just one intervention.

Using a range of intervention types including ‘push’ and ‘pull’ measures are likely to be most effective at reducing car use in the long run (Stern, 2000) and gain both public and political acceptance (Gärling & Schuitema, 2007). Push measures aim to make car travel more difficult through measures such as increasing fuel costs and parking charges or limiting car access areas. In contrast, pull measures aim to

increase the attractiveness of alternative travel modes through measures such as improving information, improving public transport quality or designating more bus and cycle lanes on roads. Pull measures are often more acceptable to the public where they are helped and not forced to make sustainable changes to their lifestyles (Stradling, et al., 2000). Integrated ticketing is an example of a ‘pull’ measure increasing the attractiveness of public transport, although the cost of the project is likely to be significant, involving public, industry and government consultation processes.

## **4.4 Conclusion**

An abundant number of studies use environmental behaviour models to try and explain the motivations for acting in a pro-environmental manner. The literature reviewed in this chapter highlights the importance of adopting an integrated theoretical approach to fully understand what contributes towards individual pro-environmental behaviours. Aside from the theoretical approach, a number of psychological and structural barriers have been shown to affect reactions towards certain policy types. These barriers are not explained specifically in the integrated theoretical model, but may affect the strength of certain constructs in the model. For example information provision could enhance awareness of consequences leading to increased intention to act in a pro-environmental manner.

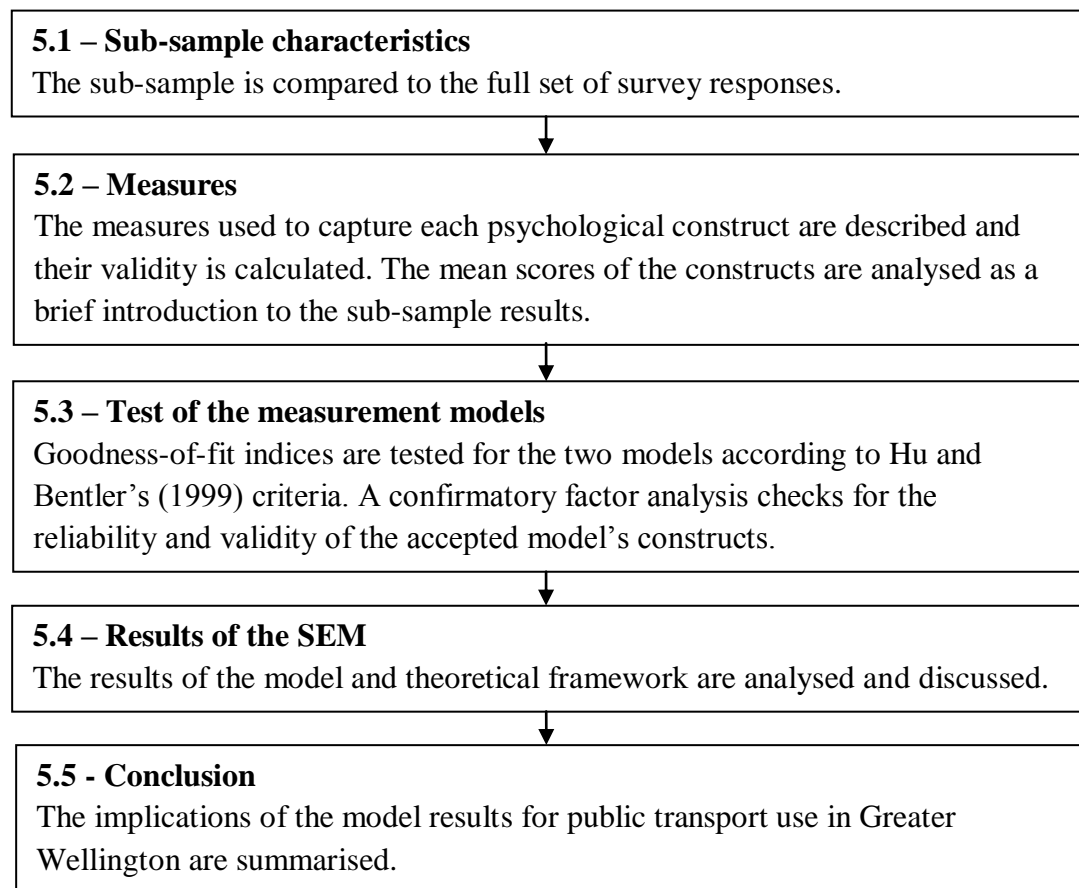
The present research tests the integrated theoretical models proposed by Bamberg and Möser (2007) and used by Bamberg et al., (2007) to address research sub-question 2, ‘how do pro-environmental intentions affect public transport use?’ in Greater Wellington. The objective is to better understand the relationship of the psychological constructs leading towards intentions to use public transport for those who also have the option to drive, and to see whether intention to use public transport leads to actual public transport use. The results of testing the models with data collected from an online survey in Greater Wellington follow this chapter. The results are supplemented in Chapter 6 by an evaluation of perceptions of the public transport system and of an integrated ticketing system for Greater Wellington. The results of Chapter 6 address some of the contextual factors influencing public

transport use which can help explain any gap between intentions and behaviour found in the environmental behaviour model.

## Chapter 5 – Results: environmental behaviour model

### *Sub-question 2 – ‘How do pro-environmental intentions affect public transport use?’*

To answer research sub-question 2 the integrated theoretical environmental behaviour models proposed by Bamberg and Möser (2007) and Bamberg et al. (2007), as discussed in Chapter 4, were tested with the data collected from the sub-sample in the online survey. Figure 5.1 below outlines the structure of this chapter including the conventional processes used to test and analyse structural equation models (SEM).



**Figure 5.1** – Chapter structure and analysis procedures for the environmental behaviour model.

## 5.1 Sub-sample characteristics

A sub-sample of data from the online survey was used as input for the integrated model. The full survey characteristics are presented in Chapter 6, section 6.1<sup>19</sup>.

Questions in the online survey defined the sub-group of respondents as those who identified themselves driving for at least one everyday trip (to get to work/study, food shopping, leisure facilities, and sport activities). Table 5.1 presents the socio-demographic characteristics of the sub-sample.

**Table 5.1** - Socio-demographic variables of the sub-sample (n=359).

Variable	(%)	Variable	(%)	Variable	(%)
<b>GW Area</b>		<b>Employment</b>		<b>Household</b>	
Kapiti Coast	5.0%	Full time	83.4%	Single occupier	9.5%
Masterton	0.3%	Part time	8.1%	Group living together	15.6%
South Wairarapa	0.6%	Not working	8.4%	Couple - no children at home	36.0%
Lower Hutt	22.6%			Family - pre-school children	11.7%
Wellington City	54.3%	<b>Income (\$)</b>		Family - school children	17.3%
Porirua	10.3%	0 - 20,000	9.8%	Family - adult children	9.8%
Upper Hutt	7.0%	20,001 - 50,000	19.4%		
		50,001 - 70,000	24.9%	<b>Public transport use <sup>a</sup></b>	
<b>Age</b>		70,001 - 100,000	28.0%	Regular users	49%
Median	39	100,000 +	17.8%	Occasional users	22.6%
				Light users	23.7%
<b>Sex</b>				Non-users	4.7%
Male	52.7%				
Female	47.3%				

*Note:* Values are percentage values except the Age variable where the median age is shown. <sup>a</sup>Public transport use categories were classified according to how often they used public transport: Regular users – 3 or more days a week; Occasional users – between twice a week and once a fortnight; Light users – once a month or less; Non-users – never.

The data is similar to that for the whole sample, with the exception of:

- slightly more males (52.7% compared with 48.9%),
- fewer people in the low income category \$0 – 20,000 (9.8% compared with 20.1%),

<sup>19</sup> Although it is unconventional to present the sub-sample characteristics before that of the whole sample, the thesis is structured this way to increase the clarity and comprehension of the environmental behaviour model discussed in the previous chapter.



- more in the higher income categories, \$50,001 – 70,000 (24.9% compared with 21.9%), \$70,001 – 100,000 (28% compared with 22.3%), and \$100,000+ (17.8% compared with 13.5%).

As expected, there were more light users and non-users of public transport in the sub-sample than the main survey sample, likely to be due to the higher proportion of people with access to a car.

## 5.2 Measures

To understand how pro-environmental intentions are formed, and how they lead towards behaviour, 26 questions in the survey identified the latent constructs used in the environmental behaviour model (numbered 1 – 8 in Table 5.2). The observed behaviour construct was identified by three separate questions in the survey (number 9 in Table 5.2). The measures used closely followed those applied and pre-tested in the Bamberg et al. (2007) study. To ensure the constructs are adequately captured and consistent (Diamantopoulos & Siguaw, 2000) three items were used for each construct. Several items were therefore added to those of the Bamberg et al. (2007) study and were informed by the literature review. They are indicated by a <sup>+</sup> sign next to the item name in Table 5.2. Also expanding on from the previous study, one item for each construct was reverse scored to reduce response pattern-bias (where a respondent's answers are all skewed to one end of the scale because they do not think about the question fully before answering). Reverse scored items are indicated by an \* in Table 5.2. Also to reduce response pattern bias, questions were randomized for each survey participant.

**Table 5.2** - Measures used to predict public transport use behaviour (continues over page).

#	Construct	Item
1	Problem awareness (PA) <i>Cronbach's <math>\alpha</math> 0.741</i>	<b>PA1</b> – Car use is one of the main global environmental problems. <b>PA2</b> – There is an urgent need to do something about the environmental pollution caused by car use. <b>PA3</b> <sup>+</sup> * - Increasing car traffic is not a big problem for the protection of the environment.
2	Awareness of consequences (AC) <i>Cronbach's <math>\alpha</math> 0.745</i>	<b>AC1</b> – When I drive, exhaust gases are emitted which have a negative effect on the global climate system. <b>AC2</b> – When I drive, exhaust gases are emitted which endanger other people's health. <b>AC3</b> * – I do not think my personal car use has a negative impact on the living quality of future generations.

3	Social norms (SN) <i>Cronbach's <math>\alpha</math></i> 0.521	<p><b>SN1</b> – People who are close to me (e.g. friends and family) would support my decision to use public transport instead of the car for everyday trips in Greater Wellington.</p> <p><b>SN2</b> – People who are close to me (e.g. friends and family) think I should use public transport more and drive less for everyday trips in Greater Wellington.</p> <p><b>SN3*</b> – Most people I know don't care if I drive or take public transport for everyday trips here in Greater Wellington.</p> <p><b>SN4*</b> – Most people who are important to me would support me using the car for everyday trips in Greater Wellington.</p>
4	Guilt (G) <i>Cronbach's <math>\alpha</math></i> 0.807	<p><b>G1*</b> – When I use the car I do not feel guilty in terms of the environment.</p> <p><b>G2</b> – If I always used my car, I would have a bad environmental conscience.</p> <p><b>G3</b> – Taking into account that pollutants from car use threaten other people's health, I would have a bad conscience when using the car.</p>
5	Perceived behavioural control (PBC) <i>Cronbach's <math>\alpha</math></i> 0.716	<p><b>PBC1</b> – It would be (impossible / possible) for me to use public transport instead of the car for everyday trips in Greater Wellington.</p> <p><b>PBC2</b> – I am (unsure / sure) that in the next few days I can use public transport instead of the car for everyday trips in Greater Wellington.</p> <p><b>PBC3</b> – It is mostly up to me whether I use public transport instead of the car for everyday trips here in Greater Wellington.</p> <p><b>PBC4</b> – I have (no / full) freedom of choice to use public transport rather than drive for everyday trips in Greater Wellington.</p>
6	Attitude (ATT)  <i>Cronbach's <math>\alpha</math></i> 0.778	<p><b>ATT1*</b> – I would not like to use public transport instead of the car for everyday trips in Greater Wellington.</p> <p><b>ATT2</b> – Using public transport instead of the car for everyday trips in Greater Wellington would be (unpleasant / pleasant) for me.</p> <p><b>ATT3</b> – Using public transport instead of the car for everyday trips in Greater Wellington would be (good / bad) for me.</p>
7	Personal norm (PN) <i>Cronbach's <math>\alpha</math></i> 0.839	<p><b>PN1*</b> – According to my own values and principles I do not feel obligated to use public transport instead of driving.</p> <p><b>PN2</b> – Regardless of what other people do, I feel obligated to use public transport because of my own values and principles.</p> <p><b>PN3</b> – I feel obligated to use public transport for environmental reasons.</p>
8	Intention (INT) <i>Cronbach's <math>\alpha</math></i> 0.911	<p><b>INT1</b> – It is (unlikely / likely) that in the next few weeks I will use public transport for everyday trips in Greater Wellington.</p> <p><b>INT2</b> – My intention to use public transport in the next few weeks instead of the car for trips within Greater Wellington is (weak / strong).</p> <p><b>INT3</b> – I intend to use public transport instead of the car in the next few weeks for everyday trips around Greater Wellington.</p>
9	Behaviour (BEH)  -	<p><b>BEH1*</b> – On average how often do you use public transport (bus, train, ferry or cable car) within the Greater Wellington region? (Scaled 1 -7, from '5 or more days a week' – 'Never')</p> <p><b>BEH2</b> – Indicate below if you would like to go into the draw to win a \$100 public transport voucher. (Yes / No)</p> <p><b>BEH3</b> – Ratio of mode used for the 4 everyday trips (work/study, food shopping, recreation facilities, and sport activities) from 0.0 (none by public transport) to 1.0 (all by public transport).</p>

*Note:* The questions were adapted from Bamberg et al., (2007) unless indicated by a <sup>+</sup>. Items marked with an \* were reverse scored for analysis. All items were answered on a scale ranging from 1 to 5 where 5 indicated a more favourable response, excluding those for behaviour. Unless otherwise indicated question response options ranged from strongly disagree to strongly agree. SN4 and PBC4 were added after the pilot due to initial low Cronbach's alpha values. SN3 and PBC4 were later removed from the SEM because of weak factor loadings (discussed below).

To test the validity of the measures used to indicate each psychological construct Cronbach's alpha ( $\alpha$ ) values were calculated. The Cronbach alpha values were all above the recommended acceptable value of 0.7, indicating good internal consistency (Hair, Black, Babin, Anderson, & Tatham, 2006) except for the social norm construct which was also weak in the pilot study. Social norms differ across culture, region and group according to exposure to different situations (Ostrom, 2000). Therefore the weaker social norm may reflect regional context<sup>20</sup>. However  $\alpha$  is not too low (below 0.3) to reject completely (Pallant, 2010). Social norms were identified in the literature review to be influential in determining pro-environmental outcomes through the theory of planned behaviour and various modified versions (Harland, et al., 1999; Wall, et al., 2007). Therefore the social norm construct is retained to align with the integrated environmental behaviour models.

To provide an overview of how survey participants responded to the measures, the mean score for each psychological construct leading to behaviour was calculated and compared to the scale mid-point (3). The results are shown in Table 5.3 below.

**Table 5.3** - Means, standard deviations (SD) and t-test results for the constructs in the integrated environmental behaviour model (Bamberg & Möser, 2007) as used in the present study.

Construct	Survey sub-sample n=359			
	Mean	SD	t	Sig. (2-tailed) <sup>20</sup>
Problem awareness	3.45	0.90	9.50	0.00
Awareness of consequences	3.79	0.73	20.34	0.00
Social norm	2.88	0.64	-3.675	0.00
Guilt	2.98	0.97	-.308	0.76
Perceived behavioural control	3.74	0.84	16.82	0.00
Attitude	3.24	0.92	5.00	0.00
Personal norm	2.94	1.06	-1.025	0.31
Intention	3.13	1.32	1.82	0.07
Public transport frequency <sup>a</sup>	3.04	2.01	9.01	0.00
Public transport ticket <sup>a</sup>	-	-	-	-
Trip ratio <sup>a</sup>	0.14	0.16	-42.24	0.00

*Note:* Constructs were measured on a scale from 1 to 5 with a mid-point of 3. <sup>a</sup> Except behaviour variables which were measured on different scales and therefore kept separate for comparison: Public transport frequency, scaled high = 1, to no use = 7 (reverse coded for analysis) with a mid point of 4; Participate in the free public transport ticket prize draw, yes = 1, no = 2 (therefore no mean score, standard deviation or t-test value); and Ratio of the four everyday trips taken by public transport, scaled from 0 = no use, to 1= always use with a mid point of 0.5.

<sup>20</sup> A thesis study by Lake (2010) found that social norms did not affect pro-environmental behaviour (the study focused on edible gardening behaviour) in Eastbourne, Greater Wellington.

Problem awareness and awareness of consequences show high mean scores which are significantly different<sup>21</sup> from the mid-point of 3, inferring that the sub-sample believe that car use is an environmental problem and acknowledge that their car use causes both social and environmental damages. Respondents also felt that it was fairly easy to take public transport for everyday trips in Greater Wellington, shown by the mean score of 3.74 for perceived behavioural control. High levels of perceived behavioural control could reflect the fact that 94% of the sub-sample lived within 1km of a public transport stop, but also that access to public transport in general is not perceived to be an issue. Feelings of guilt, personal norm and social norm are within the neutral range of the scale, although attitude towards public transport is just above the mid-point of 3 suggesting that, in general, there is a good perception of public transport in Greater Wellington. Intention to use public transport is neutral. However the mean scores for the behavioural variables are neutral to low, suggesting that there is a gap between intention to use public transport and actual use as suggested in the literature review in Chapter 4. The gap may be explained by some of the contextual factors, such as service reliability, or weather which are discussed further in Chapter 6.

The following section in this chapter assesses how the data collected fit the integrated behaviour model discussed in Chapter 4. The reliability of the model constructs' measures are presented before detailing the relationships between the constructs and analysing the results of the environmental behaviour model. The link between the contextual factors posited in Chapter 4, and psychological factors presented in this chapter are discussed in unison in the concluding Chapter 7.

## **5.3 Test of the measurement models**

### **5.3.1 Goodness-of-fit indices**

Goodness-of-fit indices are used to test whether empirical data fit a theoretical model. The indices reveal how well the theoretical model replicates the covariance matrix for each measure, therefore testing the similarity between the observed and

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<sup>21</sup> At  $p < 0.05$ . Therefore, values of significance (Sig.) that are below 0.05 indicate that the means are statistically different from the scale midpoint (Field, 2005).

estimated covariance matrices (Hair, et al., 2006). There is an array of indices that has been put forth by researchers in attempts to refine the numerous ways in which a model can represent the observed data<sup>22</sup>. To report them all is well beyond the scope of this study, if even possible. Therefore it remains up to the researcher's judgement to assess the criteria to use, taking into account practical, statistical and theoretical considerations (Byrne, 2001). In line with the Bamberg and Möser (2007) study and supported by the literature (Byrne, 2001; Diamantopoulos & Siguaw, 2000), the fit indices recommended by Hu and Bentler (1999) were used as primary criteria.

To assess the goodness-of-fit of the data to the models, fit criteria were used which are based on using the maximum-likelihood procedure<sup>23</sup> computed in LISREL. An acceptable criteria for a good model fit follows that the root mean squared error of approximation (RMSEA) should be above 0.05 in combination with a standardised root-mean square residual (SRMR) less than, or equal to, 0.10. Also the comparative fit index (CFI) should be above 0.96 in combination with SRMR less than or equal to 0.10 (Hu & Bentler, 1999). Complementing the CFI is the non-normed fit index (NNFI), where values close to 1.00 are indicative of a good model fit (Diamantopoulos & Siguaw, 2000). Commonly reported fit measures are also presented including Chi-square ( $\chi^2$ ), degrees of freedom (df) and Chi-square divided by degrees of freedom ( $\chi^2/\text{df}$ ), where values below 3 indicate better fitting models (Hair et al, 2006).

The theoretical model proposed by Bamberg and Möser (2007) (Model 1a) was tested with the data collected. Secondly the model used by Bamberg et al. (2007)

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<sup>22</sup> For brief review of the different goodness-of-fit indices see Diamantopoulos and Siguaw (2000, p82-88). For a more comprehensive statistical analysis see Hu and Bentler (1995), or Marsh, Balla and Hau (1996).

<sup>23</sup> The maximum likelihood (ML) procedure is the default and most commonly used method in SEM. It assumes that the sample is large, the distributions of the observed variables are multivariate normal, the hypothesized model is valid, and that the scale of the observed variables is continuous (Byrne, 2001). In this study one of the behaviour measures used a dichotomous scale violating the assumption of normality: Participate in the free public transport ticket prize draw, yes = 1, no = 2. The use of ML is however justified considering: that 28 of the 29 measures satisfy the ML criteria; the sample size is between the recommended >150 and <400 (Hair et al., 2006); and that ML has been shown to be fairly strong with slight deviations from the critical assumptions (Diamantopoulos & Siguaw, 2000).

(Model 2a) was tested. The differences between the two models are that Model 2a excludes the pathway of problem awareness predicting awareness of consequences; and includes the pathway of problem awareness predicting perceived behavioural control and attitude, and guilt predicting intention. Besides testing the two models, analyses were also performed to verify whether excluding non-significant paths from the models would improve model fit. Both models were tested without their non-significant pathways, calculated in LISREL by t-values lower than 1.96. The results of the models fit are shown in Table 5.4.

**Table 5.4** - Goodness-of-fit indices for Models 1 and 2.

<b>Model</b>	<b>df</b>	<b><math>\chi^2</math></b>	<b><math>\chi^2/\text{df}</math></b>	<b>RMSEA</b>	<b>SRMR</b>	<b>CFI</b>	<b>NNFI</b>
<b>1a</b> As proposed by Bamberg and Möser (2007)	303	590.71	1.95	0.052	0.056	0.98	0.97
<b>1b</b> As 1a without non- significant pathways	311	599.60	1.93	0.051	0.056	0.98	0.97
<b>2a</b> As used in the study by Bamberg et al., (2007)	306	592.94	1.94	0.051	0.056	0.98	0.97
<b>2b</b> As 2a without non- significant pathways	312	673.78	2.16	0.057	0.063	0.97	0.97

According to the fit criteria all of the models fit reasonably well. The model's goodness-of-fit indices fulfil the combinational rules, such as CFI greater or equal to 0.96 and SRMR less than or equal to 0.10, which gives increased confidence of the fit of the model to the data at hand than if single fit criterion were used independently (Hu & Bentler, 1999). Model 1a, based on the meta-analysis by Bamberg and Möser (2007), has the lowest values for  $\chi^2$  and degrees of freedom, shown in Table 5.4. However, the values are too high to judge the model's goodness-of-fit on these criteria alone. The value for  $\chi^2/\text{df}$  is well below the cut-off point of 3 and RMSEA, SRMR, CFI and NNFI all satisfy the combinational rules for acceptable fit according to Hu and Bentler (1999). The removal of the non-significant pathways in Model 1b did not improve the model fit substantially, shown by higher values for  $\chi^2$  and degrees of freedom. The fit criteria results for Model 2a, based on research by Bamberg et al. (2007), are similar to that of Model

1a, although  $\chi^2$  is slightly higher. Similarly, removing the non-significant pathways did not improve model fit. Rather, Model 2b shows the worst fit seen by the highest  $\chi^2$  value and lowest CFI from all four models.

Model 1a is accepted as the model to use for further analysis because of the good fit indices as well as theoretical considerations. First, Model 1a was the result of a comprehensive meta-analysis by Bamberg and Möser (2007), including 46 studies with 57 independent samples and is thus theoretically and empirically superior to the Bamberg et al. (2007) model which included only 3 samples. Another deciding factor was the point of difference between Models 1 and 2, the pathway of problem awareness predicting awareness of consequences which was empirically significant ( $t = 11.24$ ) in Model 1a. The other points of difference between the models were non-significant, or weakly significant. The results from Model 1a are therefore theoretically and empirically more sound than Models 1b, 2a and 2b. Given this evidence, Model 1a was the model used for further analysis.

### **5.3.2 Confirmatory factor analysis**

The reliability of the scales measuring each psychological construct was calculated using Cronbach's  $\alpha$  reported in section 5.1 above. The validity and reliability of the constructs used in the model are also tested in a confirmatory factor analysis, following the approach used by Bamberg et al. (2007). Table 5.5 presents the results of the confirmatory factor analysis where the standardized factor loading ( $\lambda$ ) shows the relationships between the items and the latent construct.

**Table 5.5** - Results of the confirmatory factor analysis testing the reliability of the measures used for each construct in the model.

	<b>Construct</b>	<b>Item</b>	<b>N=359 <math>\lambda</math></b>
1	Problem awareness	PA1 PA2 PA3	0.72 0.84 0.56
2	Awareness of consequences	AC1 AC2 AC3	0.74 0.68 0.71
3	Social norm	SN1 SN2 SN3 SN4	0.54 0.50 0.51 0.39
4	Guilt	G1 G2 G3	0.69 0.77 0.83
5	Perceived behavioural control	PBC1 PBC2 PBC3 PBC4	0.71 0.92 0.25 0.44
6	Attitude	ATT1 ATT2 ATT3	0.66 0.75 0.81
7	Personal norm	PN1 PN2 PN3	0.74 0.80 0.84
8	Intention	INT1 INT2 INT3	0.91 0.89 0.84
9	Behaviour	BEH1 BEH2 <sup>a</sup> BEH3	0.72 0.28 1.00

*Note:*  $\lambda$  = standardized factor loadings. <sup>a</sup> BEH2 was the dichotomous measure, which explains the low  $\lambda$  value.

Most standardized factor loadings ( $\lambda$ ) are above the minimum value of 0.5 which indicates that the measures are valid indicators of their specific constructs (Hair et al., 2006). The measures PBC3 for perceived behavioural control, and SN4 for social norm were much lower than 0.5 and were removed to increase reliability and decrease measurement error in the structural equation model (SEM). The measure PBC4 had a  $\lambda$  value of 0.44, slightly lower than the cut off 0.5 value and BEH2 measuring behaviour was had a low value  $\lambda=0.28$ . However these items were kept, firstly so that each construct had three measuring items, which is the recommended



minimum number (Diamantopoulos & Siguaw, 2000). Secondly, the low  $\lambda$  value for behaviour item 2 can be explained because it is not measured on a continuous scale but is dichotomous<sup>24</sup> (see Table 5.2). Thirdly there are several items measuring the construct so that the error effects are likely to be negligible (Babakus, Ferguson, & Jöreskog, 1987).

The results presented thus far provide empirical evidence that the data collected from the Greater Wellington sub-sample fit the model proposed by Bamberg and Möser (2007). The following section analyses and discusses the relationships between the psychological constructs in the model.

## **5.4 Results of the structural equation model (SEM)**

The SEM was estimated in LISREL (version 8.80) to find out how pro-environmental intentions affect public transport use (research sub-question 2). The results of the SEM allow for an examination of the constructs leading to pro-environmental intention and behaviour, as discussed in Chapter 4 and, as postulated in the Bamberg and Möser (2007) model. An overview of the SEM is presented and the results of the theoretical constructs are discussed and then concluded in section 5.5. The model results are revisited in Chapter 7 in synthesis with results presented in Chapter 6.

### **5.4.1 Test of the theoretical framework**

Figure 5.1 presents the results of the SEM showing the standardised structural coefficients ( $\beta$ )<sup>25</sup> for each pathway and explained variances ( $R^2$ )<sup>26</sup>. The LISREL syntax input is documented in Appendix B. To assess how the model constructs influence intentions to take public transport, and how these intentions relate to

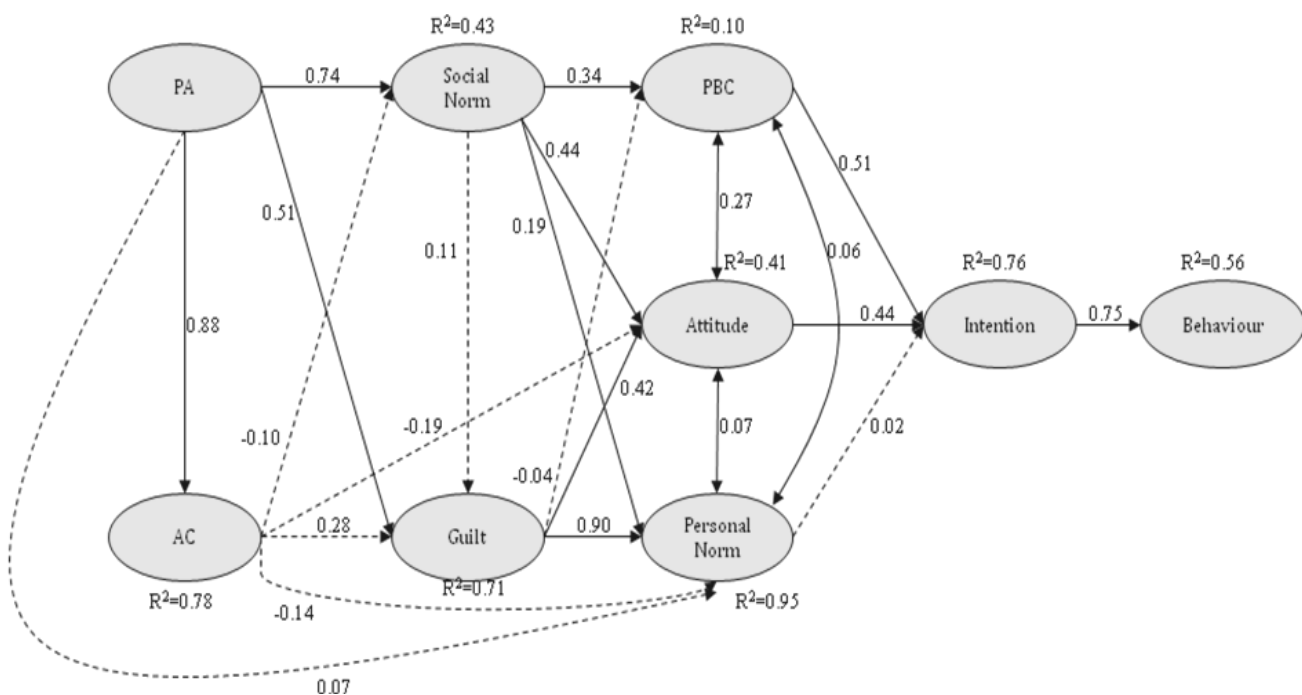
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<sup>24</sup> The technique of reporting behavioural choices to assess pro-environmental behaviour was similarly used in a study by Cameron, Brown and Chapman (1998).

<sup>25</sup> Standardized structural coefficients help to ascertain the extent of the influence from the independent latent variable (from where the arrow starts in the model) on the endogenous variable (where the arrow ends), where 0 = no influence and 1 = fully influences (Diamantopoulos & Siguaw, 2000). For example, the extent of the influence that problem awareness has on awareness of consequences is high at  $\beta=0.88$ .

<sup>26</sup> Variance is the average percentage of a construct which can be explained by other constructs. A higher  $R^2$  value indicates high reliability for the construct concerned (Diamantopoulos & Siguaw, 2000).

behaviour, the model will be discussed in parts. The inter-correlation of the perceived behavioural control, attitude and personal norm constructs are low, between 0.07 and 0.27. Consequently there is empirical evidence to confirm the hypothesis from the theoretical model that these three constructs are independent predictors of intention. Therefore the three main predictors of intention are analysed and discussed separately. Their relationship with intention to use public transport is then discussed followed by an analysis of public transport behaviour.



**Figure 5.2** – The results of the integrated environmental behaviour model for Greater Wellington, as proposed by Bamberg and Möser (2007). *Note:* PA = Problem Awareness, AC = Awareness of Consequences and PBC = Perceived Behavioural Control. Single headed arrows are standardised path coefficients, double headed arrows are correlations and  $R^2$  are the explained variances. Dashed lines indicate non-significant paths ( $t < 1.96$ ,  $p > .05$ ).

### ***Perceived behavioural control***

Perceived behavioural control (ease of taking public transport) was hypothesised to predict intention to take public transport and be directly affected by social norms (the extent that others' opinion of public transport affects personal public transport use) and guilt (personal guilt about the negative consequences of driving) (Bamberg & Möser, 2007). The model shows the largest influence on perceived behavioural control is from social norms ( $\beta = 0.34$ ). However the effect of guilt is not

statistically significant suggesting that, for the sub-sample, personal capability is more important than feelings of guilt about the environmental and social impacts of driving when deciding which mode of transport to use. This is further evidenced as perceived behavioural control is only to a limited extent ( $R^2 = 0.10$ ) affected by problem awareness (awareness of global environmental problems caused by car use) mediated by social norms. The direct predictive effect of perceived behaviour control on intention to use public transport is quite high ( $\beta = 0.51$ ). Therefore the stronger people's feelings of perceived behavioural control, the stronger they intend to use public transport.

The model results show that perceived behaviour control to taking public transport is mostly influenced by social norms. Although the relatively low  $R^2$  value (0.10) suggests that other factors not captured in the model may also be related to perceived behavioural control. These may include contextual factors discussed in Chapter 6. Therefore, social norms indirectly influence intention to use public transport for the Greater Wellington sub-sample. The hypothesis that social norms are not direct predictors of intention, as originally postulated in the TPB, but instead mediated by attitude and perceived behavioural control (Ajzen, 1991; Armitage & Conner, 2001; Bamberg, et al., 2007; Bamberg & Möser, 2007) is corroborated by these findings.

### ***Attitude***

Attitude (attitudes towards using public transport rather than driving) is the second strongest predictor of intention. It follows therefore that people with a more positive attitude towards public transport will intend to use it more. The variance ( $R^2=0.41$ ) between attitude and intention is explained by social norm, guilt and awareness of consequences (consequences on society and the environment from personal car use). Like the influences on personal norm, the formation of attitudes toward public transport is associated with awareness of environmental problems, which is also mediated by feelings of guilt and social norms. The empirical evidence therefore shows that attitudes toward taking public transport are related to feelings of guilt about driving, as well as social norms, supporting the review of the original TPB model (Ajzen, 1991).

The influence of social norms on attitude and perceived behavioural control has practical implications for the marketing of public transport. If general public opinion (social norms) can be generated in favour of public transport, this may lead to the activation of better attitudes and greater perceived behavioural control (i.e. the perception that public transport is a pleasant mode of transport and that it is easy to use). Bamberg et al. (2007) suggest that changing public opinion may be a precondition to any intervention attempt to change behaviour. Increasing awareness of the problems caused by car use (problem awareness), which is strongly linked to the formation of social norms, may also be beneficial in changing attitudes towards public transport. Attitude indirectly influences behaviour to use public transport mediated through intention in line with the TPB.

### ***Personal Norm***

The variance (95%) in the personal norm construct can be explained by social norm, guilt, problem awareness and awareness of consequences. The hypothesis that the NAM variables are not the only factors influencing personal norm is therefore confirmed, although it is acknowledged that guilt exerts the heaviest influence on personal norm ( $\beta = 0.90$ ). There is a strong association between problem awareness and awareness of consequences ( $\beta = 0.88$ ), and their combined influence on personal norm is mediated by guilt ( $\beta = 0.51$  and  $0.28$  respectively). Stronger feelings of guilt related to global and local knowledge of the environmental problems caused by car use are therefore associated with a stronger personal norm towards using public transport.

In contrast to the theoretical model, the results of this study show that personal norm is not a statistically significant predictor of intention when considered alone. This is not entirely unexpected considering the debate in the literature (discussed in Chapter 4, section 4.1.1) about the role of personal norm influencing intention and behaviour (Bamberg & Schmidt, 2003; Bamberg et al., 2007). The results for the Greater Wellington sub-sample show that the formation of personal norms comes from a combination of individuals having knowledge of the environmental impacts of car use and emotional and social factors. The latter are especially characterised by feelings of guilt and social norms associated with driving versus taking public

transport. Therefore the personal norm construct is significantly influenced ( $R^2 = 0.95$ ) by other constructs that have an indirect association with intention (guilt and social norms) and to some extent also influences perceived behavioural control and attitude.

However, personal norm is not a significant predictor of intention to use public transport in this study. This could suggest that for the Greater Wellington sub-sample travel by public transport is not considered to be a moral choice. Instead public transport use is a mode choice influenced more by general attitudes about the service and perceived ease of use, which as discussed above are shaped by social norms, guilt and awareness of environmental problems caused by car use.

### ***Intention and Behaviour***

The model results show that perceived behavioural control and attitude are the strongest predictors of intention ( $\beta = 0.51$  and  $0.44$ , respectively). Together with personal norm, they explain 76% of variance of the intention construct. The results indicate that for the Greater Wellington sub-sample, intention to use public transport rather than to drive is mainly influenced by perceived behavioural control (i.e. how easy/difficult is it to take public transport rather than drive?) and attitude (i.e. what are the positive/negative consequences of using public transport rather than driving?). Intention is indirectly related to knowledge of environmental problems, social norms and guilt, which are mediated through the three predictors of intention (perceived behavioural control, attitude and personal norm).

Research sub-question 2 asked how pro-environmental intentions affect public transport use. The standardised path coefficient between intention and behaviour is high ( $\beta = 0.76$ ) and a significant proportion of the variance of behaviour (56%) can be explained by intention. These results support the application of the TPB because intention mediates all influencing factors in the model leading towards behaviour, in this study public transport use. The missing 44% of the variance of behaviour may be in part due to measurement error, but may also be explained by outside contextual factors. These factors are discussed in Chapter 6, but are primarily reliability, convenience and cost. Reliability may have been especially influential

because the survey was taken during a period of disruption to many of the train services. Although public transport use remained relatively stable between 2003 and 2010, the perception of public transport reliability has decreased across all modes. Satisfaction of reliability levels from train users dropped from 60% in 2009 to 37% satisfaction in 2010 (Premium Research, 2010) suggesting that poor service may, in part, explain the intention-behaviour gap.

#### **5.4.2 Model results summary**

Figure 5.2 empirically shows that the data fit the environmental behaviour model proposed by Bamberg and Möser (2007). Theoretically, it supports the hypothesis that both elements from Ajzen's (1991) self-motivated theory of planned behaviour (TPB) and Schwartz's pro-social motivated norm-activation theory (NAM) lead to pro-environmental behaviour. Intention mediates the influence of all other model constructs on pro-environmental behaviour, as postulated in the TPB; and awareness of consequences and guilt<sup>27</sup> significantly influence personal norm, as proposed in the NAM. Problem awareness is indirectly associated with behaviour to use public transport which is a contributing factor in Stern et al.'s (1999) VBN theory (where it is labelled adverse consequences).

The significance of the psychological constructs on perceived behavioural control, attitude and personal norm, which lead to intention and behaviour, indicate the need for the integrative model approach when examining complex pro-environmental behaviours such as public transport use. The integrated modelling approach is perhaps even more important in transport behaviour studies such as the present research. The myriad of psychological barriers, including habits, and structural barriers, such as public transport availability (see Chapter 4, section 4.2), that affect decisions to use public transport over driving a car make changing those decisions extremely hard (Abrahamse et al., 2009; Fujii, 2006). The missing explained variance in the relationship of intention with behaviour suggests that an overview of contextual factors which include structural barriers would be helpful in identifying other influences on public transport use and is covered in Chapter 6.

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<sup>27</sup> Guilt is labelled ascription of responsibility in the NAM.

## **5.5 Conclusion**

The results are mainly in line with findings from the original model proposed by Bamberg and Möser (2007). The hypothesis that pro-environmental behaviour can be motivated by both pro-social interests as well as self-interests is confirmed. Also, the findings of this study suggest that more research is needed on the role of moral constructs, such as personal norm and guilt, in affecting the formation of pro-environmental norms as well as influencing pro-environmental behaviour. The role of guilt was found to be significant in both the Bamberg and Möser and Bamberg et al. (2007) studies, but according to Bamberg et al. (2007) only two other studies have examined the role of guilt in forming pro-environmental norms. The results of this study do not support the direct influence of personal norms on intention to use public transport. Further research is needed to assess whether this result is due to contextual factors, such as country, sample-size or sampling method, or theoretical considerations.

The significance of the constructs leading to personal norm, attitude and perceived behavioural control further substantiate the need for an integrative model when analysing pro-environmental intentions and behaviours. Pro-environmental intentions influence 56% of the variance of public transport use in the model. The following chapter discusses the role of contextual factors which potentially explain the intention-behaviour gap. Context is assessed by perceptions of public transport use and integrated ticketing, a measure which may increase the attractiveness of public transport and encourage a modal shift away from the car in Greater Wellington.

The psychological approach has highlighted the importance of the constructs in the decision making process to use public transport. Significantly, if perceptions of public transport are improved through social norms, perceived behavioural control and attitude, public transport use may be encouraged. In other words interventions to increase public transport patronage and decrease car use should focus on enhancing: public opinion of public transport (social norms); the perception that travel on public transport is easy (perceived behaviour control), and more pleasant or good for you (attitude). The implications of these results are discussed in Chapter

7 in conjunction with the results detailed in the following chapter concerning the contextual factors associated with perceptions of public transport and integrated ticketing.



## Chapter 6 – Results: Public transport use and integrated ticketing

This chapter presents the results from the online survey. Specifically, the chapter addresses why people use public transport and their perceptions of Snapper and integrated ticketing, as defined in research sub-questions 1, 5, 6 and 7 introduced in Chapter 1. The results are organized according to the sub-questions and drawn together in the conclusion of this chapter.

### 6.1 Survey sample characteristics

The socio-demographic characteristics of the 559 survey respondents are shown in Table 6.1. The survey was open to all residents of the Greater Wellington region.

**Table 6.1** - Characteristics of the full survey sample, n = 559.

Variable	%	Variable	%	Variable	%
<b>GW Area</b>		<b>Sex</b>		<b>Household</b>	
Kapiti Coast	3.8%	Male	48.9%	Single occupier	11.5%
Masterton	0.4%	Female	51.1%	Group living together	24.4%
Carterton	0.2%			Couple - no children at home	32.8%
South Wairarapa	0.5%	<b>Income (NZ\$)</b>		Family - pre-school children	8.6%
Lower Hutt	17.9%	0 - 20,000	20.1%	Family - school children	12.5%
Wellington City	63.1%	20,001 - 50,000	22.3%	Family - adult children	9.7%
Porirua	8.8%	50,001 - 70,000	21.9%	Other	0.5%
Upper Hutt	5.4%	70,001 - 100,000	22.3%		
		100,000+	13.5%	<b>Public transport use <sup>a</sup></b>	
<b>Age (years)</b>				Regular users	51.9%
<= 24	20.7	<b>Employment</b>		Occasional users	25%
25 - 44	52.8	Full time	74.4%	Light users	19.7%
45 - 59	19.6	Part time	12.5%	Non-users	3.4%
60+	6.9	Not working	13.2%		

*Note:* GW = Greater Wellington. <sup>a</sup> Public transport use categories were classified according to how often they used public transport: Regular users – 3 or more days a week; Occasional users – between twice a week and once a fortnight; Light users – once a month or less; Non-users – never.

The majority identified themselves as being from the Wellington City district (63.1%), or neighbouring areas such as Lower Hutt (17.9%) and Porirua (8.8%).

Participants from areas further from the city were low. Wellington City, although having the largest population base in the region, was still over represented in the survey when compared to responses from the Kapiti Coast, Masterton, South Wairarapa and Carterton, which were largely under represented. Results cannot therefore be generalized for the region as a whole. However they give an indication of perceptions from the three largest regions in terms of population. The majority of respondents were either regular users (51.9%) or occasional users (25%) of public transport. Whilst this reflects Wellington's comparatively high levels of public transport use compared with other major cities in New Zealand (GWRC, 2010), the survey sample cannot be classified as being representative of the region's travelling population. Consequently the results are mostly presented according to public transport use so as not to create bias. The disproportions in region and public transport use could be due to the sampling strategy used and is considered as a limitation in Chapter 7.

## **6.2 Understanding public transport use in Greater Wellington**

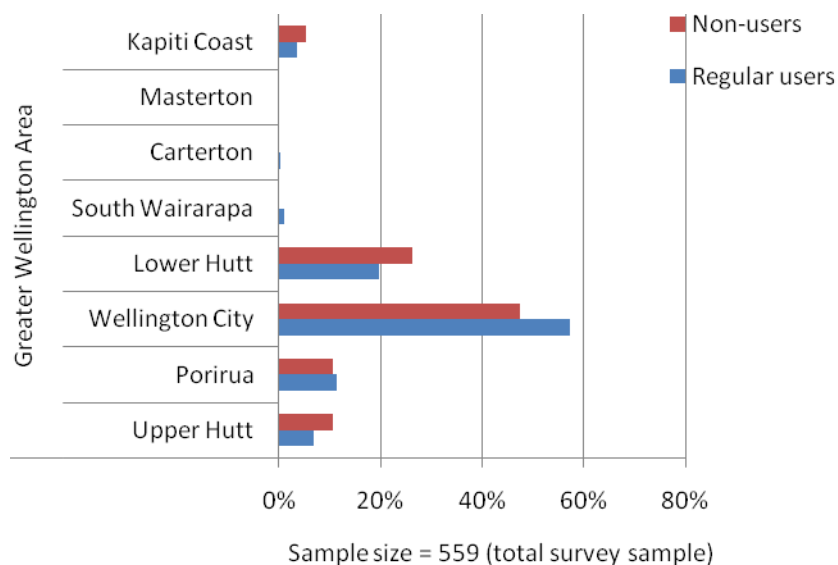
### ***Sub-question 1 - 'Why do people use/not use public transport in Greater Wellington?'***

Research sub-question 1 asked 'Why do people use/not use public transport in Greater Wellington?' to gain an understanding of why people use public transport and the factors which influence people's transport decisions. First, several variables were cross-tabulated against how frequently people use public transport. These were quantitatively analysed and are discussed below. The variables included: Access to public transport; Car access; Age; Sex; Income; Household; Greater Wellington Area; Work; Food; Leisure; and Recreation. Second, two open ended questions were asked in the survey and were coded for cross-tabulation and qualitative analysis. A selection of the full open responses are presented and discussed in addition to the results of the cross-tabulations to substantiate and further validate the quantitative data.

### 6.2.1 Quantitative results

The survey sample reported good access to public transport, which is in line with previous Greater Wellington Regional Council (GWRC) surveys (Premium Research, 2010). Access to public transport did not seem to affect public transport use, where almost all (94.8%) of those surveyed lived within 1km of a public transport stop, including most (89.5%) non-public transport users. Although car access was highest amongst non-users of public transport, 74.5% of regular users still had access to a car, suggesting that car access does not limit decisions to taking public transport.

Interestingly, whilst the highest proportion of regular users were Wellington City residents, they also made up the highest proportion of non-users as shown in Figure 6.1. It is likely this reflects the diverse landscape of the Wellington City district, with inner city residents easily being able to walk around the city centre, whilst those in the outer suburbs would be more reliant on motorised transport to cover larger distances to the city. Similarly, the majority of both regular and non-users of public transport fell within the same age category of between 25 – 44 years, and fell in the same household category of ‘couple with no children at home’. This possibly reflects some bias towards high internet users.



**Figure 6.1** – Proportion of public transport users by region.

Income categories were fairly evenly spread amongst the user groups, with less regular and occasional users in the highest income category (annual income of \$100,000+). There were little differences in use of public transport for males and females, although slightly more females were occasional and non-users of public transport.

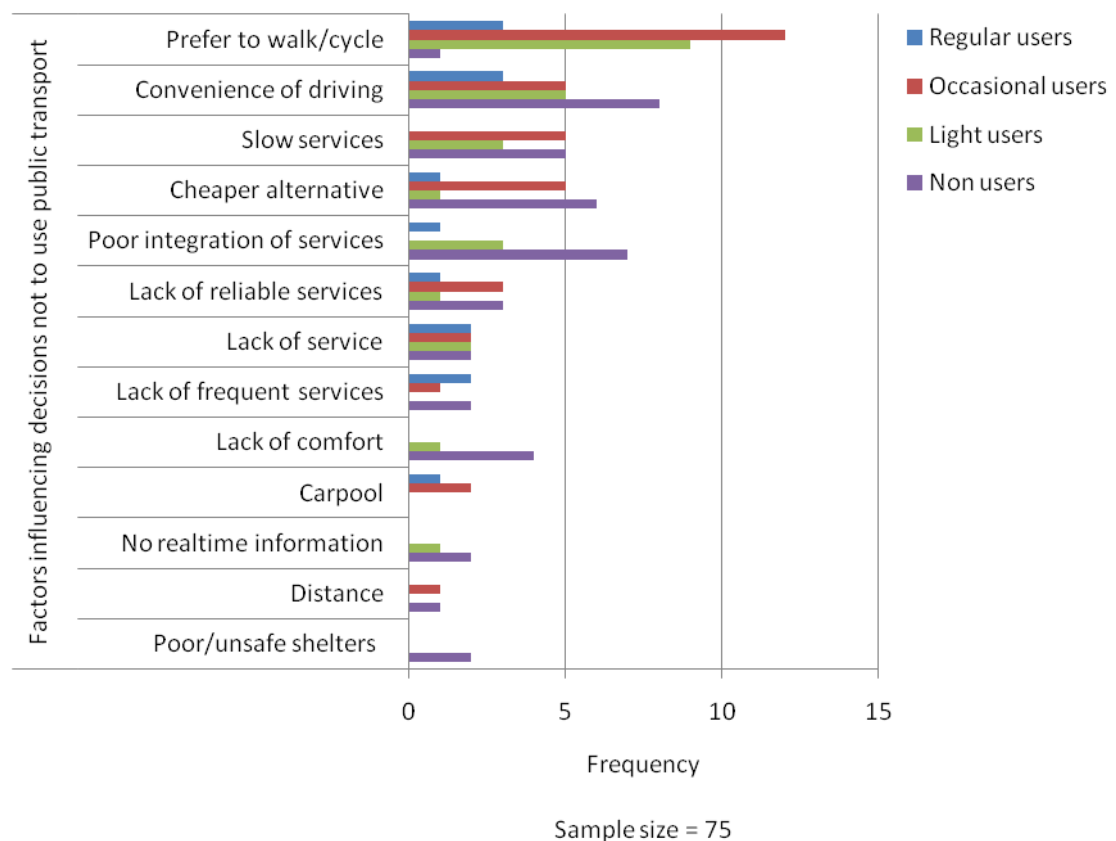
Survey data showed that use of public transport for ‘everyday activities’ (specified as getting to work, food shopping, leisure and recreation facilities) was highest for journeys to work and, perhaps unsurprisingly, lowest for trips to buy food. Most regular users of public transport (85%) used it to get to work, compared with very few (11%) taking it to buy food. Out of the non-users surveyed most drove to work and leisure locations (84% each) and drove to food shopping and recreation facilities (89% each). Across all activity variables the use of a car was consistently highest amongst light and non-users of public transport. Active modes of transport (walking, cycling and other non-motorized forms of transport) was highest amongst occasional public transport users, suggesting that this group may be more affected by outside factors contributing towards their decision to use public transport.

To summarise the above, roughly half of the respondents are regular users of public transport, using it largely for commuting to work or study. Three-quarters of those surveyed have regular access to a car, which is the main mode of transport for non-work related activities, even though the large majority have access to public transport stops. Comparing socio-demographic variables across user groups did not show any large differences, but rather reflected the naturally diverse landscape and population base within the sample, especially the larger numbers in the 24 – 44 years age category and respondents from Wellington City.

### **6.2.2 Qualitative results**

What other factors contribute to public transport decisions? How can the service be improved to increase use and especially encourage non-users and light users of public transport to use the service rather than drive? To answer these questions open ended responses were coded and cross-tabulated to differentiate between high and low users of public transport.

The primary factor influencing public transport use for survey respondents who used public transport was the convenience of the service for them and the availability of direct services. The second reason was the relative overall cost. Weather was the third factor, and the fourth consideration influencing public transport use was the cost and availability of parking<sup>28</sup>. Light and occasional users seem most concerned with convenience and time factors (including the speed of the trip and time of day) in their decisions to use public transport. Weather seems more influential for occasional and light users, who prefer to walk or cycle when the weather is fine, which is illustrated in Figure 6.2 (factors influencing people *not* to use public transport).



**Figure 6.2** – Survey responses indicating reasons why people do not use public transport.

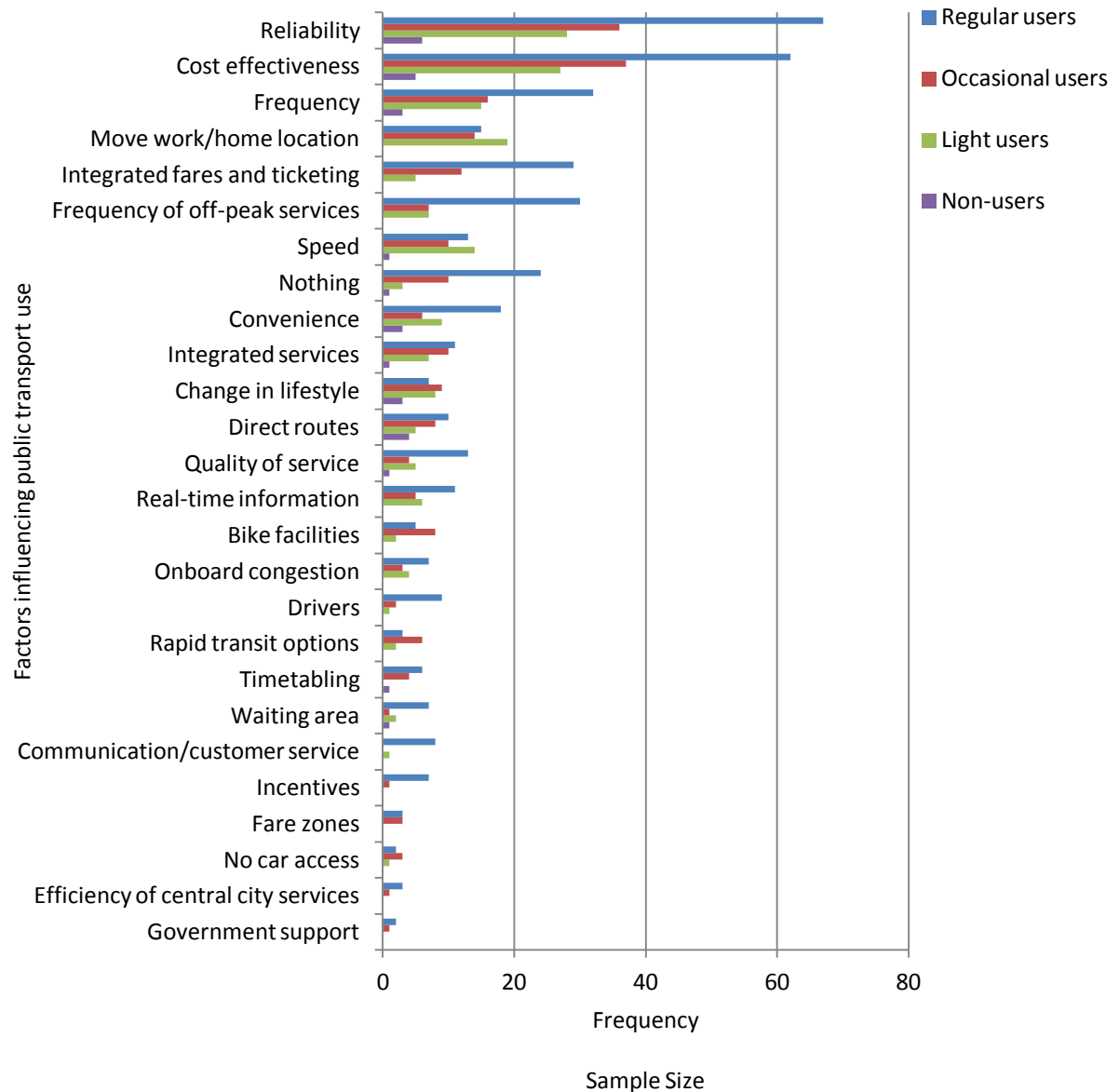
Cost and availability of parking, and the cost of driving (including petrol and car maintenance), were more important for regular users of public transport compared with occasional and light users. This may have important policy implications. If

<sup>28</sup> See Appendix C for a graph of all the influencing factors mentioned in the open responses.

‘car-friendly’ policies are introduced within the region that increase the convenience of the car (e.g. lower taxes on petrol, cheaper and more available car parking), there may be an increase in the number of car users exasperating traffic, environment and health problems. That the cost of car parking discourages drivers is recognised by Greater Wellington regional council, however, and it would contradict the RLTS to change policy in favour of cars (GWRC, 2010).

Environmental reasons for using public transport were mentioned by 11% of survey respondents who were mainly regular or occasional users of public transport. This suggests that for less frequent users of public transport context, such as convenience, cost and time, is a more important influence on public transport use than environmental impact. Chapter 5 discussed the gap between environmental awareness, intention to use public transport and actual use in the environmental behaviour model. As was suggested in section 4.2, there are numerous barriers which can explain why people do not act in a pro-environmental manner and why intentions and behaviour are not always aligned. Specific contextual factors are not identified in the model but contribute towards perceptions of public transport and car use captured within the psychological constructs and appear to be an important consideration in public transport behaviour decisions.

It is recognised that there are many factors at play in decisions to use public transport which, like the weather, may change daily. An awareness of the most important reasons (highlighted here as convenience and cost) will be important in assessing new developments to encourage public transport use, such as integrated ticketing discussed in sections 6.4 and 6.5 below. But how can the public transport service be improved, or what may influence people to use the service more? Figure 6.3 below illustrates the range of responses survey participants noted as being important for them to increase their use of public transport.



**Figure 6.3** - Factors influencing decisions to use the public transport system more than current levels, according to current use rates.

Reliability was of primary importance for 52% of survey respondents, comprising all user groups. This is in line with findings from the last three Annual Public Transport Satisfaction Monitor reports conducted for GWRC (Premium Research, 2008; 2009; 2010). Comment 1 in Table 6.2 illustrates the importance of reliability even for regular users of public transport.

**Table 6.2** – Comments from survey respondents alluding to changes required in Greater Wellington public transport.

Comment number	Survey responses highlighting the major improvements needed for people to use the public transport system more.	Public transport use
	<i>Reliability</i>	
1	I cannot stress how much reliability would [need to] change for me to make me use public transport more!! Not even that, just giving a time frame for when trains/buses are going to approximately arrive, like Christchurch does with GPS.	Regular user
	<i>Cost</i>	
2	Lower fares, the price hikes are absolutely ridiculous and make travelling a luxury I cannot afford.	Occasional user
3	It has to be affordable, a bus and train combined fare is equal to operating a car including fuel, parking and running costs (i.e. insurances and maintenance). If you want people to use public transport cut the costs ... Public transport is a community service not a bottomless pot of gold for private enterprise to dip their fingers into.	Non-user
	<i>Frequency</i>	
4	For someone who doesn't use a regular bus route make it easier to figure out where the bus routes are going when you don't have access to the internet to plan your route. Bus drivers are intimidating if you are not a regular user, they are off putting.	Regular user
5	I already use it the maximum I would on weekdays. On weekends I might use it a little more if services were more frequent or went to my usual weekend destinations and I knew about times and routes even for the services I used rarely; but it is much more convenient for me to use my car at those times.	Regular user
	<i>Integration</i>	
6	I use the train every weekday to come into Wellington. If I go to Newtown on a Saturday I usually take my car. I would be encouraged to go to Newtown by train and bus if I had an integrated travel pass. For me, knowing that I wouldn't have to bother with multiple tickets for that journey would be enough to make that small behavioural shift away from using my car. Incrementally, therefore, that shift, if taken up by a few thousand people in the region, would produce a range of benefits to the Wellington area.	Regular user

Cost effectiveness was the second most important factor for 47% of all survey participants which is encapsulated in comments 3 and 4 in Table 6.2. This corresponds to the results discussed in section 6.2.1 above. For example, the cost of public transport compared to driving was a motivation for both the use of public transport when it is cheaper commuting into the city on weekdays, and non-use of public transport when it is comparably more expensive than driving on weekends when free parking is more readily available.



Increased frequency of public transport services (both on and off-peak services) was reported as being important for 20% of the sample, which is in line with the previous GWRC monitor reports, where convenience was also rated highly. The present research shows that convenience and frequency were more important as motivational factors to light and non-users of public transport, although frequency was generally important for all groups. Convenience, directness of routes, cost, frequency and reliability are the main elements that would have to improve to encourage non-users of public transport onto the system. There was evidence in the responses to suggest that even regular users of public transport find taking a different route from their usual was difficult to plan and therefore discouraging, shown in comments 4 and 5 in Table 6.2.

Integration factors were also important for public transport users, likely reflecting the 37% who usually use two or more modes, or operators, of public transport in one journey. Speed and more integrated services were important for light users of public transport while integrated fares and ticketing were mostly mentioned by regular and occasional users of public transport. Quote 6 in Table 6.2 provides a compelling argument that integrated fares and ticketing could have a positive effect on public transport patronage in Greater Wellington. Integrated fares and ticketing are discussed in more detail in section 6.3.

There are obvious individual preferences as to what factors would have to change for people to use public transport in Greater Wellington more, shown above in the graph in Figure 6.3. Those who responded to the open ended question in the survey thought that reliability and cost effectiveness needed most improvement to encourage their use of the public transport system. Again, this is unsurprising when compared to the results of the past three annual monitor reports taken for GWRC where reliability has remained the key issue across all forms of transport and cost effectiveness the most important for buses (Premium Research, 2010). The 2008 and 2009 GWRC reports also draw attention to the general perception that driving is more cost effective than taking public transport in Greater Wellington (Premium Research, 2008; 2009). It is worth noting that the present survey was taken in September 2010 during a period of several train delays due to public works on the

rail tracks. In conjunction a price rise beginning October 2010 was being advertised at the time of the survey. These events may partly explain the importance placed on reliability and cost.

Overall, convenience was most important for non-users of public transport compared with other user groups. However, it was evident from open ended responses that even regular users thought in many cases (largely when not commuting) that driving was more convenient than taking public transport. For transport policy makers and planners, the results suggest that whilst reliability is the main issue needing improvement, creating an 'easy' journey for passengers to increase the attractiveness and convenience of the system may help encourage more use. Such measures would include more frequent services which are direct or well integrated, quick and of better quality.

### **6.2.3 Sub-question 1 summary**

In summary at least three-quarters of those surveyed use public transport on an occasional basis or more often. Most use it for commuting to work or study and drive for other everyday trips within the Greater Wellington region, largely because it is perceived to be more convenient and cost effective than taking public transport. The primary reason for light and occasional users of public transport not to use the system is the preference to walk or cycle. This indication is likely representative of the larger number of respondents from Wellington City and Lower Hutt, where commuting distances to the city are smaller and therefore more feasible by active modes.

Convenience and time factors (including frequency, speed, direct routes and rapid transit options) are most important to non-regular users of public transport. The qualitative responses indicate that besides cost and reliability, public transport must be more convenient for people to use it more. This is a challenge for transport policy and planners as it involves not only changing fundamental planning and timetabling of routes, but changing the public's perception away from a public transport system that is unreliable, slow, fragmented and of a poor quality to one that is reliable, seamless, and overall, convenient to use. The following sections

review the results of two ways in which this transition in perception of Greater Wellington's public transport system could be advanced: firstly by the introduction of the Snapper card; and secondly through the introduction of integrated fares and ticketing.

## **6.3 Snapper cards**

### ***Sub-question 5 – What is the public's perception of the Snapper system?***

The Snapper system is a smartcard form of payment for selected buses in Wellington City, Lower Hutt City and parts of Upper Hutt City within the Greater Wellington region<sup>29</sup>. The purpose of research sub-question 5 was to provide a snapshot of how the Greater Wellington public perceive the existing electronic smartcard ticketing system before looking in more detail at an integrated smartcard ticketing system for all forms of public transport. Section 6.3.1 presents the descriptive results for why people use the Snapper card and how satisfied people are with the Snapper card system. Open ended question responses were coded for analysis and are discussed in section 6.3.2.

#### **6.3.1 Snapper use**

Just over half (52%) of the survey respondents indicated that they use a Snapper card. In response to a multiple choice question asking why they use the card the majority selected convenience (77%) and the cheaper fares offered compared to cash (74%). These findings relate to the importance of convenience and cost in deciding to use public transport found in section 6.2. Other reasons (such as being able to use the card for retail purchases) were identified by no more than 5% of Snapper users. This suggests that the main function of the card is a transport ticket first and foremost, despite the growing number of retailers accepting Snapper payments.

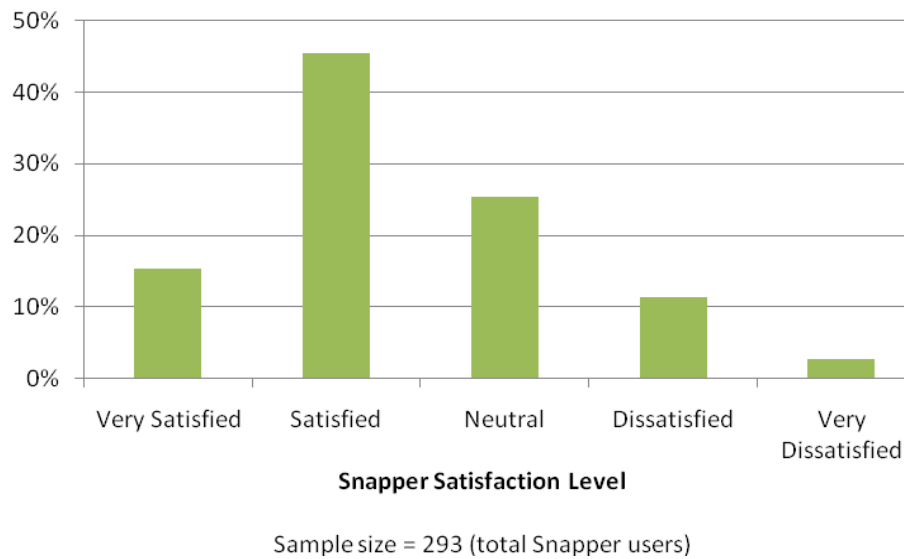
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<sup>29</sup> Snapper card readers have since been introduced in taxis, but were not available during the survey period.

Respondents who did not use a Snapper card indicated that this was primarily because they never, or hardly ever, used bus services (32% of non Snapper users). The cost of the card was a barrier for 20% of non Snapper users as well as the limited area that the card covers (affecting another 20% of respondents). This could help explain the 15% of people who thought it would be an inconvenience to use Snapper as well as those who thought that it was not worth it for them, or that other tickets were cheaper for them (11% each). For those passengers frequently taking multiple journeys on public transport within the city and outside, using Snapper would have worked out to be more costly than buying a paper 'Daytripper' ticket or a similar product for other public transport services. A small proportion thought that there was a lack of information on Snapper cards which inhibited them from buying one, and only a small proportion (4%) had privacy concerns about the smartcard. Cost, fares integration, information and privacy will therefore be important to consider when planning the introduction of an integrated smartcard ticket for use on all modes of public transport and are discussed in section 6.4.1 below.

### **6.3.2 Snapper satisfaction**

The majority of Snapper users (61%) were satisfied or very satisfied with their card, shown in Figure 6.4. These people were happy that the card worked as it should, although there was evidence in the open ended responses that the system was not perfect and could be improved. Table 6.3 shows a range of typical responses from Snapper users at each level of satisfaction from 'Very Satisfied' to 'Very Dissatisfied'. The 14% of respondents who were dissatisfied or very dissatisfied with the Snapper cards suggested this was largely due to tag on, tag off hassles (you have to swipe your card over a reader both on entry and exit to the bus), and topping up issues. However, only 3% of Snapper users thought that the tag-off process slowed overall travel time, so that the process may be more of an inconvenience factor than actually causing travel delay.



**Figure 6.4** – Survey responses to levels of satisfaction with the Snapper card.

The open ended responses (a selection shown in Table 6.3 below) indicate that in general the majority of users are happy with the Snapper card, although they feel that improvements to the system could be made. Largely these improvements involve extending the scope of the card for use on other modes of public transport, and to other bus operators, as well as making it easier and cheaper for travel involving multiple trips. Those who were dissatisfied with the system felt some resentment that old ticket products had been replaced, or were due for imminent replacement, with the Snapper card. They were also not in favour of the top-up fee charged, or the inconvenience posed by having to tag off.

**Table 6.3** - Open ended responses indicating why participants are satisfied or dissatisfied with the Snapper card system. These responses represent general feedback for each satisfaction group ranging from 'Very Satisfied' to 'Very dissatisfied'.

<b>Snapper Satisfaction</b>	<b>Responses from the online survey</b>	
<b>Very Satisfied</b>	No coins, no ticket change required.	It's a faster method of payment. I don't have to carry cash. Cash fares cost more. Cash fares can slow the journey down significantly.
<b>Satisfied</b>	A little dissatisfied due to the 'clunkyness' [sic] of the tag in tag out. It isn't as smooth as it should be e.g. Oyster in London. Generally happy with the system.	It's easy and convenient on the bus - don't have to carry coins on me all the time which is nice. You could make it universally useful though - trains and for parking meters could be an idea!
<b>Neutral</b>	For some people Snapper works first time every time; for others they have to try several times before it reads. It is annoying when the cards don't work (or the people can't get them to work) and we're standing waiting.	I am satisfied with the snapper card itself; however, it is still very annoying that I can't use it on all services. For example, if I catch a bus from my home in Titahi Bay, I have to pay a cash fare as Snapper is not accepted on Mana buses, then purchase a train ticket for my trip between Porirua and Wellington, and <i>then</i> I can use my Snapper on the Wellington City buses. We are in desperate need of a simplified and completely integrated ticketing system!
<b>Dissatisfied</b>	Difficult to know how much money I have on my card, can't top up at any of the dairies near my house, don't like being charged extra money (to top up) on top of my transport costs, don't like the annoying noises on the buses, often the tag-off points on buses don't even work. Seems like unnecessary innovation for the sake of innovation, rather than actually improving my life in any way.	It's picky with how it's used, i.e. you have to hold it very still. You have to remember it at the beginning and end of your journey. You can't top up on buses.
<b>Very Dissatisfied</b>	I can't use it for Daytripper purchases, and it doesn't give me any discount for city section. The costs if I forget to tag off are too high. I would have to buy the card. I would have to maintain the balance etc. It hasn't made boarding noticeably faster. Go Wellington are using it as an excuse to get rid of my favourite fare types (Gold card for regular users, Daytripper, etc). It can't be used on Mana or the trains. Using for more than one passenger is slow and painful. They don't always work.	Have been double charged for some trips, and getting the money back is difficult.

### **6.3.3 Sub-question 5 summary**

The overall positive perception of the Snapper card concept bodes well for any future introduction of integrated ticketing. The results also suggest that, although convenient to a certain extent, Snapper is not sufficient to meet the needs of all those travelling by public transport. That over half the participants in the survey used the card, despite the varying levels of satisfaction, also implies that uptake and use of a new integrated smartcard ticket would be good. Valuable lessons can be learnt from feedback provided on the Snapper card and applied to implementing an integrated smartcard ticket. The results suggest that the reasons for use (such as convenience and cheaper fares), alongside the barriers to use (area/mode coverage, technological failures and initial card cost), should be prioritised in the development of any new smartcard integrated ticketing system. The section below presents the results of the public's perception towards a multi-modal integrated ticketing and fares system.

## **6.4 Perception of integrated ticketing**

### ***Sub-question 6 – What is the public's perception of a future integrated ticketing system on a regional and national scale?***

Sub-question 6 attempts to gauge the public's perception of integrated ticketing; a potential solution to address problems within Greater Wellington's public transport system identified above. Reliability, cost-effectiveness and convenience were distinguished in sub-question 1 as the most important factors for improvement to encourage use of the public transport system, and sub-question 5 showed that the Snapper card had plenty of scope to improve and extend its service.

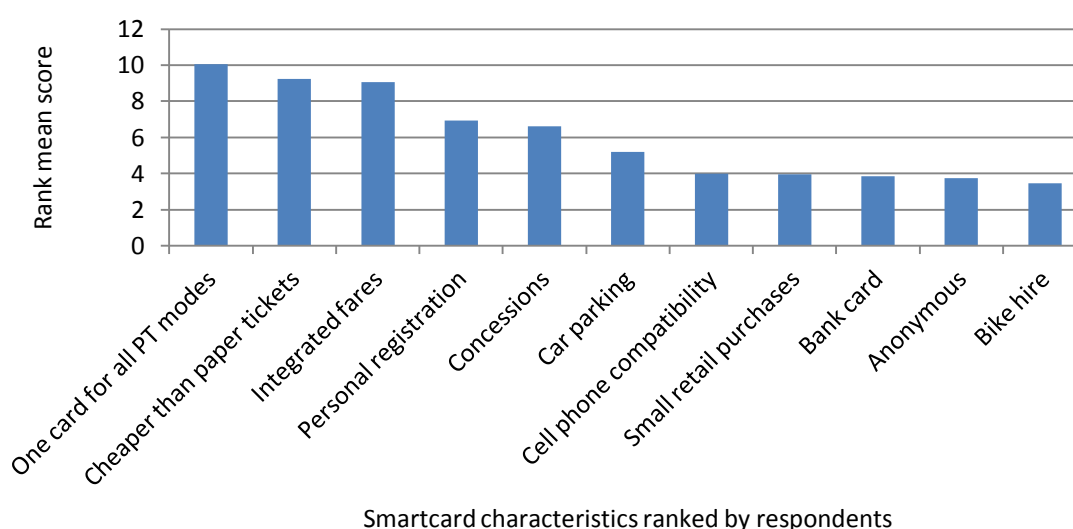
Participants in the online survey were presented with an explanation of smartcards and integrated ticketing, and then asked a range of questions relating to such a system being placed in Greater Wellington and other cities in New Zealand. The results are presented below. Firstly the results of the responses to questions about a Greater Wellington regional card are presented including quantitative and qualitative responses about smartcard characteristics, importance of integrated

ticketing and support for government funding. Secondly public perceptions for a national integrated ticketing system are shown and briefly discussed. The results were also cross-tabulated to address any potential bias arising between users and non-users of public transport, and people who have some previous knowledge about, or experience with smartcards.

#### 6.4.1 Perception of integrated ticketing for Greater Wellington

##### *Smartcard characteristics*

Smartcard integrated ticketing systems can be extremely complex with a range of functions besides public transport use, such as integrating bank cards and purchasing non-transport related goods (see Chapter 3). With these functions in mind, if a smartcard integrated ticket existed for public transport in Greater Wellington, what characteristics would people want the card to have? Figure 6.5 illustrates the mean score for eleven characteristics which were ranked by participants in the online survey. Participants could also fill in an open-ended question below the ranking question to add further comments.



**Figure 6.5** - Mean scores of ranking the smartcard characteristics. *Note:* Scores were reversed for analysis so that 11 = most important and 1 = least important. PT stands for public transport.

Two of the most important characteristics for the smartcard were that it can be used on all modes of public transport in the Greater Wellington region and that fares are integrated. These are the essential components of an integrated ticketing system. As



established in the literature review in Chapter 3, having a single card for all modes of public transport allows the greatest possible set of advantages to be had from an integrated ticketing system (Preston et al, 2008). This is recognised in the Greater Wellington Regional Land Transport Strategy 2010 – 2040. However recent reports suggest that electronic ticketing will be developed on rail first before being integrated with buses (Dominion Post, 2011; Public Transport Voice, 2011). In light of the importance of the multi-modal function to passengers illustrated in Figure 6.5 and highlighted in the literature review, delaying integration of modes may deter, rather than encourage people to use public transport. Meanwhile GWRC is actively involved in other public transport projects such as the realtime information project on buses (GWRC, 2010), satisfying preconditions for the successful implementation of integrated ticketing. Therefore there appears to be little rationale in adopting the ‘rail first, bus later’ approach (see section 3.4.4) recently discussed by policy makers.

In addition, a high priority in ranking the smartcard characteristics was that fares should be cheaper on smartcards than buying a paper ticket. The priority placed on cost is expected as it is standard practice to promote cheaper fares on smartcards to encourage their uptake and use. Fares in London using an Oyster card for example are over 50% cheaper than buying a paper ticket and the Snapper card in Wellington also offers a 20% discount when the card is used (see Table 3.1, Chapter 3). The importance of cost for survey respondents is also in line with findings from sub-questions 1 and 5 where cost-effectiveness was a crucial element in determining public transport use and Snapper use. For example, a regular user said that:

I would be concerned that an integrated card would not deliver the cheapest fare for train use. Although I have rated the use of the card for small retail purchases, I have had experience of doing this in Hong Kong and have found it quite convenient, but am not sure that it delivers value for money, something that I would be more concerned about when not on holiday. If it could be shown that cost savings would be overall to my advantage, I would probably put an integrated card near or at the top of my list.

Another regular user was concerned that an integrated ticket would be:

targeted towards people who use various services/routes on a daily basis, and [would] therefore [be] quite expensive. The new Snapper 'GetAbout' card is an example of this - \$185 for 30 days travel on several different bus operators. However, my day-to-day usage is on one bus route, back and forward, between zones 3 & 1. So I don't need an integrated ticket, but would use one if it was convenient and just as cheap.

Cheaper fares have been integral to the success of many integrated ticketing systems in Europe (FitzRoy & Smith, 1998). There may be an expectation of features that are similar to other systems, such as lower costs, because 68% of survey respondents had used a smartcard previously either in New Zealand or overseas. Previous research also suggested that people perceive integrated ticketing as a natural progression in the public transport system, but do not expect fare price increases as a result (Ipsos Mori & Institute of Transport Studies, 2010). This will have implications for fare policy (Preston et al., 2008), and is discussed further throughout this chapter.

Of secondary importance in prioritising smartcard characteristics, with mean scores above the neutral mid-point of 5.5, are the personal registration and concessions functions on the cards. The ability to have your card personalised, to retrieve money lost from system errors or to cancel your card if lost, was an important characteristic of the Snapper card. Therefore it follows that it would be important also for a general integrated ticket.

Like the results from Snapper users, the ability to use a smartcard card for other related functions, such as retail transactions, was less important in comparison to the primary public transport related functions. Car parking had a higher ranking than other non-public transport related functions which could have important implications on actual public transport use, especially outside of commuting hours. The car parking characteristic was included because it was mentioned in the pilot survey and in interviews with transport experts as being a logical addition to an

integrated ticketing system. If used for sustainable initiatives in conjunction with public transport, such as park and ride schemes, there may be a positive influence on public transport use. However, if it was adopted widely for car parking, either on or off the street, the ‘convenience’ of driving could be further increased with the negative effect of more cars on the road. Therefore it is a characteristic for developers to carefully consider in the design of an integrated ticketing system. Despite the relatively low importance placed on related functions, such as cell phone and bank card compatibility, previous research has suggested that once a scheme has been adopted these extra functions will contribute to increased convenience for the passenger leading towards increased public transport use (Turner & Wilson, 2010). For an introductory scheme however, and in line with public, and stakeholder perceptions (from Chapter 3), the public transport functions should be of primary importance. As shown in the Snapper use and satisfaction results (section 6.3), achieving a smooth and efficient ticketing system is important to passengers above added functionality such as retail.

The open ended responses indicate that, as well as the characteristics listed, there was high priority placed on having period passes (for example daily, weekly and monthly passes) loaded onto the card. This would be especially important for train users in the transition from a paper ticketing system to a smartcard integrated ticketing system. Whilst it is important to have a variety of ticket types available to purchase on the smartcard, it should be noted that simply translating the current number of ticket products onto the card could be disastrous, as exemplified by Sydney’s costly attempt reviewed earlier in Chapter 3. A priority for policy makers and planners introducing an integrated ticketing system will be simplifying and reducing integrated fare costs as much as possible.

Two other elements identified in the open ended responses as necessary for effective integrated ticketing were ease of topping up and checking your balance, and the ability to do it online for free. For example, an occasional public transport user suggests that:

You should be able to put monthly tickets on your card, like you can in London. ... should be registered to you if you wish, so that if you

lose it, you can cancel the funds on it and don't lose them. (In London, your card can be anonymous, but you can also register it). You should be able to top it up by a variety of methods - e.g. internet banking, online, automatic (when your account drops below a certain level), phone, credit card, and self service stations. It should read the card quickly (Snapper cards have a delay, but Oyster card was basically instantaneous). It should be inexpensive, e.g. \$3. Snapper cards are expensive.

Snapper users highlighted similar issues with the Snapper system. These convenience factors should be considered for improvement in a new integrated ticketing system, especially to encourage occasional and light users of public transport.

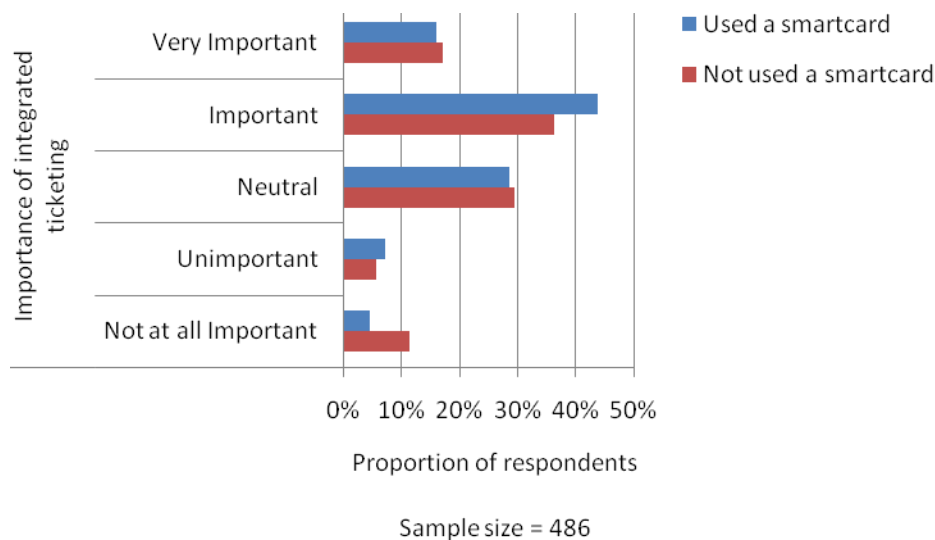
To summarise the smartcard characteristics reviewed, it is most important that the card functions as it is intended to function. The survey results show respondents perceive that the most important characteristic is that the one smartcard should be accepted on all forms of public transport in the Greater Wellington region, secondly it has to be cost effective, and thirdly fares should be integrated throughout the system. These factors are also highlighted in the literature reviewed in Chapter 3 as conditions for a successful integrated ticketing system (Abrate, et al., 2009; Marchese, 2006; Matas, 2004; Preston, et al., 2008).

Whilst the public transport functions of the card are of primary importance, some interest was shown in non-public transport characteristics, particularly car parking. The implications for policy makers and smartcard designers is that the function of the card as a public transport ticket should be the first and most important step to get right in a new system, in particular simplifying ticket products, fare costs and transactions. When the system is running 'as it should' other characteristics could be offered. This approach was mentioned in Chapter 3 and is being adopted in the Auckland Integrated Fares System (AIFS) project. Meeting passenger's expectations first, will likely lead to trust and use; exceeding their expectations is an added benefit which could encourage further use of the public transport system. These results suggest there is a favourable perception towards the primary functions

of integrated ticketing. The section below shows how important integrated ticketing is for public transport users and non-users, and if government funding would be supported for an integrated ticketing system in Greater Wellington.

### ***Importance of integrated ticketing***

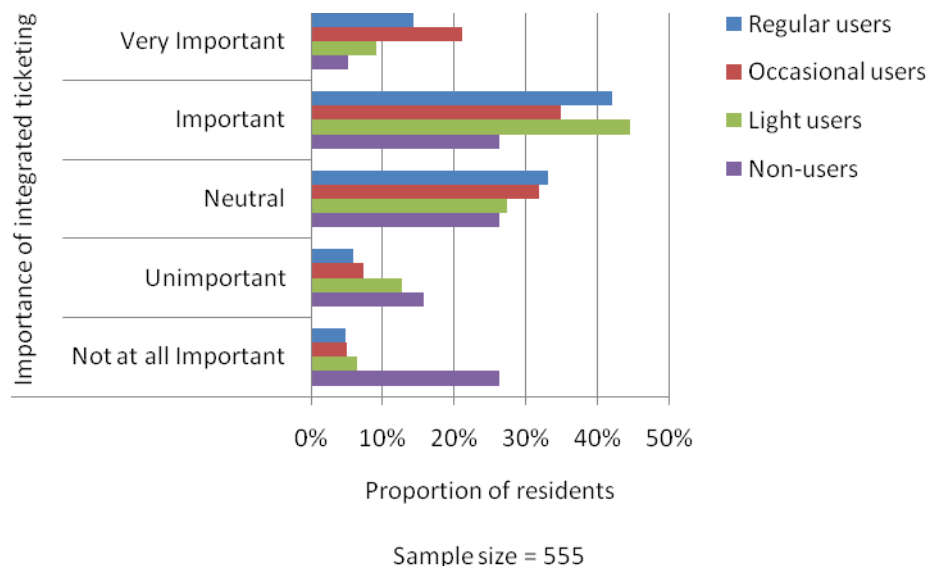
Importance of integrated ticketing is high shown by over half (54.4%) of respondents who indicated that it was important or very important to them. Integrated ticketing was important for those who had used smartcards as well as those that had not, as shown in Figure 6.6. It was slightly less important for those that had not used a smartcard (17%) compared with those that had used one (11%).



**Figure 6.6** - The relative importance of integrated ticketing according to previous smartcard use.

Figure 6.7 below illustrates that most survey respondents across all public transport user groups feel that integrated ticketing is important for them. The small percentage of public transport users who feel integrated ticketing is unimportant may reflect the ‘train-walk’ culture that exists in Wellington whereby many commuters use a single mode of transport to get to and from work (see Chapter 3, section 3.3.1). They may not perceive the need for an integrated ticket despite the fact that it could be used for park-and-ride, or commuting trips. However, 32% of non-public transport users also feel that it is important or very important for them. Nearly half those in the light users’ category also feel it is important to have integrated ticketing in Greater Wellington. Nearly a third (31%) of survey

respondents were ‘neutral’ to the importance of integrated ticketing. This could reflect the perception of a lack of urgency towards developing integrated ticketing compared with other public transport improvements identified as important in Figure 6.3 (section 6.2.1), especially improving service reliability.



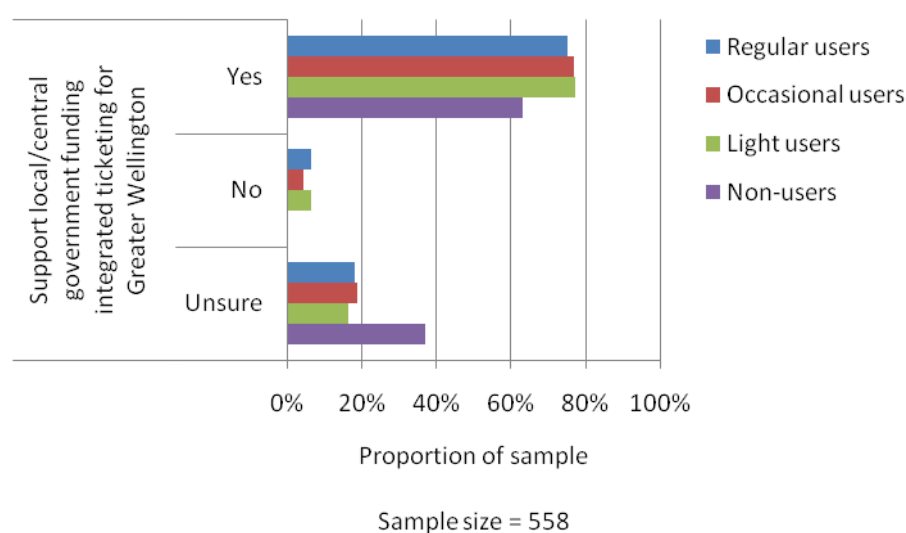
**Figure 6.7** – The relative importance of integrated ticketing according to public transport use.

These results are in line with studies in the UK which found that in three different regions smartcard options were favourable for 15 – 20% of non-public transport users and 39 – 63% of public transport users (Ipsos Mori & Institute of Transport Studies, 2010). If integrated ticketing is perceived to be important to these low user groups and is introduced, it seems likely that they will be encouraged to use the Greater Wellington public transport system more frequently. This speculation is further discussed in section 6.5.

### ***Support for government funding of integrated ticketing***

One of the largest barriers to integrated ticketing is cost (as discussed in Chapter 3, section 3.4.3). Integrated ticketing projects are also complex because of the public commitment to provide a service which is often run by a combination of public and privately owned companies, under the umbrella of a regional council, which are subject to policy direction from national government. As a result, support for such a large project is needed from the public, private companies and government bodies. The results below further the discussion from Chapter 3 on the importance of government funding support for integrated ticketing projects.

Just over half of survey respondents thought integrated ticketing was important for them, but an overwhelming 76% supported local and, or, central government funding for a system in Greater Wellington. The strength of the public's commitment to integrated ticketing is reflected in this percentage because ultimately it is their tax money which the government would use to invest in the system. The results of the cross tabulation show little difference in support for government funding according to previous smartcard use. Interestingly, however, nearly two thirds (63%) of non-users of public transport supported funding for integrated ticketing and not a single non-user was against it. Figure 6.8 shows support for government funding according to each user group. Whilst 19% of respondents were unsure whether or not they would support government funding, the large majority across all groups are in favour.



**Figure 6.8** - Support for local/central government funding of an integrated ticketing system for Greater Wellington.

Qualitative responses give further insight into why survey respondents support, or do not support government funding integrated ticketing for Greater Wellington. Table 6.4 presents a range of opinions according to the respondent's level of support.

**Table 6.4** - Responses from the online survey to the question, ‘Please explain why, or why not, you would support government funding?’ according to their support level.

<b>Support funding</b>	<b>Responses from the online survey</b>	<b>User Group</b>
Yes	Because it is a service that benefits the community as a whole, and also makes it easier for visitors to Wellington to use all the public transport facilities and if they were amalgamated to a single card this could be easier.	Occasional user
	Although I seldom use public transport, I do think that an easier less complicated system for those who do is necessary. It would also be easier for tourists and visitors to the city.	Non-user
	Anything that encourages use of public transport over cars is good for traffic and the environment. The cost savings here would partially offset the government investment.	Occasional user
	Encouraging use of public transport is most easily done through value for money, and convenience. An integrated ticket system would be an excellent way to achieve this.	Occasional user
	Our population is growing - in order to better manage our cities, encourage tourism, meet emission targets we need to have an integrated and efficient public transport system and I think integrated ticketing is a key part of that system. When I was in Vancouver for a summer you brought one ticket and could use it on the ferry, sky train, and buses.	Occasional user
Unsure	The public transport system needs to be improved so that more people use it before spending on new things. Although if this encouraged more people to use it, it would achieve the same ends.	Occasional user
	The old 10 trip tickets and the current monthly gold pass are very convenient options; the introduction of the snapper card has effectively increased the cost of travel (by comparison) and is far more inconvenient (particularly having to tag off and getting charged a full fare if you forget - why not tell the driver where you are going and pay with the card rather than cash? Seems a bit of a money grabbing opportunity). And I would be fairly concerned that this would happen with the introduction of a combined/integrated travel card.	Regular user
	Unsure because it might mean cheap options become the same price as more expensive options. Might also take a while to implement and get step up which might mean more delays. Would be good to synch buses and trains though.	Regular user
	I prefer monthly passes which don't need to be scanned, just shown to the driver on embarking.	Regular user
	WCC already pays ~55% of tickets (according to Metlink last time I looked), and tickets keep going up with worse service, I think either the system should be owned by the government and leased to service providers, or not funded at all... I just don't think the Wellington transport agencies can be trusted with public money.	Regular user
No	It is funding a private company. They should be owned and run by local and/or national government. I would like transport services not transport companies ... out to make as much profit as they can get away with.	Light user
	It is more important to me that the services improve. They need to be worthwhile using before we invest money in a ticketing system.	Light user



Respondents that support government funding, do so because they believe it is a community investment which may also have environmental benefits and aid tourist travel. Interestingly, environmental reasons were not often remarked on for factors influencing public transport use, but were mentioned frequently as an important reason for government to support integrated ticketing. This could be because those aware of the environmental consequences of driving prefer to walk or cycle rather than take public transport or drive. Weather could also have been cited as a factor influencing use of public transport for those that walk and cycle, rather than concern for the environment. Improving convenience was frequently mentioned in support of government funding, again highlighting the importance of the convenience factor within the public transport system. These positive externalities have been recognised as encouraging investment in integrated ticketing, in spite of the often large set up costs (Welde, 2009) and therefore it is positive that most Greater Wellington survey respondents see the wider benefits of such a system.

Many of those who were unsure about government support felt they did not have enough information to decide, but also that other elements of the public transport system should be invested in before integrated ticketing. Unsure respondents were also worried about increasing costs of public transport if the government funded it. There is also evidence that some users would prefer to stay with the paper based ticketing system, and felt that a new system should not be forced upon them. Some unsure respondents and the majority of those against government funding believed that it would benefit commercial companies' back pockets, i.e. the bus companies, more than the community. They would prefer to see tax money spent on other elements of the public transport system, especially reducing costs.

In summary, the majority of respondents are in favour of local and, or, central government funding an integrated ticketing system for Greater Wellington. These people are not all regular public transport users but see the wider benefit for the community, environment and tourist industry. Those unsure or not in favour of the system are concerned about costs rising, subsidising private company profits and not seeing the real benefits over the costs. It is clear therefore, that a comprehensive information campaign would need to address the issues surrounding public

uncertainty of integrated ticketing in the lead up to and launch of a new ticketing system. Policy makers should also be aware of some of the public's dislike of private ownership of parts of the public transport system. Mediating private company and public concerns has been a large part of AIFS and results show the situation is likely to be similar for Greater Wellington.

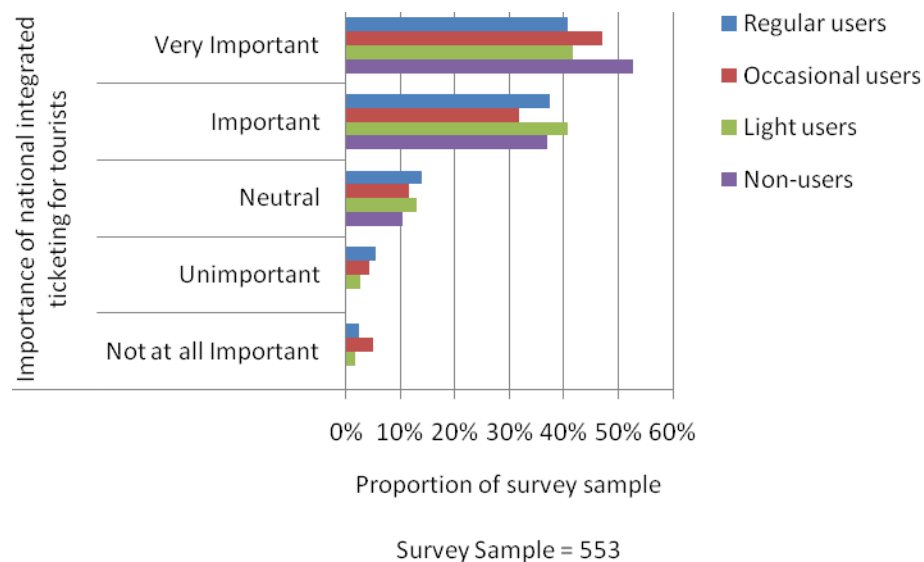
#### **6.4.2 Perception of integrated ticketing on a national scale**

The NZTA partially funded AIFS on condition that elements of the system would be used for future integrated ticketing projects in other cities throughout New Zealand (discussed in Chapter 3). Therefore, there is potential for the same public transport ticket to be used in several major cities of New Zealand. However, comments from NZTA (discussed in Chapter 3) suggest that this goal remains an aspiration at present. Does the Greater Wellington public perceive this as a worthwhile goal? Separate questions in the online survey identified how important for the respondent and how important for tourists, a national integrated ticket would be.

Survey respondents thought in general that national integrated ticketing was important. It was important or very important for just under half (43%), whilst about a third (36%) were neutral to the idea and the remainder (21%) considered it unimportant. There was little difference in the level of importance attributed to previous smartcard use, or how often people use public transport, although non-users represented the highest proportion within the 'not at all important' category. There is likely to be a proportion of non-users that will never consider using public transport which could be reflected in this category.

The importance of national integrated ticketing for tourists was rated highly from survey respondents with 79% considering it important or very important. Importance was also rated highly across all user groups and most highly by non-users, shown in Figure 6.9. It is interesting that non-users rate the importance of integrated ticketing higher for tourists than themselves. This could reflect the importance of New Zealand's tourist industry as the country's biggest export industry (TIANZ, 2010). It also implies that even though some people may not use

public transport themselves they view it as a necessary means of travel for others. It is noted that further research should be done to ask the tourists themselves if they would be in favour of national integrated ticketing.



**Figure 6.9** - Importance of integrated ticketing for tourists, according to public transport use.

National integrated ticketing is a future goal but the building blocks are being developed within AIFS. Results of the survey from Greater Wellington respondents indicate that there would be reasonable support for such a venture and even more so amongst those in the tourist industry. Previous research has shown that the more integrated a public transport system is and the wider region it covers, the greater the benefits in terms of patronage and reduced car use (DfT & Detica, 2009b; FitzRoy & Smith 1998; Preston et al., 2008). However, areas with disparate transport systems and low population densities may not see the benefits large cities, such as Auckland and Greater Wellington, would due to wide-ranging pricing schemes. Where large distances have to be covered, patronage is lower and overheads are usually higher (Marchese, 2006). Nevertheless, a key reason the NZTA National Integrated Ticketing Programme was set up was to provide for procurement efficiencies so that other regions could use parts of technology used for AIFS (see Chapter 3, section 3.4.3). National integrated ticketing should therefore remain a national goal, following the success of region wide systems.

### **6.4.3 Sub-question 6 summary**

In conclusion, the survey results indicate there is a positive perception of integrated ticketing on both a regional and national scale. There is a higher level of importance placed on regional integrated ticketing than national, which is to be expected as people often show stronger feelings towards occurrences in their community or region than elsewhere. This is in line with the NZTA approach. The survey respondents had a clear idea of what they expect to see from a smartcard integrated ticket, which are that:

- it can be used on all modes of public transport in the region;
- smartcard fares are cheaper than paper tickets;
- fares are integrated to allow for multiple trips at cheaper prices.

Developing a cost-effective system for the region will be a high priority for government, operators and the general public. Funding support from central and, or, local government is encouraged by most survey respondents and is likely to be needed if integrated ticketing is to be developed for the Greater Wellington region. This was acknowledged in interviews with key stakeholders (reported in Chapter 3, section 3.4.3) and insufficient funding has the potential to be a barrier to successful implementation if that support is not granted.

The positive response amongst high and low user groups is encouraging for policy makers trying to develop integrated ticketing for Greater Wellington. How this may affect public transport use is discussed in section 6.5 below.

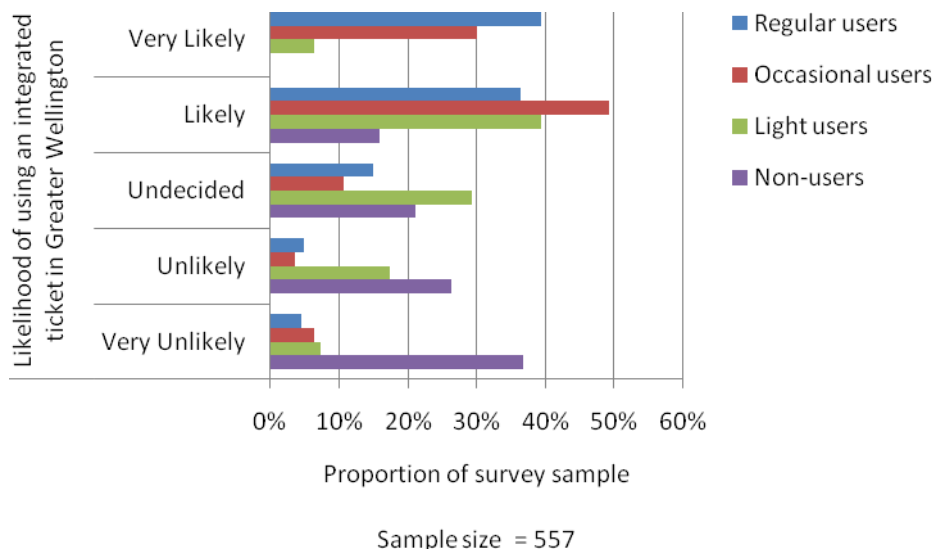
## **6.5 Integrated ticketing and public transport use**

### ***Sub-question 7 - How might integrated ticketing affect public transport use?***

The results above from the online survey show there is, in general, a good perception of integrated ticketing. How can this perception be translated to actual use of the integrated ticketing system, and an increase in public transport use as a result? Two questions were asked in the survey to identify how likely participants would be to use an integrated ticket and how participants thought it would affect their use of public transport in Greater Wellington. Again the survey responses are cross-tabulated to check for bias from previous smartcard use, and to see the differences between user groups. Assessing the perception of integrated ticketing use and perceived effect on public transport use by different user groups is crucial to understand the impact integrated ticketing may have on the public transport system.

#### **6.5.1 Likelihood of integrated ticket use**

How likely is it that people will use an integrated ticket in Greater Wellington? Two thirds (67%) of survey respondents thought that they were likely or very likely to use an integrated ticket. The majority of those who were likely to use an integrated ticket had used a smartcard previously, but half (51%) of those who had not used a smartcard indicated that they would also be likely or very likely to use a Greater Wellington integrated ticket. The majority of those likely to use an integrated ticket are occasional and regular users of public transport, followed by light users, as shown in Figure 6.10 below. Non-users were most unlikely to use the integrated ticket.



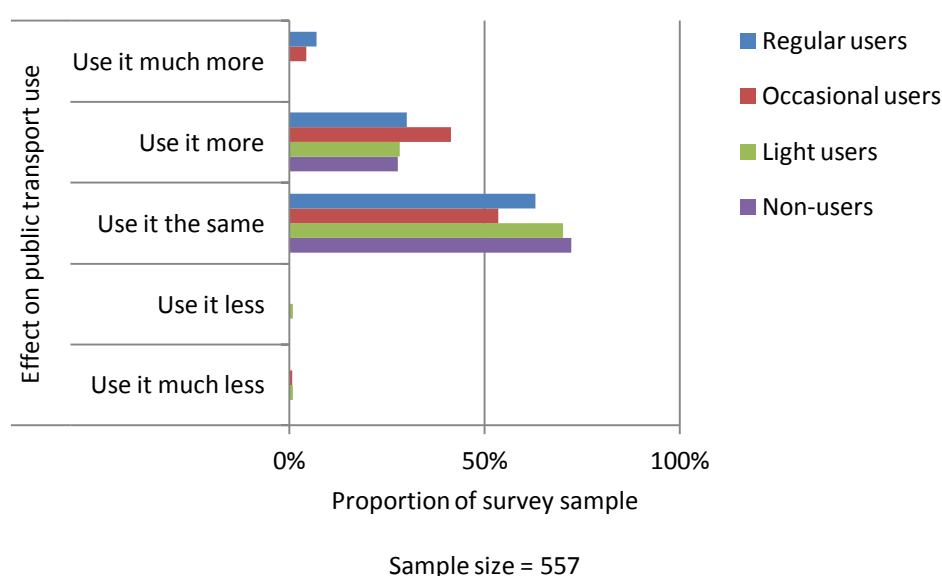
**Figure 6.10** - Likelihood of survey participants to use a smartcard integrated ticket within Greater Wellington, according to how frequently they use public transport.

The findings are slightly different to the importance of integrated ticketing discussed in section 6.4.1 where non-users placed more importance on integrated ticketing. Therefore, there seems to be a perception amongst non-users that integrated ticketing is an important element of the public transport system even if they may not use it themselves. Similarly, the small percentage of regular users who would not use integrated ticketing, may illustrate those single mode commuters who do not perceive the need for an integrated public transport ticket themselves. Certainly public transport users who usually use two or more modes or operators are more likely to use an integrated ticket (78%) than those who usually only use one mode (66%). Both figures are relatively high however, suggesting that uptake and use of integrated ticketing would be good amongst both groups, and may even encourage single mode users to try other forms of public transport.

## 6.5.2 Effect on public transport use

The remaining question is whether those likely to use integrated ticketing, especially those in the low user groups, would increase their use of public transport in Greater Wellington as a result. The majority of survey respondents (62%) across all user groups felt that they would use the public transport system about the same as they do currently. Figure 6.11 shows that 45% of occasional users and 37% of regular users felt they would use public transport more, or, much more than at

present as well as 28% of light and non-users. About a third (28%) of light and non-users felt they would use public transport more. These proportions, whilst not huge, do represent a significant increase in public transport use of 37% of the survey sample. Only three people from those surveyed felt that they would use the public transport system less.



**Figure 6.11** - Effect on public transport use if integrated ticketing was introduced in Greater Wellington, according to public transport use.

There are several implications of these results for the development of integrated ticketing in Greater Wellington. Firstly, uptake is likely to be mixed amongst user groups. More frequent public transport users are likely to adopt the card first. Previous research suggests that effects on patronage from integrated ticketing are likely to be small in the short run and larger in the long run as transport infrastructure improves and wider integrated transport strategies are adopted (see discussion in Chapter 3 and Abrate, et al., 2009; FitzRoy & Smith, 1998; Matas, 2004). There are opportunities to grow patronage in the long run in Greater Wellington where there are currently extensive upgrades of the rail system taking place alongside developments in realtime information for buses. The increasing numbers using Snapper give further claim to the expectation that patronage may increase. However, there will need to be a comprehensive information campaign to coax less frequent users towards understanding and using the card, as suggested in

section 6.4.1. This is supported by research in Europe. Effective marketing contributed to the success of the Verkehrsverbund integrated transport systems in Europe, alongside improvements in public transport quality and fares (Pucher & Kurth, 1995). Based on the present research and following the experience of other countries, operators and policy makers should plan for and may expect increases in patronage following integrated ticketing in Greater Wellington. Short-run patronage increase will be more likely if current projects (rail upgrades and realtime) run smoothly when fully completed. In addition, a successful launch of AIFS will contribute to positive perceptions of integrated ticketing being launched in Greater Wellington. Patronage increases do have the potential to be problematic in peak periods with congestion already apparent on some services. Congestion could compromise passenger safety (see discussion on security Chapter 3, section 3.3.1) and should also be planned for.

### **6.5.3 Sub-question 7 summary**

Over half of survey respondents are likely to use integrated ticketing in Greater Wellington and about one quarter are undecided. The undecided and those who feel they are less likely to use integrated ticketing are predominantly light and non-users of public transport. Similarly more light and non-users perceive that they would use the public transport system the same as at present across the user groups, although all groups were clustered in this category. Over one third of the survey respondents felt they would use public transport more if integrated ticketing was introduced in Wellington.

Overall the response is positive in terms of increasing patronage which may lead to multiple benefits in the long run if the system is successful. The results presented in this section should not be looked at in isolation. The previous results presented, in particular the qualitative data, give valuable information as to how the general public perceive integrated ticketing and what they might expect. The concluding section to this Chapter brings together the elements from sub-questions 1, 5, 6, and 7 going partway to answering the central research question ‘how might an integrated ticketing system affect public transport use in the Greater Wellington region?’



## **6.6 Conclusion**

The results of the online survey addressing sub-questions 1, 5, 6 and 7 have provided evidence for how people in Greater Wellington use and perceive the public transport system. Used with sub-question 3 results on the advantages and disadvantages of integrated ticketing (presented in Chapter 3 and discussed throughout this chapter) the opportunities for, and barriers to, developing integrated ticketing for Greater Wellington start to become clear.

The survey results are aligned with results from Greater Wellington's Annual Public Transport Satisfaction Monitor (Premium Research, 2008; 2009; 2010) in terms of public transport use for the region which is generally high for New Zealand standards and is used largely for commuting to work or study. Non public transport users were influenced by the inconvenience compared to driving, poor integration of services, and cost of public transport which discouraged their use of the system. For current public transport users cost was a significant barrier to using the system more. Participants also mentioned reliability, frequency of services and integrated fares and ticketing needed to be improved to increase patronage.

Just over half of respondents had used Snapper and were generally satisfied with the system. The inadequacies of the Snapper card, including non-integrated fares, use on only one bus and ferry operator, and difficulties of topping up and reading the card balance were also mentioned as important characteristics to consider in the development of a smartcard integrated ticket for Greater Wellington. Most importantly an integrated ticket should meet the needs of the public. These needs are: that it is multi-modal and covers the Greater Wellington region; and is cost effective and cheaper than buying paper tickets. If the expectations are met and sufficient information is conveyed to the public on the benefits and use of the card there is an opportunity to reduce the 'inconvenience' barrier to using public transport.

Integrated ticketing for Greater Wellington was perceived to be important for the majority of the survey sample. It is important for those who have used smartcards and those who have not, for the majority of public transport users and about a third

of non-users. There is strong support for government funding an integrated ticketing system, which is an important finding as cost is often the largest barrier to integrated ticketing (Jakubauskas, 2006) and is likely to be no different in Greater Wellington. Having strong community support as well as government and industry backing is crucial for the system to be developed in an efficient and effective manner. Overseas experience has demonstrated the huge costs and delays of not collaborating on, or effectively managing public and private relations (see Chapter 3, section 3.4).

The results also support the findings of previous research on patronage levels increasing as a result of integrated ticketing introductions including other improvements to the public transport system. The survey results show that more irregular users of public transport perceive that they will be encouraged to use the system more with integrated ticketing. The reputation of public transport travels fast in Greater Wellington and it will be important to ensure a new system is introduced with minimal problems to reduce the chances of losing those passengers. This point was highlighted in an interview with Graeme Mowday, Marketing Manager for Tranz Metro (Wellington's rail company), and in GWRC's 2010 monitor report (Premium Research, 2010) following the large number of rail disruptions last year. Poor reliability of public transport at present is therefore an important detractor for public transport uptake for many survey respondents, as well as cost. As is planned, upgrades to the system including realtime information on bus routes and new trains, should be complete before integrated ticketing is to be introduced so that the greatest benefits from the system are felt.

The following chapter presents and discusses the results of this chapter alongside those from the environmental behaviour model presented in Chapter 5. A review of both the underlying psychological motivations for using public transport and the external contextual factors influencing public transport decisions will lead to a thorough examination of the motivations to use public transport in Greater Wellington. Chapter 7 will also present the limitations of this study and recommendations for further research and policy are suggested.

## **Chapter 7 – Discussion and conclusion**

The central research question for this study was ‘How might an integrated ticketing system affect public transport use in the Greater Wellington region?’ An interdisciplinary approach was used to answer this question comprising elements from psychology to understand public transport use behaviour, and from policy analysis to understand the context in which public transport decisions are made. This concluding chapter brings the two approaches together and discusses them in light of the central research question. Limitations to the study are acknowledged and recommendations for further study and policy are made before concluding the present research in section 7.4.

### **7.1 Public transport behaviour and context**

The purpose of this study was to look at ways of motivating people to use public transport rather than driving for everyday trips in Greater Wellington. A specific measure, integrated ticketing, was assessed as part of a strategy to increase the attractiveness of public transport and reduce personal car use. The first part of this assessment considered the psychological reasons relating to public transport use, including the influence of pro-environmental beliefs such as problem awareness (that driving causes harm to the environment on a global scale) and awareness of consequences (that respondent’s personal car use damages the environment on a global and local scale). Previous research suggests that changing travel mode behaviour away from driving towards more sustainable forms of transport is extremely challenging despite environmental awareness (Fujii, 2006). Nevertheless it may be easier where pro-environmental norms are activated alongside incentive factors such as reduced fares (Hunecke, et al., 2001) or integrated ticketing.

The environmental behaviour model results presented in Chapter 5 gave evidence that problem awareness influences attitudes towards public transport through feelings of guilt about the effects of personal car use on the environment. Whilst there was a strong link between problem awareness and awareness of consequences,

the effect of awareness of consequences was not significant on attitudes towards, or intention to use, public transport. This suggests that the Greater Wellington sub-sample (those who use a car for everyday trips) perceive the environmental effects of driving to be a problem more on a global scale than locally. This perception is in keeping with successful marketing of New Zealand as a 'Clean Green' country to locals and tourists. Although this image is criticised internationally (see Pearce, 2009) it may be more strongly reinforced for New Zealanders.

Problem awareness was also shown to indirectly influence intentions to use public transport through social norms and perceived behavioural control. The perception that public transport is easy (shown through perceived behaviour control) and attitudes towards public transport (how agreeable taking public transport is over driving) were the two most important influences on intentions to use public transport. The implications of these results for future policy aimed at motivating public transport use in Greater Wellington is that using pro-environmental marketing alongside strategies to improve ease and convenience, such as integrated ticketing, will be likely to have positive effects on public transport use. Marketing strategies should be inclusive and, as suggested by Brög (2004) in his Public Awareness Strategy, establish a communicative network between different groups of people, such as decision makers, the public, transport operators and the media.

There was a direct relationship in the model between intention to use public transport and actual public transport use. Intention did not however fully explain public transport use behaviour, and is unlikely to because of the many psychological and structural barriers to pro-environmental behaviour (Swim, et al., 2009). Psychological barriers are harder to surpass, such as overcoming engrained habits, because they affect individuals differently (Eriksson, et al., 2008; Verplanken, et al., 1998). Structural barriers on the other hand often require changes in infrastructure or policy, affecting whole areas or regions. Chapter 6 identified some of these structural barriers. Reliability, cost of services, and convenience factors most influenced public transport decisions for the Greater Wellington respondents. Integrated ticketing has the potential to overcome cost and convenience factors, in particular for multi-modal journeys. It is important to

increase the convenience of public transport and not car use because the results showed that the convenience of car use was a large detractor for using public transport. Park and ride schemes can be used with integrated ticketing and other policies (such as increasing inner city parking fees) to encourage heavy car users to use public transport, especially in off-peak hours. However, public transport reliability is a key operator problem which should be solved before integrated ticketing is launched.

Providing preconditions are met, such as improved service reliability and stakeholder relationships, the opportunities for integrated ticketing in Greater Wellington are plentiful. The results indicated that public perception is good overall and suggested that patronage and modal shift may even increase as result of removing the inconvenience barrier to public transport. However, if, as suggested by GWRC recently (see Chapter 3), electronic ticketing is developed with rail and not integrated with bus the benefits of an integrated ticketing system will be much harder to achieve. The largest barrier to implementation is likely to be the cost of the system. However, Greater Wellington has the distinct advantage of overseeing the Auckland Integrated Fares System (AIFS) development and NZTA's National Integrated Ticketing Programme (NITP). The NITP should be more advanced in achieving its purpose to ensure procurement efficiencies and reduce the cost of integrated ticketing in New Zealand when GWRC starts their integrated ticketing developments.

Integrated ticketing projects take at least three years from system specification, to procurement, to system development and implementation (Baxter & Kole, 2007). Greater Wellington has the distinct advantage of learning from a variety of overseas projects and AIFS, which is due for at least partial completion by September 2011. To reduce industry uncertainty, risks, and delays, and to meet the Regional Land Transport Strategy (RLTS) target of integrated ticketing implemented by 2020, planning should advance as soon as possible. Preparations should review the preconditions for integrated ticketing suggested in the integration ladder (Preston, et al., 2008) such as service integration, including reliability of services, and ensure

that operators and the public are kept informed of developments or issues as they arise. Recommendations for policy are outlined in section 7.3.

## **7.2 Limitations**

On completion of this research two gaps have been identified for improvement. Firstly, the effect of habit as a psychological barrier to public transport use, although acknowledged, was not tested for. It was felt at the beginning of the research that including another predictor in the environmental behaviour model may make the questions too lengthy in the online survey. Habit was added to the behaviour model in the Bamberg et al., (2007) study, measured by assessing past public transport use one year before the final study was carried out. For practical and time reasons this part of the method could not be emulated.

The self-selection sampling method used may have had implications on the results. The sample was not representative of the Greater Wellington population with Wellington City residents over represented and Masterton and Carterton residents largely under represented<sup>30</sup>. There were also much lower numbers of non-public transport users than public transport users (see Chapter 6, section 6.1). Although the survey was online and accessible to all internet users within the region, advertisement of the survey was limited to: e-mail invitations to friends and colleagues who mostly live in the Wellington City or Lower Hutt areas; handing out flyers at Wellington train station; and advertising on the Greater Wellington Regional Council (GWRC), Snapper, and Centre for Sustainable Cities website which are all based in Wellington City. The sampling method may also have excluded older generations who do not use the internet frequently, and younger generations who may not have seen the advertisements. However, the large sample collected substantiates the results and is indicative of public transport perceptions for those in all but the extreme age groups and for Wellington City residents at least. The present research also had similar results to those of GWRC's annual public transport monitoring surveys, which are region-wide, giving further confidence to the significance of the results for the region.

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<sup>30</sup> Census data on regional populations are compared with the survey respondents in Appendix D.

## **7.3 Recommendations**

### **7.3.1 Recommendations for research**

The present study extends recent research on integrating behaviour models (Bamberg, et al., 2007; Bamberg & Möser, 2007) in an attempt to explain pro-environmental outcomes. In contrast to the original research the influence of personal norms on intention to use public transport was found to be insignificant. It was not the purpose of this study to assess the effect of personal norms on behaviour specifically, but rather to look at the whole relationship of psychological constructs. Future research could add to the debate on the effect of personal norms influencing transport mode choice (Abrahamse, et al., 2009; Stern, et al., 1999; Wall, et al., 2007) by using the integrated model used in this study and by Bamberg et al. (2007). Also, including habit as a predictor of public transport use would provide empirical evidence of the habit-behaviour link and would be useful to know in terms of policy attempting to change these engrained habits.

### **7.3.2 Recommendations for policy**

Research overseas and evidence collected in the present study suggest several preconditions are necessary to achieve a successful integrated ticketing system. These preconditions are:

- Basic levels of transport integration
- Simplify the number and type of fares available
- Integrate fares across modes
- Open and transparent communication between government, transport operators and the public.

The following policy recommendations encompass these preconditions with application to integrated ticketing for Greater Wellington.

#### ***1. Ensure basic levels of public transport integration***

Note that basic levels of transport integration are needed for a smooth transition to integrated ticketing (Abrate, et al., 2009). Focus on current policy measures aimed at better integrating the public transport system. This includes integrating timetables between services and implementing realtime information systems for bus and rail.

Improving the reliability of services is also important to ensure public transport runs smoothly between modes before introducing integrated ticketing.

## ***2. Plan and implement a multi-modal integrated ticketing system by 2016***

A multi-modal integrated ticketing system is outlined in the RLTS and expected by the public. International evidence shows that with multi-modal integrated ticketing systems the benefits are highest for the passenger, operator and governing body (Preston, 2008). By definition introducing electronic ticketing on rail is not implementing an integrated ticketing system unless it is also compatible for use on buses or ferries. Therefore, if a Greater Wellington system is to be rolled out in two stages as currently suggested, there should be a very small gap between electronic ticketing on rail and full integration with bus and ferry. In light of the rapid AIFS developments, which plan to launch in Auckland this year, there seems no justification for delaying integrated ticketing in the Wellington RLTS from the 2016 target to 2020. Instead of waiting for the results of AIFS, GWRC should recognise the needs of their own region and work in conjunction with Auckland and the NZTA. It is recommended that the 2016 target is reinstated and planning starts by 2012.

## ***3. Maintain communication with the public***

Perceptions of public transport have been shown to significantly affect use. The results of the present research and the GWRC Annual Public Transport Satisfaction Monitor reports (Premium Research, 2008; 2009; 2010) placed reliability (i.e. being able to trust that their mode of transportation arrived on time) a key priority. The public should be kept informed of developments as they arise, especially if electronic ticketing is to be introduced on rail first. In particular information concerning fares integration, costs and privacy were highlighted by Snapper users as important areas for communication and should be prioritised in a GWRC integrated ticketing system. Moreover, it will be important to communicate with bus users if electronic ticketing on rail is introduced first and Snapper is not chosen as the provider for rail. Marketing and awareness campaigns tailored to the needs of Greater Wellington, such as those suggested by the OECD (2004), can be used to



increase favourable perceptions towards public transport and integrated ticketing which will be effective in encouraging their use.

#### ***4. Maintain communication with operators***

Often, the biggest cause of delays and escalating costs arise from miscommunication or lack of communication between policy makers and public transport operators, as illustrated in Sydney (Douglas, 2008). Considering the development of AIFS and the NITP, GWRC should be in a good position to coordinate effective consultations with relevant parties. Consultations should be collaborative between private operators and government departments in order to avoid power struggles and focus on improving public transport for the passenger, not profits for the incumbents.

## **7.4 Conclusion**

Motivating the use of sustainable transport modes over driving is notoriously difficult. Although the Greater Wellington respondents show recognition of the environmental problems caused by car use, their intentions to use public transport are largely affected by perceptions of the system including how easy and pleasant it is to use. Currently public transport perceptions are not good enough to encourage modal shift. Institutional barriers compound the problem as government money is poured onto roads and, in comparison trickled onto public transport.

The development of integrated ticketing in New Zealand presents an opportunity for the tide to change. Millions of dollars have been spent on AIFS as other cities such as Greater Wellington watch to see how the system evolves and what effect it has on public transport patronage. However, the benefits of integrated ticketing go beyond patronage increases. It presents an opportunity to further integrate the land transport system, creating smooth transitions between sustainable transport modes and quick seamless journeys for passengers. Whilst reducing traffic congestion and its impact on society and the environment is an urgent environmental problem, integrated ticketing is unlikely to be a ‘quick-fix’ solution for Greater Wellington. The costly delays illustrated overseas and developments in Auckland have setback

the Greater Wellington planned implementation. Nevertheless it is noted that Greater Wellington needs some time, as preconditions to successful integrated ticketing are met, to gain trust from the public on issues of importance like reliability.

## References

- Abrahamse, W., Steg, L., Gifford, R., & Vlek, C. (2009). Factors influencing car use for commuting and the intention to reduce it: A question of self-interest or morality? *Transportation Research Part F-Traffic Psychology and Behaviour*, 12(4), 317-324.
- Abrate, G., Piacenza, M., & Vannoni, D. (2009). The impact of Integrated Tariff Systems on public transport demand: Evidence from Italy. *Regional Science and Urban Economics*, 39(2), 120-127.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Anable, J., & Shaw, J. (2007). Priorities, policies and (time)scales: the delivery of emissions reductions in the UK transport sector. *Area*, 39, 443-457.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *The British Journal of Social Psychology*, 40, 471-499.
- Ashmore, D. P., & Mellor, A. D. (2010). The 2008 New Zealand public transport management act: Rationale, key provisions, and parallels with the United Kingdom. *Research in Transportation Economics*, 29(1), 164-182.
- Babakus, E., Ferguson, C. E., Jr., & Jöreskog, K. G. (1987). The Sensitivity of Confirmatory Maximum Likelihood Factor Analysis to Violations of Measurement Scale and Distributional Assumptions. *JMR, Journal of Marketing Research*, 24(2), 222-228.
- Bachels, M., & Smith, B. (2010). Christchurch: A Sustainable Public Transport Success Story. *Highways and Transit*, 22(66). Retrieved 16th December 2009, from [http://www.pbworld.com/news\\_events/publications/network/Issue\\_66/pdf/66\\_27\\_Bachels\\_ChristChurch.pdf](http://www.pbworld.com/news_events/publications/network/Issue_66/pdf/66_27_Bachels_ChristChurch.pdf)
- Bagchi, M., & White, P. R. (2005). The potential of public transport smart card data. *Transport Policy*, 12(5), 464-474.
- Bamberg, S., Hunecke, M., & Blöbaum, A. (2007). Social context, personal norms and the use of public transportation: Two field studies. *Journal of Environmental Psychology*, 27(3), 190-203.
- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14-25.
- Bamberg, S., & Schmidt, P. (2003). Incentives, morality, or habit? Predicting students' car use for University routes with the models of Ajzen, Schwartz, and Triandis. *Environment and Behavior*, 35(2), 264-285.
- Black, J. S., Stern, P. C., & Elworth, J. T. (1985). Personal and Contextual Influences on Household Energy Adaptations. *Journal of Applied Psychology*, 70(1), 3-21.
- Black, W. R. (2000). Socio-economic barriers to sustainable transport. *Journal of Transport Geography*, 8(2), 141-147.
- Blythe, P. (2004). Improving public transport ticketing through smart cards. *Proceedings of Civil Engineers, Municipal Engineer*, 157(1), 47-54.

- Blythe, P., & Carr, J. (2005). *Challenges and Opportunities for the Future Roll-Out of Transport Smartcards in the UK*. Paper presented 3rd November 2005 at the 12th World Congress on Intelligent Transport Systems and Services, San Francisco.
- Boldero, J. (1995). The Prediction of Household Recycling of Newspapers - the Role of Attitudes, Intentions, and Situational Factors. *Journal of Applied Social Psychology*, 25(5), 440-462.
- Brand, C., & Boardman, B. (2008). Taming of the few -The unequal distribution of greenhouse gas emissions from personal travel in the UK. *Energy Policy*, 36(1), 224-238.
- Bresson, G., Dargay, J., Madre, J.-L., & Pirotte, A. (2003). The main determinants of the demand for public transport: a comparative analysis of England and France using shrinkage estimators. *Transportation Research Part A: Policy and Practice*, 37(7), 605-627.
- Brög, W. (2003). *Reducing Car Use!? Just do it!* Roy Cresswell Lecture at the 27th Nottingham Transport Conference - "Sharing Success", March 2003. Retrieved 8th February 2011, from [http://www.socialdata.de/alt/Car\\_use.pdf](http://www.socialdata.de/alt/Car_use.pdf)
- Brög, W. (2004). *Present Situation: Between Scylla and Charybdis*. Communicating Environmentally Sustainable Transport - The Role of Soft Measures (pp. 80-82). Paris: OECD.
- Brög, W., Erl, E., & Mense, N. (2004). *Individualised Marketing: Changing Travel Behaviour for a Better Environment*. Communicating Environmentally Sustainable Transport: The Role of Soft Measures (pp. 83-97). Paris: OECD.
- Bryman, A. (2008). *Social Research Methods* (3rd ed.). New York: Oxford University Press Inc.
- Burwell, D., & Sperling, D. (2007). Towards a Policy Agenda for Climate Change. In D. Sperling & J. S. Cannon (Eds.), *Driving Climate Change: Cutting Carbon from Transport*. Amsterdam; Boston: Elsevier.
- Byrne, B. M. (2001). *Structural Equation Modeling with AMOS: Basic Concepts, Applications and Programming*. Mahwah, N. J.: Lawrence Erlbaum Associates.
- Cameron, L., Brown, P. M., & Chapman, J. G. (1998). Social Value Orientations and Decisions to Take Proenvironmental Action. *Journal of Applied Social Psychology*, 28(8), 675-697.
- Chan, K. (1998). Mass communication and pro-environmental behaviour: waste recycling in Hong Kong. *Journal of Environmental Management*, 52(4), 317-325.
- Chapman, R. (2008). Transitioning to Low-Carbon Urban Form and Transport in New Zealand. *Political Science*, 60(1), 89-98.
- Currie, G., & Wallis, I. (2008). Effective ways to grow urban bus markets - a synthesis of evidence. *Journal of Transport Geography*, 16(6), 419-429.
- De Groot, J. I. M., & Steg, L. (2009). Morality and prosocial behavior: the role of awareness, responsibility, and norms in the norm activation model. *Journal of Social Psychology*, 149(4), 425-449.
- Dempsey, S. P. (2008). *Privacy Issues with the Use of Smart Cards*. Legal Research Digest pp2-25. Transportation Research Board: Washington. Retrieved 6th April 2010, from <http://www.tcrponline.org/bin/search.pl?keyword=privacy&go=Search>

- Denscombe, M. (1998). *The good research guide: for small-scale social research projects* (3rd ed.). Buckingham, England; Philadelphia, Pa: Open University Press.
- Department for Transport (DfT). (1997). *A new deal for transport: better for everyone*. White Paper. Retrieved 12th March 2010, from <http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/about/strategy/whitepapers/previous/aneuadealfortransportbetterfo5695>
- Department for Transport (DfT). (2010). Transport Spending Review Press Notice, 20th October 2010. Retrieved 15th February 2011, from <http://nds.coi.gov.uk/clientmicrosite/Content/Detail.aspx?ClientId=202&NewsAreaId=2&ReleaseID=416118&SubjectId=36>
- Department for Transport (DfT). (2011). *Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen*. London: Department for Transport.
- Department for Transport (DfT)., & Detica. (2009a). *The benefits and costs of a national smart ticketing infrastructure*. London: Department for Transport.
- Department for Transport (DfT)., & Detica. (2009b). *Smart and Integrated Ticketing Strategy*. London: Department for Transport.
- Diamantopoulos, A., & Sigauw, J. A. (2000). *Introducing LISREL: a Guide for the Uninitiated*. London: Sage Publications.
- Dillman, D. A. (2009). *Internet, mail, and mixed-mode surveys: the tailored design method* (3rd ed.). Hoboken, N.J.: Wiley & Sons.
- Dinant, J. M., & Keuleers, E. (2004). Multi-application smart card schemes. *Computer Law and Security Report*, 20(1), 22-28.
- Dominion Post. (2010). 'Shambolic' mall group ordered to pay \$43000. Retrieved 7th June 2010, from <http://www.stuff.co.nz/national/3765358/Shambolic-mall-group-ordered-to-pay-43-000>
- Domnion Post. (2011). Single ticket plan gets spiked. Retrieved 9th February 2011, from <http://www.stuff.co.nz/dominion-post/news/4634576/Single-ticket-plan-gets-spiked>
- Douglas, N. (2008). *Integrated Fares, Integrated Ticketing & Electronic Ticketing: Review of developments*. Wellington: Bus and Coach Association.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425-442.
- Ebreo, A., Vining, J., & Cristancho, S. (2002). Responsibility for environmental problems and the consequences of waste reduction: A test of the norm-activation model. *Journal of Environmental Systems*, 29(3), 219-244.
- Eriksson, L., Garvill, J., & Nordlund, A. M. (2008). Interrupting habitual car use: The importance of car habit strength and moral motivation for personal car use reduction. *Transportation Research Part F: Traffic Psychology and Behaviour*, 11(1), 10-23.
- Ewing, R., Bartholomew, K., Winkleman, S., Walters, J., & Chen, D. (2008). *Growing Cooler: The Evidence on Urban Development and Climate Change*. Washington: the Urban Land Institute.
- Eysenbach, G. (2004). Improving the Quality of Web Surveys: The Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *Journal of Medical Internet Research*, 6(3): e34.
- Field, A. (2005). *Discovering Statistics Using SPSS: (and sex and drugs and rock 'n' roll)* (2nd ed.). Los Angeles; London: Sage Publications.

- Fisher, G. W., Rolfe, K. A., Kjellstrom, T., Woodward, A., Hales, S., Sturmam, A. P., et al. (2002). *Health Effects Due to Motor Vehicle Air Pollution in New Zealand*. Retrieved 10th March, 2010, from [www.transport.govt.nz/assets/PDFs/health-effects-of-vehicle-emissions.pdf](http://www.transport.govt.nz/assets/PDFs/health-effects-of-vehicle-emissions.pdf).
- FitzRoy, F., & Smith, I. (1998). Public transport demand in Freiburg: why did patronage double in a decade? *Transport Policy*, 5(3), 163-173.
- Fujii, S. (2006). Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. *Journal of Environmental Psychology*, 26(4), 262-268.
- Gardner, G., T., & Stern, P., C. (2002). *Environmental Problems and Human Behavior*. (2nd ed.). Boston: Pearson Custom Publishing.
- Gärling, T., & Schuitema, G. (2007). Travel Demand Management Targeting Reduced Private Car Use: Effectiveness, Public Acceptability and Political Feasibility. *Journal of Social Issues*, 63(1), 139-153.
- Gilbert, C. L., & Jalilian, H. (1991). The Demand for Travel and for Travelcards on London Regional Transport. *Journal of Transport Economics and Policy*, 25(1), 3-29.
- Golob, T. F. (2003). Structural equation modeling for travel behavior research. *Transportation Research Part B: Methodological*, 37(1), 1-25.
- Gomez, B., & Jones, J. P. (Eds.). (2010). *Research Methods in Geography*. Chichester: Blackwell Publishing Ltd.
- Göriz, A. S. (2006). Incentives in Web Studies: Methodological Issues and a Review. *International Journal of Internet Science*, 1(1), 58-70.
- Greene, D. L., & Wegener, M. (1997). Sustainable transport. *Journal of Transport Geography*, 5(3), 177-190.
- Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships: A natural experiment with curbside recycling. *Environment and Behavior*, 27(5), 699-718.
- Greater Wellington Regional Council (GWRC). (2007). *Wellington Regional Land Transport Strategy 2007-2016*. Wellington: Greater Wellington Regional Council.
- Greater Wellington Regional Council (GWRC). (2010). *Wellington Regional Land Transport Strategy 2010-40*. Wellington: Greater Wellington Regional Council.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate Data Analysis*. New Jersey: Pearson Education Inc.
- Han, S. S. (2010). Managing motorization in sustainable transport planning: the Singapore experience. *Journal of Transport Geography*, 18(2), 314-321.
- Hansen, J., Sato, M., Kharecha, P., Beerling, D., Berner, R., Masson-Delmotte, V., et al. (2008). Target Atmospheric CO<sub>2</sub>: Where Should Humanity Aim? *The Open Atmospheric Science Journal*, 2(15), 217-231.
- Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162(3859), 1243-1248.
- Harland, P., Staats, H., & Wilke, H. A. M. (1999). Explaining proenvironmental intention and behavior by personal norms and the theory of planned behavior. *Journal of Applied Social Psychology*, 29(12), 2505-2528.
- Harris, C. (2010). Outside the metal box: Transport and the urban public realm. In P. Howden-Chapman, K. Stuart & R. Chapman (Eds.), *Sizing up the City: Urban form and transport in New Zealand* (pp. 80-92). Wellington: Steele Roberts Publishers.

- Hay, I. (2005). *Qualitative research methods in human geography* (2nd ed.). South Melbourne, Victoria: New York: Oxford University Press.
- Heath, Y., & Gifford, R. (2002). Extending the theory of planned behaviour: Predicting the use of public transport. *Journal of Applied Social Psychology*, 32(10), 2154-2189.
- Himanen, V., Lee-Gosselin, M., & Perrels, A. (2005). Sustainability and the interactions between external effects of transport. *Journal of Transport Geography*, 13(1), 23-28.
- Hine, J. (2000). Integration, integration, integration... Planning for sustainable and integrated transport systems in the new millennium. *Transport Policy*, 7(3), 175-177.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/7). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education*, 18, 1-8.
- Hu, L.-T., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: concepts, issues, and applications* (pp. 76-99). Thousand Oaks: Sage Publications.
- Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55.
- Hunecke, M., Blöbaum, A., Matthies, E., & Hoyer, R. (2001). Responsibility and environment - Ecological norm orientation and external factors in the domain of travel mode choice behavior. *Environment and Behavior*, 33(6), 830-852.
- Ipsos Mori, & Institute of Transport Studies. (2010). *SMART & Integrated Ticketing*. London: Department for Transport.
- Jakob, A., Craig, J. L., & Fisher, G. (2006). Transport cost analysis: a case study of the total costs of private and public transport in Auckland. *Environmental Science & Policy*, 9(1), 55-66.
- Jakubauskas, G. (2006). Improvement of urban passenger transport ticketing systems by deploying intelligent transport systems. *Transport*, 21(4), 252-259.
- Janic, M., & Reggiani, A. (2001). Integrated transport systems in the European Union: an overview of some recent developments. *Transport Reviews*, 21(4), 469-497.
- Johansson, M., V., Heldt, T., & Johansson, P. (2006). The effects of attitudes and personality traits on mode choice. *Transportation Research Part A: Policy and Practice*, 40(6), 507-525.
- Johnston, R. A., Gao, S., & Clay, M. J. (2008). Modeling Long-Range Transportation and Land Use Scenarios for the Sacramento Region, Using Citizen-Generated Policies. *Transportation Research Record: Journal of the Transportation Research Board*, 1902, 99-102.
- Joireman, J. A., Van Lange, P. A. M., & Van Vugt, M. (2004). Who cares about the environmental impact of cars? Those with an eye toward the future. *Environment and Behavior*, 36(2), 187-206.
- Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8 User's Reference Guide; PRELIS 2 User's Reference Guide*. Chicago: Scientific Software International.
- Kenyon, S., & Lyons, G. (2003). The value of integrated multimodal traveller information and its potential contribution to modal change. *Transportation Research Part F: Traffic Psychology and Behaviour*, 6(1), 1-21.



- Kole, A., & Baxter, B. (2007). *Integrated Ticketing - progress report and next steps. Report 07.395*. Wellington: Greater Wellington Regional Council.
- Krumdieck, S. (2010). Transportation in a sustainable urban form. In P. Howden-Chapman, K. Stuart & R. Chapman (Eds.), *Sizing up the City: urban form and transport in New Zealand*. (pp. 93-109). Wellington: Steele Roberts Publishers.
- Laudenslager, M. S., Holt, D. T., & Lofgren, S. T. (2004). Understanding Air Force members' intentions to participate in pro-environmental behaviors: An application of the theory of planned behavior. *Perceptual and Motor Skills*, 98(3), 1162-1170.
- Lake, B. (2010). *Quantifying, predicting and promoting edible gardening in Eastbourne, Aotearoa, New Zealand*. Thesis submitted as partial fulfillment of requirements for the degree of Master of Environmental Studies, Victoria University of Wellington Wellington.
- Lee, R. W., & Rivasplata, C. R. (2001). Metropolitan transportation planning in the 1990s: comparisons and contrasts in New Zealand, Chile and California. *Transport Policy*, 8(1), 47-61.
- Lueck, T. J. (1998). New York's Bus Ridership Surges After Long Decline. Retrieved 20th January 2011, from <http://www.nytimes.com/1998/12/22/nyregion/new-york-s-bus-ridership-surges-after-long-decline.html>
- Madge, C., & O'Connor, H. (2004). Online methods in geography educational research. *Journal of Geography in Higher Education*, 28(1), 143 - 152.
- Manfreda, K. L., & Vehovar, V. (2008). Internet surveys. In E. D. de Leeuw, J. J. Hox & D. A. Dillman (Eds.), *International Handbook of Survey Methodology*. New York: Taylor & Francis Group, LLC.
- Marchese, C. (2006). The economic rationale for integrated tariffs in local public transport. *The Annals of Regional Science*, 40(4), 875-885.
- Marsh, H. W., Balla, J. R., & Hau, K.-T. (1996). An evaluation of incremental fit indices: A clarification of mathematical and empirical properties. In G. A. Marcoulides & R. E. Schumacker (Eds.), *Advanced structural equation modeling : issues and techniques* (pp. 315-353). Mahwah, N.J. : Lawrence Erlbaum Associates.
- Matas, A. (2004). Demand and Revenue Implications of an Integrated Public Transport Policy: The Case of Madrid. *Transport Reviews: A Transnational Transdisciplinary Journal*, 24(2), 195-217.
- May, A. D., Kelly, C., & Shepherd, S. (2006). The principles of integration in urban transport strategies. *Transport Policy*, 13(4), 319-327.
- Ministry of Economic Development (MED). (2005). 6. Size of the Internet. *Statistics on Information Technology in New Zealand: Updated to 2003*. Retrieved 18th October 2010, from [http://www.med.govt.nz/templates/MultipageDocumentPage\\_9980.aspx](http://www.med.govt.nz/templates/MultipageDocumentPage_9980.aspx)
- Ministry of Economic Development (MED). (2010). Quarterly Comparison of Petrol Price and Taxes in OECD Countries. Retrieved 13th June 2010, from [http://www.med.govt.nz/templates/Page\\_43320.aspx](http://www.med.govt.nz/templates/Page_43320.aspx)
- Mees, P., & Dodson, J. (2002). *The American Heresy: Transport Planning in Auckland 1950 - 2000*. Paper presented at the Institute of Australian Geographers and New Zealand Geographical Association Conference '2001 Geography: A Spatial Odyssey', 31<sup>st</sup> – 3<sup>rd</sup> February. Dunedin, New Zealand.



- Metlink. (2011). Patronage Numbers. Annual patronage by mode including peak/offpeak. Retrieved on October 4th 2011, from <http://www.metlink.org.nz/patronage-numbers/>
- Ministry for the Environment (MfE). (2009a). *New Zealand's Greenhouse Gas Inventory 1990-2008*. Wellington: Ministry for the Environment.
- Ministry for the Environment (MfE). (2009b). *Vehicle Kilometres Travelled by Road. Environmental Report Card*. Wellington: Ministry for the Environment.
- Milfont, T. L. (2010). Global Warming, Climate Change and Human Psychology. In V. Corral-Verdugo, C. H. García-Cadena & M. Frías-Arment (Eds.), *Psychological approaches to sustainability: Current trends in theory, research and practice* (pp. 19-42). New York: Nova Science Publishers.
- Milfont, T. L., & Duckitt, J. (2006). A cross-cultural study of environmental motive concerns and their implications for pro-environmental behaviour. *Environment and Behavior*, 38(6), 745-767.
- Milfont, T. L., & Gouveia, V. V. (2006). Time perspective values: An exploratory study of their relations to environmental attitudes. *Journal of Environmental Psychology*, 26(1), 72-82.
- Monita, G. (2007). Barclaycard launches OnePlus. *Banking Times*. Retrieved on May 28th 2010, from <http://www.bankingtimes.co.uk/11092007-barclaycard-launches-oneplus/>
- Ministry of Transport (MoT). (2008). *The New Zealand Transport Strategy*. Wellington: New Zealand Government.
- Ministry of Transport (MoT). (2009). *Government Policy Statement on Land Transport Funding 2009/10 - 2018/19*. Wellington: New Zealand Government.
- NEA, OGM, & TSU. (2003). *Integration and Regulatory Structures in Public Transport*. Brussels: European Commission DGTREN.
- Norman, R. (2010). Govt 'guessing' with \$11billion transport spend. Retrieved 1st November 2010, from <http://www.greens.org.nz/press-releases/govt-guessing-11billion-transport-spend>
- New Zealand Transport Agency (NZTA). (2010). *Implementation Plan - Actions to Transform Public Transport Effectiveness*. Wellington: NZTA.
- OECD. (2002). *OECD Guidelines towards Environmentally Sustainable Transport*. Paris: OECD Publishing.
- OECD. (2004). *Communicating environmentally sustainable transport - the role of soft measures*. Paris: OECD Publishing.
- OECD. (2007). *OECD Environmental Performance Reviews New Zealand*. Paris: OECD Publishing.
- Ostrom, E. (2000). Collective Action and the Evolution of Social Norms. *The Journal of Economic Perspectives*, 14(3), 137-158.
- Pallant, J. (2010). *SPSS Survival Manual* (4th ed.). Crows Nest, NSW: Allen & Unwin.
- Park, J. Y., Kim, D.-J., & Lim, Y. (2008). Use of Smart Card Data to Define Public Transit Use in Seoul, South Korea. *Transportation Research Record: Journal of the Transportation Research Board*, 2063, 3-9.
- Parsons, C. (2007). Web-Based Surveys: Best Practices Based on the Research Literature. *Visitor Studies*, 10(1), 13-33.

- Pelletier, M.-P., Trépanier, M., & Morency, C. (2011). Smart card data use in public transit: A literature review. *Transportation Research Part C: Emerging Technologies*, 9, 557-568.
- Pearce, F. (2009). New Zealand was a friend to Middle Earth, but it's no friend of the earth, *The Guardian*. Retrieved 12th February 2011, from <http://www.guardian.co.uk/environment/cif-green/2009/nov/12/new-zealand-greenwash>
- Peters, A., Gutscher, H., & Scholz, R. W. (2011). Psychological determinants of fuel consumption of purchased new cars. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(3), 229-239.
- Poortinga, W., Steg, L., & Vlek, C. (2004). Values, Environmental Concern, and Environmental Behavior. *Environment and Behavior*, 36(1), 70-93
- Premium Research. (2008). *Annual Public Transport Satisfaction Monitor 2008 Market Research Report*. Wellington: Greater Wellington Regional Council.
- Premium Research. (2009). *Greater Wellington Regional Council Annual Public Transport Satisfaction Monitor 2009 Report*. Wellington: Greater Wellington Regional Council.
- Premium Research. (2010). *Annual Public Transport Satisfaction Monitor 2010 Report*. Wellington: Greater Wellington Regional Council.
- Preston, J., Marshall, M., & Tochtermann, L. (2008). *On the Move: delivering integrated transport in Britain's cities*. London: Centre for Cities.
- Public Transport Voice. (2011). Public Participation: Submission to the Economic Wellbeing Committee of GWRC. Retrieved 9th February 2011, from [http://wellingtontransport.files.wordpress.com/2011/02/ptv\\_gw\\_ewc\\_presentation.pdf](http://wellingtontransport.files.wordpress.com/2011/02/ptv_gw_ewc_presentation.pdf)
- Pucher, J., & Kurth, S. (1995). Verkehrsverbund: the success of regional public transport in Germany, Austria and Switzerland. *Transport Policy*, 2(4), 279-291.
- Richardson, B. C. (2005). Sustainable transport: analysis frameworks. *Journal of Transport Geography*, 13(1), 29-39.
- Santos, G., Behrendt, H., & Teytelboym, A. (2010). Part II: Policy instruments for sustainable road transport. *Research in Transportation Economics*, 28(1), 46-91.
- Schwartz, S. (1977). Normative influences on altruism. In L. Berkowitz (Ed). *Advances in experimental social psychology*, 10, 222-279.
- Shapiro, R. J., Hassett, K. A., & Arnold, F. A. (2002). *Conserving Energy and Preserving the Environment: The Role of Public Transportation*. Washington DC: American Public Transport Association. Retrieved 24th November 2009, from [http://74.125.155.132/scholar?q=cache:I-jJ5wG580gJ:scholar.google.com/+transport+shapiro+2002&hl=en&as\\_sdt=2000](http://74.125.155.132/scholar?q=cache:I-jJ5wG580gJ:scholar.google.com/+transport+shapiro+2002&hl=en&as_sdt=2000)
- Smith, R. A. (2008). Enabling technologies for demand management: Transport. *Energy Policy*, 36(12), 4444-4448.
- Staats, H. (2004). Pro-environmental Attitudes and Behavioral Change. In C. Spielberger (Ed.), *Encyclopedia of Applied Psychology* (Vol. 3, pp. 127-135). New York: Elsevier.
- Statistics NZ. (2004). Household Access to the Internet. Retrieved 27th May 2010, from [http://www.stats.govt.nz/browse\\_for\\_stats/people\\_and\\_communities/households/household-access-to-the-internet.aspx](http://www.stats.govt.nz/browse_for_stats/people_and_communities/households/household-access-to-the-internet.aspx)

- Statistics NZ. (2006). Meshblock Dataset. Retrieved 10th November 2010, from <http://www.stats.govt.nz/Census/2006CensusHomePage/MeshblockDataset.aspx?tab=Download>
- Statistics NZ. (2010). *Household Use of Information and Communication Technology: 2009*. Wellington: Statistics New Zealand.
- Steg, L., & Gifford, R. (2005). Sustainable transportation and quality of life. *Journal of Transport Geography*, 13(1), 59-69.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309-317.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *The Journal of Social Issues*, 56(3), 407-424.
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value belief norm theory of support for social movements: The case of environmental concern. *Human Ecology Review*, 6(2), 81-97.
- Stradling, S. G., Meadows, M. L., & Beatty, S. (2000). Helping drivers out of their cars Integrating transport policy and social psychology for sustainable change. *Transport Policy*, 7(3), 207-215.
- Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., et al. (2009). *Psychology and Global Climate Change: Addressing a Multi-faceted Phenomenon and Set of Challenges*. A Report by the American Psychological Association's Task Force on the Interface Between Psychology and Global Climate Change. Retrieved 7th June 2010, from <http://www.apa.org/science/about/publications/climate-change.aspx>
- Tertoolen, G., van Kreveld, D., & Verstraten, B. (1998). Psychological resistance against attempts to reduce private car use. *Transportation Research Part A: Policy and Practice*, 32(3), 171-181.
- Tertoolen, G., Verstraten, E. C. H., S. Zwerver, R. S., van Rompaey, A. R., Kok, M. T. J., & Berk, M. M. (1995). Changing Attitudes and Behaviour by Means of Providing Information. A Study on Private Car Use. *Studies in Environmental Science*, 65(2), 1189-1192.
- Tourism Industry Association New Zealand (TIANZ). (2010). Key Tourism Statistics. Retrieved 10th February 2011, from <http://www.tianz.org.nz/main/key-tourism-statistics/>
- Transport for London (TfL). (2011). Tickets > Fares Bus and Tram. Retrieved 25th January 2011, from <http://www.tfl.gov.uk/tickets/14415.aspx>
- TNS Social, Transport Research Laboratory, & Transport Research Institute. (2004). *Integrated Ticketing in Scotland - Needs Analysis and Options*. Edinburgh: Scottish Executive.
- Trafinz. (2009). Trafinz Conference a success. *Trafinz, NZ Traffic Institute Conference eNewsletter*. Retrieved 15th October 2009, from <http://www.livingstreets.org.nz/sites/livingstreets.org.nz/files/Trafinz%20eNewsletter%203.pdf>
- Tranter, C. (2010). MyZone ticket system starts in Sydney. *The Age*. Retrieved May 30th 2010, from <http://news.theage.com.au/breaking-news-national/myzone-ticket-system-starts-in-sydney-20100419-sn3e.html>
- Turner, M., & Wilson, R. (2010). Smart and integrated ticketing in the UK: Piecing together the jigsaw. *Computer Law & Security Review*, 26(2), 170-177.
- Van Vugt, M. (2009). Averting the Tragedy of the Commons. *Current Directions in Psychological Science*, 18(3), 169-173.

- Verplanken, B., Aarts, H., van Knippenberg, A., & Moonen, A. (1998). Habit, information acquisition, and the process of making travel mode choices. *British Journal of Social Psychology*, 37, 111–128.
- Victoria Univeristy of Wellington (VUW). (2007). Human Ethics Policy. Retrieved 4th March 2009, from <http://policy.vuw.ac.nz/Amphora!~policy.vuw.ac.nz~POLICY~000000000744.pdf>
- Wall, R., Devine-Wright, P., & Mill, G. (2007). Comparing and Combining Theories to Explain Proenvironmental Intentions. *Environment and Behavior*, 39(6), 731-.
- Welde, M. (2009). Smart card ticketing in Trondheim delivers substantial benefits to society. *Nordic Road and Transport Research* (3), 6. Retrieved 16th December 2010, from <http://www.nordicroads.com/website/files/Nordic-3-2009.pdf>
- White, P. R. (1981). "Travelcard" Tickets in Urban Public Transport. *Journal of Transport Economics and Policy*, 15(1), 17-34.
- Williamson, K. (2009). Police look into bus driver's fare theft. *The Dominion Post*. Retrieved 16th December 2009 from <http://www.stuff.co.nz/national/crime/2576742/Police-look-into-bus-drivers-fare-thefts>
- Wilson, C., & Dowlatabadi, H. (2007). Models of Decision Making and Residential Energy Use. *Annual Review of Environment and Resources*, 32, 169-203.

# Appendices

## Appendix A1 – Ethics approval



### MEMORANDUM

Phone 0-4-463 5676  
Fax 0-4-463 5209  
Email Allison.kirkman@vuw.ac.nz

TO	Camilla Morley
COPY TO	Sophie Bond
FROM	Dr Allison Kirkman, Convener, Human Ethics Committee
DATE	19th May 2010
PAGES	1
SUBJECT	<b>Ethics Approval: No 17602 Investigating options for integrated ticketing and its impact on public transport use within Greater Wellington</b>

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 from the above date and this approval continues until 01 March 2011. 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 A2 – Interview schedule



1

### Interview schedule

**Masters Research Project:** “Investigating options for integrated ticketing and its impact on public transport use within greater Wellington”

**Date:** 2<sup>nd</sup> September, 2010

**Researcher:** Camilla Morley, Victoria University of Wellington

**Interviewee:** David Lewry, Major Projects Team Leader, Greater Wellington

1. Introduction

- Human Ethics forms – discuss and sign.

2. IT in Wellington

How long has GW been involved in planning integrated ticketing?

- Motivations
- Developments
- Benefits
- Barriers

3. Policy

Research suggests that the greatest increases in demand for public transport occurred in cities where there are integrated fares and ticketing, alongside other integrated policies. What other integrated transport policies are in place in, or planned for, Wellington?

- What government policies (central and local) or legislation affect the developments of integrated ticketing schemes (e.g. standards specifications, setting of fares, integrated planning, transport timetables)?

- Central

- Local

4. GW role

What would GW's predominant role be in the development of the regional system, and post-development (e.g. fare setting)?

- Passenger response
- Preparing passengers (rail esp.)
- Affect on PT use

5. NIT

- GW's involvement in process
- AIFS
- Further opportunities

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Te Kura Tatai Aro Whenua

## Appendix A3 – Informed consent form for interviews



1

### Informed Consent Form

#### Master's Thesis Research Project:

**"Investigating options for integrated ticketing and its impact on public transport use within Greater Wellington"**

**27 August 2010**

#### Introduction

Victoria University of Wellington requires that all Participants involved in research for the purposes of data collection must be fully informed about the research, and consent to participate. This form has been designed in accordance with these requirements. It is meant to ensure that research Participants and their communities are protected from any harm potentially arising from their participation in the research process.

#### Access to Research Results

The information collected during this interview 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. Data and opinions collected in the interviews will be treated as confidential, unless otherwise specified below.

#### Please Circle Yes (Y) or No (N)

1. I agree to participate in an audio-recorded semi-structured telephone interview, not lasting more than one hour. Y / N
2. I understand that the data I provide will not be used for any other purposes other than those described in the 'Information Sheet', or released to others without written consent. Y / N
3. I agree for my real name to be used in publications, or other outputs identified above and in the 'Information sheet'. Y / N  

If "No" please answer question 4.

If "Yes", please skip to 5.
4. I would like to be identified as (please tick one):
  - ☐ An official from the organization I represent
  - ☐ A letter code (e.g. Participant X)
  - ☐ Other (please specify) \_\_\_\_\_

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5. I understand that I have the opportunity to request and review a transcript of this interview and may correct and establish how my contribution is represented.

Y / N

6. I would like to receive a summary of the results of this research when it is completed.

Y / N

If yes, please send to: \_\_\_\_\_

### Participant

I have read and understood the information in the 'Information Sheet' and have had all questions related to my participation in this research answered to my satisfaction.

Signature: .....

Name: .....

Date: .....

### Researcher

I certify that this form and the 'Information Sheet' provide a complete and accurate description of the aims and processes of this research project.

Camilla Morley

Date: .....

Researcher: Camilla Morley  
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 Mobile: +64 21 061 2313  
 Email: morleycami@myvuw.ac.nz

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## Appendix A4 – Participant information sheet for interviews



1

### Interview Participant Information Sheet

#### Master's Thesis Research Project:

**“Investigating options for integrated ticketing and its impact on public transport use within Greater Wellington”**

July, 2010

Researcher: Camilla Morley Email: morleycami@myvuw.ac.nz	School of Geography, Environment and Earth Sciences (SGEES) Victoria University of Wellington PO BOX 600 Wellington 6140 +64 463 5337
Supervisor: Sophie Bond Email: sophie.bond@vuw.ac.nz	

Dear Project Participant,

You are being asked to take part in a semi-structured interview as part of my Masters research at Victoria University of Wellington. According with University policy for all research involving human participants, the interview schedule has been approved by the Human Ethics Committee.

The following information provides you with brief details of my project and your rights as a research participant.

#### Research Aim

The research project will investigate opportunities for, and barriers to, integrated ticketing in Greater Wellington as part of a strategy to encourage public transport uptake and reduce car use. Integrated ticketing is where a passenger can use the same ticket (usually in electronic form) to travel on all modes of public transport. In Wellington this would include bus, train, ferry and cable car.

The study will answer the following major questions:

1. What are the advantages and disadvantages of integrated ticketing systems?
2. Why do people use / not use public transport in the Greater Wellington region?
3. How do pro-environmental attitudes affect travel mode choice?
4. How might integrated ticketing affect mode choice?
5. What is the public's perception of the Snapper system and of a possible future integrated ticketing system on a regional and national scale?
6. What are the key stakeholder perceptions of an integrated ticketing system on a regional and national scale?

#### Research Format

The study will use both quantitative and qualitative methods through an online survey and semi-structured interviews.

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### **Participant's Role**

The interview will be of a semi-structured format, whereby I will have a list of questions that I would like to cover; however other topics are free to be covered where relevant. Questions will be available prior to the interview. The interviews will take no longer than one hour, at a time and location that is convenient to you.

### **Confidentiality**

All the information that we discuss is entirely confidential. I will not record your name in association with any of the information or issues that we discuss, unless indicated by you on the consent form.

### **Storage and Disposal of Raw Data**

The interviews will be recorded digitally and transcribed by me. Access to the written and electronic material will be restricted to me. All written material will be kept in a locked file, and all electronic material will be password protected. After the completion of the research, any interview material, or similar, will be destroyed and the audio recordings of the interviews will be electronically wiped.

The data will be reported in my thesis, which will be submitted for marking to the School of Geography, Environment and Earth Sciences, Victoria University of Wellington and a copy will be held in the Victoria University of Wellington and Otago University of Dunedin libraries. The information may also feature in academic, industry or local government publications and/or be presented at academic or professional conferences.

### **Right of Withdrawal**

During the course of the interview, you will have the right to withdraw or refuse to answer any question(s) at any time. You may request that the transcript of your interview be destroyed and not used in the study, for any reason. Please inform me of your withdrawal no more than 8 weeks after the date that the interview took place.

### **Provision of Feedback**

You have the right to check the interview transcript, and will be able to provide any corrections at any time, prior to final analysis of data.

If you have any other questions about this project, please feel free to ask me now, or contact me, or my supervisor, Sophie Bond, later. Both contact details are provided on the first page of this sheet.

Your help is much appreciated.

Sincerely,

Camilla Morley

## Appendix A5 – Online survey

*Note* – Questions were viewed by survey participants according to their responses. Therefore, not all questions were viewed by participants.

Participant consent

Greater Wellington Transport Survey

Click on the button below to take the survey.

☐ I confirm that I have read and understand the contents on the ["Information for Participants"](#) page.

PT2

A map of the Greater Wellington region will load below.

1. Please click in the relevant box to indicate which area you live in.

The following questions apply to your travel within the [Greater Wellington region](#). This is the area that extends from Island Bay and Seatoun situated south of Wellington, out to the Wairarapa in the east and Otaki in the north, as was shown in the map in Question 1. [Click here to see a map of the region again](#).

2. How often do you have access to a car, or van, for trips around Greater Wellington?

☐ All of the time  
☐ Most of the time  
☐ Mainly in the evenings  
☐ Mainly at weekends  
☐ Rarely  
☐ Never

3. What is the main mode of transport that you usually use in Greater Wellington to travel to the activities stated below?

a) Work or study

☐ Bus  
☐ Wellington City Cable-car  
☐ Motorcycle  
☐ Taxi  
☐ Train  
☐ Driver in a car  
☐ Bicycle  
☐ Other - Please state   
☐ Ferry  
☐ Passenger in a car  
☐ Walk

**b) Food shopping**

- |                             |   |                                  |  |
|-----------------------------|---|----------------------------------|--|
| <input type="radio"/> Bus   | <input type="radio"/> Wellington City Cable-car | <input type="radio"/> Motorcycle | <input type="radio"/> Taxi   |
| <input type="radio"/> Train | <input type="radio"/> Driver in a car           | <input type="radio"/> Bicycle    | <input type="radio"/> Other - Please state<br><input type="text"/> |
| <input type="radio"/> Ferry | <input type="radio"/> Passenger in a car        | <input type="radio"/> Walk       |  |

**c) Leisure activities (e.g. shopping or visiting friends)**

- |                             |   |                                  |  |
|-----------------------------|---|----------------------------------|--|
| <input type="radio"/> Bus   | <input type="radio"/> Wellington City Cable-car | <input type="radio"/> Motorcycle | <input type="radio"/> Taxi   |
| <input type="radio"/> Train | <input type="radio"/> Driver in a car           | <input type="radio"/> Bicycle    | <input type="radio"/> Other - Please state<br><input type="text"/> |
| <input type="radio"/> Ferry | <input type="radio"/> Passenger in a car        | <input type="radio"/> Walk       |  |

**d) Recreation / sports activities**

- |                             |   |                                  |  |
|-----------------------------|---|----------------------------------|--|
| <input type="radio"/> Bus   | <input type="radio"/> Wellington City Cable-car | <input type="radio"/> Motorcycle | <input type="radio"/> Taxi   |
| <input type="radio"/> Train | <input type="radio"/> Driver in a car           | <input type="radio"/> Bicycle    | <input type="radio"/> Other - Please state<br><input type="text"/> |
| <input type="radio"/> Ferry | <input type="radio"/> Passenger in a car        | <input type="radio"/> Walk       |  |

**4. Do you live within 1km of a public transport stop (bus, train, ferry or cable-car)?**

If you are unsure please click on the following link to open Google Maps in a new window: <http://maps.google.co.nz>. Zoom in on your street and the public transport stops will be displayed by a blue icon as shown below.



- ☐ Yes  
☐ No

**5. On average, how often do you use public transport (bus, train, ferry or cable-car) within the Greater Wellington region?**

- ☐ 5 or more days a week  
☐ 3-4 days a week  
☐ 1-2 days a week  
☐ Once a fortnight  
☐ Once a month  
☐ Less than once a month  
☐ Never

**5.a) How do you get to your public transport stop? (E.g. Walk, drive)****6. What factors contribute to your use of public transport?**  
**6. What factors contribute towards you not using public transport?**

**7. What type of ticket do you usually buy for the following transport modes in Greater Wellington?**

**a) Bus**

Single cash fare

- ☐ Single smartcard fare (e.g. Snapper or Mana/Newlands)
- ☐ SuperGold concession card
- ☐ Daily bus ticket valid on only one bus operator (e.g. Daytripper)
- ☐ Daily bus ticket valid on more than one bus operator (e.g. STARPass)
- ☐ Daily combined bus and train ticket (e.g. Metlink Explorer)
- ☐ Monthly bus ticket valid on only one bus operator (e.g. Gold Pass)
- ☐ Monthly bus ticket valid on more than one bus operator (e.g. Platinum Pass)
- ☐ Monthly combined bus and train ticket (e.g. Metlink Hutt Plus Monthly)
- ☐ Quarterly combined bus and train ticket (e.g. Metlink Kapiti Plus)
- ☐ Other - Please state
- ☐ I do not use the bus

**b) Train**

- ☐ Peak cash fare
- ☐ Off-peak cash fare
- ☐ SuperGold concession card
- ☐ Daily train ticket (e.g. Day Rover)
- ☐ Peak 10-trip ticket
- ☐ Off-peak 10-trip ticket
- ☐ Monthly train ticket
- ☐ Quarterly train ticket
- ☐ Monthly combined bus and train ticket
- ☐ Quarterly combined bus and train ticket
- ☐ Other - Please state
- ☐ I do not use the train

**c) Ferry**

- ☐ Single cash ticket
- ☐ Snapper fare
- ☐ 10-trip ticket
- ☐ Monthly ticket
- ☐ SuperGold concession card
- ☐ Other - Please state
- ☐ I do not use the ferry

**d) Wellington City cable-car**

- ☐ Single ticket
- ☐ Return ticket
- ☐ Multi-trip card
- ☐ Other - Please state
- ☐ I do not use the cable-car



8. On average, for how many of your journeys do you have to get more than one public transport service (bus or train, or change between buses, trains, ferry or cable-car) within Greater Wellington?

E.g. For your journey to work you get on the train, change to a bus, and then arrive at work.



- ☐ All of my journeys
- ☐ Most of my journeys
- ☐ Some of my journeys
- ☐ A few of my journeys
- ☐ None of my journeys

8.a) Which public transport services do you usually change between? (E.g. Bus and train, or bus and bus)

### Snapper

#### Snapper cards

Snapper is an electronic smartcard which is used to pay for travel on Go Wellington, Valley Flyer and Airport Flyer buses and the The Dominion Post Ferry.

9. Do you use a Snapper card?



- ☐ Yes
- ☐ No

10. Why do you use a Snapper card? (You may state more than one reason)

- ☐ Cheaper fares
- ☐ Convenience
- ☐ I like to use it for other purchases
- ☐ Because my friends do
- ☐ Other - Please state

10. Why do you not use a Snapper card? (You may state more than one reason)

- ☐ It is not available on my bus service
- ☐ Initial cost of card
- ☐ Inconvenience
- ☐ Privacy
- ☐ Lack of information
- ☐ Cannot buy a day pass
- ☐ Other - Please state

11. Since Snapper has been introduced on buses have you noticed any change in your travel time?

- ☐ Much shorter
- ☐ Moderately shorter
- ☐ No change in travel time
- ☐ Longer
- ☐ Much Longer
- ☐ I haven't noticed

12. a) How satisfied are you with your Snapper card?

- |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Very Dissatisfied     | Dissatisfied          | Neutral               | Satisfied             | Very Satisfied        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

12. b) Please explain why you are dissatisfied / satisfied with Snapper?

#### Smart cards

##### Smartcards

The following questions are about electronic smartcards. This is a card which can be used to electronically store tickets that you have bought, or credit that is used to pay for your journey at the time of travel. Snapper and Mana/Newlands travelcards are examples in Wellington. You swipe the card over a reader on entry, and sometimes on exit to a public transport vehicle as shown in the picture below.



13. Have you heard of a smartcard?

- ☐ Yes
- ☐ No

14. Please indicate from the options below what type of smartcard, if any, you have used for public transport in New Zealand and abroad?

- ☐ Snapper card
- ☐ Mana/ Newlands smartcard
- ☐ Other New Zealand smartcard - Please state
- ☐ International smartcard - Please state
- ☐ I have not used a smartcard

##### Smartcards and Integrated Tickets

An integrated ticket is one ticket which can be used on a variety of public transport services within a region. Integrated tickets nowadays usually come in the form of electronic smartcards, e.g. the Melbourne Myki card, or the London Oyster card shown below. They can be topped up with credit, or ticket products.



An integrated ticket is being launched in the Auckland region over the next two years, allowing passengers to travel on all buses, trains and ferries in the region using a single electronic ticket. The system is also being considered for Wellington.

Integrated tickets have many characteristics which can increase convenience for the passenger and provide other purchasing opportunities.

**16. If an integrated ticket was available for regional travel in Greater Wellington, what characteristics would you like the card to have?**

Rank the options below where 1 indicates the most important characteristic and 10 the least important.

To rank the characteristics click on the option and, holding your mouse down, drag it to the position you want it to be in and release.

One card to pay for all travel on public transport

Integrated fare prices - single fares between different services are integrated into one fare (e.g. a maximum price cap on travel, where after a certain number of trips you are no longer charged for further travel within that day).

Cheaper fare prices than using a paper ticket

Personal registered cards (can be cancelled or redeemed if lost)

Anonymous cards (cannot be cancelled or redeemed if lost)

Concessions (cheaper travel for students, beneficiaries, or the elderly)

Use the card for parking

Use the card for small retail purchases (coffee, magazines, etc)

Use the card for bike hire

Joint with your bank card/ bank account

Cell phone compatibility - use your cell phone as a ticket

Use the space below to add other characteristics you would like an integrated ticket to have, or to expand on your answers above.

**17. If an integrated ticket was introduced for Greater Wellington, how likely is it that you would use it?**

Very Unlikely

Unlikely

Undecided

Likely

Very Likely



**18. If an integrated ticket was available in Greater Wellington, how do you think it would affect your use of public transport?**



19. What factors would have to change for you to use the public transport system more?

20.a) Would you support local and/or central government investing in integrated ticketing for public transport in Greater Wellington?

- ☐ Yes
- ☐ No
- ☐ Unsure

20.b) Please explain why you would / or would not support government funding for integrated ticketing.

21. How important is it for you to have a regional integrated ticket for all modes of public transport in Greater Wellington?

- Not at all important      Unimportant      Neutral      Important      Very important
- ☐      ☐      ☐      ☐      ☐

The New Zealand Transport Agency is looking at integrated ticketing on a national scale. This means you could potentially use the same public transport ticket in Wellington, Auckland and other major cities.

22. How important for you, is it to have a national integrated ticket for all modes of public transport in New Zealand (bus, train, ferry and cable car throughout major cities in New Zealand)?

- Not at all important      Unimportant      Neutral      Important      Very important
- ☐      ☐      ☐      ☐      ☐

23. How important do you think it would be for tourists visiting New Zealand to have a national integrated ticket?

- Not at all important      Unimportant      Neutral      Important      Very important
- ☐      ☐      ☐      ☐      ☐

#### Environmental attitude questions

Thank you for your responses so far.

The following questions ask you to think about everyday trips that you take within Greater Wellington (e.g. getting to work or study, recreation, leisure or shopping activities). Please keep this in mind when answering.

Some of the questions are similar, this is intentional. Please read each one carefully and answer all of them.

**24. Choose a word from the list on the right to fill in the gaps for the following statements.**

It is ____ that in the next few weeks I will use public transport instead of the car for everyday trips within Greater Wellington?	Very unlikely	Unlikely	Undecided	Likely	Very likely
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am ____ that in the next few weeks I can use public transport instead of the car for everyday trips in Greater Wellington.	Very unsure	Unsure	Undecided	Sure	Very sure
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My intention to use public transport in the next few weeks instead of the car for trips within Greater Wellington is ____.	Very weak	Weak	Neutral	Strong	Very strong
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have ____ freedom of choice to use public transport rather than drive for everyday trips in Greater Wellington.	Absolutely no	Mostly little	Neither little nor full	Mostly full	Absolutely full
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It would be ____ for me to use public transport instead of the car for everyday trips in Greater Wellington.	Absolutely impossible	Impossible	Neither impossible nor possible	Possible	Very possible
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using public transport instead of the car for everyday trips in Greater Wellington would be ____ for me.	Very bad	Bad	Neither bad nor good	Good	Very good
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using public transport instead of the car for everyday trips in Greater Wellington would be ____ for me.	Very unpleasant	Unpleasant	Neither unpleasant nor pleasant	Pleasant	Very pleasant
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**25. Please indicate to what extent you agree, or disagree, with the following statements on your decisions to use public transport for everyday trips in the Greater Wellington region.**

Some of the questions are similar, this is intentional. Please read each one carefully and answer all of them.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Most people I know don't care if I drive or take public transport for everyday trips here in Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People who are close to me (e.g. friends and family) would support my decision to use public transport for everyday trips in Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I intend to use public transport instead of the car in the next few weeks for everyday trips around Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would not like to use public transport instead of the car for everyday trips in Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People who are close to me (e.g. friends and family) think I should use public transport more and drive less for everyday trips in Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is mostly up to me whether I use public transport instead of the car for trips here in Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regardless of what other people do, I feel obligated to use public transport for everyday trips in Greater Wellington because of my own values and principles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not feel obligated to use public transport instead of driving for everyday trips in Greater Wellington according to my own values and principles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most people who are important to me would support me using the car for everyday trips in Greater Wellington.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**26. Please indicate to what extent you agree, or disagree, with the following statements on environmental problems and car use.**

Some of the questions are similar, this is intentional. Please read each one carefully and answer all of them.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Increasing car traffic is not a big problem for the protection of the environment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taking into account that pollutants from car use threaten other people's health, I would have a bad conscience when using the car.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I always used the car, I would have a bad 'environmental conscience'.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is an urgent need to do something about the environmental pollution caused by car use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel obliged to use public transport for environmental reasons.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I drive, exhaust gases are emitted which have a negative effect on the global climate system.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Car use is one of the main global environmental problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not think my personal car use has negative impacts on the living quality of future generations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I drive, exhaust gases are emitted which may endanger other people's health.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I use the car, I do not feel guilty in terms of the environment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thank you! You are nearly at the end of the survey.

Lastly there are just a few background questions.  
Please remember that your responses are confidential and anonymous.

**27. What is your gender?**

- ☐ Male  
☐ Female

**28. What is your age? (E.g. 42)**

**29. What were your average personal earnings for the last year, 2009?**

- ☐ \$1 - \$5,000  
☐ \$5,001 - \$10,000  
☐ \$10,001 - \$15,000  
☐ \$15,001 - \$20,000  
☐ \$20,001-\$25,000  
☐ \$25,001-\$40,000  
☐ \$40,001-\$50,000  
☐ \$50,001-\$70,000  
☐ \$70,000 - \$100,000  
☐ \$100,001 or more  
☐ Other - Please state   
☐ Prefer not to say

**30. Which best describes your employment situation? (Please select all that apply)**

- ☐ Full time paid employment – 20 hours or more per week
- ☐ Part time paid employment – less than 20 hours per week
- ☐ Full time intermediate / secondary school student
- ☐ Full time tertiary student
- ☐ Part time tertiary student
- ☐ Not in paid employment
- ☐ Other - Please state
- ☐ Prefer not to say

**31. Which of the following best describes your living situation?**

- ☐ Single living alone
- ☐ Group living together
- ☐ Couple with no children living at home
- ☐ Family with mainly pre-school children
- ☐ Family with mainly school children
- ☐ Family with mainly adult children living at home
- ☐ Other - Please state

**Thank you for taking the time to complete this survey.  
Your answers and opinions are highly valued.**

**If you would like to go into the draw to win a \$100 voucher for free public transport travel please indicate so below. You will be redirected to a new page to enter your contact details so this information remains anonymous.**

- ☐ Enter me into the draw to win a \$100 voucher for travel on my choice of public transport!
- ☐ No thank you. End survey.



## Appendix A6 – Participant information sheet for survey



1

### Online Survey Participant Information Sheet

**Master's Thesis Research Project:**  
**"Investigating options for integrated ticketing and its impact on public transport use within Greater Wellington"**

**August 2010**

Researcher: Camilla Morley Email: morleycami@myvu.ac.nz	School of Geography, Environment and Earth Sciences (SGEES) Victoria University of Wellington PO BOX 600 Wellington 6140 +64 463 5337
Supervisor: Sophie Bond Email: sophie.bond@vu.ac.nz	

Dear Project Participant,

The following information provides you with brief details of my project and your rights as a research participant. According with University policy for all research involving human participants, the online survey has been approved by the Human Ethics Committee.

#### Research Project

The research project will investigate opportunities for, and barriers to, integrated ticketing in Greater Wellington as part of a strategy to encourage public transport uptake and reduce car use. Integrated ticketing is where a passenger can use the same ticket (usually in electronic form) to travel on all modes of public transport. In Wellington this would include bus, train, ferry and cable car.

The study will answer the following major questions:

1. What are the advantages and disadvantages of integrated ticketing systems?
2. Why do people use / not use public transport in the Greater Wellington region?
3. How do pro-environmental attitudes affect travel mode choice?
4. How might integrated ticketing affect mode choice?
5. What is the public's perception of the Snapper system and of a possible future integrated ticketing system on a regional and national scale?
6. What are the key stakeholder perceptions of an integrated ticketing system on a regional and national scale?

The study will use both quantitative and qualitative methodology through an online questionnaire and semi-structured interviews with transport experts.

#### Participants' Role

The questionnaire will be used to get a public perspective of public transport and integrated ticketing within Greater Wellington. It is your chance to voice your opinion and comment on the system before it is introduced. It should take no longer than 20 - 25 minutes to complete. Please enter your details at the end of the questionnaire to enter into the prize draw to win a

SCHOOL OF GEOGRAPHY, ENVIRONMENT AND EARTH SCIENCES  
PO Box 600, Wellington, New Zealand  
Phone +64-4-463 5337 Fax +64-4-463 5186 Website [www.geo.vuw.ac.nz](http://www.geo.vuw.ac.nz)

Te Kura Tatai Aro Whenua

Participants must be living in the Greater Wellington region – this extends from Island Bay and Seatoun south of Wellington, out to the Wairarapa and Waikanae in the north. Please click [here](#) to see a map of the region.

All of the information you provide is entirely confidential. Personal details will be collected only for those who wish to enter the prize draw. All personal details will be destroyed once the prizes have been claimed, or, after March 1<sup>st</sup> 2011, whichever is sooner. I will not record your name in association with any of the information provided in the questionnaire.

#### **Storage and Disposal of Data**

Access to the electronic material will be restricted to me and all electronic material will be password protected.

The data collected will be aggregated and may be used in strict confidentiality by Greater Wellington regional council. No user of this data will be able to attribute opinions, facts, or other information to you. The data will be reported in my thesis, and will be potentially presented in academic journals and conferences. The thesis will be submitted for marking to the School of Geography, Environment and Earth Sciences, Victoria University of Wellington and a copy will be held in the Victoria University of Wellington and Otago University of Dunedin libraries. After the completion of the research all of the questionnaire data will be held with Greater Wellington or electronically wiped.

#### **Right of Withdrawal**

You have the right to withdraw from the questionnaire at any time. You may request that the data from your response be destroyed and not used in the study, for any reason. You must inform me of your withdrawal no more than 4 weeks after the completion date of the questionnaire.

#### **Provision of Feedback**

You may request to see the results of this survey. Results will be sent, by request, in aggregated form. No personal details or opinions will be attributable to any one person.

If you have any other questions about this project, please feel free to contact me, or my supervisor, Sophie Bond. Both contact details are provided below.

Your input is much appreciated.

Sincerely,

Camilla Morley

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Te Kura Tatai Aro Whenua

## Appendix B – LISREL syntax input

ATT\_1R SN\_4R PN\_3 PA\_1 PA\_2 G\_1R PA\_3R AC\_1 AC\_2 AC\_3R G\_2 G\_3 PT\_freq beh TripRatio

Latent Variables: PBC ATT PN INT SN G PA AC BEHAV  
Covariance Matrix from File Dec.COV.DAT  
Sample Size = 359

Relationships:

PBC\_1 = 1\*PBC  
PBC\_2 PBC\_4 = PBC

ATT\_1R = 1\*ATT  
ATT\_2 ATT\_3 = ATT

PN\_1R = 1\*PN  
PN\_2 PN\_3 = PN

INT\_1 = 1\*INT  
INT\_2 INT\_3 = INT

SN\_1 = 1\*SN  
SN\_2 SN\_3R = SN

G\_1R = 1\*G  
G\_2 G\_3 = G

PA\_1 = 1\*PA  
PA\_2 PA\_3R = PA

AC\_1 = 1\*AC  
AC\_2 AC\_3R = AC

beh = 1\*BEHAV  
PT\_freq = BEHAV  
TripRatio = BEHAV

PA -> SN G AC PN  
AC -> SN G PN ATT

SN -> G PBC ATT PN  
G -> PBC ATT PN  
PBC ATT PN -> INT

INT -> BEHAV

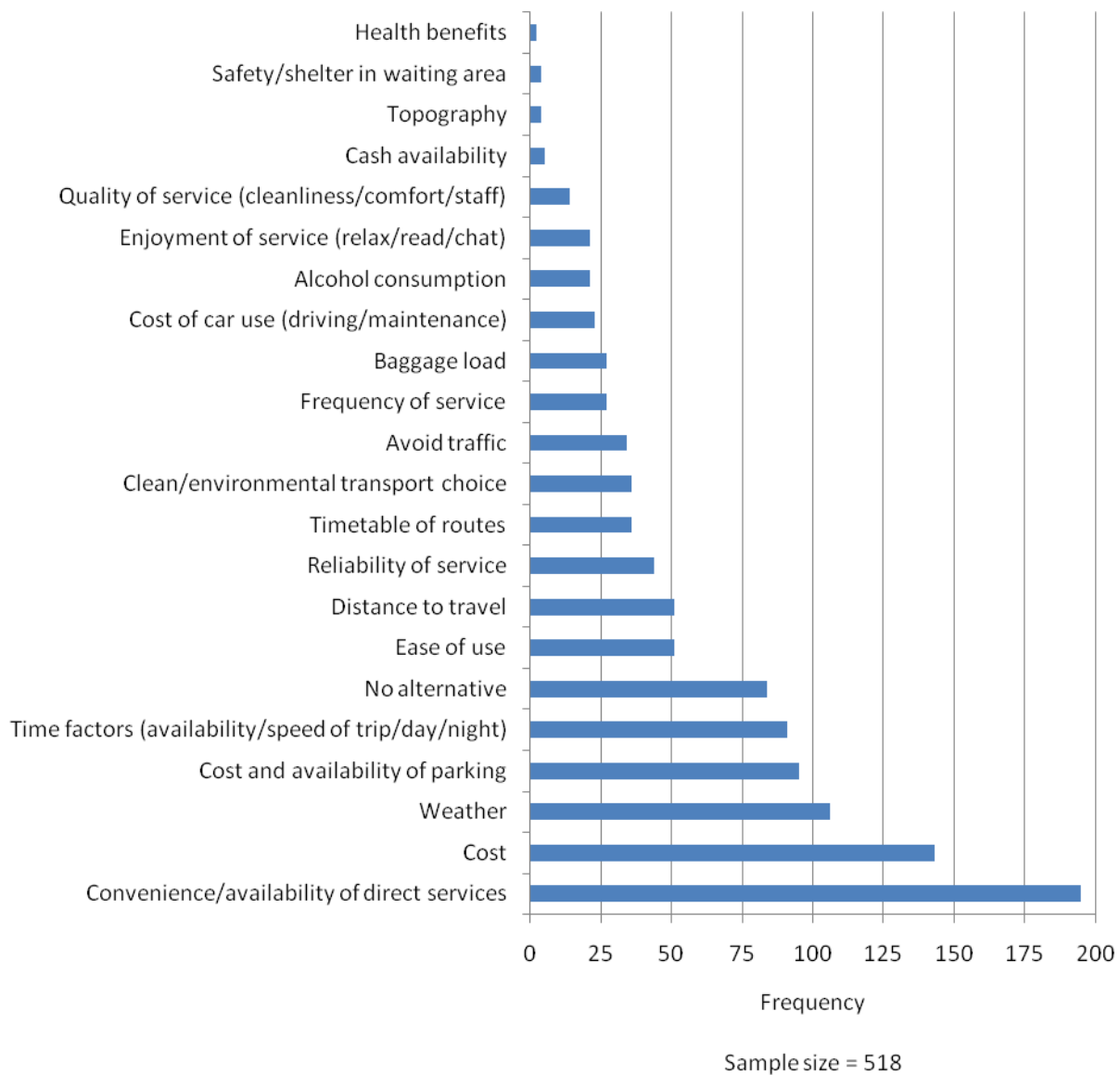
Let PBC and ATT correlate  
Let PBC and PN correlate  
Let ATT and PN correlate

Set the Error Variance of TripRatio 0.01

Path Diagram  
End of Problem

Sample Size = 359

## Appendix C – Factors influencing use of public transport



**Figure C1** – Responses to the open ended question ‘What factors influence you to use public transport’, coded for graphical representation.



## Appendix D – Wellington region population data

**Table D1** – Percentage of residents of the Greater Wellington region by area, according the results of the present survey and the census data from 2006. Source: (Statistics NZ, 2006).

<b>Greater Wellington Area</b>	<b>Survey participants</b>	<b>Census Data 2006</b>
Wellington City	63.1 %	40.0 %
Lower Hutt City	17.9 %	21.8 %
Porirua City	8.8 %	10.8 %
Kapiti Coast District	3.8 %	10.3 %
Upper Hutt City	5.4 %	8.6 %
Masterton District	0.4 %	5.0 %
South Wairarapa District	0.5 %	2.0 %
Carterton District	0.2 %	1.6 %
Total (Count)	559	448941

*Note* –The table above shows the census data population for the regions covered by the survey only. The survey did not include the Tararua District or Areas Outside of Territorial Authority because of limited access to public transport in these areas.