Understanding Decision Making Constraints Facing Car Commuters & How to Overcome them

Reported as part of the FRST Research Programme: Identifying Factors to Change People's Transport Use

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1. Introduction

The UK Government established the *Technology Foresight* programme in 1993, bringing together scientists and industrialists to identify the primary challenges and market and technological opportunities likely to develop in the next 10 to 20 years. Transport was one of 15 sectors considered and in 1995 the *Foresight* panel reported that the most pressing issue for transport was *the need to reconcile the individual desire for mobility and access with the social desire for a cleaner and safer environment*. This sentiment has been echoed to some degree by the European Commission, many OECD countries, and the US Department of Transport all of whom have directed significant resources to research and other activities directed towards achieving sustainable transportation systems (see Resource Futures International 1996 and O'Fallon 1997 for summaries of these activities).

Traditionally, decision makers have had three approaches to encourage changes in traffic: (1) modify the supply of networks (build more capacity); (2) manage the demand through various means (travel demand management techniques) and (3) modifying land use. The UK Government and the OECD have publicly observed that it is no longer acceptable to simply build more roads to meet increased demand (O'Fallon 1997:46). Traffic demand management techniques and modifying land use commonly involve the implementation of various policies by decision makers. However, the European Commission (EC) noted in its 4th Framework Programme (Transport) that decision making commonly suffered from "insufficient knowledge on the understanding of mobility, logistic requirements and the effects of various policy tools" (p.9).

A key element of the EC's programme, therefore, was devoted to developing a "better understanding of causal relations between policy goals/targets and policy measures taking into consideration potential conflicts between them". However, the focus of the research was on measuring the effect of the policy on travel behaviour after implementation, by modelling the observed travel behaviour in the form of vehicle flows or patronage numbers using traffic or operational models. These types of models, very commonly used in transport studies (see Handy 1996 and Button 1995 for good summaries of the types of models and their research outputs), do not understand the rationale or constraints affecting an individual's travel choices. Because the rationale is not understood, all too often changes in conditions of a passenger transport service or transport policy do not have their full intended impact.

An individual decision maker (= the car driver) processes a set of attributes and levels associated with each of the available alternatives and selects one with the highest utility / satisfaction. Their behaviour is conditioned by accumulated knowledge and their socio economic profile as confirmed by Hensher (1993:3): "as personal and/or household incomes rise, individuals have tended to consume both more land and more travel." Clearly, the analyst has less than full information when assessing travel behaviour - there is always a set of relevant but unobserved influences on choices. These unobserved influences may act as constraints on the decision-maker, preventing the matching of attitudes with overt responses. The key issue becomes to identify the constraints that are preventing the desired behaviour and understanding how to modify them using incentives or other means.

A limited amount of work has been undertaken in New Zealand to try to understand consumer travel behaviour. A recently completed study in Wellington considered commuters' receptiveness to various policy changes, namely improvements to passenger transport and increased vehicle running costs. Commuters were asked what their potential was for shifting to passenger transport, and those whose vehicle running costs and/or parking costs are paid for by their employer are highly resistant to shifting. Improved frequency, increased number of routes and reduced fares were considered to be the passenger transport options that would encourage drivers to shift modes. There was significant support for improving passenger transport services as a means of reducing congestion (and presumably car use). At the same time, however, there was a significant *lack of* support for any measures that would impact directly on car users, such as increased parking charges, congestion charges, and reducing car park availability. These results imply an attitude that passenger transport "isn't for me but the other bloke should use it" (John Collyns, pers. comm., 1997). This is further supported by *The Auckland Transport Models Project: Stated Preference Mode Choice Survey* (1994) which revealed that it is difficult (at best) and impossible (at worst) to convince motorists to abandon their cars. In the study, the required "sticks" (raising petrol costs and parking costs by 100%) or "carrots" (idealised public transport measures) are quite significant to incur even a small change in car-based traffic.

The objective of this research programme is to develop an understanding of the constraints affecting consumer preferences and decision-making processes when choosing to travel by car. Understanding these factors will enable us to provide transport planners, policy makers and passenger transport providers with the knowledge and tools to:

- overcome the constraints to making travel decisions
- better meet individual consumer needs for transport
- meet societal preference to reduce congestion and pollution and to improve the environment that transport operates in.

In the first phase of the programme (1998-2000), we have focused on two particular groups of car drivers, namely:

- Those driving to work / place of study before 10 a.m. on weekdays
- Parents / caregivers driving their children to school (NOT as part of their home-work trip).

The following sections outline the specific research question addressed and describe the process used to answer it. The chapter closes with a brief synopsis of the remainder of the report.

2. Research Design

2.1 The Research Question

This research programme has been designed to address the question:

> *What are New Zealander's constraints to reducing car use and how can we alleviate them?*

It has been observed elsewhere (RFI 1996:9) that "significant demand reduction will not occur until individuals willingly choose to drive and consume less."

In addressing this question, a wide range of information was sought, including perceived and real constraints to reducing car use and perceived and proposed options to reducing car use. These options are broader than altering provision of public transport (see Hensher 1994 for a summary of arguments as to why public transport is not "the" answer) or implementing new policy measures. It may incorporate, for example, travel blending; trip timing, change in destination (e.g. tele-commuting or home offices) or origin (e.g. shifting closer to work) and reducing the number of trips.

2.2 Developing the Focus for Phase One (1998 - 2000)

Clearly, there are many different approaches that could be followed to address our research question. In order to focus the research programme on the particular areas of interest to our end-users, we held 3 half-day workshops (2 in Wellington and 1 in Auckland) in August /September 1998 to identify what end users particularly wished to understand in terms of:

- population segments
- strategies / mechanisms / tools to alter behaviour
- specific trade-offs between strategies

In addition, we asked end users to identify any issues they wanted addresses and to outline potential constraints they thought could affect people's travel decisions. Forty-seven individuals, representing 26 different organisations from Wellington, Auckland, Christchurch and Hamilton, attended the workshops (Appendix 1 contains a listing of the organisations represented).

2.2.1 Identifying the Target Population Segments

As could be expected, end users identified many possible population segments that could be examined in the context of this research programme. However, five specific population segments were clearly indicated as being of the greatest interest:

- car drivers to / from work in the central city during peak hours
- parents or caregivers driving children to school
- seniors (tentatively considered to be 65+)
- irregular passenger transport users

- weekend recreational / leisure car users travelling regularly into the central city (or other identified congested) area.

Parents / caregivers driving their children to school is a modern phenomenon as most children 20 to 30 years ago either walked to school or caught a school bus. High levels of week end car use is also a recent occurrence arising, in part, because of the extension of shopping hours, with some NZ cities reporting congestion levels exceeding those of weekday peak periods on some urban streets.

We recognise that there is highly likely to be overlap within these groups (e.g. one person may be car only to/from work, drive one or more child(ren) to school, and use a car in the city on weekends). However, we thought it would be possible to structure our fieldwork to focus on particular behaviours.

Due to time and budget constraints[1], we decided to focus the first phase of the research programme on travel during the morning "peak period" by two particular groups:

- Those driving to work / place of study before 10 a.m. on weekdays
- Parents / caregivers driving their children to school (NOT as part of their home-work trip).

These two groups of drivers are significant in terms of their contribution to the transportation network, as demonstrated by the 1998/99 Household Travel Survey (sponsored by the Land Transport Safety Authority):

- 75% of trips from home to work by full time employees are by car
- 53% of trips from home to school by 5-12 year olds are as car passengers
- 43.4% of trips from home to school by 13-17 year olds are as car passengers.

In addition, for the 1998-2000 period, we limited the collection of data to 2 main urban centres, Auckland and Wellington, in order to have meaningful sample sizes. The extension of our research programme to June 2002 meant that a survey of Christchurch morning peak period car drivers was conducted in 2001. In addition, funds were allocated to geocode the destinations and calculate trip lengths for all three cities in the 2001-2002 period.

2.2.2 Identifying the Strategies / Tools to Investigate

In the three workshops there was a reasonable emphasis on identifying strategies that end users thought could be useful in altering people's travel choices, particularly car use. Not unexpectedly, a wide range of strategies were highlighted, but there was a very definite emphasis on the following types of strategies:

- adjusting the cost of car use, by altering the balance between fixed and variable costs, or making "hidden" costs more "visible".
- the use of various forms of road pricing.

[1] Subsequently, the research programme has been extended for two years to June 2002. This extension will allow us to further investigate our two chosen groups as well as to include research on weekend car users.

- the use of various types of parking constraints, i.e. affecting quantity, price and/or convenience of parking but also provision of "park and ride" facilities and "free" parking for company employees
- the use of education and information in changing attitudes and mobility patterns
- altering passenger transport services - e.g. increased comfort, increased reliability, decreased journey time, cost, safety, convenience; changes to frequency or routes, comprehensive ticketing, "free" PT days so that people can experience PT use, providing complementary services, express services, and improving image.
- changing work arrangements: compressed work weeks and tele-commuting (working from home).
- government non-transport policies - e.g. school zoning or importation tariffs, altering fuel taxes, altering school opening hours.
- altering land use: intensification, "car free" subdivisions, integration with transport planning, etc.

The strategies which had the greatest mention / discussion were the ones related to road pricing, parking, passenger transport improvements and education / information. In the workshops, end users also made it very clear that they wished to understand how various strategies interacted with each other.

For the first phase of the research programme (1998-2000), in Auckland and Wellington, we decided to focus on the following strategies:

- parking
- road pricing / congestion pricing
- passenger transport improvements
- changing work arrangements (tele-commuting, compressed work week).

In order to define particular tools for use within these broader strategies, we reviewed the international literature[2] and consulted on a one-to-one basis with selected end users, such as Wellington Regional Council and Auckland Regional Council. We refined our initial a list of potential tools or mechanisms for our field work programme by a process of in-depth interviews, consultation with end users, and Prof. David Hensher, an international expert in transport-related stated choice experiments. We were aiming for a set of tools that covered the range of strategies identified above, were relevant to the particular population segments we were studying and were easy to comprehend for participants in our fieldwork.

With the extension of the database to include Christchurch in 2001, we focused on the same strategies as for Wellington and Auckland as well as collecting information on cycle use and options. Of the three cities studied, Christchurch has the topography most suited to cycling.

[2] The following references provide an overview of the available tools and their usage in international settings: Road Transport Research (1995) *Congestion Control and Demand Management* (OECD); Luk *et al* (1998) *Reducing road demand by land-use changes, public transport improvements and TDM measures – a review* (ARRB Transport Research Report ARR 313); and Todd Litman (1999) *Comparing Transportation Emission Reduction Strategies* (VTPI website).

2.3 Questionnaire Design

Once we had identified the two population segments and the strategies we were going to focus on for the 1998 – 2000 period, we began to construct the survey for the fieldwork. Initially, we had planned to have a single survey for both groups under study, but questionnaire length and early field testing of the survey prompted us to separate the surveys into what we termed the "main" (for car drivers who regularly drive to work / place of study before 10 a.m.) and "supplementary" (for parents / caregivers regularly driving children to school and not going to work). The main questionnaire is attached as Appendix A (later version, used in Christchurch 2001) and the supplementary questionnaire as Appendix B.

The design and nature of each of these surveys is discussed separately below.

2.3.1 The Survey of Morning Peak Period Car Drivers in Wellington and Auckland

2.3.1.1 Overall Structure: Stated Choice Questionnaire

The main survey of car drivers regularly driving to work or their place of study before 10 a.m. had six sections, namely:

- screening questions
- a one day trip diary covering each trip / stop from 5 a.m. until 10 p.m.
- stated choice scenarios
- changing work arrangements
- attitude statements
- demographic / contextual data.

The survey was refined through an extensive pre-testing and piloting process in Wellington and Auckland described below. Four hundred eighty-five respondents (250 in Auckland and 235 in Wellington) completed the finalised questionnaire in face-to-face interviews.

2.3.1.2 Pre-testing

Pre-testing allowed us to refine and focus the policy tools and questions for inclusion in the final survey. It was during the pre-testing phase that we concluded that we should have two separate surveys.

Pre-testing of early drafts of the survey involved end-users with a specialist knowledge of the transport area, particularly transport-related policy tools, passenger transport, and vehicle users as well as "typical" members of the public. In all, 19 individuals were involved in the pre-testing, including representatives from:

- Auckland Regional Council
- Wellington Regional Council
- NZ Automobile Association
- Transfund New Zealand
- Waitakere City Council
- Bus & Coach Association
- Land Transport Safety Association.

Consumer Link arranged nine interviews with pre-selected respondents in Auckland and two further interviews were conducted in Wellington with “typical” car drivers.

2.3.1.3 Piloting

The complexity of the questionnaire meant that comprehensive piloting spread over several weeks was necessary to ensure that the questionnaire was acceptably easy to answer by a wide range of respondents. In total 27 complete pilot interviews were done. BRC Research completed 15 in Wellington, and the National Research Bureau (NRB) completed 12 in Auckland.

Piloting was completed in three stages:

1. Initial piloting followed on naturally from pre-testing. Seven interviews were completed in this phase, with improvements being made after every one or two interviews.
2. Intended “final” piloting comprised 11 interviews in both Auckland and Wellington in early May. This generated so many changes that we found it prudent to conduct a further round of piloting before beginning the main field work. Such an extra round of piloting is not normally required.
3. Actual “final” piloting consisted of nine interviews in both Wellington and Auckland in mid-May.

Each element of the survey is outlined in the following sections.

2.3.1.4 Screening Questions

Respondents were screened initially by a simple query as to whether they drove to work or a place of education (either their educational institution or their child/ren’s) before 10 a.m. in the previous week. If they drove at least twice on weekdays, then they were eligible for either the main or the supplementary survey. Subsequent screening questions about their paid employment, and about how often they either drove to their work / place of study or drove their children to school ascertained which survey would be most appropriate for them to respond to.

Respondents driving to work / place of study were also asked where they mainly parked in the past month.

2.3.1.5 One Day Trip Diary

The day discussed with respondents for the purposes of the trip diary was randomly allocated over the last three weekdays (given that most household interviewing occurs at weekends), with Monday and Tuesday being allocated only if the respondent did not make a relevant trip on the later weekdays. Respondents were then asked about their car use from 5 a.m. (or first trip after this time) until 10 p.m. on that day. For the purpose of the questionnaire, a “trip” was defined to include each stop in a multiple destination car trip, such that going from home, dropping a child at school, and then driving to work was two trips. For the first trip, they were asked:

- start time of trip
- where they went (street and suburb)
- purpose of stop
- whose vehicle they used
- how many people were in the vehicle

For each subsequent trip (until they either returned home or 10 p.m., whichever came first), respondents were asked:

- start time of trip
- where they went (street and suburb)
- purpose of stop.

As the stated choice scenarios were based on the same randomly selected day as the trip diary, the respondent could consider their car use in the context of an actual day and make decisions as to whether they could have changed their use in the face of a transformed driving environment. The trip diary also disclosed some trip-making habits that could be incorporated subsequent modelling of the data.

2.3.1.6 Scenario Structure

The principal focus of the survey was the stated choice scenarios. Each respondent was presented with 9 different scenarios and asked how they would have travelled to work on the day in question in the face of the policy changes outlined in the scenario. The first time they chose to continue to use their car, the respondent was asked why, in particular, they had not chosen to use passenger transport. Depending on their response to this question, the respondent may have been asked one to two follow on questions. In addition, each time that they switched from using their car, the respondent was asked to indicate what it was in the scenario that had caused them to say that they would switch. Finally, all respondents were asked to indicate how likely it was they would have switched transport modes as a simple check on the firmness of their decision.

Each scenario was comprised of 10 attributes or policy tools that, when in place, could potentially affect car use. Table 2-1 shows that half of these tools could be considered to reduce car use while the remainder could be seen as promoting passenger transport use.

Table 2-1 Ten attributes and their respective levels for use in stated choice experiment (Auckland and Wellington)

Tools to Reduce Car Use	Level 1	Level 2	Level 3
Extra daily parking charge on car park buildings and lots	None in place	$5 / day	$10 / day
Restricting on-street parking to ≤2 hours within a nominated radius of work / study place	No change	Within 0.5 km = ≤P120	Within 1.5 km = ≤P120
Converting all on-street parking within a 1 km radius of work / study place to metered parking	No change	$2.50 / hour	$5.00 / hour
Cordon charge to enter central city before 10 a.m.	None in place	$5 each entry	$10 each entry
Vehicle registration surcharge per km driven	None in place	10¢ / km	30¢ / km
Tools to Increase Passenger Transport Use			
Improved frequency of services during peak hours	No change	50% more often	Twice as often
Lower passenger transport fares	No change	25% decrease in cost	50% decrease in cost
Improved / shortened trip times of services (e.g. through ticketing improvements, preferential bus treatment at intersections, etc)	10% better	25% better	35% better (including HOV lane)
Improved route coverage of services	No change	Bus stops within 400 m of home and work place	Bus stops within 800 m of home and work place
Increased off-peak services	No change	Services every 15 minutes during off peak	Services every 30 minutes during off-peak

As can be seen from Table 2-1, each of the 10 attributes has three different levels, one of which is usually the status quo. Every scenario was comprised of 10 attributes, with each attribute set to one of the three levels, as determined by use of an orthogonal matrix. The 81 scenarios were created by a fractional factorial design (more specifically, a 3^{10-6} design supplied by our specialist collaborator Professor David Hensher). Order of the 81 scenarios was randomised and then grouped into 9 booklets with 9 scenarios each (each respondent worked through 1 booklet only). Thus, each scenario was used approximately 56 times in collecting the data from our 485 respondents. A sample scenario is shown in Figure 2-1 below.

Figure 2-1: Example of scenario (Auckland & Wellington)

	Scenario A
PARKING …	
1. **Extra charge in a carpark lot / building** (one where you already pay)	$5 extra per day
2. **On-street availability**	no change
3. **On-street charges**	all on-street parking within 1.0 km of your work/study place costs $2.50/hr and strictly enforced
PRIVATE VEHICLE …	
4. **Registration increase**	10c/km (= $1000 per 10,000 km driven)
5. **Fee to enter central city up to 10AM** .	none in place
PUBLIC TRANSPORT (trains/buses/ferries) …	
6. **Frequency**.....	runs twice as often
7. **Fares**	costs half as much
8. **Trip time changes**	shorten bus trip time by 25% (e.g., priority signalling, quicker ticketing, fewer stops)
9. **Route coverage**.....	no change
10. **Hours of operation**	service runs at least every 15 minutes during off-peak hours up to 10pm

Respondents were shown a practice scenario and offered explanations for a number of points contained in the scenarios. In particular, respondents were shown a map of their metropolitan area (either Auckland or Wellington) that had the cordon boundary lines marked on it. They were asked if they lived inside or outside the toll area and how often in the previous week they would have crossed the cordon. Respondents were also shown sample bus and train fares for selected short-, medium-, and long-distance journeys along with a timetable showing the possible improved frequency of passenger transport services (see Showcard 2 in Appendix A).

Following the sample scenario, respondents were presented with the first of the nine scenarios. After looking it over, they were asked to imagine that the scenario was in place on the day in question (based on the day for which a trip diary was created) and to say how they would have travelled to their work or place of study. If the respondent said that they would not have used their car that day, we asked them what in the scenario had caused them to say they would change how they travelled. We also asked how likely it was (on a 5-point scale) that they would really have changed from driving their car that day. The same process was followed for the remaining 8 scenarios.

The first time a respondent said they would probably continue to drive their car in light of a scenario, we asked them an open-ended question as to why they thought it was unlikely they would use public transport. Respondents were asked to identify all reasons as well as their main reason. In our coding of their responses, there were sometimes follow-on questions related to their main reason, for example, if their main reason was that they had an employer-provided car park or that their employer paid some or all of their vehicle costs, we asked if they would consider “cashing up” and using an alternative method of travel to work.

2.3.1.7 Changing Work Arrangements

Our end users expressed keen interest in the exploration of alternative working arrangements, particularly working from home (tele-commuting) and altering start and finish times in the work place. We took the latter a step further and suggested a compressed workweek that would have the effect of altering start and finish times in order to ensure that the required number of hours was worked. Thus, following on from the 9 stated choice scenarios, we asked each respondent to consider the possibility of changing their work arrangements.

The first option discussed was working from home one or more days per week where space and quiet would be required in their home to use as an office or workspace. We asked if it was practical for them to consider working from home. If the respondent said no, we asked them why it wasn’t practical. If they said yes, we asked if they would have worked from home on the day in question and. When given a negative response, we asked why they thought they would not have worked from home on that day.

The second option discussed was compressing their workweek. Two examples were described, either working 4 longer days per week and having a 3 day weekend or, on a fortnightly basis, working 9 slightly longer days and have one long weekend per fortnight. We asked if it was practical for them to work a compressed week and, if not, why not. We also asked if they would work a compressed week if the option was available and, if

they said no, why they though they would not compress their workweek. Lastly we queried how likely it was they would drive their car on their day off and, if they said it was likely, whether it was likely that this would be during the morning rush hour.

2.3.1.8 Attitudinal Statements

Based on end user requests for information, we initially developed over 40 attitudinal statements for this survey. However, time and space constraints meant that this was eventually pared down to six statements concerning timing, cost and personal safety of public / passenger transport, ridesharing, and the convenience of driving. The six statements used in the Wellington and Auckland surveys were:

- I feel it is safe to ride on PT.
- Even if buses or trains were free, I wouldn't use them.
- I feel it is safe to wait at a bus stop/train or ferry station during the day.
- If someone could organise it, I would be happy to share a ride with other people who work near me.
- I value the convenience of driving my car – I can do what I want, when I want.
- I'd use PT more if I could be sure it would arrive at my destination on time.Demographic and Other Contextual Data Collected

In addition to information on their employment status and where they usually parked their vehicle while at their work or study place, we collected other data on the respondents, including:

- how much they had paid for parking in the previous week
- how often and when they had driven children to school in the previous week
- how often they used their vehicle for work-related trips during working hours
- their age category
- household composition
- number and age grouping of children
- their gender.

2.3.2 The Survey of Morning Peak Period Car Drivers in Christchurch

Essentially the survey design used in Auckland and Wellington was also applied to Christchurch. The overall structure of the survey was the same, including:

- screening questions
- a one day trip diary covering each trip / stop from 5 a.m. until 10 p.m.
- stated choice scenarios
- changing work arrangements
- attitude statements
- demographic / contextual data.

Specific changes were made to the order of some of the questions to ensure that more (or most) of the Christchurch sample was given the opportunity to respond to them than had been the case in Wellington and Auckland. In addition, some modifications occurred to the scenarios and attitudinal statements to reflect the greater potential for cycling as a mode of transport in Christchurch. Each of the modifications is discussed below.

2.3.2.1 Scenario Content

In discussion with Environment Canterbury (formerly known as Canterbury Regional Council) and Christchurch City Council, we modified the scenario content to reflect current driving conditions in the Christchurch area. The population and topography of Christchurch (and focus as a urban centre serving rural communities) means that it does not have the same traffic levels experienced in either Auckland or Wellington, thus the parking charges are much lower and the need for interventions such as a cordon are less. Hence, the potential extra daily parking charges on car park buildings and lots were set at "none in place", "$2.50 per day" and "$5.00 per day." In Auckland and Wellington, the corresponding charges were none in place, $5.00 and $10.00. For Christchurch, cordon charges were set at "none in place", "$2.50 per crossing" (before 10 a.m.) and "$5.00 per crossing"; in Auckland and Wellington, these were none, $5.00 and $10.00 per crossing. On-street parking charges were set at "no change","$1.25 per hour" and "$2.50 per hour" compared with "no change", $2.50 and $5.00 per hour in the earlier survey.

As noted above, we also modified the scenarios to include a change to improve conditions for cycling in Christchurch. Thus, we removed the passenger transport attribute that modified off-peak service availability, as we found it to not be significant when modelling the results for Auckland and Wellington, and replaced it with changes in cycle lane availability.

All of the changes are shown in Table 2-2 below.

Table 2-2 Ten attributes and their respective levels for use in stated choice experiment (Christchurch)

Tools to Reduce Car Use	**Level 1**	**Level 2**	**Level 3**
Extra daily parking charge on car park buildings and lots	None in place	$2.50 / day	$5 / day
Restricting on-street parking to ≤2 hours within a nominated radius of work / study place	No change	Within 0.5 km = ≤P120	Within 1.5 km = ≤P120
Converting all on-street parking within a 1 km radius of work / study place to metered parking	No change	$1.25 / hour	$2.50 / hour
Cordon charge to enter central city before 10 a.m.	None in place	$2.50 each entry	$5 each entry
Vehicle registration surcharge per km driven	None in place	10¢ / km	30¢ / km
Tools to Increase Cycle Use			
Cycle Lane Availability	No change	Along 50% of route to work / study	Along 100% of route to work / study
Tools to Increase Passenger Transport Use			
Improved frequency of services during peak hours	No change	50% more often	Twice as often
Lower passenger transport fares	No change	25% decrease in cost	50% decrease in cost
Improved / shortened trip times of services (e.g. through ticketing improvements, preferential bus treatment at intersections, etc)	10% better	25% better	35% better (including HOV lane)
Improved route coverage of services	No change	Bus stops within 400 m of home and work place	Bus stops within 800 m of home and work place

Apart from the changes in the scenario content, the respondents in Christchurch went through a similar questioning process used in the earlier Auckland and Wellington survey, namely:

- They were given a practice scenario
- They were asked to respond to nine different scenarios
- If they chose to not use their car in response to a scenario, they were asked what in the scenario caused them to switch
- The first time they chose to continue to drive their car in light of a scenario, respondents were asked an open ended question about why they thought it was unlikely they would use public transport.

We did not ask them how likely it was they would really have changed from driving their car that day, as we found in the Auckland and Wellington survey that people were very consistent with their responses (hence this check was unnecessary in Christchurch).

2.3.2.2 Attitudinal Statements

In the earlier survey, we had 6 attitudinal statements (refer to Section 2.3.1.8), which we kept, in the Christchurch survey. We added two further attitudinal statements related to cycling to the revised survey:

- I'd bike to work or study at least once a week if: all traffic on those roads was restricted to 30 km/h.
- I'd bike to work or study at least once a week if: I had a good bike, and there were good cycle lanes off the road all along my route to work / study, and there was a secure place to lock up my bike at work / study.

2.3.2.3 Demographic and other Contextual Data Collected

In addition to the demographic and contextual information we collected for Auckland and Wellington (refer to Section 2.3.1.9), in Christchurch we gathered data on:

- Owning a bicycle in good working order
- How often a respondent cycled to work or study in the previous week
- Personal and household income levels.

2.3.2.4 Re-positioned Questions Asked in Christchurch

In the Auckland and Wellington survey, we had positioned several follow-on questions related to the "main" reason respondents gave for not choosing to use public transport in face of the changes proposed in a scenario. Generally, these follow on questions too few responses to be useful statistically. As our end users had expressed specific interest in these issues, we re-positioned these questions in the revised survey so that all relevant respondents would answer them. The questions thus re-positioned include:

- For those with employer provided car parks, two questions about "cashing out" their free car park
- For those who drove children to school, questions relating to the reasons for driving them to school and how their children would travel to school if the parent did not drive to work or study.
- For those who use a car during working hours for business-related trips, questions about the practicality of using taxis or passenger transport for these trips.

2.3.3 Sampling Method

The main survey used standard random household sampling techniques (details below). Where possible, the supplementary survey (in Auckland and Wellington only, not Christchurch) also used the same sampling framework, but some extra interviews for this special group were added through non-random booster sampling too (details below).

A systematic random sample was drawn separately from the Statistics New Zealand (SNZ) database for these areas:

- Auckland metropolitan (including North Shore, Waitakere and Manakau City in addition to Auckland City)
- Wellington metropolitan (including the Porirua and Hutt)
- Christchurch City Council.

SNZ meshblocks and starting addresses provided the interviewing cluster points. Meshblock descriptions defined the interviewing routes. The number of eligible dwellings it contained determined the probability of selection within a particular meshblock. Each eligible dwelling had an equal chance of inclusion in the sample (to others in the same city). Respondent selection was achieved through the questionnaire screening questions. Each meshblock load (cluster size), ignoring the supplementary survey, was designed to be a maximum of seven driver questionnaires (in Auckland and Wellington), and reduced slightly to five questionnaires in Christchurch.

2.3.3.1 Fieldwork

Interviewing was subcontracted to the National Research Bureau (NRB). Auckland/Wellington fieldwork was conducted from 28 May through to mid June 1999 (mainly in evenings and weekends). Christchurch fieldwork was in May 2001,mainly 5-13 May.

2.3.3.2 Response rate

Taking into account the length of the questionnaires and their complexity, response rate was acceptable. In Auckland / Wellington, 613 interviews (both the main survey and the supplementary survey) were completed, and 457 refusals were counted (a refusal rate of 43%). Of course, the screening to get people travelling to work or a place of education before 10 o'clock as required at the start of the questionnaire led to a large number of households being classified as "not eligible" (in total, 1,370 households were classified as not eligible). Christchurch interviews had a final response rate of 41%, including a refusal rate of 40%.

A fuller description of response rate issues is included as Appendix C.

2.3.3.3 Sampling error

The margin of error for the full sample of 737 is plus or minus 4.4%[3]. For the most commonly used sub-groups, such as the Auckland (n=250), Wellington (n=235), and Christchurch (n=252) results for the main survey, margins of error are around 6%. For the supplementary school survey (n= 128), the margin of error is 9%.

These margin of error results are for standard tables of percentages, not for the multinomial logit analysis (presented separately).

[3] Technically, the margin of error is a conventional calculation for a 95% confidence interval assuming simple random sampling. A 95% confidence interval covers the true value in 95% of all possible samples. The conventional margin of error calculations are done conservatively by assuming the estimate is around 50%. Margins of error are smaller for extremely common or rare events (e.g., where the estimates are around 90% or 10%, far from 50%).

2.3.3.4 Weighting

Normally with household surveys we use Statistics New Zealand census results to weight statistically so that imbalances in sample composition are corrected (eg to match them to census results for age, gender, household size, and/or income). We did not do this here because the census does not classify people in terms of whether or not they drive to work or place of education before 10am. Hence definitive census results were unavailable for weighting purposes.

We have considered separately weighting some results for frequency of travel (i.e. assigning higher weight to those who make such trips four times weekly than only once). But all results in the main report are currently unweighted for simplicity and clarity.

2.3.3.5 Survey Length

The main survey had a median length of 30 minutes (both in 1999 and 2001). We told respondents to expect a survey length of 35 minutes and 77% completed the questionnaire within this time. However, 62 of the 485 respondents (13%) took 45 minutes or more. This confirms that the many deletions made to shorten the questionnaire (including variables potentially useful for weighting) were necessary as we were exceeding the tolerance of many respondents for typical household surveys.

2.3.4 Data Analysis

Standard cross tabulations were done using SPSS Versions 9 and 10.

The programme LIMDEP 7.0 was used to derive a multinomial logit model to estimate the impact of policy changes. Multinomial logit modelling takes into account demographic and other characteristics, attitudes, and some habits of the car drivers surveyed while simultaneously estimating the impact of policy changes.

2.3.5 The Survey of Parents Driving Children to School (Wellington and Auckland)

The supplementary survey of Wellington and Auckland parents / caregivers who regularly drive their children to school but are not on their way to work consisted of 4 parts:

- a one day trip diary covering each trip / stop from leaving home until their return to home
- proposed alternative travel methods for their child/ren to go to and from school
- attitude statements
- demographic data.

The trip diary for the supplementary survey requested the same information as was asked in the main survey. Its purpose in the supplementary survey, as in the main survey, was to focus respondents' on their car use over a particular time period so that they could make an informed answer to queries about using alternative methods for their child/ren's travel to school.

The attitude statements and demographic data collected for the supplementary survey was the same as that described for the main survey.

There were 128 completed supplementary surveys, 65 in Auckland and the remainder in Wellington.

2.3.5.1 Alternative Travel Methods

Initially we asked each respondent how likely it was they would have driven their child/ren to school on the trip diary day if the vehicle they had used was not available. We also asked how their child/ren would have travelled to school in this situation. Thirdly, we asked for an estimate of the distance between their home and their child/rens' school (in minutes by walking or driving time or by distance in kilometres)

We then looked at alternative ways for children to travel to school, in particular:

- bus / train services
- people buses (since relabelled as "walking school bus")
- shuttle / taxi services
- car pooling.

Bus / Train Services

We asked respondents if there was an existing bus or train service available from their suburb to their child's school and how often their child/ren had used this service either travelling to or from school in the previous week. If their child/ren did not use the existing service, we asked them to give their reasons why and to indicate which was their main reason.

In the cases where no service was currently available, we asked if they would use such a service if one became available. Again, we sought their reasons for not using the service.

People Bus

In the questionnaire, we described a people or walking school bus as having an adult walking along a set route collecting children from designated stops along the route. After school, they walk back the same route. The service is free and a co-ordinator helps to organise volunteers. Parents are not required to volunteer to "drive" the walking school bus. We also set a limit of 10 children per adult.

The questions we asked were similar to those asked for the new bus or train service, namely:

- how often would your child/ren use the people bus to go to school?
- how often would your child/ren use the people bus from school to home?
- if they would not use the service, what are the reasons, including the main reason, your child/ren would not use the people bus?

We also asked how their child/ren's use of the people bus would be affected by a requirement that parents volunteer to drive it at least 5 sessions per term.

Shuttle/Taxi Service

In the questionnaire, we described the shuttle/taxi service as one which would pick up children at the door and drop them at school. After school, the process is followed in reverse with the same driver and the same children. We suggested the service would cost $2 - $3 per day depending on the number of children and the distance from school and that it could be co-ordinated by a parent committee.

Again, we asked how frequently their child/ren would use the service to travel to school and, if they said never or rarely, we queried the reasons for their response.

In addition, we did a small check on price sensitivity, raising the price to $3.20 to $4 per day and asking how their child/ren's use of the service would be affected.

Car pooling
With respect to car pooling, we asked respondents if they were aware of a car pool operating from their suburb to their child/ren's school and if they were, did their child/ren use it to travel to school.

2.3.5.2 Sampling Method

The same systematic random sample drawn for Auckland and Wellington for the main survey was used as the starting basis for the supplementary survey. Each meshblock load consisted of one or two (systematic allocation within Auckland and Wellington to achieve an even spread) "school only" questionnaires. In order to capture the respondents for the supplementary survey, an effort was made at 3 levels:

- they were captured through the screening questions of the main survey if they qualified.
- Interviewers were instructed to work within their meshblock descriptions (per SNZ) and an open house quota was placed. Up to 2 callbacks were allowed on each open house. Callbacks could be done either on another day or at least 4 hours later. Interviewers were allowed to extend their meshblock area in a few cases, following the same route as established by their meshblock description, if the meshblock definitions made it impractical to achieve their quota (i.e. the meshblock had a limited number of houses, etc.).
- Interviewers were instructed, as directed, to ask respondents if any of their neighbours / friends might qualify for the "school only" questionnaire, if they still encountered difficulty in finding booster respondents after following the route and callback instructions above. The interviews were done wherever the respondent lived, regardless of the meshblock definition.

2.3.5.3 Survey Length

The median length of the school survey was 22 minutes. We told respondents to expect a length of 25 minutes, and 75% of the respondents completed the interview in 25 minutes or less. Only eight of the 128 respondents took 35 minutes or more (i.e. 10 minutes more than we had led them to expect).

Appendix A
Main questionnaire and showcards

(in separate file on the website)

Appendix B
Supplementary (school) questionnaire and showcards

(in separate file on the website)

Appendix C
Response rate details

Auckland & Wellington

Interviews	613
Refusals	457
Unavailable (person required not talked to)	62
Person not available during survey period	131
Not eligible	1,370
No reply	751
Quota filled	27
Other	52
Language	25
Vacant dwelling	43
Dogs	44
Business	27
Total contacts	3,602

Unfortunately, the response rate details were not collected separately for the main and supplementary (school) surveys in Auckland and Wellington.

Christchurch

Interviews	254
Non-eligible respondents	535
No reply (after 3 calls)	356
Eligible but not available	128
Refused	169
Other	43
Total contacts	1485