

Rebuilding sustainable commuting in Christchurch?

A MIXED-METHODS STUDY OF THE EFFECTS OF WORKPLACE
RELOCATION ON TRANSPORT CHOICE AND EMISSIONS

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The transportation performance of a building is all about location.

(Farr, 2008)

Rebuilding sustainable commuting in Christchurch? A mixed-methods study of the effects of workplace relocation on transport choice and emissions

Kate Whitwell

Abstract

Tackling the challenge of climate change will require rapid emissions reductions across all sectors, including transport. This study adds to the literature by investigating factors that may encourage sustainable transport choices at a time of change and therefore reduce emissions. A mix of quantitative and qualitative methods was used to explore the impact of a relocation of employees from several dispersed work locations back to one office building in the central business district on transport choices and carbon emissions in Christchurch, New Zealand.

This case study found that such a recentralisation of employment can result in employees making more sustainable transport choices and can contribute to decreases in transport emissions from commuting, even in a highly car-dependent city. The relocation led to a 12 percent rise in the proportion of employees commuting actively or by public transport and resulted in a significant drop in commuting emissions (16 percent). The primary contributing factor was the change in location of the office itself, reducing the average commuting distance and increasing accessibility to public transport and active travel. A further contributing factor was the perceived reduction in parking availability at the new location. Further results support the existing literature on barriers to sustainable transport, identifying any factor that impacts on the feasibility of the journey by alternative modes, such as commute time or safety, as a significant barrier to uptake. Overall findings suggest that relocating offices provides a good opportunity to encourage employees to consider changing to a more sustainable commute mode, and that significant numbers may make such a shift if commute time or distance are reduced. Realising substantial mode shift however will depend on cities providing feasible and efficient sustainable alternatives to driving a car to work.

Key words: sustainable transport; workplace relocation; travel mode choice; carbon emissions; commuting; active travel; public transport; walking; cycling; New Zealand.

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Ehara taku toa, he takitahi, he toa takitini

“My strength is not that of a single warrior, but that of many”

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1. Introduction

New Zealand ratified the Paris Agreement in late 2016, thereby joining the overwhelming majority of nations who agree that deep reductions in global emissions will be required over the next few decades to address the urgent threat posed by climate change (MfE, 2016; UNFCCC, 2015). Carbon emissions from road transport were one of the largest contributors to the increase in New Zealand greenhouse gas emissions from 1990 to 2013 and road transport emissions contributed over 40% of total emissions from the energy sector in 2013 (MfE, 2015). Given that the energy sector is New Zealand's second largest emitter after agriculture, it is important to find ways to reduce road transport emissions.

Transport is also intimately related to urban form, shaping accessibility pathways in cities (Rode et al., 2014). Understanding the nexus between the two may help to shed light on ways to reduce New Zealand's emissions in line with domestic and international targets. One of the many ways to explore this question is to investigate the impact of people's travel mode choices during their commute to work.

An opportunity emerged to do some research in this area based on a natural experiment arising from the Canterbury rebuild following the earthquakes of 2010 and 2011. A collection of government departments relocated into a new building in central Christchurch from their previously dispersed suburban locations (Wood, 2015). The present study took the opportunity to investigate the impact of this relocation on employee travel behaviour. While there has been a great deal of international research into factors impacting on travel mode choice (Murphy, 2009; Santos, Maoh, Potoglou, & von Brunn, 2013) or indeed, the influence of travel mode choice on home location (Beenackers et al., 2012; Kim, Pagliara, & Preston, 2005), there are far fewer examples of recent research based around a change in office location (Vale, 2013; Walker, Thomas, & Verplanken, 2014). The aim of this study was to address this gap in the literature by studying the relationship between workplace relocation as a life event and employee travel behaviour while also contributing more generally to the literature on the links between urban form, accessibility and transport choices. Ultimately this study

aimed to understand whether recentralisation of employment can result in more sustainable commuting patterns for employees.

1.1. Christchurch City

Christchurch is the largest city in the South Island of New Zealand, and may have recently overtaken Wellington to become the second largest city behind Auckland (Statistics NZ, 2012). The Greater Christchurch area recorded a population of 341,469 in the 2013 census (Statistics NZ, 2014a, 2014b). At the time of writing, Christchurch is entering into the seventh year of recovery following two major earthquakes in 2010 and 2011. Geographically, Christchurch occupies a prominent position on the Canterbury plains on the East Coast of New Zealand's South Island. The city lies on flat terrain, bounded by the Port Hills to the south and the ocean to the east. Prior to the earthquakes commercial and business activity was concentrated in the central business district (CBD) centred on Cathedral Square.

Following the earthquakes that resulted in the destruction and temporary closure of much of the CBD, businesses moved out in various directions. Many offices and businesses relocated to 'temporary' homes in secondary suburban centres or to greenfield locations near the city's large arterial ring roads; while others temporarily worked from home, moved online or ceased trading (Snook & Hannah, 2011). Between the 2006 and 2013 NZ censuses, employment density in the city halved and the employment profile changed. The numbers of people employed in financial services, professional services, accommodation and food services in the central city dropped by over 2000 during this time (Statistics NZ, 2015b). This reduction in the relative importance of the CBD compared to suburban centres has led some writers to use the term 'doughnut' city to refer to Christchurch, i.e. "an urban area with functional suburbs, but an almost empty core" (Bogunovich & Budgett, 2014).

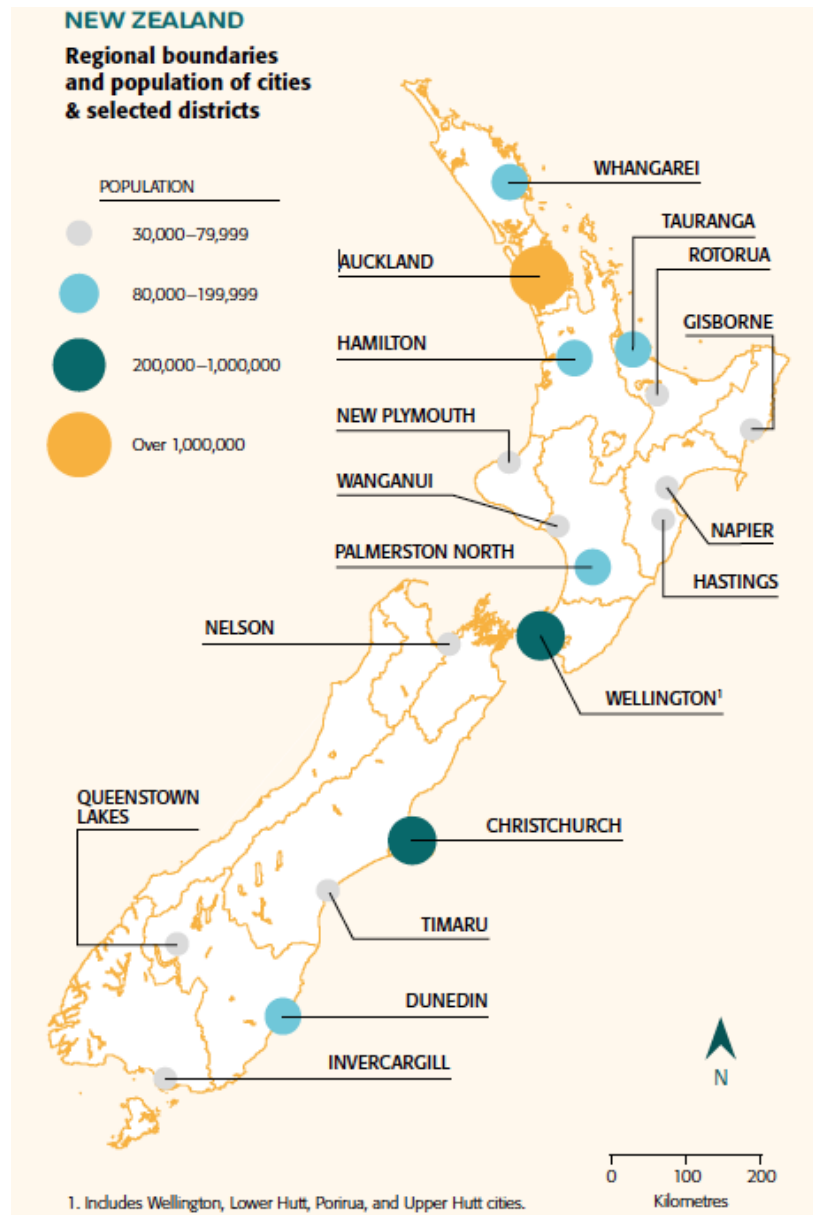


Figure 1-1: New Zealand cities by population (source: Statistics NZ, NZ in profile 2015)

Many of these relocated businesses are yet to return to the CBD. Only in 2015 and 2016 did significant numbers of office workers start to return to central Christchurch as new office space was developed, led by central government projects. One of these new developments was the BNZ Centre Stage 1 that is the focus of this study (McDonald, 2016). Due to the ‘red-zoning’¹ of large swathes of residential land, the city’s residential map has also been redrawn, with a noticeable geographic shift in the residential centre to the North and West and away from the South and East (Salmon, 2015).

¹ Red-zoning – refers to the land in Christchurch deemed unsuitable for rebuilding on post-earthquake (NZTA, 2011).

Before the earthquakes, the strategic plan for future urban development in Christchurch foregrounded the need to encourage a more liveable, compact city by enabling urban living and supporting sustainable transport modes (Salmon, 2015). Unfortunately, as Salmon argues, this plan faded into the background following the disruption of the quakes. The resulting involvement of central government in the earthquake rebuild process has arguably led to much more rapid residential green-field development and a slow recovery of the CBD (ibid).

While it may be true that the Christchurch City Council (CCC) has been marginalised in aspects of the rebuild process, the aims and goals of the original strategic plan have not entirely disappeared, particularly with regard to transport. For example, the most recent CCC Strategic Plan includes the following transport policy aims: “provide transport choice”, “create cycle network during rebuild” and “strengthen integration of land use and transport planning”. (CCC, 2012).

1.2. Christchurch and Transport

During the 20th century Christchurch became a very car dependent city as it followed a pattern of suburban expansion that resulted in a low-density urban form (Imran & Pearce, 2015). The effects of this increasing sprawl on both mode share and average travel distance in Christchurch were documented by Buchanan and colleagues who noted that car use in Christchurch notably increased at the expense of both public transport and cycling/walking over the course of a decade (Buchanan, Barnett, Kingham, & Johnston, 2006). Even ten years prior to the 2010/11 earthquakes, this same study noted a small shift towards greater suburban employment availability at the expense of the CBD.

More than 7 out of 10 people drove to work on census day in New Zealand (Statistics NZ, 2015a) and approximately 8.4 people out of 10 drove to work in greater Christchurch (Statistics NZ, 2014b). Nevertheless Christchurch enjoys one of the highest mode shares for cycling amongst the major New Zealand cities. Christchurch is a relatively flat and leafy city and approximately 6% of travel to work was by bicycle on census day in 2013 (Statistics NZ, 2015a). Christchurch’s share of public transport

journeys was low compared to other New Zealand cities, dropping from 5.1% in the 2006 pre-earthquake census to 3.7% in 2013 (ibid). Christchurch does not have a commuter rail system so all public transport is by bus or ferry; the latter solely between Diamond Harbour and Lyttleton (Environment Canterbury, n.d.). The highest proportion of public transport users live in the inner suburbs and bus use progressively drops the further people live from the CBD (Statistics NZ, 2014b).

The road network in Christchurch was badly affected by the earthquakes (Figure 1-2).

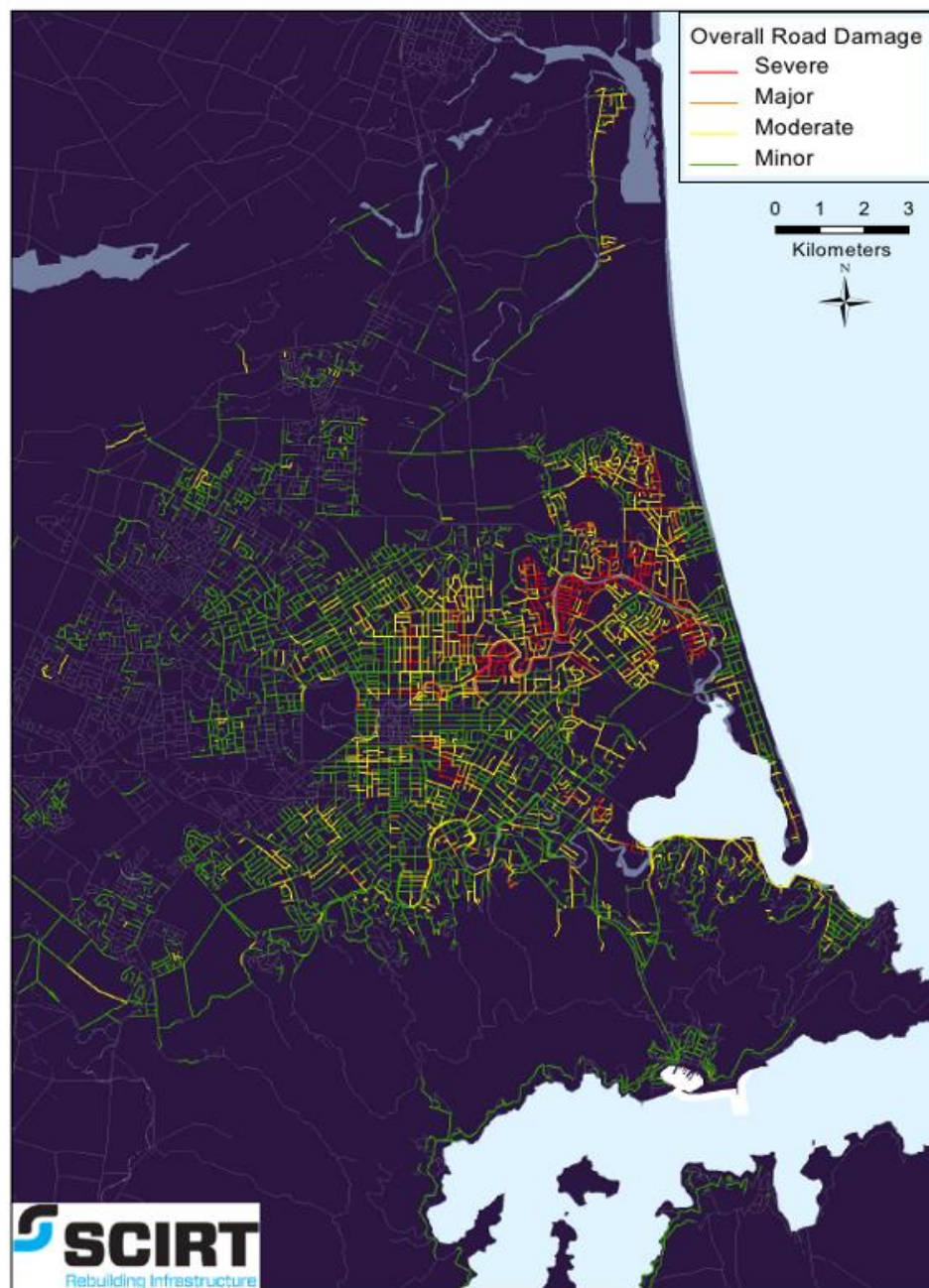


Figure 1-2: Extent of earthquake damage to Christchurch roads (source SCIRT)

Approximately 1000km of the 2300km network sustained damage, with 330km of that being either moderately or severely damaged. (Macaskill & Guthrie, 2015). Similar levels of damage to waste and water systems and debate over responsibility for infrastructure repairs led to the formation of a new entity to manage the repair work (Stronger Christchurch Infrastructure Repair Team or SCIRT), who only were due to complete their work by the end of 2016 (SCIRT, n.d.). With the geographical shift of residential and business activity creating new travel patterns in the city, and ongoing repair work, traffic congestion is a much more common experience in post-earthquake Christchurch than before.

Agencies responsible for transport systems in Christchurch have responded to post-earthquake travel pattern changes differently. Environment Canterbury has redesigned the bus network on several occasions in an attempt to better meet Canterbury public transport needs (Environment Canterbury, 2012, 2014). Their efforts have not yet arrested falls in bus patronage and have led to public conflict with the Christchurch City Council over both the network design and public transport priorities (Law, 2016; Winder, 2015). There are plans to improve priority measures for buses as part of the rebuild, but implementation has been frustratingly slow, with the result that buses are often still stuck in the same congestion as cars (Winder, 2015). Central to much of the network planning is the new Christchurch Bus Interchange, situated within two blocks of the BNZ Centre, which recently reported being the origin of over 1.7 million trips in its first year (Environment Canterbury, 2014).

Meanwhile, road building to cater to new patterns of road use continues apace. The NZ Transport Agency is constructing numerous new motorways in and around Christchurch, as part of a nationwide 'roads of national significance' project that was initiated just prior to the earthquakes, at a projected total cost of \$900 million (NZTA, 2016b). As a counterpoint, to support active travel, Christchurch City Council is making progress towards completing 13 major cycle routes across the city, building on an already extensive network of paths and cycleways (CCC, n.d.). So while there are some encouraging signs that the rebuild process may lead to improved cycling and

(slightly) improved public transport infrastructure, improving the road network appears to remain the highest priority and attracts high levels of funding.

1.3. The present study

This study is focussed on the relocation of staff from multiple government agencies into the new BNZ Centre Stage 1 building on Hereford St in Christchurch. Approximately 380 staff from eight agencies moved in from various sites across Christchurch during February 2016. This office move is the first of a series of projects designed to relocate central government staff back into the Christchurch CBD. These projects were designed to support the Christchurch rebuild and encourage collaboration amongst co-locating agencies (MBIE, 2016). Figure 1-3 shows the locations of the agencies before the move relative to the BNZ Centre; approximate staff numbers are also shown².

Planning to encourage staff to consider their transport options after the move to the BNZ Centre began early with the NZ Transport Agency taking the lead role for staff travel planning. The resulting “All of Government Travel Plan” project involved key members of all agencies coming together to plan ways to encourage staff to consider leaving their cars at home and commute instead by bus, bicycle or on foot (NZTA, 2016a).

² This map includes only those agencies from which survey results were received. Several of the agencies involved with the move had very small numbers of staff (fewer than 4) and did not participate.

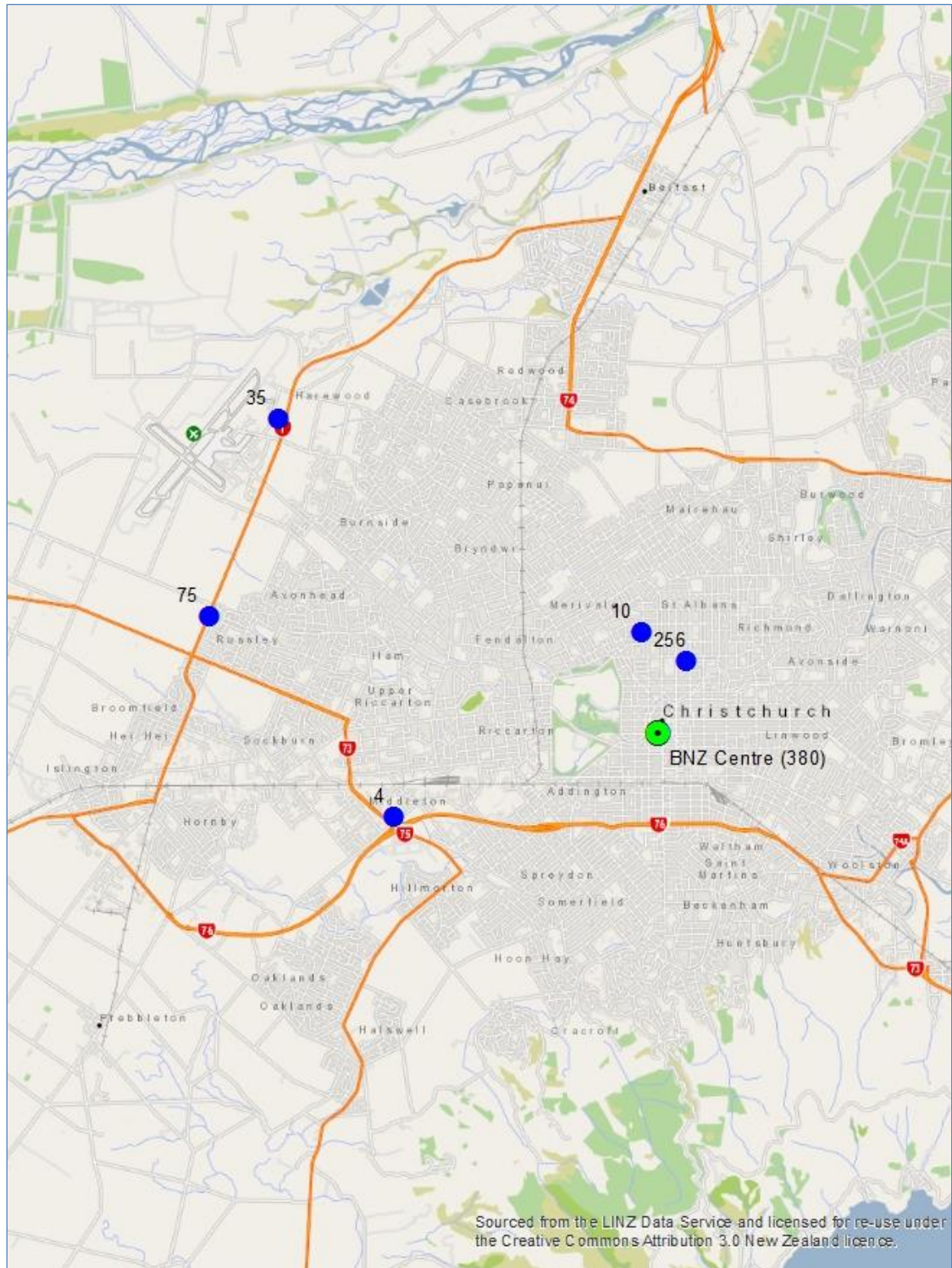


Figure 1-3: Christchurch map showing office locations before the move in relation to the BNZ Centre (approximate staff numbers are shown)

1.3.1. Travel Incentive Programmes

All staff employed prior to the relocation were offered the opportunity to participate in two incentive programmes to encourage mode shift after the move. To encourage bus use, they were offered either a new Metrocard pre-loaded with \$30, or a \$30 top-up to existing Metrocards. Metrocard is the smartcard system used on all buses. This offer was supported by the local regional authority, Environment Canterbury. Cyclists were offered a new padlock compatible with the BNZ Centre cycle racks.

1.3.2. Building Locations

BNZ Centre Stage 1 - Destination

Site Address:, 120 Hereford St, within the CBD

The BNZ Centre is the new workplace for all agencies included in this study and is located in the Christchurch CBD (Figure 1-4). The new bus interchange is two blocks away, and the centre is one street away from the nominal heart of the city, Cathedral Square. There is some short-term paid on-street parking nearby and several long-term car parks within walking distance. On-site parking is limited and primarily used by shared staff vehicles. The building has secure bicycle parking for several hundred bikes, showers and locker facilities.

Airport Business Park

Site Address: 92 Russley Road

Distance from CBD: 12km north-west

Previously the office location for approximately 75 employees of the NZ Transport Agency, this office was 4km from the airport along a busy four-lane arterial road to the north-west of Christchurch (Figure 1-5). It was an industrial site pre-earthquake subsequently converted to offices, with limited free parking on site. Parking was available on the road opposite the site, or in the nearby residential area. However, the residential area was rezoned for 120 minute parking at the request of residents, so staff who drove had to park further away or spend time moving their car (Figure 1-6). The site was on a regular bus route. There was no cycle route nearby.



Figure 1-4: BNZ Centre Stage 1 - Street View (2016 Kate Whitwell)



Figure 1-5: Airport Business Park, view of the complex from the gates (2016 Kate Whitwell)



Figure 1-6: Parking restrictions near Airport Business Park (2016 Kate Whitwell)

Dollan House

Site Address: 401 Madras St

Distance to CBD: 1.5km north

Dollan House was the previous workplace of the largest number of employees affected by the move, approximately 250 staff of two different agencies. This complex is a low-rise office building in a mixed-use area with industrial, office and residential properties along a busy one-way road (Figure 1-7). The site is on a range of bus routes. Although there are no cycle lanes nearby, the roads are wide and easily cycled. There was ample free staff car and sheltered bicycle parking onsite along with free parking on local roads.

Orchard Road

Site Address: 100 Orchard Road

Distance from CBD: 11km north-west

Prior to the move, this site housed approximately 30 employees of the Department of Internal Affairs (Figure 1-8). It is located on the north-west edge of the city about one kilometre from the airport and the buildings are low-rise warehouse style offices surrounded by free parking in a well-fenced complex. There is a combined walking/cycle path outside the site heading towards the city and it is within 1km of the regular buses servicing the airport.

Rehua Marae

Site Address: 79 Springfield Road, St Albans

Distance to CBD: 2km north

This site is in a residential area with free onsite and street parking and housed fewer than 20 employees. It has easy pedestrian and cycling access and is close to several major bus routes (Figure 1-9).



Figure 1-7: Dollan House - street view (2016 Kate Whitwell)



Figure 1-8: Orchard Road - street view (2016 Kate Whitwell)



Figure 1-9: Rehua Marae - street view (2016, Kate Whitwell)

66A Magdala Place

Site Address: 66A Magdala Place, Middleton

Distance from CBD: 7km west

The previous workplace for approximately ten employees of the then Ministry for Pacific Island Affairs was in an industrial area. There was free street parking nearby, and a bus route within 500m of the site. It is not clear if there was on-site parking for tenants (Figure 1-10).



Figure 1-10: Magdala Place - street view (source: Google street view)

2. Literature review and research questions

This review focusses on the impact of workplace relocations on travel behaviour, as well as the wider transport and pro-environmental behaviour literature as it is relevant to this study. Travel mode choice is complex and may be influenced for any particular individual on any one day by a range of factors (Guell, Panter, Jones, & Ogilvie, 2012). The following sections outline what is currently known about the range and influence of these various factors on travel behaviour.

2.1. Impact of workplace location and relocation

The international literature has only a few examples of studies using workplace relocations to investigate employee travel behaviour, despite the fact that mobility biography literature considers it to be a life event worth studying (Rashidi, Mohammadian, & Koppelman, 2011; Scheiner & Holz-Rau, 2013). The majority of mobility biography literature centres around residential relocation, which has led to calls to widen the scope of research to include those relating to changes in employment or workplace (Müggenburg, Busch-Geertsema, & Lanzendorf, 2015).

What recent studies do provide evidence on is that a change in workplace can be an opportunity for employees to change the way they travel to work. One UK longitudinal study reported large modal shift, primarily from car to train (train mode share rose from 20% to 50%), but the authors were unable to predict this mode shift using a model based only on attitudinal measures, habit strength and socio-economic factors (Walker et al., 2014). The authors of this study concluded that these results supported claims from the geographical and planning literature that spatial and infrastructural factors, not measured by their study, are influential on commuting behaviour after a key event. In particular they postulated that the observed modal shift could have been due to the shorter walking time to the nearest train station (which dropped from 25 to 7 minutes on average) and the lack of free parking at the new workplace.

A slightly larger European study also showed that relocating workplaces can have significant impacts on employees' travel mode choices, but this time in a less sustainable direction. This study, based at the "Park of Nations" in suburban Lisbon, Portugal³, retrospectively surveyed new employees about their commuting behaviour before and after starting work at the site (Vale, 2013). The majority of employees had previously worked closer to the centre of Lisbon and results showed that the proportion of commuters travelling actively (cycling/walking) or by public transport dropped after the move in favour of car use. Vale's hypothesis was that commute time is decisive in mode choice. He postulated the idea of 'commute time tolerance'; suggesting that a decrease in commuting distance and time was not enough alone to encourage more sustainable transport patterns and if commuting time increased due to an increase in commuting distance, then shifting to a faster mode (usually the car) was more likely. Results showed that car use increased for workers commuting to the site despite good public transport accessibility. The site also had free parking, leading Vale to postulate that reducing car use at such sites may require implementation of travel demand measures, such as reducing parking availability or introducing charges (Vale, 2013).

Vale's result is consistent with the wider literature on the impact of suburbanisation of workplaces over time. Suburbanisation refers to the movement of workplaces out of the CBD that led to an increase in commuting by car and an increase in the average commute distance travelled by car. At one time, it was thought that the increased availability of jobs in the suburbs would lead to a decrease in commuting because more people could live closer to their workplace (Aguilera, 2005). However the reality has often run counter to these expectations. As employers move out towards the suburbs, they also move away from centralised public transport provision and have access to cheaper land meaning more parking can be offered (Aarhus, 2000). This starts a negative cycle where people are more likely to drive to work in order to keep commute times short; that in turn reduces the justification to invest in expensive public transport systems to suburban centres with the result that car use continues to rise (Aguiléa, Wenglenski, & Proulhac, 2009; Ma & Kang, 2011). There is evidence of similar patterns emerging in Christchurch prior to the earthquakes (Buchanan et al., 2006). So,

³ "Park of Nations" had been the site of Expo 1998 and was deliberately re-designed as a 'metropolitan' centre with good public transport links and related infrastructure to encourage businesses to relocate.

if the suburbanisation of employment leads to increased car use then, as this study postulates, the reverse could also be true and the re-centralisation of employment may help contribute to reductions in car use.

Organisations interested in sustainable building design recognise the impact of building location on transport use in terms of energy minimisation. The term “transport energy intensity” is used to describe a measure of carbon emissions related to the commute journey of the people working in a particular building; and a US study showed that this can be more than double the energy intensity of the building itself, depending on building age and design (Wilson & Navaro, 2007). Their point was that while a lot of work is done to reduce energy use in new buildings, often no effort is put into reducing that same building’s transport energy intensity. This is despite the fact that measures to reduce this are known and many are critically dependent on location (Farr, 2008). For example, urban buildings close to transit will have a much lower transport energy intensity than the same building in a suburban office park.

2.2. Travel behaviour and commute time

Commute time is an oft-discussed aspect of daily commuting behaviour in the transport literature, and there is evidence to suggest it may be more influential on mode choice than commute distance (Kang-Rae & Banister, 2006) or cost (Commins & Nolan, 2010). It seems almost common sense to suppose that commute time increases alongside commute distance, but in fact there is often no linear relationship between the two (Kang-Rae & Banister, 2006). For example, even if commute mode remains unchanged then commute time over a longer distance may be strongly influenced by other factors such as the quality of roads (for drivers) or the provision of different public transport options (e.g. express trains). In the transport sustainability literature Banister argues for the overturning of the prevailing transport maxim that ‘faster=better’ and ‘less time travelling=good’ that encourage the use of faster travel modes such as cars which are less sustainable in the long-term (Banister, 2008). Instead Banister argues that the focus should shift to keeping commute distances short and improving the overall quality of the commute journey, especially for the more sustainable (but slower) active commuting modes. Similarly, Cervero challenges the dominant use of travel time

savings as a measure in cost benefit analysis of transport projects, arguing that saving time is less valuable than increasing accessibility (Cervero, 2011).

The idea that people have a certain amount of time that they ‘prefer’ to spend travelling per day has created the notion of a ‘travel time budget’ that people choose to spend in various ways (Metz, 2013). This contradicts the idea that travel is a derived demand that rational actors wish to minimise and takes the view that travel can be desired and enjoyed for its own sake (Mokhtarian & Salomon, 2001) or be tolerated as a means to greater accessibility (Cervero, 2011). Other authors note a tendency for people to want to keep their commute time constant (all other things being equal), which has historically led to increases in commuting distances as speed of travel by different modes has increased (Kang-Rae & Banister, 2006). Therefore, when events impact people’s ‘travel time budget’ it is argued that they may re-evaluate their travel mode. For the purposes of this study, this may be a prompt for some employees to decrease their commute time, or alternatively, it may ‘free-up’ some of their travel time budget and enable them to travel via a different, potentially slower mode.

2.3. Travel behaviour and distance

The literature shows that there is a strong relationship between travel distance and travel mode. This is particularly true for active travel, where shorter distances are significantly associated with increased likelihood of travel by either walking or cycling (Commins & Nolan, 2010; Dalton, Jones, Panter, & Ogilvie, 2013; Heinen, Wee, & Maat, 2010; Khan, Kockelman, & Xiong, 2014). Christchurch is no exception. Where Buchanan et al. found distance from the CBD to be more important in explaining mode split than density (2006). There is also some evidence that simply having more destinations within walking distance can increase rates of walking (Giles-Corti et al., 2013). Therefore, all other things being equal, if the average commute length is reduced then this could lead to an increase in the number of employees commuting to work by active modes.

The evidence is less clear-cut regarding commute distance and public transport use. Increased uptake of public transport is more likely to be impacted by factors such as the relative convenience of public transport routes, frequency of service, safety, comfort and cost (Chowdhury & Ceder, 2016; Dalton et al., 2013; de Jong, Vogels, van Wijk, &

Cazemier, 2011; Kingham, Dickinson, & Copsey, 2001). Also, increasing accessibility to public transport is an acknowledged way of reducing 'transport energy intensity' or reducing commuting by car (Wilson & Navaro, 2007). Recent changes to the bus routes in Christchurch have not yet improved the mode share of buses post-earthquake (Law, 2016). However it is possible that a move back to a CBD location may bring increased numbers of employees within reach of more convenient bus route options. There is also evidence that people may be willing to walk further from their home to access public transport that delivers them closer to their workplace, implying that bus route proximity to workplace is more highly valued than bus route proximity to home (Badland, Hickey, Bull, & Giles-Corti, 2014). This is very relevant to the current study given that the new BNZ Centre is situated within two blocks of the new Christchurch bus interchange.

There is an obvious link between increasing commute distance and increased carbon emissions given that most commuting today takes place in fossil-fuel powered cars. A UK study showed that having a commute distance of more than 10km, alongside levels of car ownership, was very significant in increasing the emissions profile of individuals (Brand, Goodman, Rutter, Song, & Ogilvie, 2013). This increase was caused partly by higher fuel use, but also because higher numbers of people drove. So, reductions in emissions can be achieved both by keeping commute distances as low as possible and by encouraging mode shift away from driving. On a more cautionary note, the impact of reducing commute distance may be less than anticipated due to Vale's finding that travel mode can be resistant to change when commute distance falls (2013). Therefore while changes in commute distance may have an effect on emissions reduction, this will be dependent on a wide variety of factors.

Commute distance to a particular office building is dependent on where it is in relation to where employees live. In this particular study, the workplace relocation from a collection of more suburban locations into the CBD is expected to have an impact on the average commute distance travelled as it changes the destination relative to existing home locations. If this brings an increased number of employee homes within a certain 'active travel' buffer distance of the workplace (assuming that the majority of employees do not move house), as well as closer to key public transport modes, then there is a greater opportunity for employees to travel actively to work.

2.4. Travel behaviour and urban form

While it may be stating the obvious to say that the urban form of a city is strongly related to and shaped by way that people travel around it, the details of this relationship have long been debated in the academic literature. A prevailing theoretical view amongst urban planners is that there is strong inverse relationship between urban density and the type and amount of car travel required by residents (Metz, 2008a). In other words, as urban density increases, people tend to travel shorter distances overall, and more often by modes other than the car (Banister, 2008; McIntosh, Trubka, Kenworthy, & Newman, 2014). One of the stated aims of this literature is to reduce car dependence and to gain an understanding of its causes (McIntosh et al., 2014).

The literature does not always agree about the nature of these causes or their directionality. Authors such as Kenworthy and Newman use the global cities database to argue persuasively that both higher density and levels of transit provision cause reductions in urban car use per capita (McIntosh et al., 2014; Newman & Kenworthy, 2011). Density has also been shown to be influential in a study of rates of cycling uptake after a residential relocation (Beenackers et al., 2012). However the impact of density is challenged by Mees (2010) who argues that the focus on density has led to a lack of attention to public transport solutions designed to attract drivers away from their cars, even in low density situations. Overall it seems clear that policy measures to both encourage public transport provision and density will be required to encourage people out of their cars. This is in line with the principles of the 'Smart Growth' movement which envisions a move towards more mixed-use, denser, transit-orientated and walkable communities (Ewing, Bartholomew, & Nelson, 2014).

Looking at the impact of built environment factors on travel behavior, particularly mode choice, the evidence is sometimes inconclusive. While it is clear from longitudinal studies such as the RESIDE project in Perth, Australia, that urban design can improve levels of walking for residents if transport and recreational destinations are nearby, the impact of this on car use was not measured (Giles-Corti et al., 2013). Another study found no evidence that the built environment influenced rates of cycle uptake for transport or recreation (Badland, Knuiman, Hooper, & Giles-Corti, 2013). However, in the UK rates of active commuting (walking and cycling) did improve slightly amongst

nearby residents when a new cycleway was built (Panter, Heinen, Mackett, & Ogilvie, 2016). Recent evidence from the evaluation of improved active travel infrastructure in New Zealand showed a 30% increase in rates of active travel relative to control cities (Keall et al., 2015). Providing infrastructure to better enable active travel therefore can increase levels of activity or trip numbers. However, the complexity and contingencies associated with everyday travel decisions by individuals and families can be challenging to overcome based on new infrastructure alone (Pooley et al., 2011). There is also, as yet, little direct evidence relating such increases in active travel to decreased car use.

A meta-analysis of studies of the association between built environment and travel found that in general the individual effect sizes of the commonly termed 'D-variables' such as density, diversity, design, destination to transit and destination accessibility were low but significant (Ewing & Cervero, 2010). Destination accessibility seemed to have a larger effect on vehicle miles/kilometres travelled (vmt/vkt) than most other variables including density. However, Ewing and Cervero also note that destination accessibility is often higher in more dense neighbourhoods so there could be confounded effects between the two (Ewing & Cervero, 2010). Overall it seems clear that the nature of the built environment does affect travel behavior but the magnitude of the relationship is still under debate. It is likely that changes in one aspect of the built environment alone will have only a small impact on travel behavior, but changes across multiple dimensions could begin to enable substantial change.

That the local built environment influences the way people travel is also evidenced by studies that show a tendency for people to choose their home location based on the presence of built environment characteristics that enable their preferred travel mode. Referred to as residential self-selection, this has been shown to have a small, but measurable effect in travel mode studies (Mokhtarian & Cao, 2008). However, some researchers challenge the idea of self-selection as too simplistic, arguing that the process of re-evaluation of travel mode that occurs surrounding a relocation of home or work is far more complex than the theory allows for. For example, people sometimes re-evaluate their commute and change it post-move even if they expressed very different views on mode choice pre-move (Jones & Ogilvie, 2012). For the purposes of this study, it implies that some individuals may choose to move house based on the change

to their workplace to either enable them to continue using their current commute mode or to make it easier to change to a different, but preferred mode.

2.5. Travel behaviour, attitudes and environmental concern

Within the environmental psychology literature, there are many studies investigating the links between individual attitudes towards the environment and pro-environmental behaviour. One general finding is that positive environmental attitudes tend to have more influence on pro-environmental behaviour when the behaviour is easy to change, e.g. recycling or supporting pro-environmental policies, rather than when the behaviour is more constrained, e.g. energy conservation or reducing car use (Steg & Vlek, 2009). In the case of reducing car use, or explaining travel mode choice, so-called contextual factors such as commute time and cost (Nilsson & Kuller, 2000) or socio-demographic factors such as age, household size and education level (Poortinga, Steg, & Vlek, 2004) have more explanatory power than pro-environmental attitudes.

Nonetheless, some studies do report evidence of a relationship between pro-environmental attitudes and travel behaviour, but the effects are small. In the UK Roberts et al. (2014) found evidence that men with pro-environmental attitudes tended to drive less but the same relationship did not exist for women, leading the authors to hypothesise that female driving decisions could be more constrained than male decisions. Two Swedish studies show some evidence that pro-environmental attitudes can impact modestly on travel behaviour, but only after higher-order explanatory variables such as commute time, cost or distance along with socio-economic factors are accounted for (Nilsson & Kuller, 2000; Vredin Johansson, Heldt, & Johansson, 2006). By contrast, other studies have found no link between general environmental concern and action by households to reduce energy use for transport (Holden & Linnerud, 2011; Poortinga et al., 2004). Therefore, while environmental concern may play a small role in individual travel behaviour change, its effects may be outweighed by external constraints or by socio-demographic factors.

There is however some indication that during a time of change people with higher levels of environmental concern may be more likely to make environmentally friendly travel choices than those holding different values. Verplanken et al.(2008) used a combination

of the ‘habit discontinuity’ and ‘self-activation’ hypotheses in a study that demonstrated that higher levels of environmental concern are associated with lower levels of car use after a residential relocation. Similar results were suggested in a more recent study on a workplace relocation for the World Wildlife Fund (WWF) (Walker et al., 2014). The ‘habit discontinuity’ hypothesis gives a theoretical basis to the idea that people are more likely to consciously re-evaluate their travel options at a time when habits are being disrupted by their change in work location. It is possible that this may result in preferentially more pro-environmental travel behaviour amongst those who hold pro-environmental attitudes, if such options are available.

The impact of contextual factors on people’s travel mode choices in part explains why many of the studies into travel mode choice use a model called the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The TPB incorporates contextual factors via ‘perceived behavioural control’ that provides a measure of how people view the influence of contextual factors on their behaviour. The fact this model only includes ‘perceived’ contextual factors rather than actual measurements of contextual factors is seen as a limitation of the model by some (Steg & Vlek, 2009), while a further limitation of the TPB is the underlying assumption that individuals are primarily self-interested rational actors. Many authors have challenged the latter assumption and have subsequently used extended versions of the model to include factors such as habit to help explain travel behaviour (Bamberg, Ajzen, & Schmidt, 2003; Donald, Cooper, & Conchie, 2014). Despite these limitations, there have been many applications of the TPB to the study of travel mode choice that help shed light on the impact of individuals’ attitudes to travel modes on their choices.

2.6. Travel behaviour: behavioural & structural interventions

It is one thing to describe travel behaviour and another to successfully change it. Studies of intervention to change travel behaviour can be grouped into two broad categories: behavioural or ‘soft’ approaches that focus on individual attitudes, motivations or social factors, and structural or situational or ‘hard’ approaches that are more focussed on changing the context in which the behaviour occurs (Rajan, 2006).

Recent travel behaviour intervention studies have often focussed on ‘soft’ approaches such as providing information to encourage mode shift. The results of such studies do not always point clearly to what factors may have contributed to any resulting mode shift. A study designed to evaluate the impact of free bus passes on drivers in two different cities found car drivers were much more likely to shift modes permanently in one city than in the other, although in both cases, occasional usage of public transport did increase (Abou-Zeid & Ben-Akiva, 2012). A similar intervention that doubled the proportion of students taking the bus to a German campus concluded that such interventions could be successful by positively influencing individual attitudes towards alternatives and reducing perceived barriers to action (Bamberg et al., 2003). Both studies highlighted that positive attitudes towards public transport were important, with Abou-Zeid & Ben Akiva (2012) also noting that shifting to taking the bus was more likely in drivers who were already predisposed to shift, or who were cost-conscious. The same authors studied measures of satisfaction with commute mode and noted an interesting ‘treatment effect’, namely that those car drivers who tried public transport but did not switch modes subsequently reported greater levels of satisfaction with their regular commute by car (Abou-Zeid, Witter, Bierlaire, Kaufmann, & Ben-Akiva, 2012).

On a wider scale, looking at reviews of intervention studies into travel behaviour does not clarify the question of which interventions are the most effective and why. A recent review of 77 studies aimed at reducing car use reports that the evidence base regarding interventions of this type is weak; only 12 studies were judged to be ‘methodologically sound’ and only some of these reported moderate effects (Graham-Rowe, Skippon, Gardner, & Abraham, 2011). The evidence does suggest that there is potential to have an impact on high car users who are motivated to change or on those who are going through a transition, such as moving house or relocating employees to reduce commute time (Graham-Rowe et al., 2011).

Further analyses of interventions designed to reduce car use or increase active travel found even less evidence of success. One review of such interventions led the authors to conclude that there is a lack of methodologically robust, theory-based evidence of effects and that more research is needed into the relative efficacy of behavioural versus structural interventions (Arnott et al., 2014). A similar review, measuring the success of

Organisational Travel Plans, came to similar conclusions; namely that there is insufficient evidence to show their effectiveness at either improving health outcomes or encouraging travel mode shift (Macmillan, Hosking, Connor, Bullen, & Ameratunga, 2013). One of the more successful behavioural intervention studies showed that targeting individuals during the process of moving house can significantly increase public transport use compared to those not receiving the intervention (Bamberg, 2006). An intervention that attempted to address people's car use habits by making decision-making more deliberate was less successful (Eriksson, Garvill, & Nordlund, 2008). All of these reviews focussed on behavioural interventions alone.

The above studies also pointed to methodological concerns with the interventions, as success measures vary widely (Arnott et al., 2014; Graham-Rowe et al., 2011). Graham-Rowe et al. (2011) further noted that most studies they analysed did not report any measure of carbon emissions despite stating emissions reduction as a purpose. The present study explicitly estimates carbon emission changes as a result of the relocation.

While the evidence for the success of behavioural interventions remains mixed, several recent studies provide more robust evidence that structural interventions can have a measurable impact on travel behaviour. The recent ACTIVE study in New Zealand used a quasi-experimental design to evaluate changes in active travel in two New Zealand cities following government investment in new infrastructure and promotion of active travel (Keall et al., 2015). In Cambridge in the UK, a longitudinal study investigated the impact of a new busway and the associated walking and cycle path on local residents' travel behaviour (Heinen, Panter, Mackett, & Ogilvie, 2015). In both cases, levels of active travel increased significantly. An evaluation of new walking infrastructure in three UK locations showed evidence of population-level increases in active travel, but measures of car use by study participants did not show any related decrease in overall CO₂ emissions (Brand, Goodman, & Ogilvie, 2014). So, while structural interventions do appear to be effective at improving rates of active travel and hence will contribute positively to public health goals, more evidence will be required to evaluate whether this translates to reduced carbon emissions.

2.7. Barriers and enablers of sustainable transport

The literature on the barriers to, or enablers of, sustainable transport (walking, cycling or public transport) is vast, traversing studies on barriers and enablers of these modes either individually or combined, alongside studies aimed at reducing car-use. Many of the high-level reviews identify that the dominance of travel by car in modern Western society creates significant institutional and societal barriers to sustainable transport provision. For example provision for cars and road building often takes strategic and financial priority over sustainable transport (Cole, Burke, Leslie, Donald, & Owen, 2010; Imran & Pearce, 2015; Low, Gleeson, & Rush, 2003). Furthermore cultural norms placing driving as ‘normal’ and other modes as somehow ‘eccentric’ have to be overcome or ignored (Pooley et al., 2014). Several authors also note that barriers and enablers of active or public transport need to be considered in context because of people’s tendency to make cost and other trade-offs between modes. For example in places where driving is more expensive, rates of walking and cycling are generally higher (Forsyth & Krizek, 2010).

Common barriers to the uptake of active transport are related to the perceived feasibility of travelling actively and include factors such as distance and journey time (Forsyth & Krizek, 2010; Heinen et al., 2010; Nordfjærn, Simsekoglu, & Rundmo, 2016; Wang, Chau, Ng, & Leung, 2016). However, in grouping walking and cycling together, the distinctive nature of the barriers and enablers for each mode risk being overlooked. All able-bodied adults are pedestrians at some time, even if only while walking from a carpark to a destination; however not everyone has the ability or opportunity to ride a bicycle. Indeed lack of access to a bicycle, along with the inability to ride for transport are both cited in the literature as barriers to commuter cycling (Pucher, Dill, & Handy, 2010; Willis, Manaugh, & El-Geneidy, 2015).

Walking for transport is such an everyday activity that it is sometimes not perceived as a transport journey by those who undertake it, leading to the underreporting of walking journeys in some studies (Pooley et al., 2014). Barriers to walking more often for transport are commonly reported in the literature as distance, physical capacity (also related to distance), perceptions of personal safety, weather conditions or the availability of alternatives (Forsyth & Krizek, 2010; Nasrudin, Rostam, & Noor, 2014).

Providing high quality infrastructure (e.g. footpaths, walkways) is often cited as essential to enable walking; however other factors such as street connectivity, accessibility to a mix of destinations and population density within walking distance can be even more important, at least for adult pedestrians (Forsyth & Krizek, 2010). Furthermore there is debate about the definition of 'walking distance'. Obviously being within 'walking distance' is important, but many people will walk further than the planning 'rule of thumb', considered by many to be 400m (Forsyth & Krizek, 2010).

When looking at cycling, commute distance remains an important barrier but what that distance may be is up for debate (Heinen et al., 2010). A lack of appropriate and safe cycling infrastructure is a key barrier, with most authors agreeing that separating cycle facilities from traffic on major routes and at intersections is crucial but the debate over exactly which facilities are best for whom is ongoing (Forsyth & Krizek, 2010; Pucher & Buehler, 2008). Further barriers to cycling include the route's perceived safety, its actual safety, the cyclist's ability level, not having access to a bike, lack of facilities at work, topography (for less experienced cyclists), level of daylight (especially for women) and weather conditions (Heinen, Maat, & van Wee, 2011, 2013; Heinen et al., 2010). The list of barriers to cycling in the literature goes on to include social barriers such as negative attitudes and social norms related to cycling alongside positive attitudes to car use (Willis et al., 2015). Cycling enablers vary depending on the type of cyclist and their level of experience. The presence of any cycling infrastructure will enable some increase in cycling rates but less confident cyclists do require high quality, safe infrastructure, as much to improve perceptions of safety as the actuality (Buehler & Pucher, 2012; Willis et al., 2015). Alongside this, employers can help enable cycling by providing facilities (secure cycle parking and showers) and by having a positive attitude towards cycling and cyclists (Heinen et al., 2013; Hunt & Abraham, 2007).

The most important barriers to increasing use of public transport are accessibility (including factors such as proximity to public transport stops and ease of use) followed by quality of service (frequency and reliability) comfort, safety and cost (Batty, Palacin, & González-Gil, 2015; Kingham et al., 2001; Nasrudin et al., 2014). Cost and quality of service are perceived to be interrelated to the extent that users have been known to accept a price increase when quality has increased visibly (Redman, Friman, Gärling, &

Hartig, 2013). Perception of personal safety can be important and lack of this will deter some users (Batty et al., 2015). Other research relates the perception of public transport users as 'low-status' with a lower likelihood of considering public transport as an alternative to the car (Nordfjærn et al., 2016). The latter result is echoed and extended by a study investigating attitudes to car travel, finding that car commuters who view public transport as low status often value their car as a personal space away from others, to the extent that some individuals would rather keep driving through traffic congestion than take a quicker public transport trip (Kent, 2014). This research is particularly relevant to Christchurch where an ongoing public narrative that buses are for low status groups has been evident in official documentation for decades, in contrast to other New Zealand cities such as Wellington and Auckland (Imran & Pearce, 2015).

The importance of quality is demonstrated by research showing that provision of a high quality, easy to use and well integrated public transport service such as bus rapid transit (BRT) can lead to measurable increases in ridership (Wirasinghe et al., 2013). Further research into perceptions of 'quality' reveals that core attributes such as frequency, journey times, reliability and cost-competitiveness are required to provide a service competitive with the private car. But individual perceptions of quality attributes (e.g. less crowding, better seats, better information) then become important to attract car users (Redman et al., 2013). Overall the key enablers of public transport use are factors that make it first more feasible, and then more desirable, compared with travel by car.

Creating barriers to the use of unsustainable transport options assists to enable more sustainable choices. When the use of the private car is discouraged by various measures, e.g. reduction in road capacity or closure of key through routes, then this can lead to the phenomenon of 'disappearing traffic', revealing that car traffic is not a fixed demand but varies according to the road network capacity (Cairns, Atkins, & Goodwin, 2002). Some of those car drivers may then choose to utilise other modes to meet their transport needs. Studies have measured increases in public transport use when policies aimed at reducing travel demand by car have been introduced, such as congestion charging, parking controls and street pedestrianisation (Batty et al., 2015). Overall it is clear that combining strategies to address barriers and enable alternative modes with strategies to increase barriers to car use are likely to provide the most effective way to enable

sustainable transport options to be chosen by larger numbers of people (Forsyth & Krizek, 2010; Pucher & Buehler, 2008).

2.8. Socio-demographic factors and life events

The list of socio-demographic factors treated as potentially significant with regard to travel behaviour is long, but also relatively consistent across studies. For studies of travel mode choice gender is often significant (Commins & Nolan, 2010; Vega & Reynolds-Feighan, 2008). In New Zealand women tend to be under-represented in cycling trip statistics and over-represented in walking trips (Shaw & Russell, 2016).

Age emerges as a factor from the research into the phenomenon of ‘peak car’ (the meaning of the phrase is debated but generally refers to the levelling off or even a decrease in measures of car use across a population, for example per-capita distance travelled) and is implied by the transport literature looking at the impact of lifecycle stages. While the debate on the causes of the ‘peak car’ phenomenon is ongoing, there is some evidence that young European adults as a cohort are choosing to drive less than previous generations and larger numbers are choosing alternative travel modes (Kuhnimhof, Zumkeller, & Chlond, 2013; Metz, 2013). A similar trend may be emerging in New Zealand, particularly for urban young adults (Curran, 2014).

In addition to gender and age, studies that report the significance of socio-demographic factors have found that household composition, marital status, the presence of children, education levels, income levels and employment status may also be relevant (Commins & Nolan, 2010; Manaugh, Miranda-Moreno, & El-Geneidy, 2010; Vega & Reynolds-Feighan, 2008). Mobility biography research points to possible reasons for this. Changes in family composition are a major life event linked to changes in travel mode (Scheiner & Holz-Rau, 2013). According to one study, part-time employees are more likely to cycle than full-time employees, a result that may also be linked to commute distance, implying that employment status could be significant (Heinen et al., 2010).

2.9. Research Questions

Overall, the literature shows that commuting mode and distance are likely to be resistant to change based on attitudinal factors alone unless influenced by exogenous or structural variables; especially in car-dependent cities such as Christchurch. There is also evidence that old habits can be re-evaluated during an office move, making travel mode shift more likely.

Secondly, the literature suggests that reducing total commuting distance, e.g. by shifting a workplace to a more central location, may have a small impact on travel demand (as measured by vkt/vmt), but may not trigger mode shift for individuals without complementary measures. It is likely that policy measures, e.g. restriction on parking, provision of attractive and safe alternative modes and access to public transport will be more influential in encouraging mode shift than attitudinal factors or behavioural interventions. This leads to the following overall research question:

Can a move from distributed suburban office locations into the CBD result in more sustainable commuting patterns and how influential are structural and attitudinal factors in changing these patterns?

This research question is explored using a series of sub-questions:

1. What changes in travel mode and distance have occurred in this case study as a result of the office relocation?
2. How have these changes affected the carbon emissions of employees during their daily commute?
3. Are those employees who have stronger positive attitudes towards the environment more likely to change their commuting mode during an office relocation?
4. What encouraging or discouraging factors lie behind any change to more sustainable commuting modes?
5. What are the main barriers and enablers that have emerged as significant in preventing or encouraging employees to change their commute to a more sustainable mode?

3. Methodology

3.1. Research Context

This research has been partially funded by a scholarship from the Resilient Urban Futures (RUF) research programme of the New Zealand Centre for Sustainable Cities (NZCSC) and funded by the Ministry for Business, Innovation and Employment (MBIE). Resilient Urban Futures is designed to investigate the wider question of what possible futures for New Zealand cities will enable them to be the most resilient, liveable and competitive? (NZ Centre for Sustainable Cities, n.d.).

Simultaneously, this research has been conducted with the support of the New Zealand Transport Agency (NZTA), who, as the lead agency for the “All of Government Travel Plan”, and one of the Christchurch-based agencies relocating to the BNZ Centre, were responsible for helping to encourage all staff to adopt more sustainable ways of commuting to and from work.

3.2. Methodological Approach

This study is positioned as a case study and a natural experiment. In the social science literature, case studies have an ambivalent profile. There is a view that case studies may be somehow ‘less valid’ than other forms of research, as the specific context may limit generalisation of results or the methodology may be poorly replicable (Gerring, 2007, p. 6). However, case studies are still widely used in many situations in which social complexity exists. This complexity can be arguably better captured using a variety of research methods rather than by using one single approach.

Yin defines a case study as:

“... an empirical inquiry that investigates a real-world context, especially when the boundaries between phenomenon and context may not be clearly evident.”

(Yin, 2003, p. 16).

The current study fits with this definition, investigating transport decision-making within the real-world context of an office relocation. However the fact that their workplace is relocating is only one of many different factors that impact people's commuting choices.

Yin goes on to list features of a case study stating, "A case study inquiry:

- copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result,
- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result,
- benefits from the prior development of theoretical propositions to guide data collection and analysis."

(Yin, 2003, p. 17)

The present study relies on multiple sources of evidence and also involves the prior development of theoretical propositions. Whether it fits the definition of a technically distinctive situation with more variables of interest than data points may be debatable, depending on the definition of 'case'. This study defines 'case' as the main event triggering the investigation, namely the office relocation, thereby making this point more relevant. Within that single 'case' there are multiple individual staff members affected, but it is the effect and impact of their collective transport decisions that are the main 'variables' of interest in this current study, and that may lead to wider conclusions about the impact of such office relocations on transport sustainability.

Within the context of a case study, epistemologically this research takes a pragmatic approach. The pragmatic worldview is not based on any single philosophical view of reality, but holds rather that "Truth is what works at the time" (Creswell, 2014, p. 11). Pragmatic researchers are focussed on the consequences of their research, their ability to solve real-world problems and therefore investigate their research questions using the appropriate methods for the context based on the intended outcomes of the study (Creswell & Plano Clark, 2011). For example, the researcher may collect survey data in a relatively systematic and unbiased manner as well as qualitative data taking a more

subjective approach and then combine results to gain a more nuanced understanding of the research question. In this way, findings may be triangulated and corroborated to provide more robust results. There is a school of thought that challenges such triangulation on the basis that different methods are based in different ontological approaches and therefore that results cannot be combined in any meaningful way (Bryman, 2004). Others take the view that richer research results can be gained by working with the differing strengths of the various methods (Creswell, 2014).

When a change event is forced on a group of people due to circumstances largely not in their control, a natural experiment arises. It is otherwise not easy in the social sciences to artificially construct situations that require people to make significant changes in their daily travel behaviour and allow an observer to monitor the results. When such an opportunity does arise, a quasi-experimental approach may be taken that explores any changes arising from the event in the context of local daily travel behaviour, assuming that most of the wider contextual factors are held constant for the short period in which the quasi-experiment is taking place.

3.3. Research Design

The current study involves a case study of a single event in time and place, namely relocating several dispersed agencies to one new office building. This study explores the impact of this event on travel choices made by employees. There is a complex background to this apparently simple event, including the impact of the Christchurch earthquakes. The earthquakes changed the physical infrastructure of the city and had significant impacts on the emotional and social contexts of the city's inhabitants. Once the Christchurch CBD reached a certain stage of reconstruction, offices began to reopen allowing office workers to relocate back to the city. The present study focuses on a window of several weeks in early 2016 during which the 380 employees in the study relocated from their previous, more suburban office locations to the CBD.

This study was granted ethics approval by the Human Ethics Committee of Victoria University of Wellington (Appendix A: Ethics Approval)

3.3.1. Mixed-Methods Design

By definition a mixed-methods design involves collecting and using a variety of data, often quantitative and qualitative, to explore the research question. However the distinction between qualitative and quantitative design has been challenged as misleading, with some going so far as to eschew the term ‘mixed-methods’ for the term ‘multi-strategy designs’ (Robson, 2011). Pragmatically, the particular design chosen should be the most appropriate combination to address the research aims. Therefore, the design approach for this study has been informed by deciding on the type of data that might best answer the research questions. Furthermore, this study has been guided by the practical limitations of working with the participating agencies.

The first research focus is to explore what changes people made to their commuting patterns as a result of moving to the new office, and to analyse the impact of these changes on average carbon emissions. An online survey to all staff involved in the move was developed to provide the quantitative data needed for this analysis.

The second major focus of this research is to explore the factors lying behind any changes that did occur, as well as exploring participants’ barriers to, or enablers of, change. Methodologically, it is when exploring the factors behind individual choices and the barriers and enablers of travel mode change that this research uses both quantitative and qualitative data collection methods. Quantitative methods can explore broad patterns across a group, but qualitative open-ended questioning is best used to draw out more detail about the personalised experience of commuting, thereby adding richness to the data. Creswell (2014, p. 15) calls this pattern of data collection “convergent parallel mixed methods”; referring to research that collects both types of data at roughly the same time, then integrates and explores the results to gather overall conclusions. For the present study, the full staff survey included questions about reasons behind individual travel choices and these were further explored during focus groups.

3.4. Staff Survey

An online survey was issued to all staff members who were employed at any of the agencies in the BNZ Centre six weeks after the move. Staff were asked about how they currently commuted to work and, where relevant, how they used to commute to their previous work location. The interval of six weeks was chosen as it has been found that travel habits may take at least a few weeks to re-establish after an office relocation, regardless of whether or not people change mode (Walker et al., 2014).

The survey was issued as a confidential online survey because of the large numbers of staff involved and the fact that the researcher was Wellington-based. A link to the survey was emailed to staff by each agency involved in the move. Online surveying enables remote capture of large amounts of data within a short, specified time-frame at low cost (Creswell, 2014). The survey was created using Qualtrics software (licenced to Victoria University of Wellington) and was open for completion over a two week time-frame (from 29th March to 10th April 2016). At least one email reminder was issued during the survey period.

3.4.1. Staff Survey Design

The survey was designed to answer all five research questions. To address questions on how commute patterns had changed, the survey collected information on employees' commute to the BNZ Centre and on how they previously commuted to their prior office location. The survey included questions about respondent's attitude to their commutes, reasons why they commuted that way, their attitude to the environment and whether they participated in the travel incentive programmes offered at the time of the move. To allow comparison with census data and to control for predicted impacts on travel-mode choice the survey collected relevant socio-demographic data: gender, age, employment status (part-time vs full-time), highest education level and household composition. Survey sections were tailored based on answers to previous questions. For example, staff employed since the move were not asked to provide details of their previous commute.

This study did not collect details of personal income. Questions on personal income are known to be challenging and can lead to higher drop-out rates (Hansen & Kneale,

2013). For this reason, because data on education level was collected and for reasons of brevity, the decision was made to exclude questions on personal income.

See Appendix B for a copy of the full survey, entitled “Your Daily Commute – Personal Travel Survey”.

3.4.2. Measuring Commute Characteristics

Travel Mode Choice

Survey respondents were asked what their primary mode of transport was for journeys both to and from the BNZ Centre, and then, if they were employed prior to the office relocation, what their primary mode of transport was for journeys to and from their previous office location; for example “Q3.1: What is your primary mode of transport for your usual commute to and from the BNZ Centre?”

Transport mode categories were as follows:

- bus
- bike (including e-bike)
- private car (alone)
- private car (shared with family/household members)
- walk/run
- carpool
- motorbike/ motorscooter
- Other (please specify)

Transport mode categories were based on those used by NZTA to enable comparison with their own staff travel survey performed prior to the office move. Some categories were later combined for analysis purposes or due to low numbers. For example, private car (alone), private car (shared) and carpool were combined to category ‘Car’.

Commute Distance

Survey respondents were asked to provide their home address to enable calculation of commute distance. Providing accurate address details was not mandatory both to encourage responses and at the request of the participating agencies; however 150

survey respondents provided enough address information to allow calculation of commute distance. Commute distance was calculated using a shortest path analysis on a GIS database to find the distance across the Christchurch street network from respondents home address to the commute destination (refer to Appendix D for details).⁴

Commute Time

This survey collected self-reported commute times using the following question:

How long does it typically take you to commute to and from work?

- Less than 15 minutes
- Between 15 and 30 minutes
- Between 30 and 45 minutes
- Between 45 and 60 minutes
- Between 60 and 90 minutes
- More than 90 minutes

3.4.3. Measuring Environmental Attitudes

This study used the revised New Ecological Paradigm (NEP) Scale as a measure of attitudes towards the environment (Dunlap, Van Liere, Mertig, & Jones, 2000). The NEP asks questions designed to measure responses to five aspects of an environmental worldview; limits to growth, belief in the fragility of nature, anti-anthropocentrism, rejection of the belief that humans are apart from nature, and belief in the possibility of a future eco-crisis. The NEP has been widely used for several decades (Dunlap & Van Liere, 2008) and studies have shown that responses on this scale can be significantly correlated (if not always strongly correlated) with pro-environmental behaviour, or support for pro-environmental policies (Hawcroft & Milfont, 2010). There have been criticisms made of the NEP that it is sometimes not consistent across groups of individuals, can vary depending on the number of questions asked (Hawcroft & Milfont, 2010) or that context can influence the scores (Pienaar, Lew, & Wallmo, 2013). Despite these criticisms however the NEP remains the most widely used measure in the field.

⁴ Shortest path analysis may underestimate distance by car or bus as it does not take into account street attributes such as one-way streets. Similarly it may overestimate walking/cycling distances by neglecting non-street shortcuts.

Using the NEP as a measure of environmental concern for comparability reasons is acknowledged as a valid approach, provided care is taken to ensure a balanced list of questions is asked, (Milfont & Duckitt, 2004) hence its use for this study.

The NEP consists of a relatively short list of questions (usually 15 but can be calculated using subsets of 12, 10 or even six) compared to more recently developed measures, such as the Environmental Attitude Inventory which asks a minimum of 24 questions (Milfont & Duckitt, 2010). Conciseness was important to this study for two reasons. Firstly it is generally acknowledged that survey completion rates are affected by length (Creswell & Plano Clark, 2011), and this particular study could only survey from a pool of 380 staff. Also, several of the agencies taking the survey had expressed concerns that the survey was long, leading the researcher to focus the questions carefully. This study therefore chose to use the short, balanced, ten-question version of the NEP. The ten-question version has been shown to be correlated with an external measure of pro-environmental behaviour similarly to the full version (Milfont & Duckitt, 2004).

Respondents rated their agreement with the NEP questions on a five point Likert scale from 1-Strongly Disagree to 5-Strongly Agree. Five questions were worded positively for supporting environmental attitudes and five negatively to reduce response bias (Table 3.1, negative questions shaded)⁵. Questions were randomly shuffled for each participant to reduce order bias.

Survey results had good internal consistency across all ten questions (Cronbach's $\alpha = 0.79$). All items appear to be worthy of retention. Only one item (Q2) would result in a slight increase in alpha if it were deleted, but only by 0.004. Furthermore, all items show a good degree of item-total correlation (range 0.29 to 0.66). These results are consistent with the study that produced the revised NEP scale (Dunlap et al., 2000) and support the next stage of analysis. Aggregating each respondent's answers gave individual NEP scores theoretically ranging between 10 and 50.

⁵ Negatively worded questions were recoded positively for analysis.

Table 3.1 : Environmental Attitude questions and average ratings: NEP ten-question scale

Question		Mean	St Dev	Range
1	Human ingenuity will ensure that we do NOT make the earth unlivable.	2.8	0.9	1 - 5
2	The earth has plenty of natural resources if we just learn how to develop them.	3.0	0.9	1 - 5
3	Plants and animals have as much right as humans to exist.	3.9	1.0	1 - 5
4	The balance of nature is strong enough to cope with the impacts of modern industrial nations.	2.2	0.9	1 - 5
5	Despite our special abilities humans are still subject to the laws of nature.	4.1	0.7	2 - 5
6	Human destruction of the natural environment has been greatly exaggerated.	2.2	0.8	1 - 5
7	The earth has only limited room and resources.	4.0	0.8	1 - 5
8	Humans were meant to rule over the rest of nature.	2.3	1.0	1 - 5
9	The balance of nature is very delicate and easily upset.	3.6	0.8	1 - 5
10	If things continue on their present course, we will soon experience a major ecological disaster.	3.6	0.8	1 - 5

source: NEP 10-point survey administered by author (n=179)

Analysing NEP score by socio-demographic variables shows no significant differences by gender ($t(177)=1.538$, $p=0.126$) or employment status ($t(178)=-1.491$, $p=0.138$) (Table 3.2). Contrary to other studies (Milfont & Duckitt, 2004), there does not appear to be any significant correlation with highest education level ($F(2,177)=0.751$, $p=0.473$), and the expected negative correlation with age is negated by a higher than expected mean value for the age group 50-59 years ($F(4,171)=2.723$, $p=0.031$).

Table 3.2: Non-standardized NEP Scores by socio-demographic factors

		N	Mean	St Err	St Dev
	Overall	180	36.6	.4	5.2
Gender	Female	97	37.1	.5	5.0
	Male	82	35.9	.6	5.5
Highest Education Level	Secondary	22	35.4	1.2	5.9
	Undergraduate Degree / other Tertiary	94	36.9	.5	4.8
	Postgraduate Degree	64	36.5	.7	5.5
Employment Status	Full Time	159	36.3	.4	5.2
	Part Time	21	38.1	1.1	4.8
Age	20 to 29	21	38.6	1.0	4.6
	30 to 39	39	36.2	.8	4.7
	40 to 49	49	35.8	.7	5.0
	50 to 59	42	38.0	.9	5.7
	60 and over	25	34.8	1.1	5.3

3.4.4. Survey Data Processing and Analysis

The survey closed with n=204 responses and fifteen incomplete responses were removed, leading to a completion rate of 94%. At the time the survey was open, NZTA estimated the total number of staff employed across all the relevant agencies was approximately 380⁶. Therefore the number of complete survey responses, n=191, represents an overall response rate of approximately 50%. Responses were received from 5 of the 8 agencies involved in the move. The largest number of responses came from the largest agencies, namely Statistics NZ and the NZ Transport Agency.

For all of the analyses in the results section, unless otherwise stated, missing values were excluded pair wise. In other words, cases are only excluded if one of the variables included in the specific analysis is missing.

⁶ In any one fortnight, typically up to 4% (1/26) of employees will be absent, so the base staff complement to respond would be approximately $380 * 0.96 = 365$, taking the response rate up to 52%.

3.5. Focus Group Design

Four focus groups were held lasting one hour each with a total of 17 staff in Christchurch during the month of May 2016. Focus groups were designed to further explore the factors behind staff decisions regarding their commuting choices. Meetings were held on-site in the BNZ Centre during office hours to encourage staff attendance. Meetings were facilitated by the researcher and recorded for later transcription.

Participation in focus groups was voluntary and no incentives were offered. Volunteers were recruited via the online survey. Of the 44 volunteers who provided their details, 25 replied that they were willing to attend a meeting during the scheduled week. This number dropped to 20 once meeting dates and times were finalised, with a further three dropping out on the day due to illness or other factors.

Focus group size is an important consideration in qualitative research. Focus groups with too many participants can limit individual contributions and make it difficult for the facilitator to manage the process or to follow the discussion, while groups with too few may find it hard to generate discussion (Del Rio-Roberts, 2011). Recommended group sizes range from 6 to 12 participants (Del Rio-Roberts, 2011) to smaller groups of 3 or 4 (Carey & Asbury, 2012, p. 45). This study aimed to have 4 to 6 participants per group, both because a smaller group suits a short focus group duration (one hour in this case), and can be easier to manage (Krueger & Casey, 2009). The latter was a consideration for this researcher who was also the sole group facilitator. In practice group size ranged from 3 to 6 participants.

Participants were arranged into focus groups based on their main commute mode (car, bus, walking, cycling). This design, where three or four focus groups are held for each 'audience category' of interest, is common in social science research. Participants then have a shared point of reference and discussion can build around common themes (Krueger & Casey, 2009). Practically, the only variation from this design was that cyclists and walkers shared focus group sessions due to the low number of walking volunteers.

For a list of focus group questions and discussion prompts, refer to Appendix C.

3.5.1. Qualitative Data – Analysis approach

Focus group discussions were transcribed into NVivo by the researcher and analysed using a thematic coding approach (Robson, 2011, p. 467). Transcripts were coded iteratively into topics relevant to the research question in a process that included several stages of review, reflection and aggregation of topics into wider themes. Some codes were chosen ahead of time. For example, sections of text were coded based on the commute mode under discussion, as well as the reasons for each mode worded similarly to the reasons used in the main survey. Other codes emerged directly from the text to be analysed and refined into wider themes.

3.6. Methods Summary & Limitations

To summarise, this study is a case study that takes a pragmatic, quasi-experimental approach to investigating changes in travel behaviour as a result of an office relocation. The study uses a convergent, parallel mixed-methods design to explore the research questions.

An online staff survey was used to collect data to address at least part of all five research questions. Data collected from respondents included socio-demographic information, details of their commute journeys, reasons behind their commuting behaviour, barriers and enablers of different commute modes, their attitude to the environment and participation in incentive programmes. Focus groups were run to provide additional information on commuting decision making.

Online surveys are known to have strengths and limitations. An acknowledged strength is that the process of conducting research is simpler and easier to manage for the researcher; especially one located at a distance from the case study location, as it enables large numbers of responses to be collected over a short time. The usual limitation of response bias towards those with computer access did not apply in this case given that all employees had computer access and the link to the survey was sent out from within their own agencies. Common survey issues such as strategic bias and survey fatigue do however still apply (Robson, 2011). The latter was a particular concern in this study because staff had been already been surveyed before and after the

move on various topics. This study's survey was carefully designed to overcome these issues where possible, using survey methods such as random ordering of questions to prevent response bias and by limiting the length of the survey.

A strength of the mixed-methods approach in this case is the added depth provided to the analysis by the inclusion of focus group data. Focus groups were chosen for this study over other methods (e.g. interviews) to enable the researcher to collect views from a range of people quickly, but also because focus groups encourage discussion while eliciting a wide range of views as people respond to others (Robson, 2011, p. 294). Focus groups do however come with in-built limitations. The focus group format can limit the number of topics discussed in the time available, particularly in larger groups, and there is a risk that one or two people may dominate discussion (ibid). Such limitations were taken into account by the researcher, who is also a trained facilitator. Further strengths and limitations of this study are discussed in section 5.2.

The next chapter gives the results of the survey and focus groups as they apply to each research question in order. In the Discussion and Conclusions chapter these results are woven together with insights from the literature and the wider context of the case study.

4. Results

This section presents the results of this research in order of the research questions. The first sub-section gives an overview of socio-demographic and other characteristics of the survey sample. Following sections present the results for each research question.

4.1. Staff Survey – General Statistics and socio-demographics

To understand the characteristics of the survey respondents, Figures 4-1 to 4-4 compare selected socio-demographics of the sample with New Zealand census data for Greater Christchurch⁷ (Statistics NZ, 2014b, 2015b). The sample population differs from the working population of the Canterbury region in several aspects, being on average slightly older and more highly educated. This reflects that the agencies involved in the study employ mainly professional and administrative staff.

There are proportionally more females in the survey sample than in the population of Greater Christchurch (Figure 4-1); however this difference is not statistically significant ($X^2(1, n=191)=0.80, p=0.37$)⁸. The age distribution of the sample is similar to the employed population of Greater Christchurch (Figure 4-2), with slightly fewer young employees (under the age of 30) and more employees over the age of 40. Highest education levels however are markedly different (Figure 4-3). The majority of the survey sample are educated to tertiary level (74%) compared to less than a fifth of the general population (17%). The sample population are also significantly more likely to live in a household with children under the age of 18 than might be expected ($X^2(1, n=191)=15.70, p<0.001$) (Figure 4-4).

⁷ Greater Christchurch, as defined by Statistics New Zealand includes the three Regional Authority areas of Christchurch City, Waimakariri and Selwyn (Statistics NZ, 2015b).

⁸ The category 'Gender Diverse' was included with Females for the purposes of this test as the category did not exist for the 2013 census.

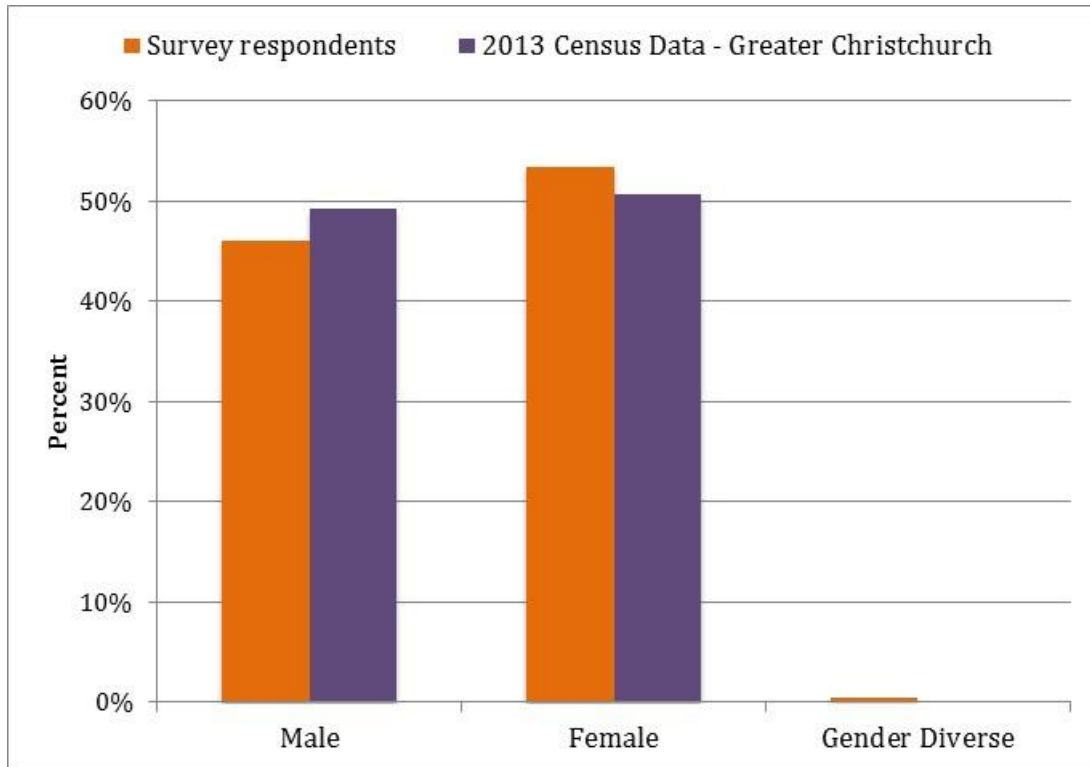


Figure 4-1: Gender of survey respondents compared with NZ census data

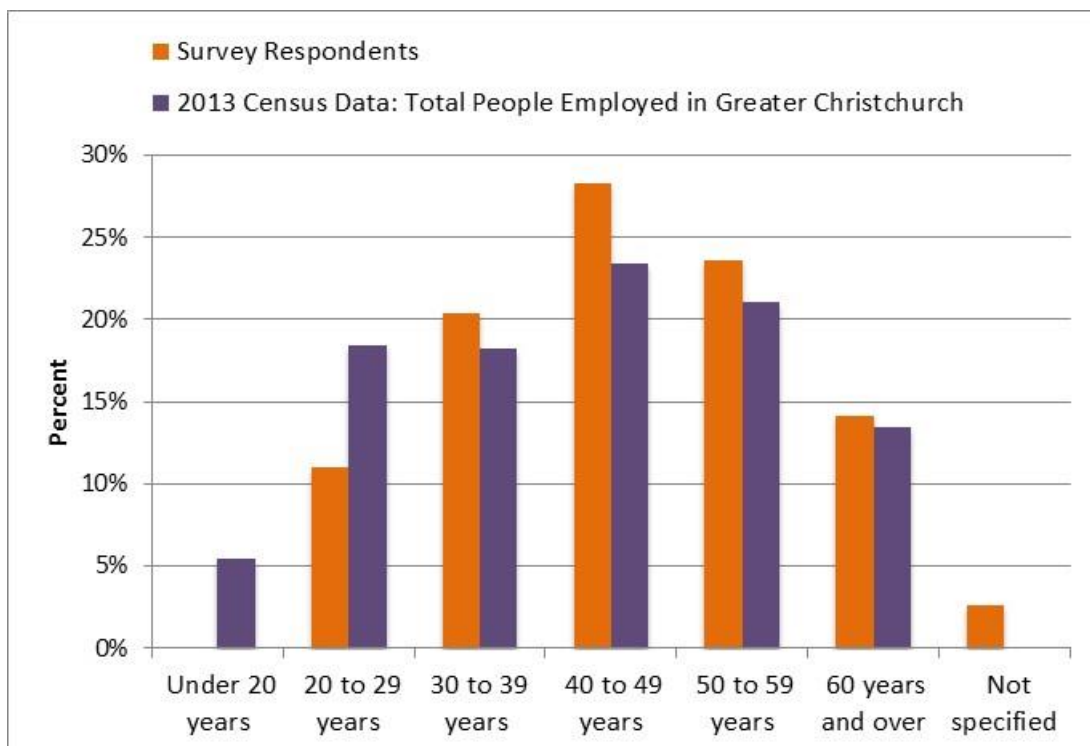


Figure 4-2: Age range of survey respondents compared with NZ census data

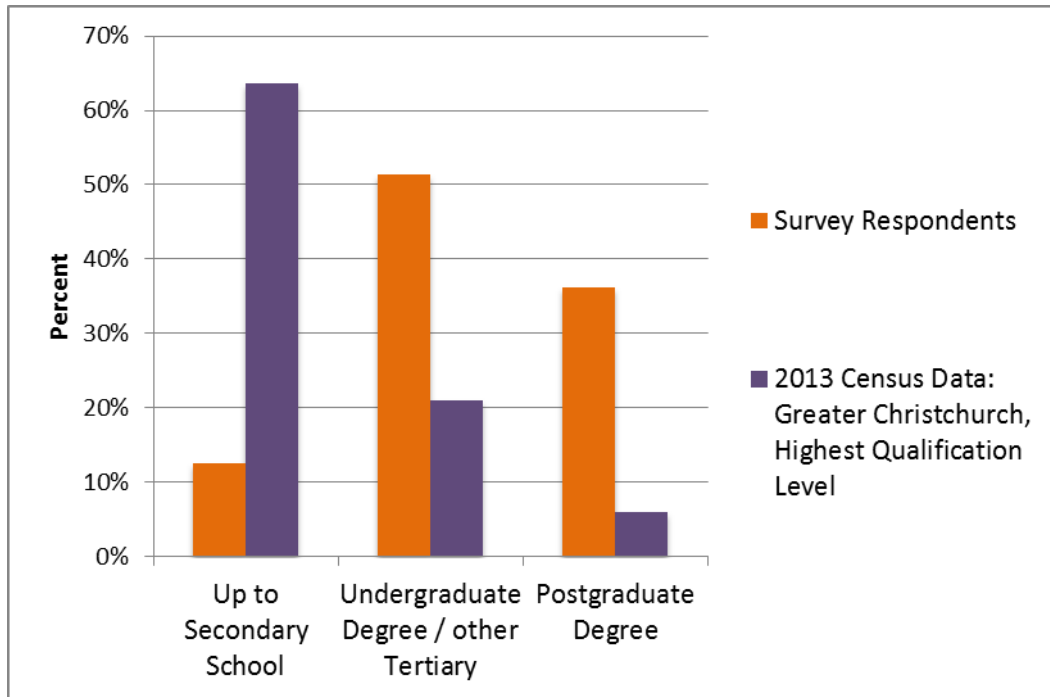


Figure 4-3: Highest education levels of survey respondents compared to NZ census data⁹

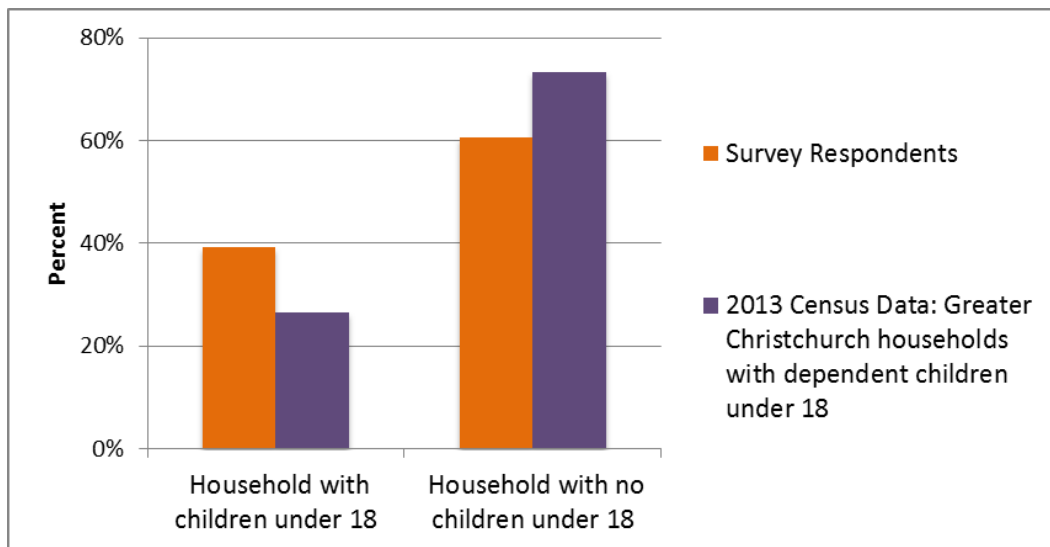


Figure 4-4: Household composition compared with NZ census data¹⁰

⁹ Census highest qualification levels matched as follows:

Secondary School (Incomplete) = No highest qualification

Secondary School qualification = Level 1 to Level 4 certificate plus Overseas Secondary School

Polytechnic or Trade Certificate = Level 5 or 6 certificate

Undergraduate Degree = Bachelor Degree and Level 7 qualification

Postgraduate Degree = Masters, Doctorate Degree

¹⁰ 2013 NZ Census Data: based on household composition by child dependency status variable. Included all household types with dependent children under 18.

In general survey respondents have a high level of access to cars (Figure 4-5) Respondents also have considerably higher bicycle ownership rates than the Canterbury average; 77% of survey respondents have access to a working bicycle compared to 57% of households in general (Figure 4-6) (MOT, 2014b). Very few individuals reported having a physical condition preventing walking or cycling (5.2%).

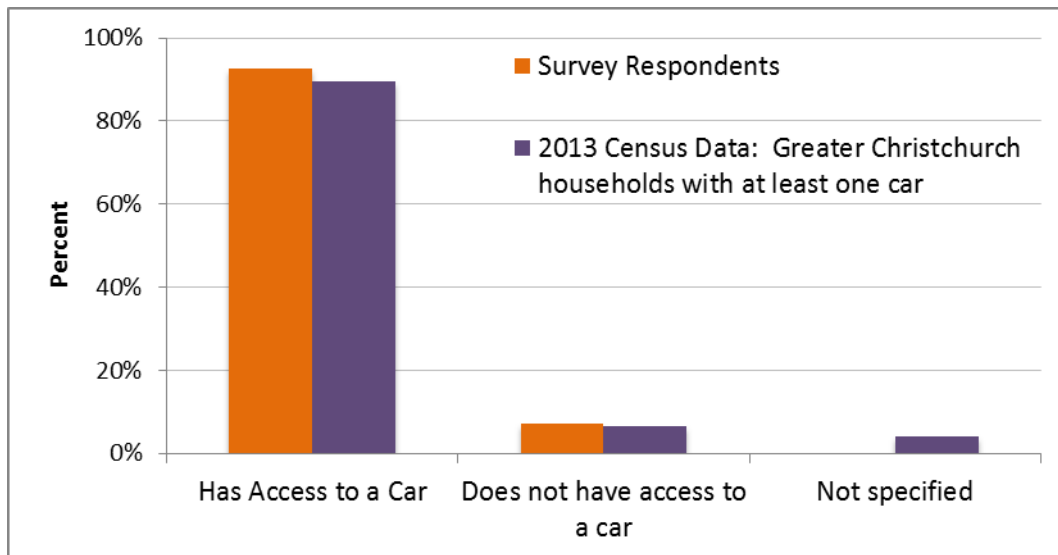


Figure 4-5: Access to a car: survey respondents and NZ census data

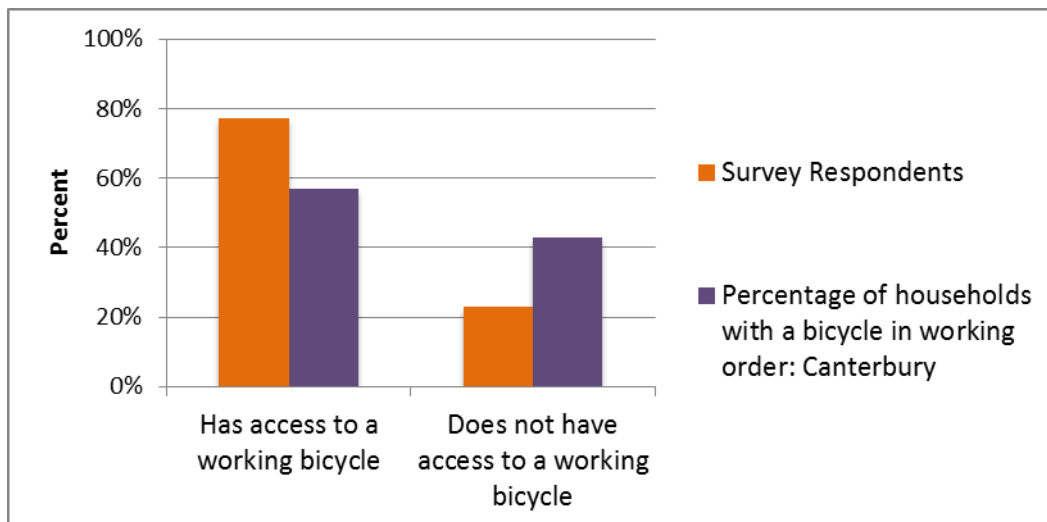


Figure 4-6: Access to a bicycle: survey respondents and NZ household travel survey data 2010-2014

Figure 4-7 compares the present study's data on the commute to work before the move with public statistics on the main mode of travel to work in the Canterbury region.

Census data records a snapshot of travel for the entire region for a day in 2013 (Statistics NZ, 2015b). The household travel survey by contrast samples all journeys taken by a subset of households within a region over a period of two days (MOT, 2014a). While these statistics measure slightly different versions of mode share, it does appear that the current survey sample may include a higher proportion of cyclists and bus users than the Canterbury average.

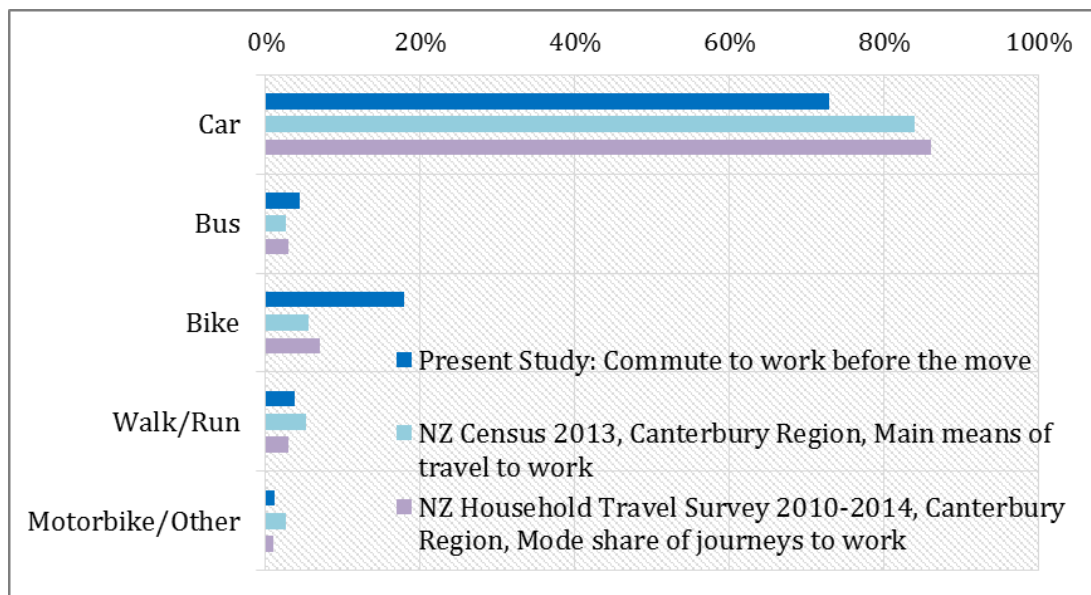


Figure 4-7: Mode share for travel to work, the present study compared to NZ census and NZ household travel survey

4.2. Staff Survey – Comparison with NZTA Baseline Survey

In May 2015, to enable their own travel planning, the NZ Transport Agency (NZTA) surveyed staff from all participating agencies scheduled to move into the BNZ Centre about their existing journeys to work. While the NZTA survey was not designed to complement the current study, they have given permission to use their results as a baseline (NZTA, 2015). The NZTA May 2015 survey asked employees anonymously about their commuting journey; however it did not include any socio-demographic questions. Therefore the two samples can only be compared on main mode of travel (Figure 4-8).

The NZTA May 2015 survey recorded 268 valid responses compared to 191 in the current study. For main commute mode, the present study's survey has a lower

percentage of respondents reporting that they used to drive to their previous work location (73% vs 78%), and a higher proportion reporting that they used to cycle (18% vs 11%) (Figure 4-8). So, the present study has captured the views of more cyclists and fewer car users than the NZTA survey before the move. This difference is statistically significant at the 0.05 level ($X^2(4)=11.39$, $p=0.023$). It is possible that the present study may have been answered by proportionally more cyclists. Alternatively, it is possible that there was a small shift towards cycling already underway prior to the move back to the CBD; i.e. more staff were cycling to work just before the move in early 2016 than there had been during May 2015. Nevertheless the current study directly compares changes in main travel mode for individuals across the time frame of the move, so is identifying actual change regardless of the initial composition of the sample.

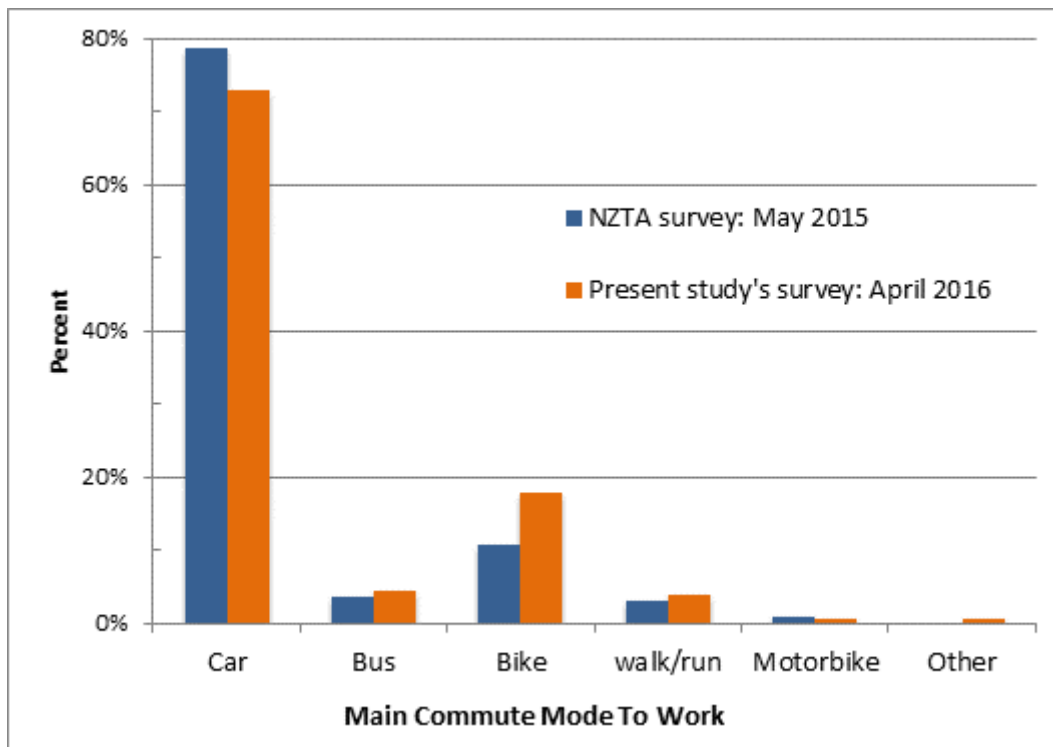


Figure 4-8: Comparing main commute mode to work responses - NZTA survey vs present study¹¹

¹¹ Car represents the present survey categories of private car (alone), private car (shared) and carpool combined. Car represents the NZTA May 2015 survey categories of private car (alone) and carpool combined. The NZTA survey asked employees to record private car (shared) travel as 'carpool'.

4.3. Research Question 1

Research question 1 asks “What changes in travel mode and distance have occurred in this case study as a result of the office relocation?” This section addresses that question by reference to the results of the present study’s staff travel survey.

4.3.1. Changes in travel mode

There has been a shift away from car use amongst those surveyed after the move to the BNZ Centre. Approximately 72% of those surveyed reported using the car to get to their previous workplace, compared to only 58% who report using the car to get to the BNZ Centre¹² (Figure 4-9). There have been corresponding rises in the percentages of respondents reporting that they now cycle, take the bus or walk. These differences are highly significant for both the journey to work ($X^2(4)=32.335$, $p\leq 0.0005$) and the journey from work ($X^2(4)=22.679$, $p\leq 0.0005$). The combined proportion of employees commuting actively or by bus has risen from approximately 27% to 39%, representing a significant shift towards more sustainable commute modes.

Figure 4-9 shows the overall changes in main mode but it does not show the relative change within each mode. For example, is it the same people walking now who used to walk to their previous office location? Figure 4-10 shows this relative change for the journey to the BNZ Centre broken down by previous main commute mode. This shows that people who are using the car to get to the BNZ Centre nearly all previously used the car to get to their workplace as well, with the exception of one person who used to walk. Meanwhile, current cyclists consist of nearly all those who previously cycled to work, with the addition of previous walkers, car users and bus users.

¹² Car = combined total of the three survey categories: Private Car (alone), Private Car (shared) and Carpool.

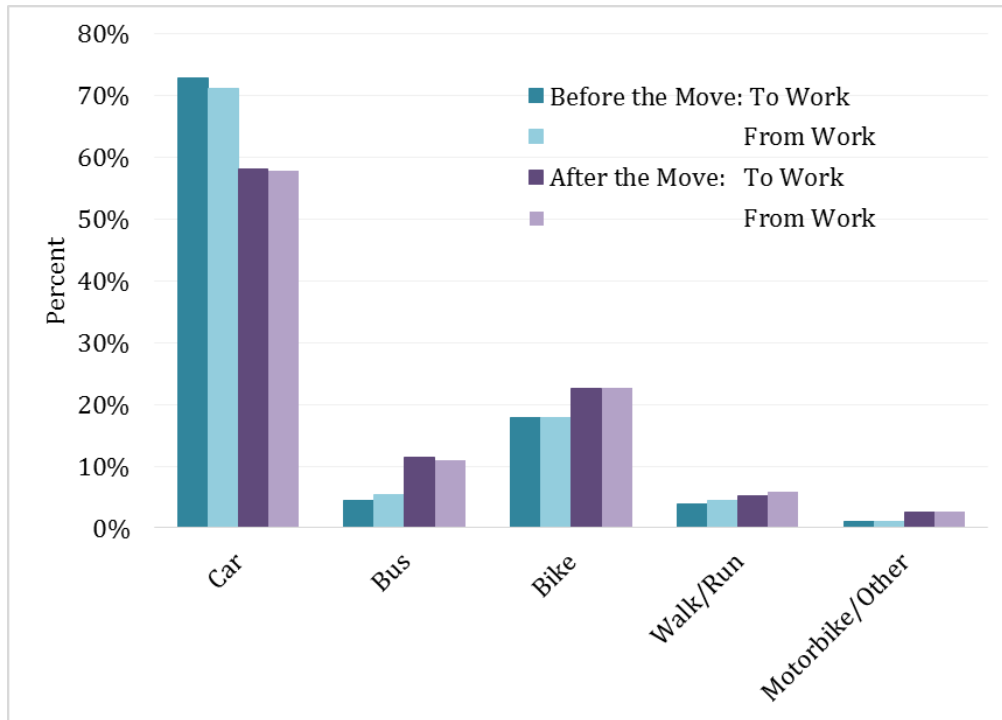


Figure 4-9: Changes in main travel mode to and from work

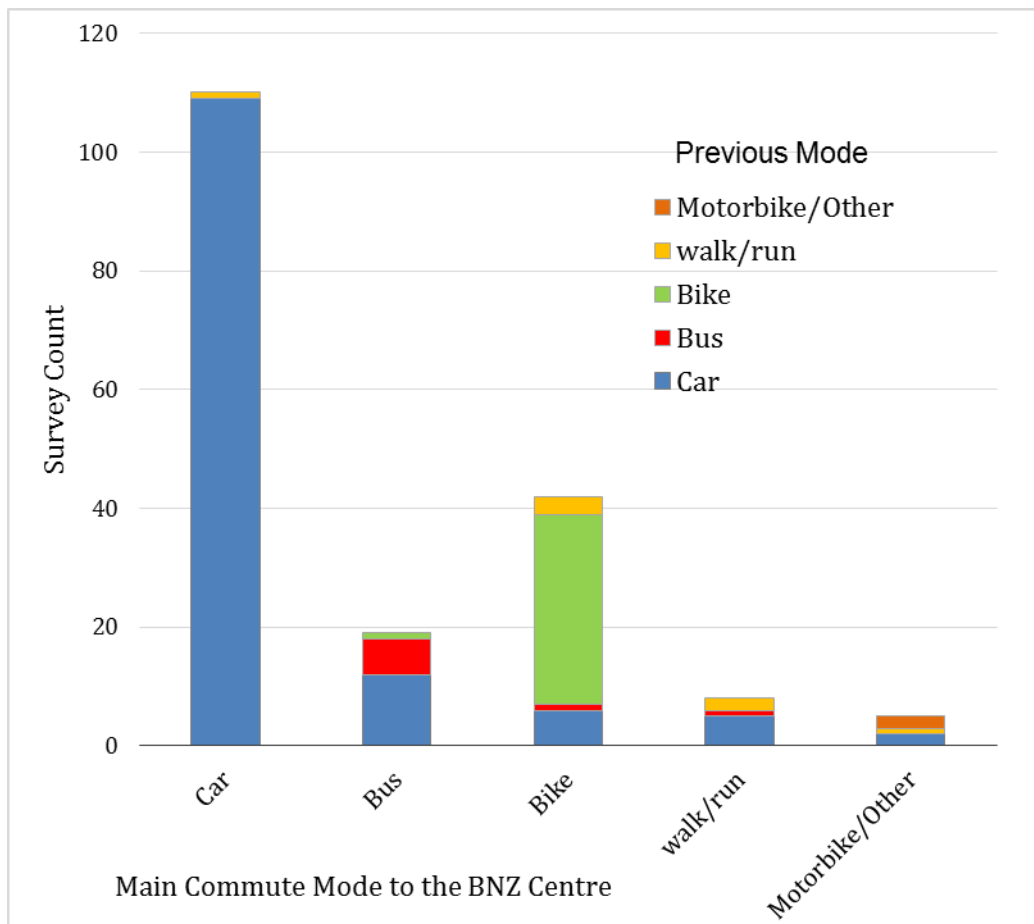


Figure 4-10: Main commute mode to the BNZ Centre by previous commute mode

Looking at this in more depth, 35 respondents (representing 18% of the survey sample) changed their main commute mode (either to or from work or both) after the move to the BNZ Centre. The majority of these 35 respondents switched away from car use (89%) to either using the bus or to active modes.

Excluding respondents who changed to a less sustainable mode (i.e. from walking to car) or who changed within one of the categories above, leaves respondents who changed at least one of their main commutes to a more sustainable mode after the move to the BNZ Centre (n=26)¹³. In this case, those who changed to a more sustainable mode were significantly more likely to have access to a bike than those who did not ($X^2(1)=3.997$, $p=0.046$). However there is no statistically significant difference between these two groups by gender ($X^2(1)=0.732$, $p=0.932$), age ($X^2(4)=9.159$, $p=0.057$), education level ($X^2(2)=5.799$, $p=0.055$), the presence of children under 18 ($X^2(1)=0.008$, $p=0.928$) or access to a car ($X^2(1)=0.538$, $p=0.463$).

Across the full survey sample there is a significant difference in main mode by gender both before ($X^2(4)=15.86$, $p=0.044$) and after the move ($X^2(4)=15.62$, $p=0.048$). Male cyclists greatly outnumber female cyclists for both commutes, although cyclist numbers increase for both genders post-move (Figure 4-11). Before the move male cyclists outnumber females at a ratio of nearly 3:1; similar to the proportion of male to female cyclists recorded cycling to work in the last New Zealand census (Shaw & Russell, 2016, p. 23). Correspondingly more females than males commute by car. Furthermore, although numbers are small, it appears that proportionally more women are taking the bus after the move than men (Figure 4-11).

¹³ Includes those who changed from Car to Bus (12), Car to Active (12) and Bus to Active (2).

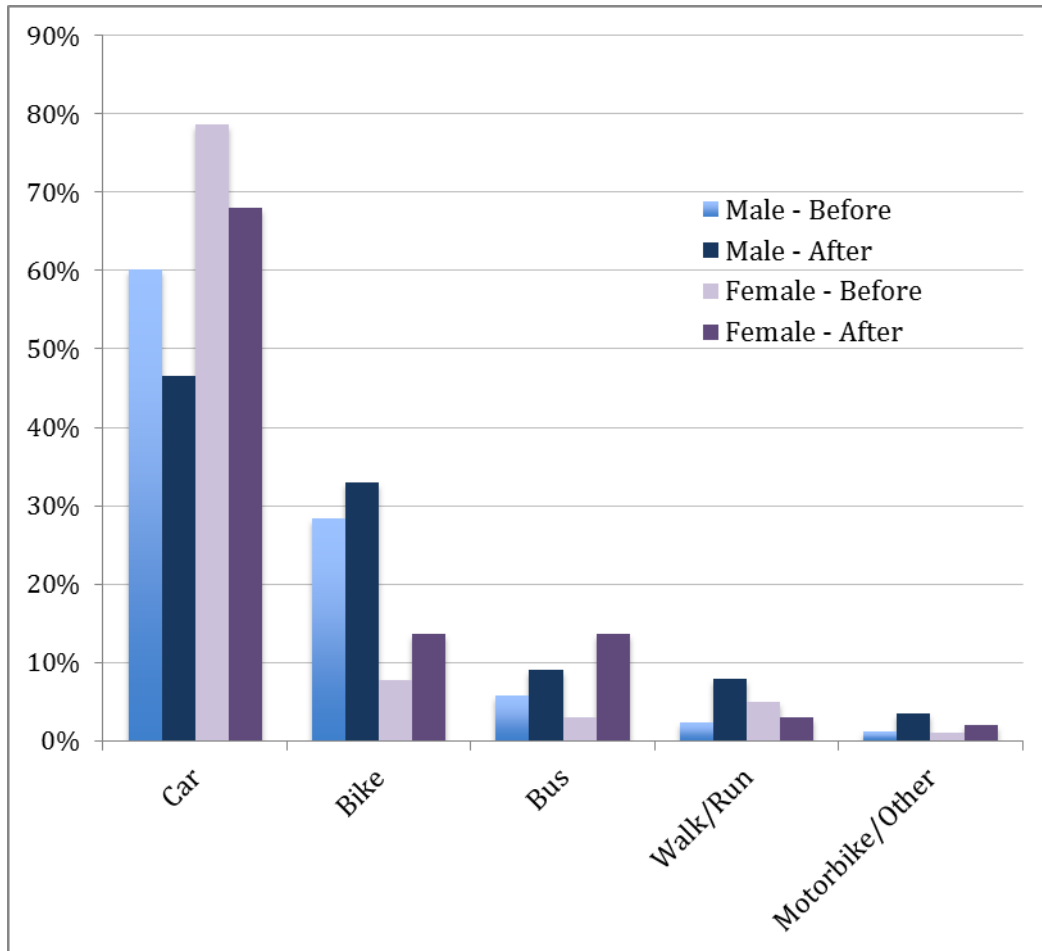


Figure 4-11: Main commute mode percentages: before and after the move by gender¹⁴

Given the significant gender differences in main commute mode, gender differences in access to a car or a bike were further investigated. Figure 4-12 and Figure 4-13 show that women are statistically less likely to have access to a bike than men ($X^2(1)=4.676$, $p=0.031$) but there is no significant difference between the genders when it comes to having access to a car ($X^2(1)=0.652$, $p=0.419$).

¹⁴ Female includes the category 'gender diverse'

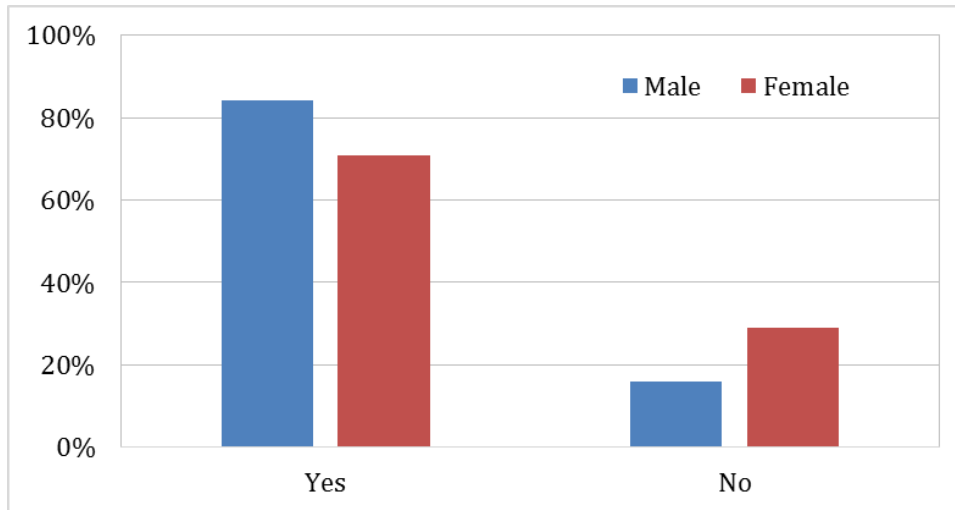


Figure 4-12: Access to a bicycle by gender

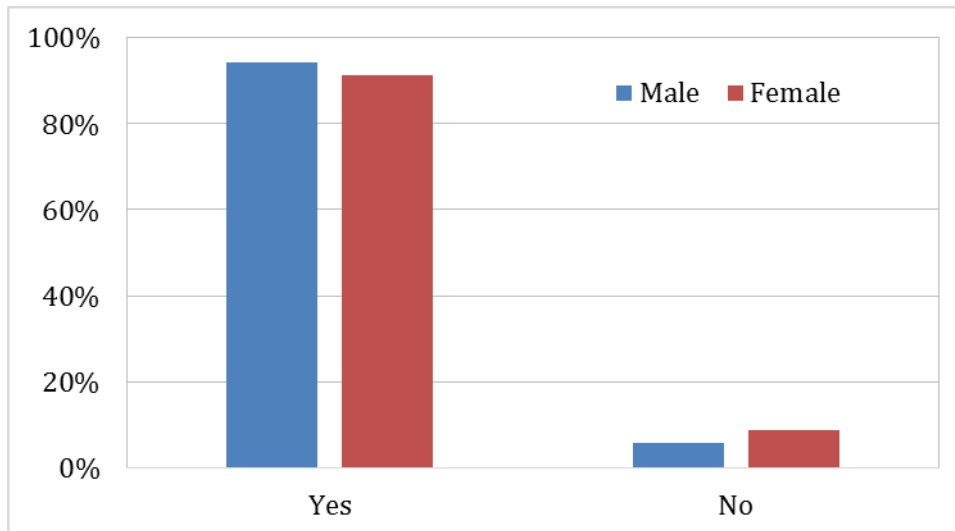


Figure 4-13: Access to a car by gender

Higher education levels are disproportionately associated with cycling and lower levels associated with catching the bus after the move to the BNZ Centre ($X^2(8)=17.57$, $\rho=0.025$) (Figure 4-14), however there is no significant difference for the journey to work before the move ($X^2(8)=4.75$ $\rho=0.784$).

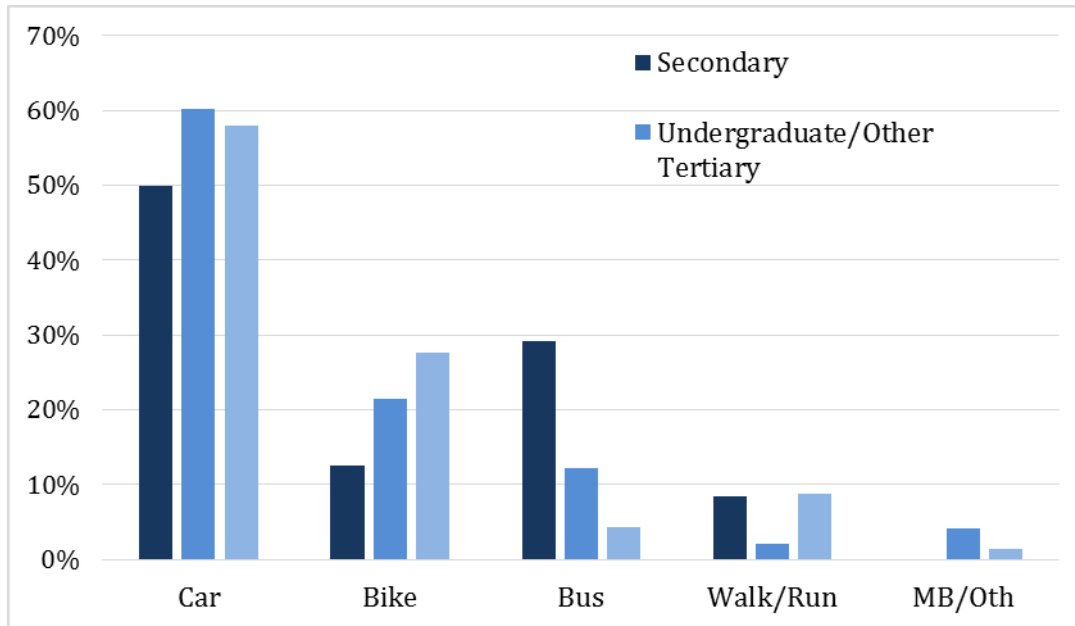


Figure 4-14: Main commute mode to the BNZ Centre by highest education level

Age and presence of children under 18 in the household are not significantly different by mode for either journey. Access to a car was not analysed in detail due to the very low numbers of respondents when split by main commute mode. Access to a bike is not independent from main commute mode in that all cyclists have access to a bike by definition (100% of people who cycle answered ‘Yes’ to this survey question).

To summarise, there has been a significant shift in the way that respondents travel to work after the move to the BNZ Centre; for example car use is down 14 percentage points and bus use and active travel combined are up by 10 percentage points. Furthermore, people who changed their main commute mode in a more sustainable direction were more likely to be those who had access to a bike and it is possible that age and education level may have some effect on who made the switch, although group size is not large enough to distinguish these effects on their own. Education may also be a factor in mode choice after the move to the BNZ Centre. Gender emerges as very significant in mode choice with males much more likely to cycle and more likely to have access to a bike while females are much more likely to drive.

4.3.2. Participation in Incentive programmes

A high proportion of all staff participated in either one or both of the Incentive programmes offered (95 respondents out of 191 or 49.7%), and only 10% of survey respondents employed before the move indicated that they had not been aware of the incentive programmes. Respondents using the relevant mode as their main mode of travel were more likely to take up the related incentive; 64% of bus commuters took up the bus incentive and 70% of cyclists took up the bike incentive (Figure 4-15 and 4-16). Many car users (35%) and cyclists (33%) also took up the bus incentive. This may indicate that there is a relatively large pool of occasional bus users or that many car users and cyclists were interested in trialling public transport.

Furthermore, respondents who made a change to a more sustainable commute mode were significantly more likely to have received a free bus pass than those who did not make a change ($X^2(1)=13.76$ $p<0.0005$) (Figure 4-17). The same was not true for the cycling incentive ($X^2(1)=2.35$ $p=0.150$) (Figure 4-18).

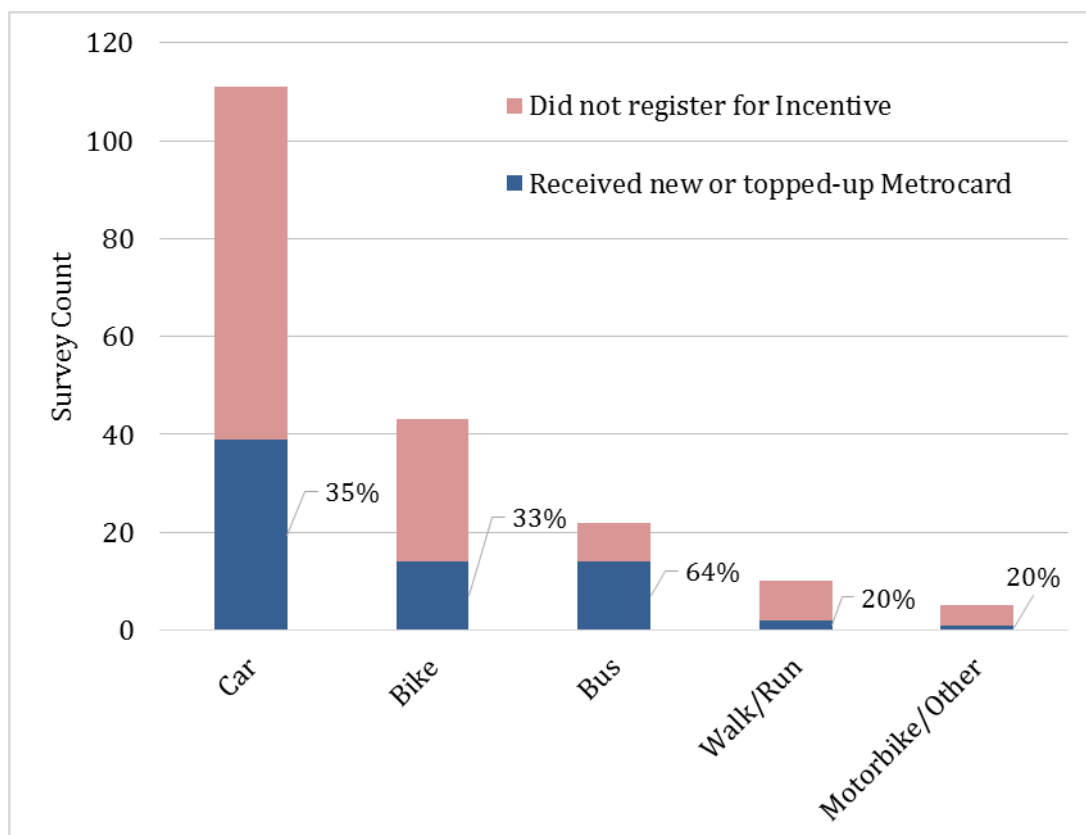


Figure 4-15: Bus incentive participation by main commute mode to the BNZ Centre

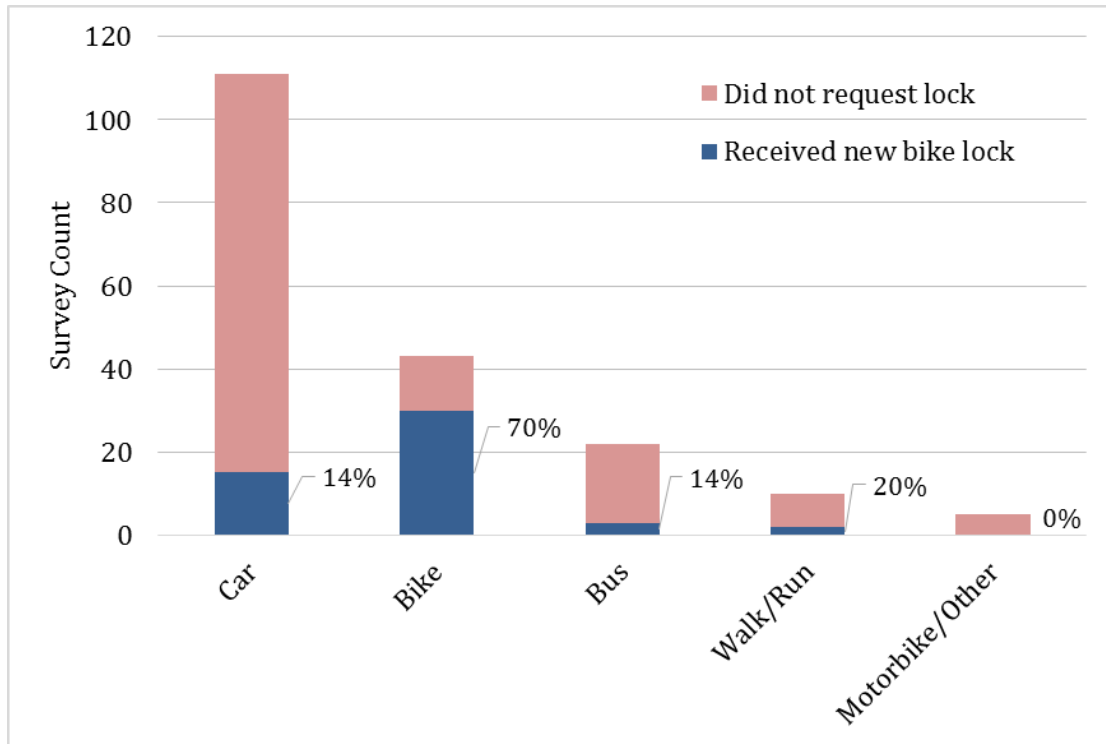


Figure 4-16: Bicycle incentive participation by main commute mode to the BNZ Centre

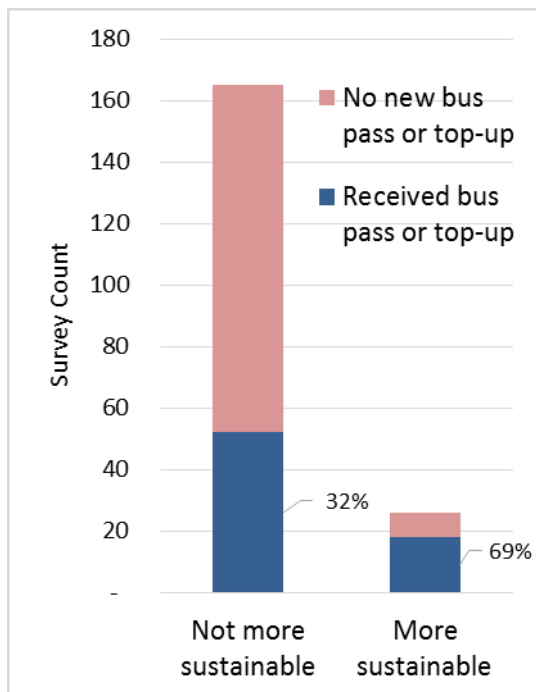


Figure 4-17: Changing to a more sustainable mode by participation in bus incentive programme

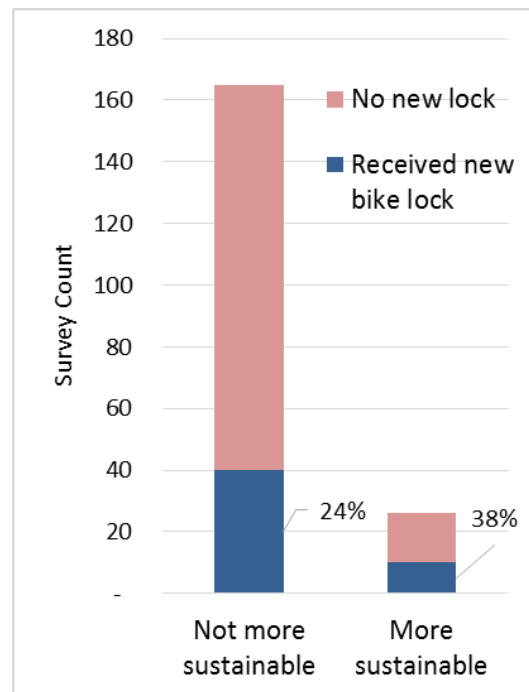


Figure 4-18: Changing to a more sustainable mode by participation in bicycle incentive programme

4.3.3. Changes in travel distance

A density map of residential locations and workplace locations shows that most survey respondents live within approximately 10km of the centre of Christchurch (Figure 4-19). Most of the survey respondent's who changed their commute mode after the move are commuting less than 15km to the BNZ Centre (30 out of 35 or 86%).

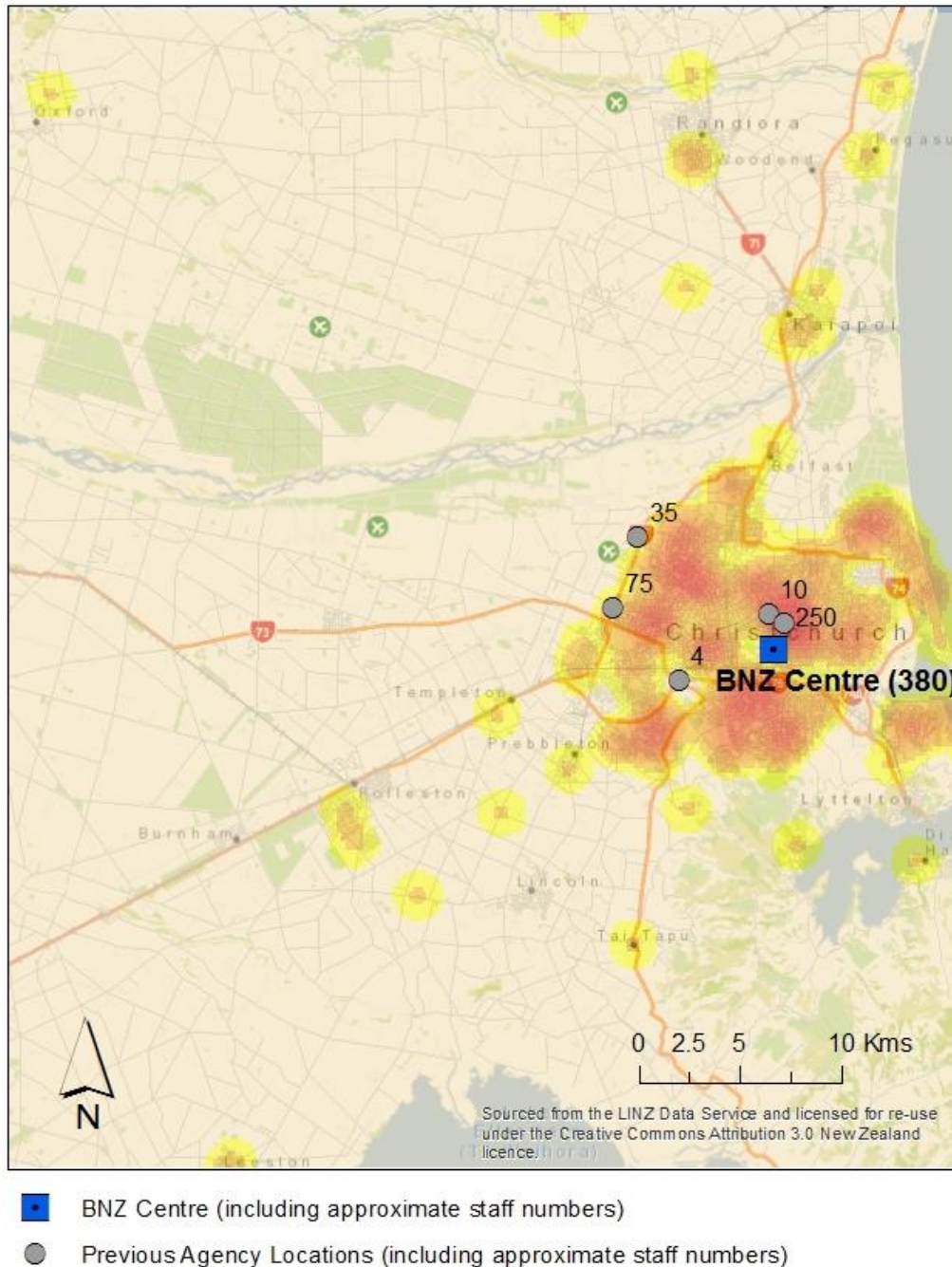


Figure 4-19: Survey respondents approximate residential location compared to study sites

The average distance travelled to work dropped from 9.6 km to 9.2 km after the move to the BNZ Centre; a 4% drop¹⁵. This difference was found to be statistically significant in a paired sample t-test; ($t(149)=2.709$, $p = 0.008$). So, the distance that employees travel to get to the BNZ Centre is significantly less, on average, than they travelled to their respective previous workplaces. This average change in distance travelled is between 0.18 km and 1.16 km per employee (95% confidence interval). Extrapolating these figures to the total number of staff involved in the move ($n \approx 380$), implies that the overall distance travelled may have reduced by between 69km and 441km every day, twice a day.

Categorising commute distance shows that the percentage of short commutes (especially those between 2 and 4km) has increased while the percentage of longer ones (especially those between 12 and 20kms) has decreased (Figure 4-20).

Looking at distance travelled by mode (Figure 4-21 and 4-22), nearly all commutes of more than 12km distance are made by car (21 out of 23, or 91% to the BNZ centre and 28 out of 29, or 97% before the move). Therefore, the mean value of distance travelled by car is much higher than the mean values for other modes (Table 4.1). This difference is statistically significant both before ($F(4,145)=4.120$, $p=0.003$) and after the move ($F(4,165) =5.966$, $p<0.0005$). Further analysis using the Least Squares Difference test for the BNZ Centre commute journey showed that significant differences (at the 0.05 level) exist between the means for distance travelled by car and each of the other modes in turn, as well as between cycling and walking.

¹⁵ Includes respondents who gave a valid address and excludes those who moved house at the time of the office relocation.

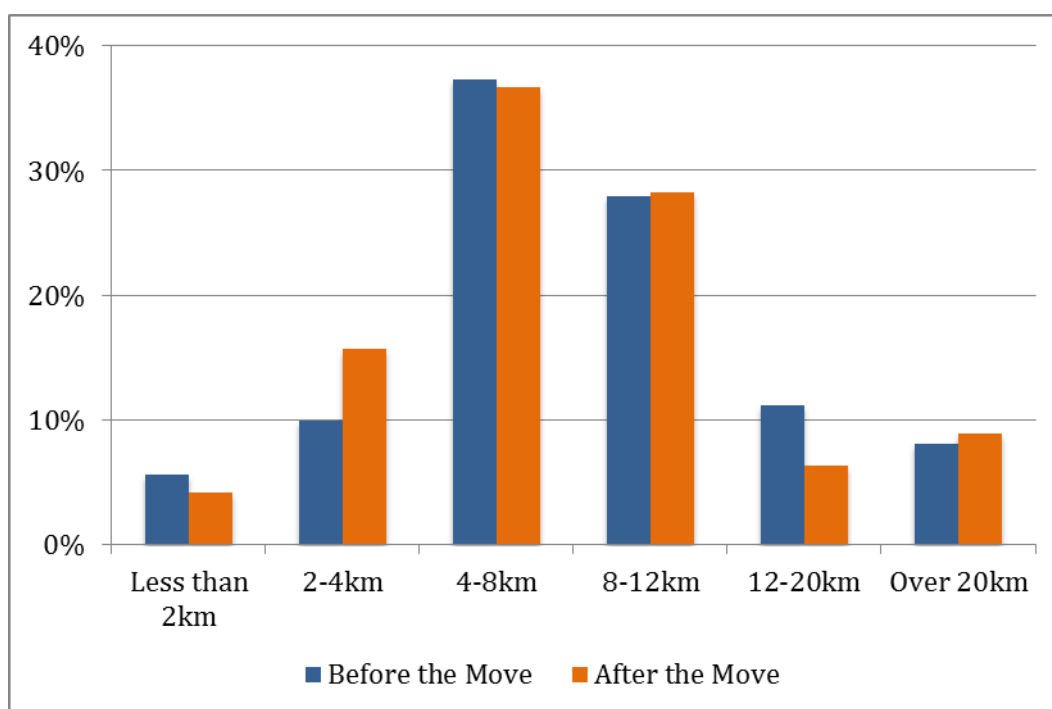


Figure 4-20: Commute distance before and after the move (percentage in category)

Table 4.1: Commute Distance Statistics by Main Mode to Work

	Before the Move				After the Move			
	N	Median (km)	Mean (km)	St Dev (km)	N	Median (km)	Mean (km)	St Dev (km)
Car	105	8.8	11.1	8.8	94	8.1	11.9	10.7
Bus	7	4.8	6.0	2.5	20	8.2	7.1	2.7
Bike	29	6.3	6.8	2.9	41	5.4	6.1	3.4
Walk/Run	7	1.1	2.2	3.3	10	1.9	2.6	2.4
Motorbike/Other	2	6.2	6.2	1.8	5	5.5	5.7	2.9
Total	150	7.8	9.6	7.9	170	7.1	9.2	8.8

To summarise, in this sample respondents who commute long distances (>15km) usually do so by car. Not unexpectedly, walkers tend to walk short distances, although there are one or two outliers here where people sometimes regularly run nearly 10km. This general pattern remains across both commute journeys. After the move average car journeys are longer and there are fewer of them. There are more people travelling by all non-car modes and bus users are travelling slightly further on average.

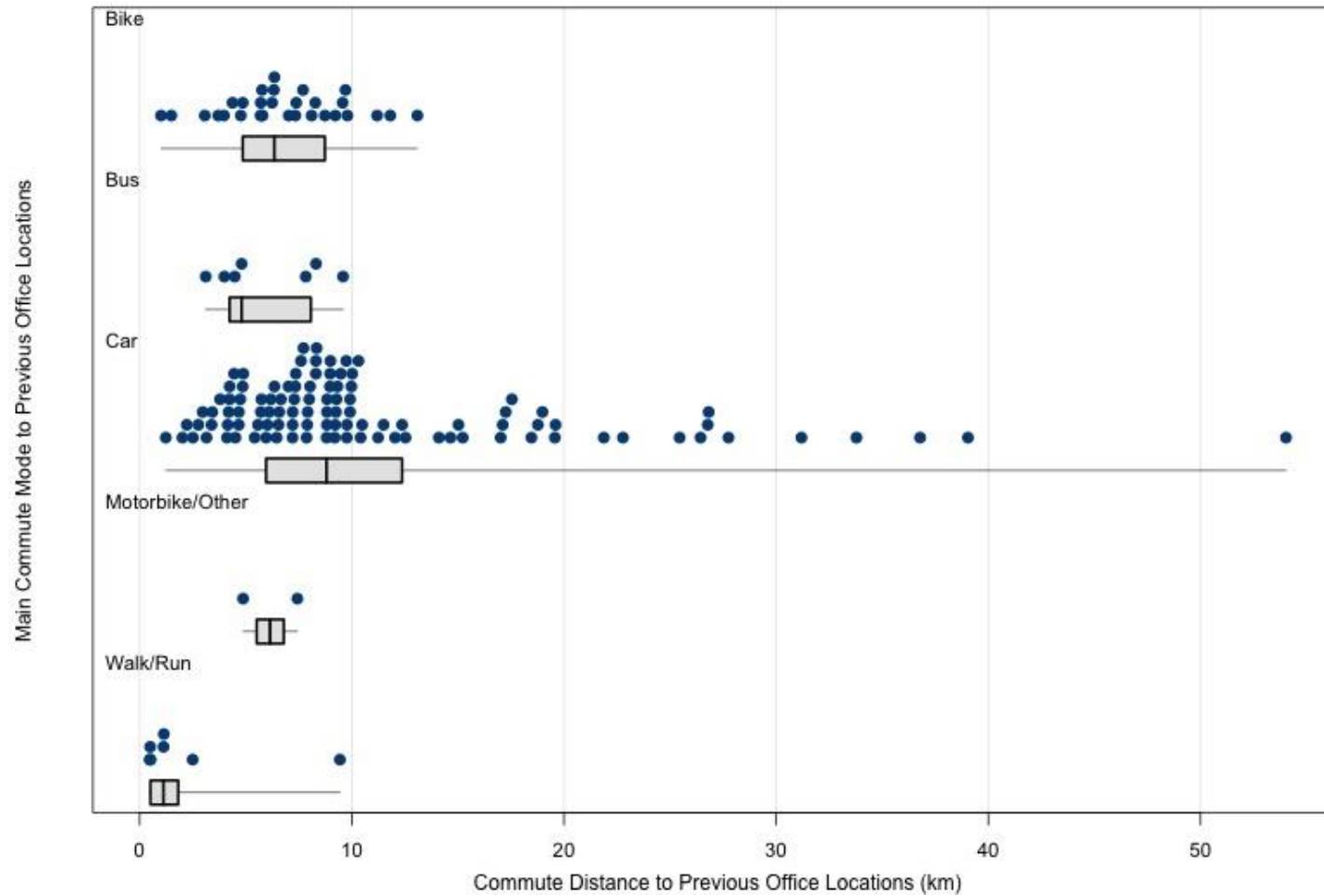


Figure 4-21: Means plot of commute distance to previous office locations by main commute mode

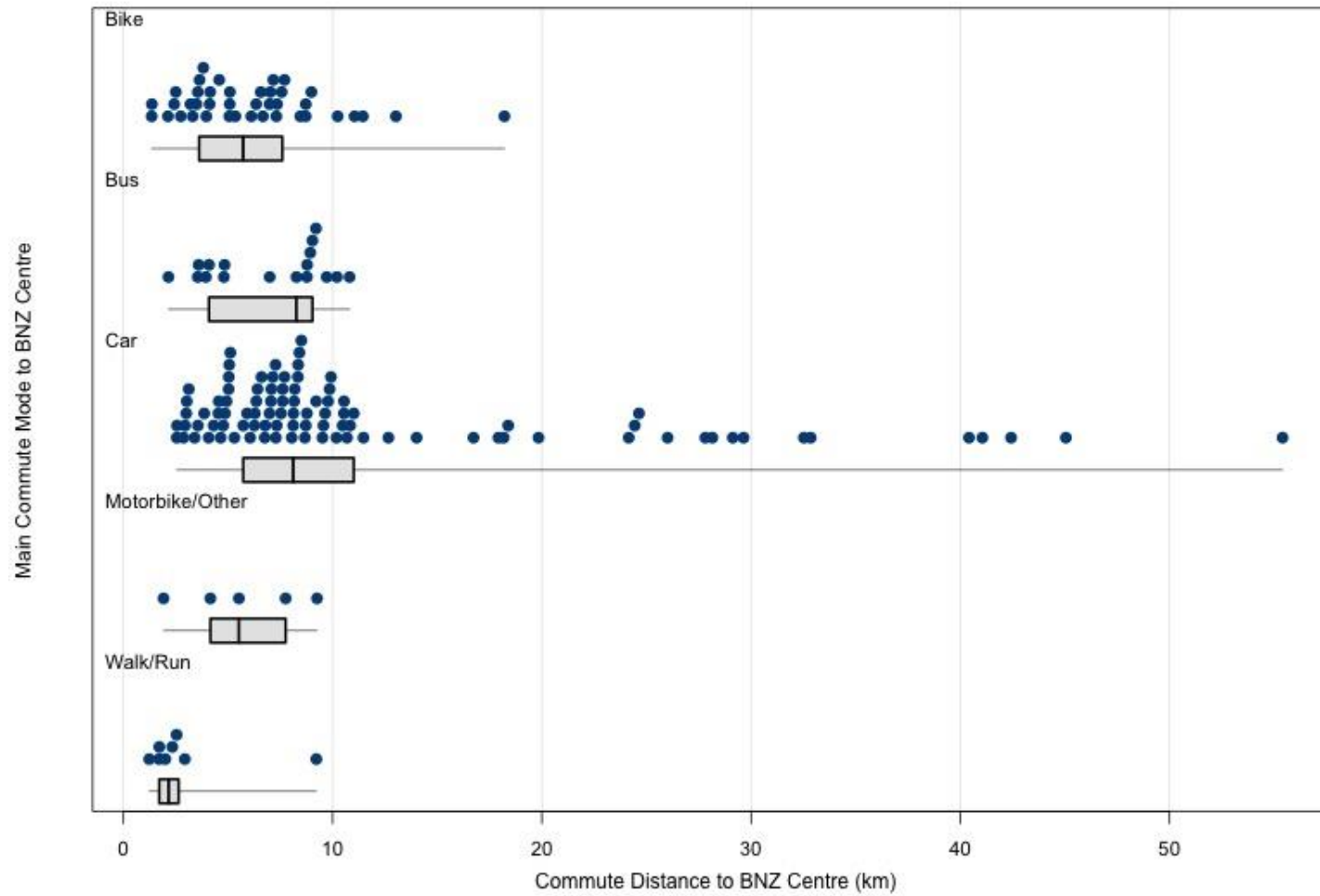


Figure 4-22: Means plot of commute distance to the BNZ Centre by main commute mode

4.3.4. Impact of previous office location

Did the location of pre-move offices have any bearing on changes in commute mode or distance? Survey respondents moved to the BNZ Centre from five previous office locations. For the purposes of this analysis these offices are grouped into two zones by distance from the BNZ Centre (Table 4.2).

Table 4.2: Previous Office Locations - Zone definition

Zone Name	Address and Agency	N (responses)
City (< 7km from BNZ Centre)	<ul style="list-style-type: none"> • Madras St, Statistics NZ • Rehua Marae, Te Puni Kokiri • Magdala Place, Ministry of Pacific Island Affairs 	143
Airport (>10km from BNZ Centre)	<ul style="list-style-type: none"> • Orchard Road, Dpt of Internal Affairs • Russley Road, NZ Transport Agency 	41

Statistical analysis revealed no significant difference between the two zones on measures of gender ($X^2(1)=0.314$, $p=0.376$), age ($X^2(4)=3.316$, $p=0.535$), highest education level ($X^2(2)=1.882$, $p=0.39$), children under the age of 18 ($X^2(1)=2.886$, $p=0.106$), access to a car ($X^2(1)=3.354$, $p=0.127$) or access to a bike ($X^2(1)=0.018$, $p=1.00$). Furthermore, there is no significant difference in commute mode share prior to the move ($X^2(2)=0.748$, $p=0.688$), after the move ($X^2(2)=0.031$, $p=0.985$) or in the proportion of respondents who changed to a more sustainable commute mode after the move ($X^2(1)=0.886$, $p=0.829$).

Employees working at locations in the airport zone did travel significantly further to their previous workplaces than they travel to the BNZ Centre ($t(148)=-2.147$, $p = 0.033$) (Figure 4-23). Employees working in city zone locations however did not significantly change their average commute distance when they moved ($t(161)=-0.731$, $p = 0.466$). Therefore the overall mean commute distance to the BNZ Centre for all employees has dropped largely because some employees no longer have to commute to work locations on the fringe of the city.

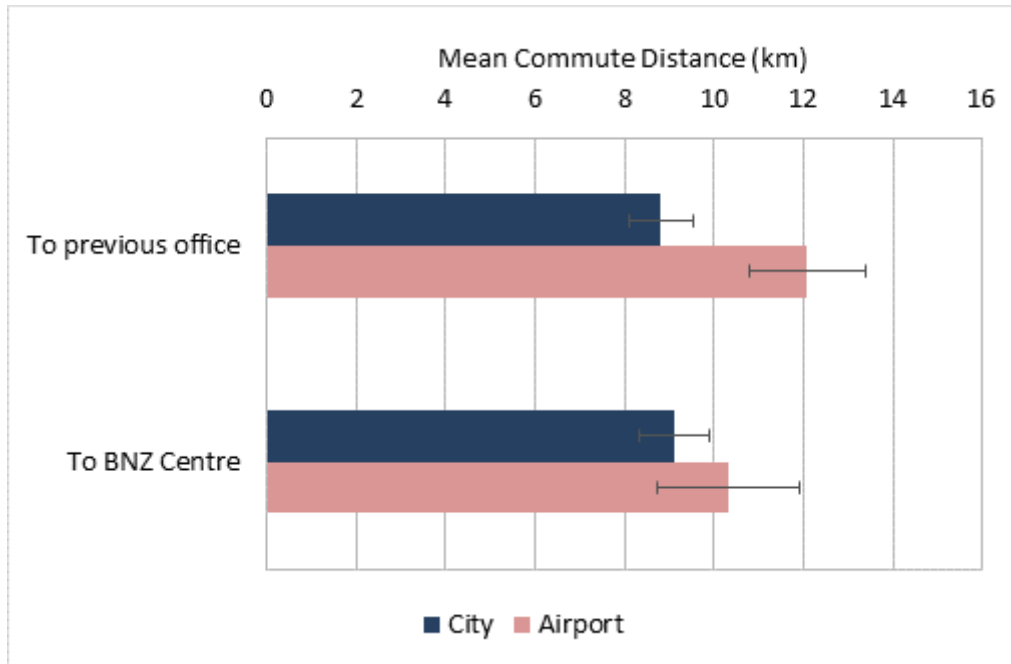


Figure 4-23: Differences in mean commute distance by previous office location (city or airport zone)

4.3.5. Moving House

Survey respondents were asked if they had moved house at the time of the office relocation. Fourteen respondents (7.7% of all those who were employed at the time of the move) reported that they had moved house at that time. Of these 14, eight rated the change of work location as ‘not at all important’ to their decision and only three (1.6%) rated it as ‘important’ or ‘very important’.

4.4. Research Question 2

Previous results on changes in commute mode and average commute distance (section 4.1) are combined with information on CO₂ emission rates to address research question 2, “How have these changes¹⁶ affected the carbon emissions of employees during their daily commute?”.

¹⁶ ‘these changes’ referring to changes in mode and distance

4.4.1. Carbon emissions calculation method

This study calculates emissions similarly to a recently published paper on urban development; combining road network models with data on average CO₂ emissions per commute (Preval, Randal, Chapman, Moores, & Howden-Chapman, 2016).

Emissions have been calculated for journeys made by motorised modes¹⁷, based on commute distances and main commute modes before and after the move, combined with the average number of days people report commuting to their workplace¹⁸. This study focuses on the change in variable emissions associated with the office move rather than total embodied emissions. Therefore, emissions for commutes made by bicycle and walking are assumed to be zero.

The method used is as follows:

1. Determine the average emissions factor for each motorised commute mode (EF)
2. Calculate the matrix totals of EF_(mode) x commute distance_(mode) x number of workdays per annum.

The approach is set out in Equations 1 & 2. Refer to Appendix E for a table of definitions and references.

Equation 1

$$TD_{jk} = \sum_{i=1}^N CD_{jki} \times D_{ji}$$

Equation 2

$$E_k = \sum_{j=1}^4 TD_{jk} \times EF_k$$

¹⁷ Cars assumed to be conventionally powered. Electric vehicle ownership rates were only 0.33 per 1000 population based on 2016 Christchurch registrations (MOT, 2016). Also motorcycle journeys are excluded based on low numbers (less than 3 respondents for each commute journey).

¹⁸ Commute Days per week = Employed days per week – Average number of days spent working from home; is assumed to remain constant over the time-frame of the move

where journey type $j=1$ to 4

and mode $k = 1, 2$

1. To work before the move
2. From work before the move
3. To work after the move
4. From work after the move

1. car
2. bus

4.4.2. Carbon emissions results

For this sample of 150 commuters, the total emissions for all car and bus journeys to and from work dropped from 65.2 tonnes CO₂ per annum before the move, to 54.8 tonnes CO₂ per annum afterwards based on reported main commute modes and estimated commute distances; a drop of 10.4 tonnes CO₂ per annum or 16% (Figure 4-24). This significant change in emissions rates is due to the combined effects of a drop in the average distance travelled and the increase in numbers of cyclists and bus users. While it is possible that this is a slight overestimate of the change (due to the exclusion of a few motorbike journeys); extrapolating this to the total number of commuters participating in the move gives an estimated drop in emissions per annum of approximately 26.4 tonnes CO₂. Refer to Appendix F for calculation details.

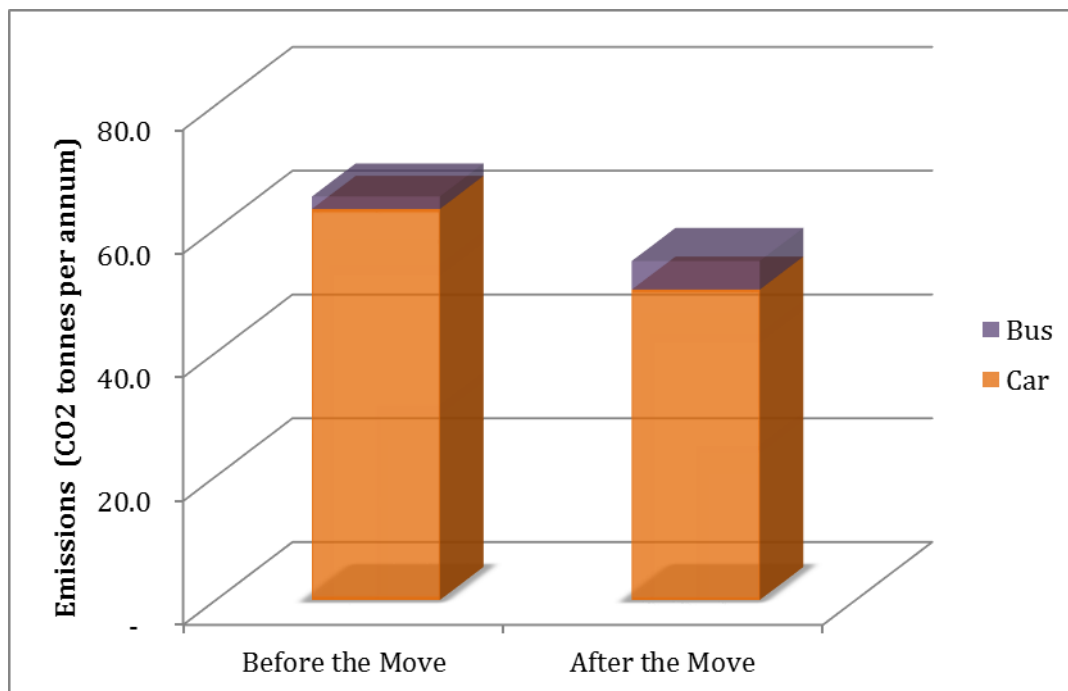


Figure 4-24: Carbon emissions for sampled commuter journeys; before and after the office relocation

4.5. Research Question 3

Research question 3 asks “Are those employees who have stronger positive attitudes towards the environment more likely to change their commuting mode during an office relocation?” This question is addressed using results from the staff travel survey.

4.5.1. Environmental Attitude and Travel Mode

Comparing NEP scores grouped by changes in commute mode it does appear that respondents who have moved to a more sustainable commute mode may have a slightly higher NEP score than those who have not changed or changed to less sustainable modes (Figure 4-25). However this difference is not statistically significant at the 0.05 level ($F(2,176)=1.429$, $p=0.242$).

Differences in NEP score by main commute mode before the move show no statistically significant difference ($F(4,168)=0.651$, $p=0.627$), in contrast to after the move ($F(4,175)=2.451$, $p=0.048$). The post-hoc tests show that cyclists after the move have a slightly more positive attitude to the environment than car drivers (Figure 4-26). It is not possible to comment on cause and effect so this small difference could be interpreted in various ways. It may indicate that respondents who started cycling after the move held slightly more positive attitudes towards the environment. However, it may also indicate that respondents who started cycling after the move were more inclined to answer the survey in a pro-environmentally friendly way because they were no longer driving. Overall, there is insufficient evidence from the sample in this case study to answer the research question conclusively.

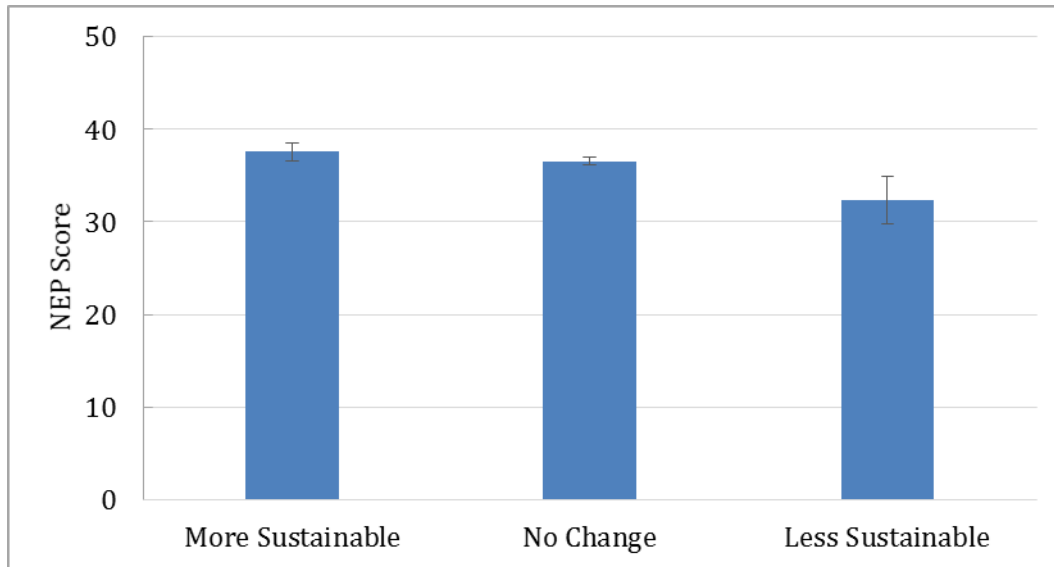


Figure 4-25: NEP score for those who have changed commute modes¹⁹

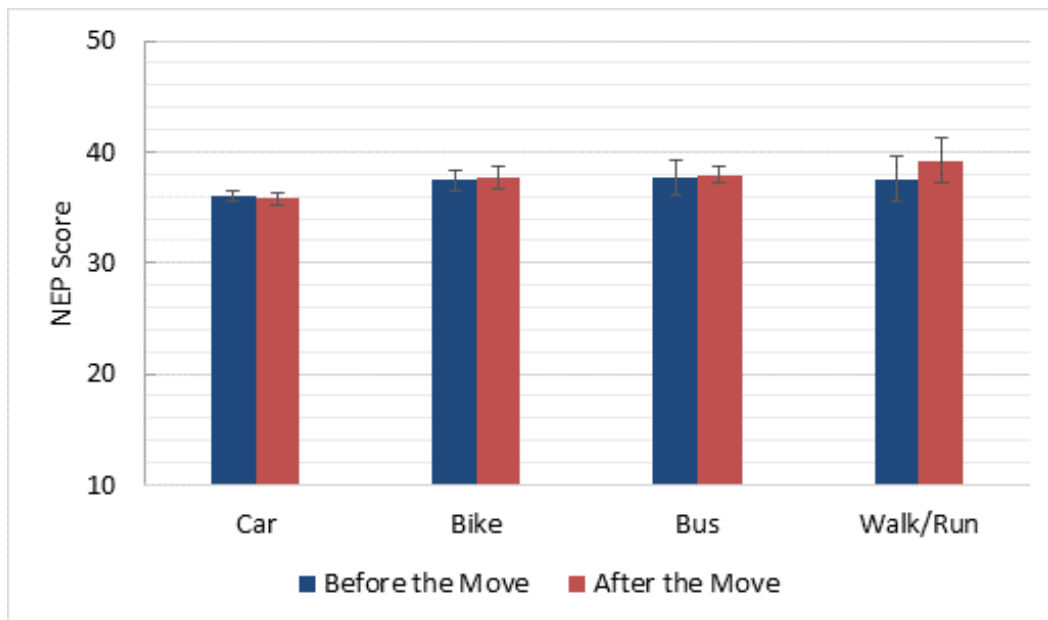


Figure 4-26: NEP score by main commute mode before and after the move

4.6. Research Question 4

Research question 4 is one of the central questions of this study, asking “What encouraging or discouraging factors lie behind any change to more sustainable

¹⁹ More Sustainable = Car to Bus (12), Car to Active (12) and Bus to Active (2), n=26.

Less Sustainable = Active to Car (2) and Active to Bus (1), n=3.

No Change includes those who swapped from Car to Motorcycle or swapped car categories, n=154.

commuting modes?” This section addresses that question via multiple data sources. Firstly, the impact on travel mode of changes in commute distance and time is analysed. Then, multinomial logistic regression is used to model main commute mode to identify some of the main factors behind observed changes. Further quantitative data from the staff survey on commute reasons sheds light on employees’ self-reported reasons for their travel mode choice. Finally qualitative data broadens the focus, by reflecting on themes that emerged from discussion of travel mode choices in the focus groups.

4.6.1. Travel mode choice and commute time

Commute time is based on survey data asking respondents to provide a self-reported estimate of their commute time for both commutes (Figure 4-27). The distribution of reported commute times has a slightly different shape for the journey to work before the move, compared to after (Figure 4-27). A number of the shorter commutes have disappeared and there are substantially more commutes that take between 15 and 30 minutes. Overall, commute times are significantly lower on average before the move than after ($Z=-2.101$, $p=0.036$), however the effect size is small ($r=0.11$)²⁰.

There was no significant difference in average commute times before and after the move for respondents who changed to a more sustainable mode, a less sustainable mode or did not change mode based on the results of paired sample t-tests.

The relationship between a change in **direction** of commute time and commute mode was investigated with results shown in Table 4.3. The Pearson Chi-Squared test is significant for this cross-tabulation at a 0.05 level ($X^2(4)=9.476$, $p=0.05$), indicating that those who changed to a more sustainable main commute mode are more likely to have an increased commute time after the move rather than decreased. Intuitively this makes sense, as commuting by bus, bicycle or walking is usually slower than driving.

²⁰ Wilcoxon Signed Rank Test; does not assume normality.

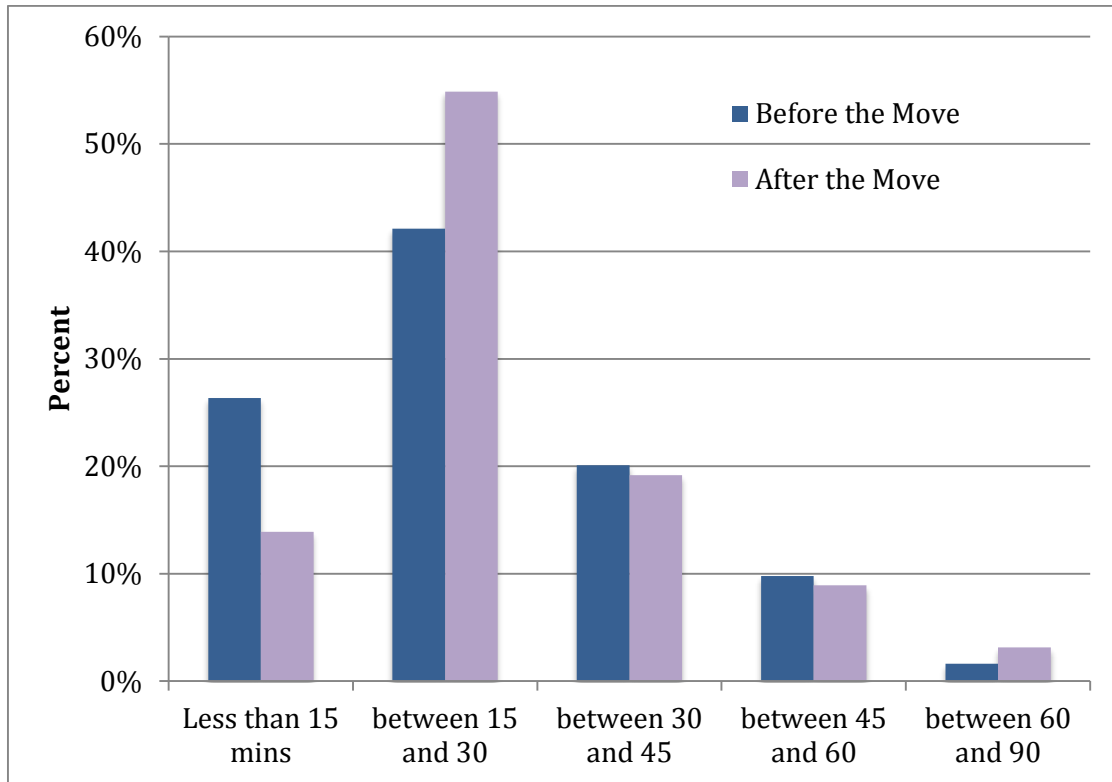


Figure 4-27: Commute times before and after the move

Table 4.3: Commute Time changes by whether main mode changed in a more or less sustainable direction

		Sustainable Mode Change			Total
		No Change (n=154)	More Sustainable (n=26)	Less Sustainable (n=3)	
Increased Commute Time	No Change	84	6	1	91
	Increase	46	14	1	61
	Decrease	24	6	0	30
	Total	154	26	2	182

Commute Time by Main Mode

Breaking down commute time by main commute mode creates different patterns for each mode, particularly car and bus (Figure 4-28 and Figure 4-29). The shorter car journeys have largely disappeared in favour of more medium length (15-30 minute) car journeys and journeys by bus or by active modes (Figure 4-29 and Figure 4-30).

Analysing these patterns reveals the following significant differences. Before the move, commutes by bus take significantly longer on average than commutes by all other modes (Welch statistic (2)=15.893, $p \leq 0.000$, bus $m=3.63$ ($n=8, sd=0.744$), car users $m=2.06$ ($n=134, sd=0.948$), active $m=2.08$ ($n=40, sd=0.859$)). Note that the number of bus commuters prior to the move is small. After the move, active commuters report significantly shorter average commute times than commutes by either bus or car (Significant Welch statistic (2)=3.733, $p=0.03$, active $m=2.04$ ($n=53, sd=0.678$), bus $m=2.45$ ($n=22, sd=0.912$), car users ($n=111, m=2.36, sd=0.980$)).

In short, while the average active commute journey times have remained the same, the average commute journey by car takes longer after the relocation and average commutes by bus have significantly shortened. Bus commuters travelling to work after the move are likely to have a shorter commute than people catching the bus to their previous workplaces, and car users are much less likely to have a short commute post-move (less than 15 minutes).

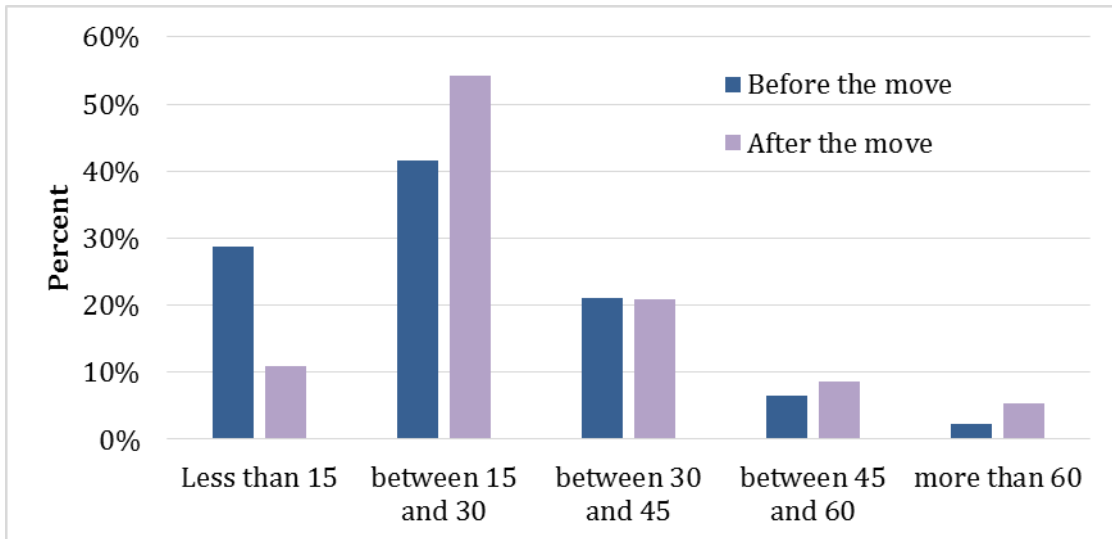


Figure 4-28: Commute time categories - car

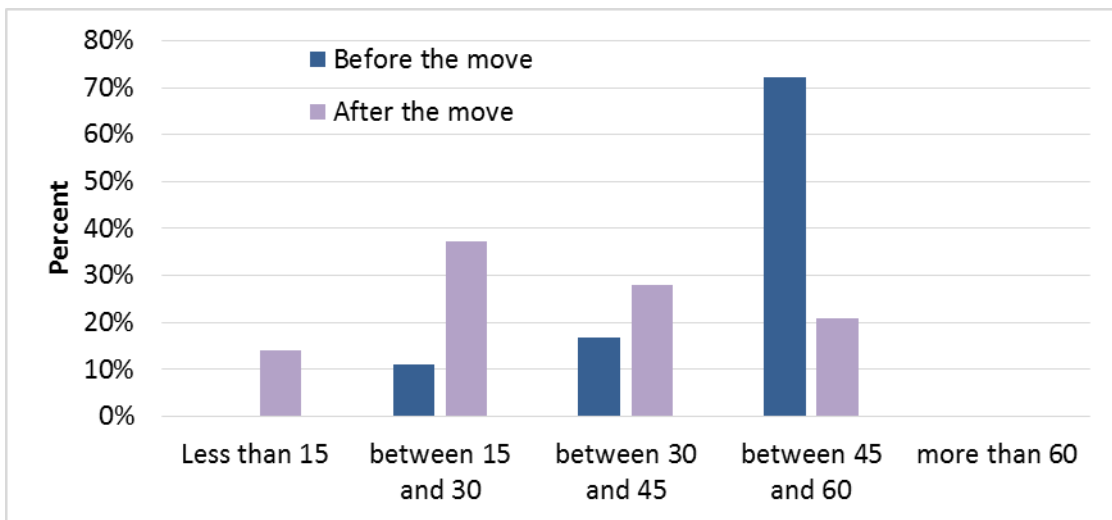


Figure 4-29: Commute time categories - bus

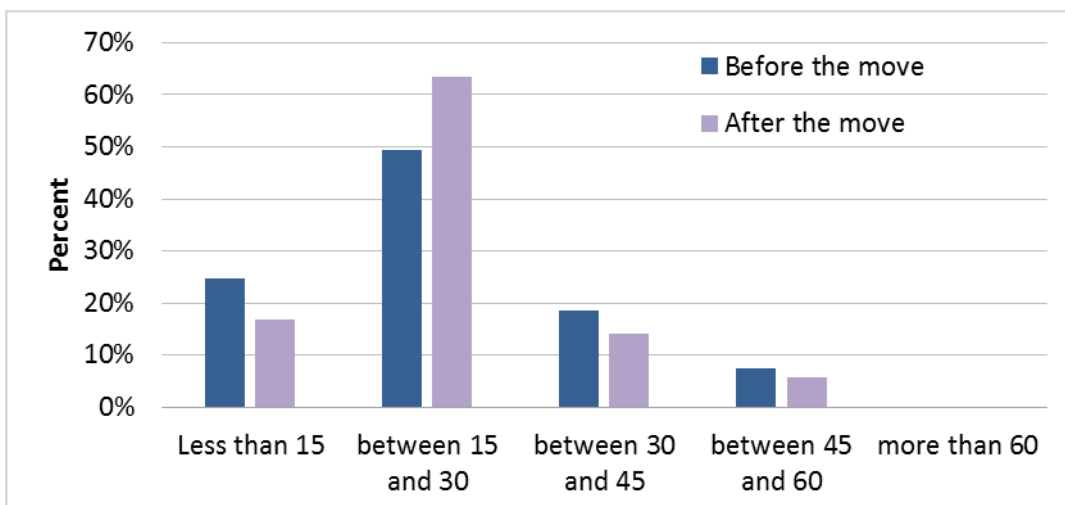


Figure 4-30: Commute mode categories - active modes (walking and cycling)

4.6.2. Travel mode choice and commute distance

This section investigates the relationship between changes in main commute mode and changes in commute distance. The average commuting distance before the move was 9.6km. After the move it appears that changing to a more sustainable commute mode is associated with a shorter commute, while changing from active travel to driving is associated with a longer commute (Figure 4-31). However, given the wide variance in commute distance, and the small numbers who changed main mode, these differences are not statistically significant ($F(2,146)=0.349$, $p=0.706$).

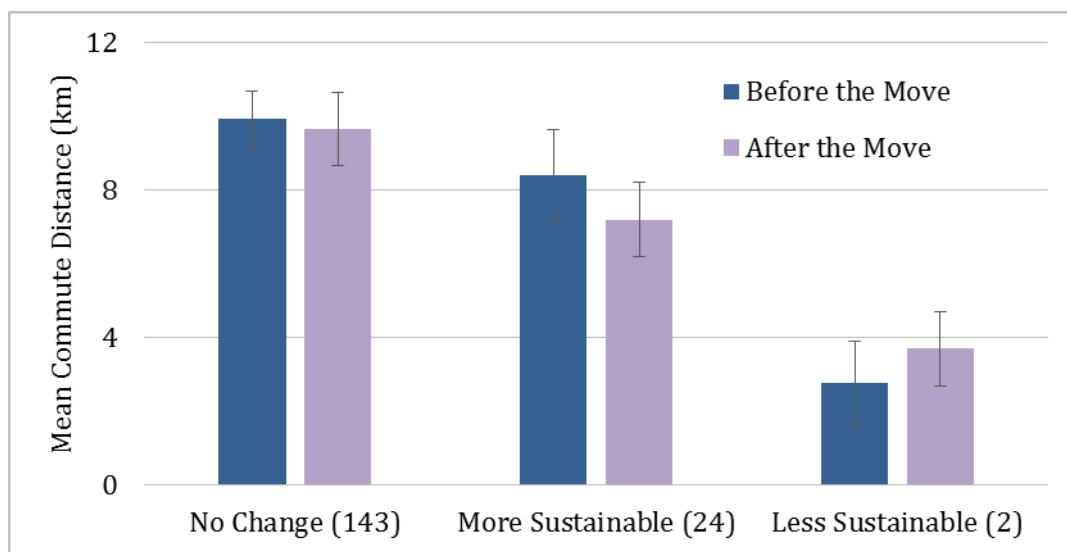


Figure 4-31: Mean commute distance by change in main commute mode

To analyse whether an increase or decrease in commute distance impacted on changes in commute mode, a comparison was done between the direction of change in commute distance and the direction of change of commute mode (Table 4.4). A Chi-square test was not statistically significant ($X^2(2)=2.115$, $p=0.347$), so there is not enough evidence from this sample to draw any conclusions.

Table 4.4: Commute Distance increase or decrease by sustainability of change in main commute mode

		Sustainable Change Flag			Total
		No Change (n=154)	More Sustainable (n=26)	Less Sustainable (n=3)	
Increase Commute Distance Flag	Increase	61	10	2	73
	Decrease	65	11	0	76
Total		126	21	2	149

4.6.3. Conceptual Model – Factors underlying travel mode choice

This study developed two multinomial logistic regression models for application across the two sets of commuting data, before and after the move respectively, to test the associations of commute mode choice with commute time, distance, attitude to the environment and socio-demographic factors. The aim was to see how well the model classifications match the observed main commute mode for these two journeys and to determine significant factors to classify main commute mode²¹. A second set of model runs compared those who changed their main commute to a more sustainable mode to those who did not using similar parameters. SPSS software was used for all analysis.

Conceptual Model Description and Development

The following model was developed to test the hypothesis that changing structural factors, or the changing context of the commute, are more significant to commute mode choice than individual attitudes (Figure 4-32).

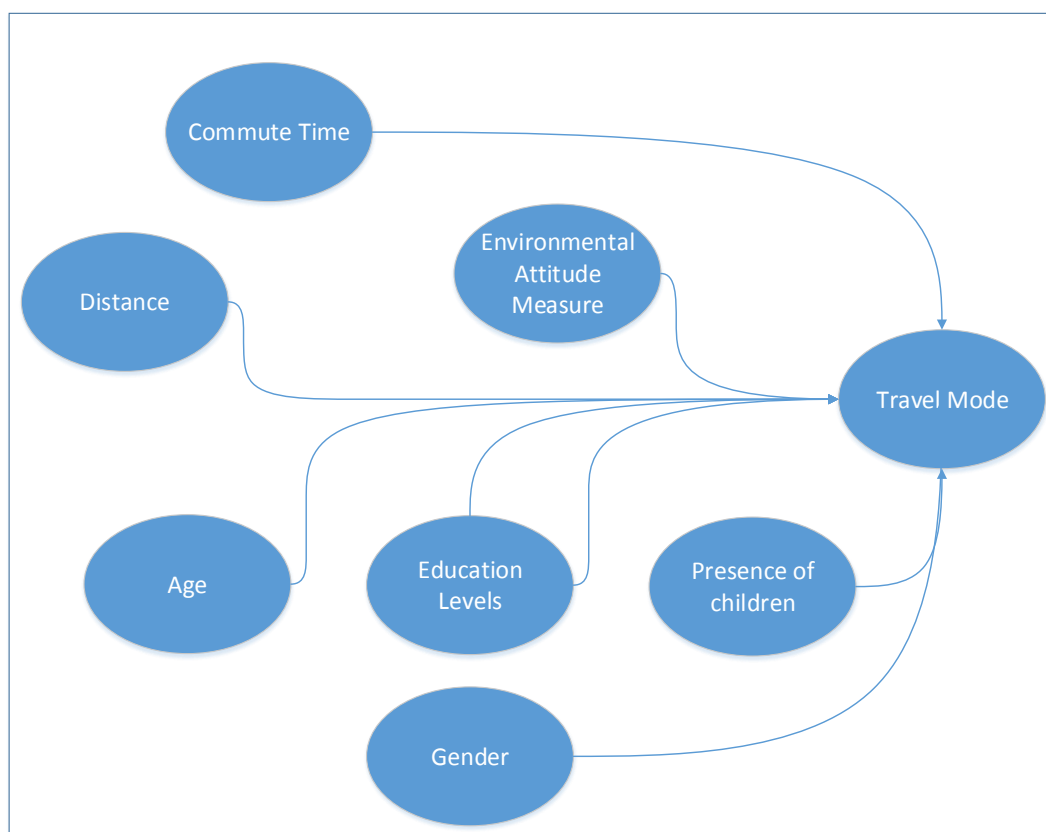


Figure 4-32: Conceptual model - Travel mode

²¹ Main Commute Mode categorised into three groups; car, bus or active (cycling/walking).

The model uses a mix of socio-demographic variables known to impact travel mode choice alongside commute characteristics that have changed as a result of the office relocation and a measure of environmental attitudes (Table 4.5). By comparing the results for the two different commute journeys, before and after the move, this model aims to uncover common associations with commute mode and highlight any differences. In so doing this section aims to shed light on the underlying factors important to mode choice at a time of change.

The structural factors measuring changes to the commute context include a self-reported measure of commute time and the commute distance in kilometres. Attitudes to the environment are measured using the NEP (refer section 4.5.1). Socio-demographic variables were chosen based on those that have been shown to be significant in previous studies of travel mode choice as described in Chapter 2.8, with the exception of income (not collected) and employment status. Employment status (part-time vs full-time) was considered for inclusion based on the literature. However in the present study, employment status was highly correlated with gender, the presence of children under 18 in the household ($r=0.29$ in both cases) and the interaction between the two; as the majority of part-time employees are female with children under 18 (65%). Consequently employment status was not included in the final model.

Table 4.5: Factors in travel mode choice: Variables used in the models

Variables		Categories	Type	Model
Socio-demographic	Gender	<ul style="list-style-type: none"> Male Not Male²² 	Binary	Independent Variable
	Age (yrs)		Continuous	Covariate
	Education	<ul style="list-style-type: none"> Secondary Undergraduate²³ Postgraduate 	Categorical	Independent Variable
	Children Under 18 in Household	<ul style="list-style-type: none"> No Yes 	Binary	Independent Variable
Commute	Commute Distance (km)		Continuous	Independent Variable
	Commute Time (minutes)	<ul style="list-style-type: none"> Less than 15 Between 15 and 30 Between 30 and 45 More than 45 	Categorical	Independent Variable
	Main Commute Mode ²⁴	<ul style="list-style-type: none"> Car Active Bus 	Categorical	Dependent Variable
Environmental Attitude	NEP score		Continuous	Independent Variable

4.6.4. Model Results

The first model run included socio-demographic variables and NEP score only for both commute journeys; before and after the move to the BNZ Centre. The second run included all variables as listed in Table 4.5.

Simply controlling for socio-demographic variables in both cases provided a statistically significant model that correctly explained approximately 60% to 70% of main commute mode choices depending on the journey, although explanatory power may be low based on pseudo-R-square values (Table 4.6). The classification accuracy of the model using socio-demographic variables alone was greater than the proportional by chance accuracy criterion (one third) both before (58.4%) and after the move (44.8%); therefore

²² 'Not Male' includes both Female and Gender Diverse

²³ Includes other non-postgraduate tertiary education

²⁴ Excludes 'Motorbike/Other'

it is somewhat useful in categorising main mode. However, it gains most of its predictive power by categorising the majority of responses into the largest category; namely car users.

Table 4.6: Travel Mode Model statistics - controlling for socio-demographic variables only

	<i>N</i>	Model Fit – Chi Square (df)	Pseudo R ² (Cox & Snell, Nagelkerke)	Percentage Classified Correctly – Overall	Percentage Classified Correctly by Mode
<i>Before the Move</i>	177	20.43(10)*	0.109, 0.144	72.9%	Car – 100% Active – 0% Bus – 0%
<i>After the Move</i>	181	41.62(10)** *	0.205, 0.243	63.0%	Car – 90% Active – 30% Bus – 14%

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Adding explanatory variables for commute time, distance and environmental attitude (NEP score) increased the model fit, improved the rate of correct classifications by approximately 10% and improved individual classifications (Table 4.7). Once again, the model shows an improvement in classification accuracy over the proportional by chance accuracy (55.0% before the move and 41.0% after the move). Note that adding these explanatory variables reduced the number of valid cases due to invalid addresses.

Table 4.7: Travel Mode Model statistics - controlling for all model variables

	<i>N</i>	Model Fit – Chi Square (df)	Pseudo R ² (Cox & Snell, Nagelkerke)	Percentage Classified Correctly – Overall	Percentage Classified Correctly by Mode
<i>Before the Move</i>	140	110.87(20)** *	0.547, 0.723	83.6%	Car – 91% Active – 60% Bus – 100%
<i>After the Move</i>	154	86.83(20)***	0.431, 0.510	70.1%	Car – 82% Active – 63% Bus – 33%

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Model parameter estimates and likelihood ratios can be found in Appendix G. All models use commute mode ‘Car’ as the reference group. Both before and after the move, commute distance, NEP score, gender and commute time are all significant

factors for active commuters, all other things being equal. Before the move compared to car users, the odds of active commuters being male are almost 7 times higher than not being male (Odds ratio = 6.96, 95% CI between 2.0 and 24.3). As for commute distance, a 1km increase in commute distance decreases the odds of a commuter being an active commuter by approximately 0.41 (Odds ratio =0.41, 95% CI between 0.27 and 0.61). Put another way, for every 1km *decrease* in commute distance the odds of a person commuting actively increases by a factor of approximately 2.5 (95% CI between 1.7 and 3.7) compared to commuting by car. There is a slightly increased chance that, all other things being equal, individuals with a slightly higher NEP score are more likely to be active commuters, but the odds ratio is only slightly larger than 1 (Odds ratio=1.13, 95% CI between 1.01 and 1.13) indicating that the effect is very small; i.e. if the NEP increased by 1 unit, then the odds of a commuter being an active commuter rather than a car user only increase by between 1% and 13%.

After the move and compared to car users, active commuters are similarly much more likely to be male (Odds ratio=6.7, 95% CI between 2.5 and 17.9) and commute shorter distances than car users (Odds ratio=0.06, 95% CI between 0.013 and 0.27). This can be interpreted to mean that if the commute distance decreases by 1km, then the odds of being an active commuter rather than a car commuter increase by $1/0.06=16.7$ times (95% CI between 3.7 and 76.6). Once again, there is a slightly increased chance that active commuters are more likely to have a more positive attitude to the environment than car users, but the effect is very small. The shortest commute category is still significant after the move, indicating that the odds of being an active commuter increase if the commute time is less than 15 minutes.

Before the move, the model parameters for bus use are uncertain due to the small group size. After the move more people are catching the bus to work. Compared to car users, significant factors associated with bus use after the move include highest education level, the presence of children aged under 18 in the household, commute time, commute distance and NEP score. Gender is not significantly different for bus users from car users. The most significant factor is highest education level; bus users are up to 7 times

more likely to be undergraduates²⁵ than postgraduates compared to car users ((Exp(B)=6.8, 95% CI between 1.3 and 36.2) and nearly 8 times more likely to have no children under the age of 18 in the household (Odds ratio=7.9, 95% CI between 1.3 and 49.5). It should be noted however, that the confidence intervals in both cases are wide, and group sizes small.

A second set of models was used to directly investigate the influence of changes in commute time or distance on changing to a more sustainable mode. In this instance the dependent variable was dichotomous with values:

1. More sustainable (26 responses)²⁶
2. No change or less sustainable (157 responses)²⁷

A series of binary logistic regressions were run using socio-demographic data and the NEP score as per Table 4.5 but varying the measures of commute time and commute distance. Most model runs did not reach significance at the 5% level indicating that they were not a good fit for the data, including a model run solely with socio-demographic data and NEP score. This is probably due to the small sample size of respondents changing to a more sustainable mode (only 26 cases).

The only model that reached significance included socio-demographic variables, the NEP score and the direction of commute time change. Distance was not included in this model. In this case, an increase in commute time was significantly associated with changing to a more sustainable main commute mode ($X^2(8)=18.727, p=0.016$); however the variance explained was small, between 10.5% (Cox and Snell R^2) and 19.2% (Nagelkerke R^2). Furthermore, this model correctly categorised 99% of responses into the 'No change or less sustainable' group, but only 9% of the 'More sustainable' group. The strongest factor associated with changing to a more sustainable commute mode was that commute time increased after the move; odds ratio of 7.9 (95% C.I. between 2.3 and 27). The second strongest factor was that their commute time had decreased; odds

²⁵ Or have a different tertiary level qualification, e.g. technical qualification.

²⁶ Includes those who changed from Car to Bus (12), Car to Active (12) and Bus to Active (2).

²⁷ Includes those who still commute by car or motorcycle and those who changed from Active to Car (2) and Active to Bus(1), excludes 'unknown'.

ratio of 5.5 (95% C.I. between 1.3 and 23.4). Both results were compared to their commute time staying the same.

This result confirms the relationship between self-reported commute time and a more sustainable commute mode as indicated in section 4.6.1; namely that an increase in commute time is associated with changing to a more sustainable commute mode after the move. Concurrently a decreased commute time is also associated with changing to a more sustainable commute mode. Both results are compared to commute time staying the same. The former result makes sense due to the fact that active journeys or bus trips often take longer than those by car assuming distance travelled is similar. The latter result is slightly less predictable, but could be related to shorter commute distances. Alternatively this may occur when taking the bus or cycling is actually quicker than their previous commute mode due to traffic congestion or parking. Model runs tested the former hypothesis by including a measure of commute distance or commute distance change but results were not significantly different from a null hypothesis.

4.6.5. Commute Reasons – Staff Survey

This study used multiple methods to capture people's individual perspectives on the factors behind their travel mode choices, including asking them to rate their reasons for commuting the way they do. The same choices were offered to respondents twice, once for their commute to the BNZ Centre and once for their prior commute to their old office location (if applicable). Responses were measured on a five-point Likert scale, where 1=Strongly Disagree and 5=Strongly Agree.

Average ratings for the different commute reasons look quite consistent for both commutes (Figure 4-33). There tends to be strong agreement that respondents commute the way they do because it's convenient, quick, reliable and is the best way to cover the distance. Respondents tend to disagree that they commute that way for environmental reasons or to maintain health and fitness. However paired sample t-tests for individual commute reasons highlight some significant differences. On average respondents rated their commute before the move significantly differently to their commute afterwards for reasons relating to time, the environment, weather, having access to a car, safety, habit and parking (Figure 4-33, highlighted in purple, refer Appendix H for statistics). For

example, respondents are significantly less likely to agree after the move that their commute is their quickest option or that they commute that way due to parking availability.

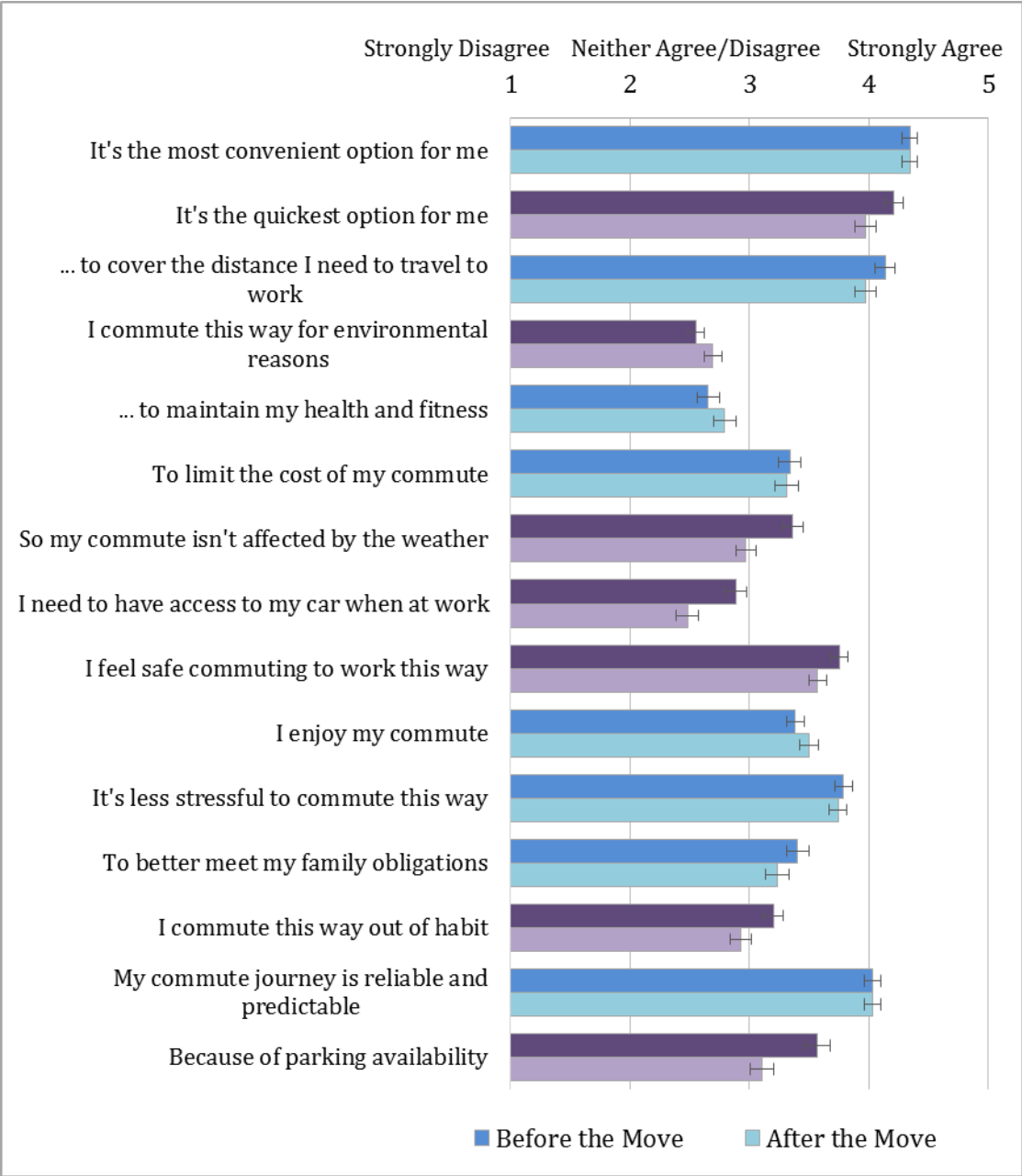


Figure 4-33: Commute reasons average ratings: before and after the move²⁸

²⁸ Reasons with significant differences in mean using paired sample t-tests at 0.05 level highlighted in purple.

Large numbers of car commuters (72% car before the move, 58% afterwards) tend to dominate the overall results. Grouping reasons by main commute mode shows significant differences between car users, cyclists, walkers and bus users.

To understand these differences Figure 4-34 and Figure 4-35 show the statistically significant differences (ANOVA asymptotic, Welch's test, significant at 0.05 level) in average ratings by main commute mode for the journey to work both before and after the move²⁹. Average ratings by main mode are shown for groups with a significant post-hoc difference from other modes and separated by colour. Modes with averages where significant differences cannot be determined are shown in light grey. For example, for the reason 'it's the most convenient option for me' there is a significant difference between the average ratings for car and bus and car and bike, but not bike and bus, so bike and bus are shown using the same colour. The overall average rating is shown instead when ratings are not significantly different by mode (e.g. "its less stressful to commute this way") (Figure 4-34).

Note that it is not possible to directly compare means for each commute reason broken down by main mode using t-tests because the respondents in each group may overlap. Groups are not independent because many respondents have not changed their main commute mode so have provided responses for both journeys. At the same time some respondents have changed their commute mode so have provided reasons for only one journey; thereby making paired-sample t-tests also inappropriate.

²⁹ Both charts group by main mode to work, excluding the group 'Motorbike/Other' due to low numbers.

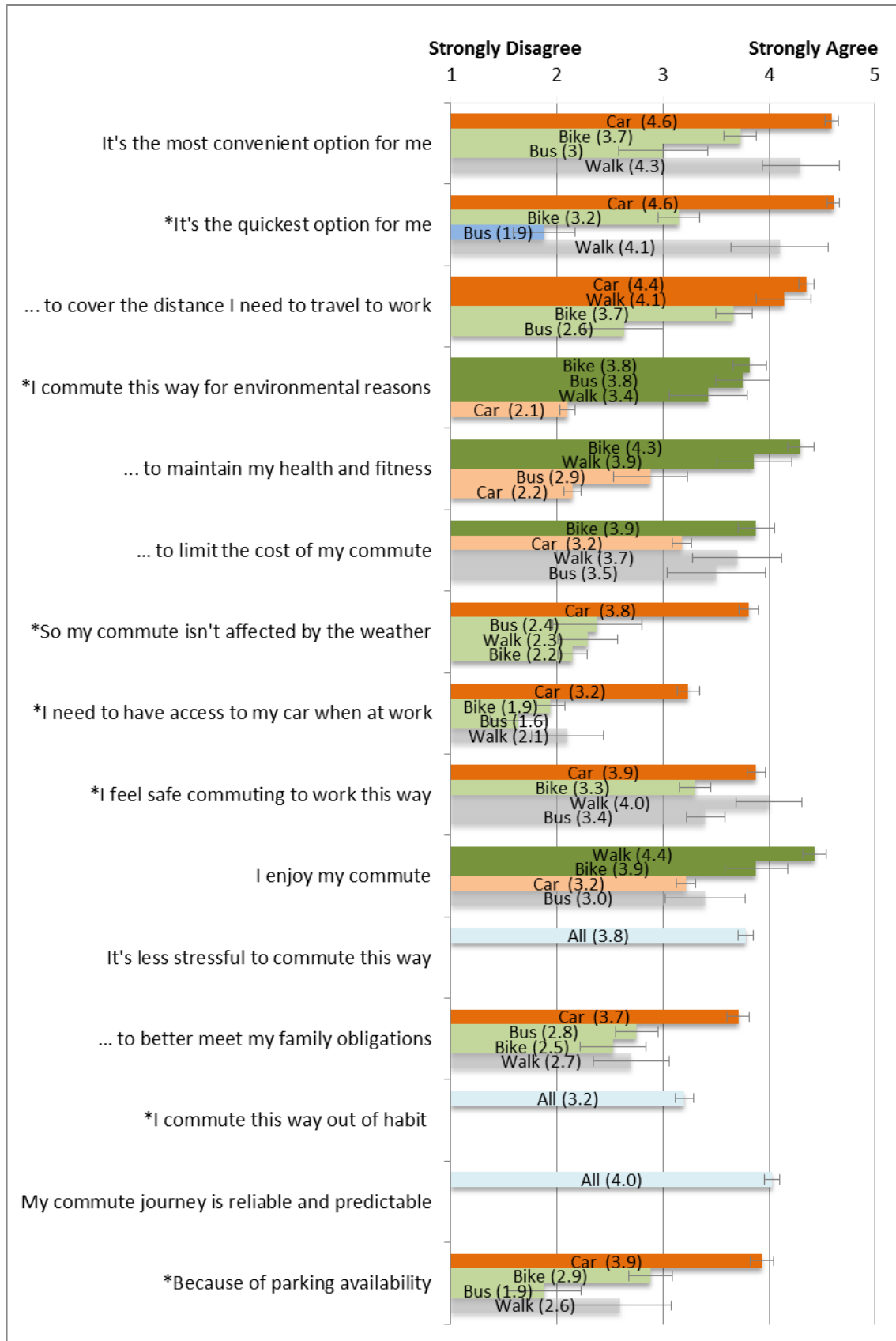


Figure 4-34: Commute reasons average ratings by main commute mode: before the move

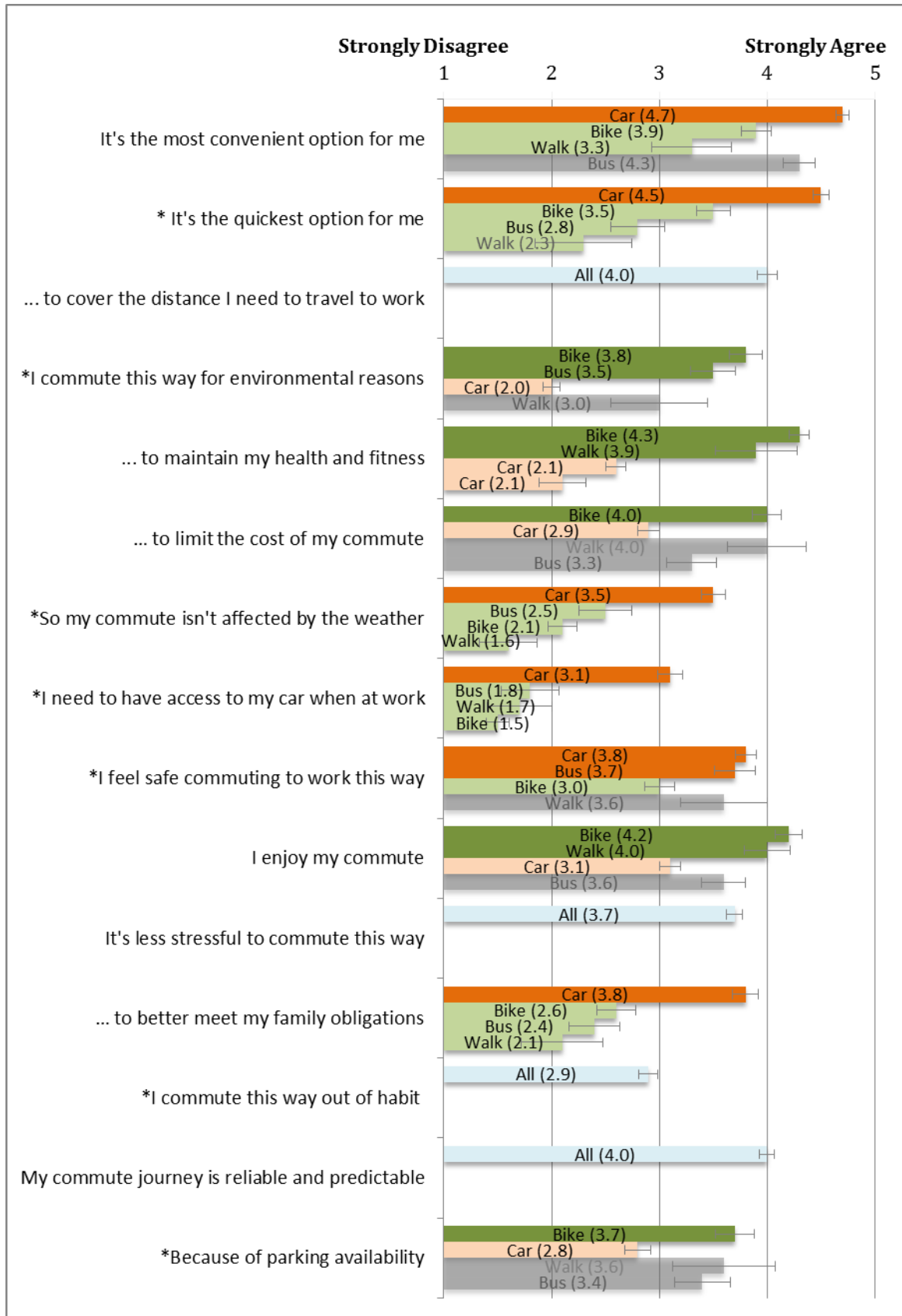


Figure 4-35: Commute reasons average ratings by main commute mode: after the move

Of the four commute reasons which do not differ significantly by main mode, only 'habit' has a significant difference in average rating value across the two commute journeys. After the move, respondents are far less likely to agree that they commute the way they do out of habit.

Car commuters for both commutes most strongly agree that they drive because it is convenient and quick. They also tend to agree that they commute that way so their commute isn't affected by the weather, they feel safe and they can better meet their family obligations. As a group, they are fairly neutral on whether they commute by car because they need access to their car at work ($M=3.2$ before and $M=3.1$ after the move, where 3 = neither agree nor disagree). Car commuters are far more likely than other groups to disagree that they commute by car for environmental reasons or to maintain their health and fitness, and this is consistently true before and after the move.

Cyclists as a group are most likely to strongly agree that they commute by bike to maintain their health and fitness, and for environmental reasons. Cyclists are also cost conscious, strongly agreeing that they commute by bike to limit the cost of their commute; in contrast to car commuters. They also enjoy their commute, along with walkers, significantly more than car commuters.

The smaller group sizes of walkers and bus users limit the power of statistical tests to distinguish significant differences. However the differences that did emerge are instructive. Walkers are often grouped with cyclists, and do also tend to more strongly agree that they commute the way they do for environmental reasons, to maintain health and fitness and that they enjoy their commute, in contrast to car commuters. Before the move, walkers appear alongside car commuters as one of the groups more likely to agree that their commute is the best way to cover the distance to work.

Bus users are much less likely than car commuters to agree that their commute is quick or convenient. In fact, before the move, they are significantly more likely to strongly disagree. Bus users are more likely than car users to disagree that they commute this way to avoid the effects of the weather, because they need to have access to a car when at work or to better meet their family obligations. However, there is no significant

difference between bus users and car commuters when it comes to health and fitness, or safety after the move.

The main difference in rating commute reasons across the two commute journeys relates to parking availability. Before the move car commuters are significantly more likely to agree that they commute the way they do because of parking availability than both cyclists and bus users (who are more likely to disagree with the statement). After the move, the direction of this relationship reverses. The only significant difference remaining is between cyclists and car commuters. Car commuters are now slightly more likely to disagree with this statement while cyclists tend to agree. This reflects the fact that free parking is less available, or less convenient to access in the CBD after the move.

4.6.6. Relationships between Commute Reasons

Table 4.8 and 4.9 show the correlations between commute reasons given in the survey for commute journeys made before and after the move respectively. There are clear patterns of responses across the two datasets, with many of the reasons highly correlated, reflecting similar ratings of commute reasons regardless of commute destination. Differences in the correlation patterns highlight where ratings of reasons may have been affected by the move to the BNZ Centre .

Table 4.8: Commute Reasons Correlations: Before the move

	Convenience	Time	Distance	Weather	Safety	Less Stress	Reliability	Access to Car	Family	Environmental	Health	Enjoyment	Cost	Habit	Parking
Convenience	1														
Time	.787**	1													
Distance	.646**	.721**	1												
Weather	.448**	.545**	.405**	1											
Safety	.453**	.408**	.351**	.541**	1										
Less Stress	.369**	.332**	.254**	.315**	.460**	1									
Reliability	.477**	.407**	.349**	.306**	.400**	.507**	1								
Access to Car	.365**	.375**	.280**	.389**	.274**	.194**	.178*	1							
Family	.275**	.256**	.171*	.243**	.095	.156*	.147*	.547**	1						
Environmental	-.337**	-.485**	-.271**	-.334**	-.088	-.020	-.082	-.281**	-.215**	1					
Health	-.244**	-.360**	-.210**	-.309**	-.071	.020	.080	-.199**	-.157*	.731**	1				
Enjoyment	.094	.014	.065	.132	.373**	.415**	.374**	-.001	-.024	.321**	.400**	1			
Cost	.157*	-.044	.037	.071	.244**	.258**	.218**	-.021	.001	.356**	.393**	.311**	1		
Habit	.072	-.005	-.103	.131	.040	.223**	.179*	-.005	-.098	.081	.191*	.269**	.126	1	
Parking	.403**	.422**	.224**	.468**	.350**	.300**	.245**	.493**	.247**	-.250**	-.151*	.168*	.162*	.140	1
**. Correlation is significant at the 0.01 level (2-tailed). Coefficient > 0.4							**. Correlation is significant at the 0.01 level (2-tailed). Coefficient < -0.4								
**. Correlation is significant at the 0.01 level (2-tailed) and positive							**. Correlation is significant at the 0.01 level (2-tailed) and negative								
*. Correlation is significant at the 0.05 level (2-tailed) and positive							*. Correlation is significant at the 0.05 level (2-tailed) and negative								

Table 4.9: Commute Reasons Correlations: After the move

	Convenience	Time	Distance	Weather	Safety	Less Stress	Reliability	Access to Car	Family	Environmental	Health	Enjoyment	Cost	Habit	Parking
Convenience	1														
Time	.630**	1													
Distance	.473**	.576**	1												
Weather	.466**	.429**	.335**	1											
Safety	.416**	.278**	.346**	.469**	1										
Less Stress	.379**	.311**	.384**	.324**	.461**	1									
Reliability	.326**	.342**	.287**	.200**	.339**	.306**	1								
Access to Car	.342**	.389**	.219**	.294**	.204**	.092	.063	1							
Family	.288**	.269**	.169*	.199**	.115	.060	-.042	.409**	1						
Environmental	-.250**	-.252**	.013	-.219**	.038	.143	.109	-.308**	-.192*	1					
Health	-.275**	-.238**	.045	-.283**	-.132	.037	.121	-.287**	-.259**	.659**	1				
Enjoyment	.075	-.026	.183*	-.002	.243**	.313**	.205**	-.208**	-.193*	.376**	.423**	1			
Cost	-.039	-.132	.151*	.015	.122	.143	.278**	-.198**	-.157*	.529**	.450**	.253**	1		
Habit	.084	.064	.057	.214**	.104	.175*	.008	.016	-.060	.110	.120	.257**	.097	1	
Parking	-.080	-.153*	-.091	-.044	-.029	.000	.084	-.074	-.226**	.157*	.128	.314**	.300**	.152*	1
**. Correlation is significant at the 0.01 level (2-tailed). Coefficient > 0.4							**. Correlation is significant at the 0.01 level (2-tailed). Coefficient < -0.4								
**. Correlation is significant at the 0.01 level (2-tailed) and positive							**. Correlation is significant at the 0.01 level (2-tailed) and negative								
*. Correlation is significant at the 0.05 level (2-tailed) and positive							*. Correlation is significant at the 0.05 level (2-tailed) and negative								

Convenience, Time and Distance

Convenience, time and distance as reasons for commuting using a particular mode are highly positively correlated with each other for both commute journeys and the strength of the associations are amongst the strongest positive correlations in the survey (from a low of 0.473 for convenience/distance after the move to a high of 0.787 for convenience/time before). In other words respondents who state that they commute by their chosen mode because it is convenient are also more likely to agree that it is the best way to cover the distance they need to travel and that it is their quickest option. The strong relationship between convenience, time and distance is reinforced by the very similar correlation patterns between them and other commute reasons. This indicates how closely related the concept of 'convenience' is to time and distance, where almost by definition, the most convenient travel mode is the one that will cover the distance in the most efficient way possible.

Before the move there are moderate negative correlations between convenience, time and distance respectively with environment and health reasons. These correlations remain post-move, although are lower in strength, while the negative correlation between distance and environment/health is no longer significant. In other words, people who agree that their commute is convenient and quick are likely to disagree that they commute that way for either environmental or health reasons, especially before the move. This result reflects the influence of the increasing numbers of cyclists post-move and the decreasing influence of car commuters.

Environment, Health

The health and environment commute reasons are very highly correlated and show similar patterns of association across both commutes. For example if respondents agreed that they commuted that way for environmental reasons or to maintain their health and fitness, then they were more likely to also agree that they enjoyed their commute or commuted that way to keep the cost down. After the move to the BNZ Centre, similar correlations with the other reasons remained, with two exceptions distance and parking. The correlation between health and parking is no longer significant and the correlation between environment and parking swaps from a negative to a positive correlation (significant at the 0.05 level). In other words, after the move to

the BNZ Centre people who agreed that they commute this way for environmental reasons are also more likely to agree that they commute this way due to parking availability, when before the move they would have been more likely to disagree.

Cost

Limiting the cost of their commute is most strongly associated with the environment, health and enjoyment reasons for both commutes. People who tend to agree that they commute that way in order to limit their costs, are also more likely to enjoy their commute, agree they commute that way for environmental reasons and for health and fitness reasons.

Access to a Car and Family

These two commute reasons are significantly positively correlated with each other (at the 0.01 level), which is perhaps unsurprising as those survey respondents with families are much more likely to agree that they need ready access to a car while at work in order to meet their family obligations. Accordingly, both reasons also are significantly positively correlated with reasons of convenience, time and distance and negatively to the environment and health across both commutes. After the move though, some of these relationships disappear. For example, they are less likely to agree that they commute that way due to parking availability. This could be another reflection of the impact of reduced parking near to the BNZ Centre after the move.

Safety & Weather & Reliability

Safety conscious commuters before the move were also those most likely to agree that they used to commute that way for reasons of convenience, to avoid the effects of the weather, because it is the quickest way to get to work or because it is less stressful. After the move to the BNZ Centre, these relationships remain, however time is no longer so highly correlated.

Reliability is strongly associated with convenience and time across both commutes, but most strongly with less stress before the move. So prior to the move to the BNZ Centre, people were more likely to agree that their commute was reliable and predictable if they also agreed that their commute was less stressful. While this positive correlation still

exists post-move, the strength of association has weakened, and other factors such as safety become more prominent.

Habit

Habit appears to be one of the outliers on the correlation matrix for commute reasons. While there are a few positive and statistically significant correlations with reasons such as enjoyment and weather, the strength of these relationships is quite low.

Parking Availability

Parking Availability is the reason that is rated most differently by respondents to the survey across the two commutes. Twelve of fourteen pairwise correlations change; either the direction of the relationship swaps, a previously significant correlation becomes insignificant or (in the case of habit) a previously insignificant correlation becomes significant. Furthermore it is often the most significant and strongest correlations before the move that disappear after the move.

Before the move parking availability has a strong positive correlation with convenience, time, access to a car and commuting to avoid the effects of the weather, which might be expected as all are highly rated by car commuters. After the move however, three of those correlations are no longer statistically significant and the correlation with time is now negative. So, after the move, those who agree they commute to the BNZ Centre the way they do because of parking availability now tend to disagree that their commute is the quickest way to get there. Similarly most of the weaker relationships between parking availability and the other reasons for respondents' commutes before the move either disappear (such as cost, health, safety, less stress and reliability) or swap direction (environment, family). In fact, those who agree that they commute a particular way due to parking availability are slightly more likely to also agree that they commute that way for environmental reasons after the move. This is another indication that the parking situation in the CBD has had a strong influence on commuting choices after the move.

4.6.7. Commute Satisfaction

Overall most survey respondents are satisfied with their commute; although there is a statistically significant difference in average satisfaction ratings across the time of the move ($t(182)=2.273$, $p=0.019$). Respondents are significantly less satisfied after the move ($M=3.9$, $SD=0.91$) than before ($M=4.1$, $SD=1.0$). Breaking down satisfaction ratings by main mode³⁰ shows that before the move bus users are significantly less satisfied than walkers ($F_{asympt}(3,22.06)=4.66$, $p=0.011$) and after the move cyclists are significantly more satisfied than car users ($F_{asympt}(3,20.93)=3.54$, $p=0.023$). This points to a possible reason for the overall drop in satisfaction. Car commuter's average satisfaction levels have significantly dropped post-move and the larger numbers of these have also affected the average rating (Figure 4-36). Even the large rise in satisfaction levels for bus users does not counteract this effect, due to the much smaller group size.

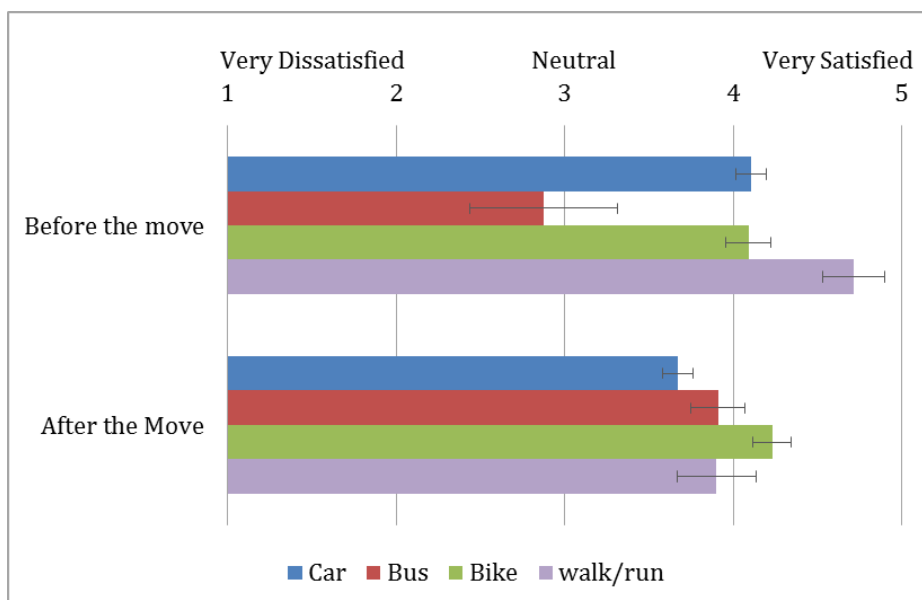


Figure 4-36: Commute satisfaction rating by main commute mode

4.6.8. Parking

Survey results indicate that parking availability has been a factor in commute mode choice for some respondents. Car users generally disagree that they commute to work after the move due to parking availability when they previously tended to agree. However, when asked where they are parking, the majority of car users still parked in

³⁰ Excluding group 'Motorbike/Other', and using main mode to work

free on-street parking spaces even after the move (Figure 4-37)³¹. Post-move there is a rise in the percentage of respondents parking in metered parking spaces, but only a small drop in the percentages of respondents parking in off-street parking spaces.

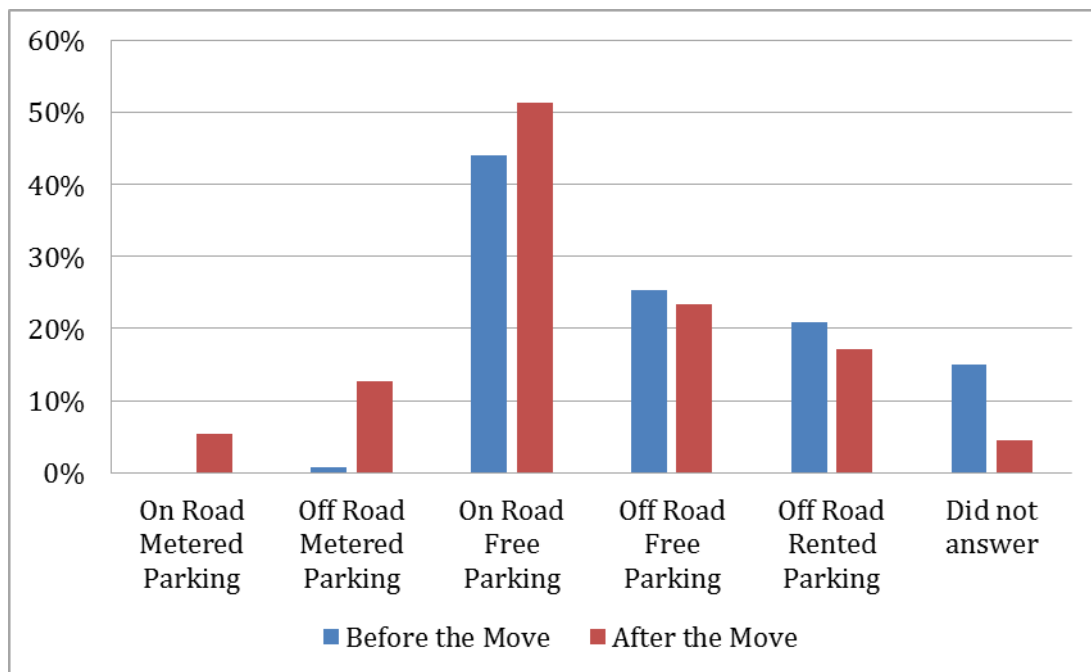


Figure 4-37: Car parking options used by car commuters before and after the move

4.6.9. Focus Group Results – Factors influencing travel mode choice

Focus group discussions both echoed and extended survey results, giving further insight into individual motivations and choices. Cyclists were the most well represented group (8 participants out of 17), followed by car users (5 participants), bus users (3 participants) and walkers (1 participant). This strict categorisation is based purely on main commute mode and in reality many participants used multiple different modes to get to and from work at various times; for example, one participant drove two days a week and caught the bus two days a week to meet family commitments, while some cyclists occasionally walk or catch the bus.

³¹ Respondents were able to select multiple options so percentages may not add to 100%.

The car as default commute mode

Focus groups discussions began with a discussion of the positive aspects of their current commute. Drivers usually described driving as the quickest and most convenient way to get to work or said it enabled them to quickly meet after-work commitments; a finding that is consistent with other qualitative studies (Jones & Ogilvie, 2012; Kent, 2014). Nearly all drivers then moved swiftly to justify their decision in terms of their inability to use one or more of the alternative modes; a pattern that has been previously observed in a NZ-based qualitative study (Lang, Collins, & Kearns, 2011).

“I drive mainly at the moment due to sport commitments, so I finish at 4.30 and have to go straight to sport, so I can’t really bus or anything like that cause I wouldn’t get there in time ...”
(Driver 1)

“Yeah I’m driving mainly ‘cause, yeah, it is quicker than bussing. Bike would probably be not much different I s’pose, but then you’ve got the whole changing aspect anyway, yeah car, mainly ...”
(Driver 2)

Drivers spent less than 40% of their time discussing issues related to driving and the majority of time discussing other modes. By contrast all other groups spent more time discussing their shared main mode(s) (Figure 4-38). Therefore this group of drivers spent more time discussing the perceived infeasibility of alternative modes as a justification for driving, with the underlying assumption that the car is therefore, by default, the only way they can commute.

This perceived lack of alternative to using the car sometimes emerged as defensiveness.

“I have encountered people sort of getting, almost defensive if they find that I travel by bus ... you know, ... oh but that wouldn’t work for me because I’ve got kids at this school and this school and I need to do that pick-up or whatever, and I thought well, good for you, you do whatever suits you, but I’m going to catch the bus.”
(regular bus user)

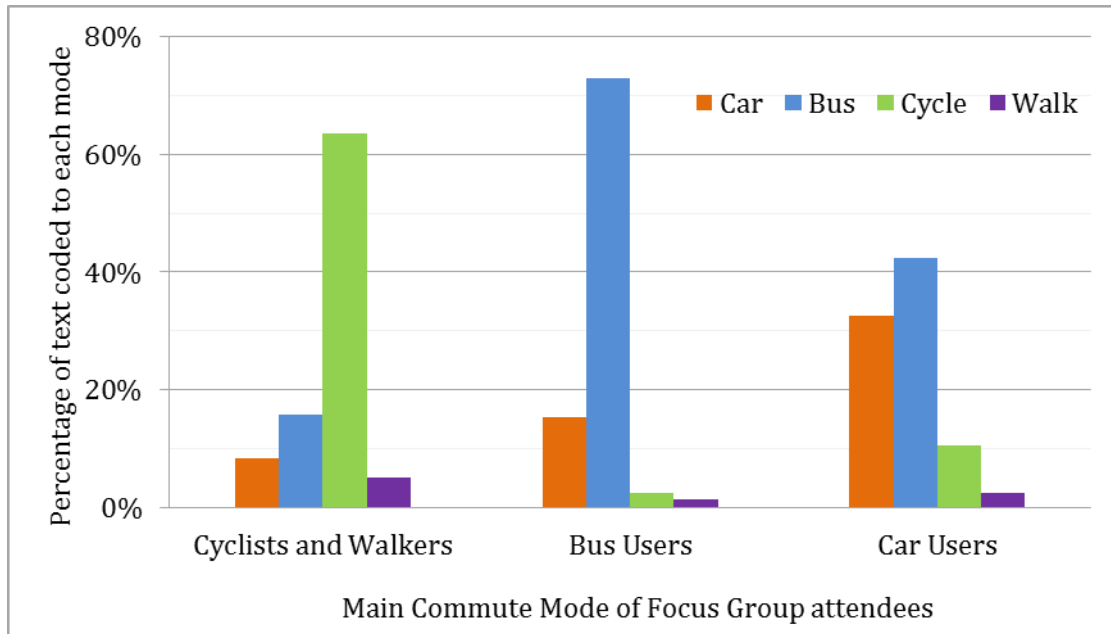


Figure 4-38: Comparison of time spent discussing different commute modes within the focus groups

By contrast, cyclists, bus users and walkers, were more likely to stay focussed on the positive aspects of their commute when asked.

“I enjoy biking. It’s fun and it’s good for your health as well.” (Cyclist)

Furthermore, it was far more common to hear expressions of positive emotions for non-car commute modes than for commuting by car. This was particularly true of cyclists who tend to ‘love’ and ‘enjoy’ cycling, are happy because they cycle, or talk about cycling being ‘fun’ or ‘awesome’. The only participant to state that they ‘used to love’ driving was a current cyclist.

The pervasiveness of car culture also emerges in some of the attitudes towards alternative modes. While many non-bus users did discuss catching the bus as a real alternative to either driving or cycling, there was also an attitude expressed that buses are only used when people have no other choice. One regular bus user commented;

“I think I’m often pitied or patronised because I use the bus. I think there’s a small sliver of people who think ‘oh buses are for poor people, or for older people on their gold cards’.”
(bus user)

Cyclists discussed the dominance of car culture with regard to cycle safety, and the tendency of the media to “incite drivers vs cyclists”, when in fact the safety of all road users is everyone’s responsibility.

“I think that what's holding back cycling to become a real normalised mode of transport in this country is this whole, it's almost like victim blaming, it's almost like the onus is on the person doing the exceptionally dangerous thing to make themselves more visible.”
(cyclist)

Convenience, Time and Distance

The strong correlations in the survey between commute reasons of time, distance and convenience are borne out by focus group discussions where these considerations are often referred to interchangeably.

“... it’s just sheer convenience for me I guess. Door to door it’s quick, it’s free.”
(cyclist)

Time is more frequently cited as the deciding factor in mode choices overall, especially when different modes are compared (Figure 4-39).

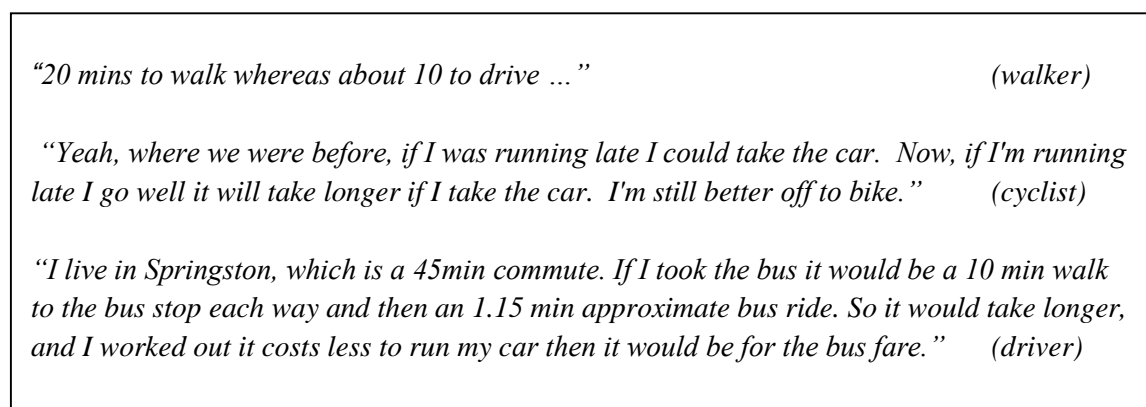


Figure 4-39: Time trade-offs when comparing commute modes

Distance is perceived to be a constraint when commutes are seen as ‘just a bit too far’. Alternatively some participants live ‘close enough’ to town to walk or cycle easily. Distance constraints are often mentioned as a precursor to time considerations.

“I’ve made a choice to live really close to work so that I can bike without it taking forever ...” (cyclist)

Convenience is related to journey time but, for drivers at least, also to the perceived flexibility of using the car; enabling them to choose when to leave home or work, to run errands or to meet other commitments.

“I drive mainly at the moment due to sport commitments, ... so it’s convenient for me to drive so I can get to there.” (regular driver)

Commute time as a consideration for active commuters can be over-ridden by other factors. For example walking usually takes longer than it would to drive, but as one walker says “... it is longer, but the pros outweigh that I spose.”. The ‘pros’ for this walker included gaining time to think, listen to podcasts and to get some exercise.

Three of the four focus groups spent a significant proportion of time discussing the pros and cons of catching the bus in Christchurch (75% Bus Group, 37% Car Group, 19% and 5% Cyclist and Walkers groups). Buses were usually the main alternative mode cited by drivers, and cyclists. In most cases, commute time was a major consideration when considering using the bus. Non-bus users stated that buses were too slow.

“I tried using the bus and ... it takes over an hour and it’s a ten kilometre distance and I’m just not prepared to lose two hours a day, because, you know, it’s not that pleasant either.” (driver)

Health

For many active commuters, the fact that their commute provides a way to exercise or improve their health is one of the main reasons why they either cycle or walk.

“I really love biking. I think its awesome, and it means I get to mix my transport and exercise.” (cyclist and working mother)

Exercise is not only valued for itself, but also for the benefits it brings to people's working day.

"It's a good way to start the day. Especially in the winter ... you just don't get warmed up in the morning unless you do something." (regular cyclist)

Weather and the Environment

The weather affects mode choice decisions for cyclists and walkers, to varying degrees depending on how comfortable they feel travelling through rain, ice or (rarely) snow. Weather conditions also raise safety concerns. In bad weather some cyclists may drive or get a lift with family while others catch the bus.

"The biggest difference at Dollan House is that I could still be lazy and take the car if I was in a hurry or something, or if it was pouring with rain, it was nice to know I could avoid ... a certain amount of getting wet." (cyclist and driver)

"I think with the bad weather ... it's not so much the wet and the cold. I don't like it because I feel the drivers can't see you as well." (cyclist)

Only two focus group participants used environmental reasons to support their decision to commute by either bus or bicycle, and even then, it was almost an afterthought. In two other focus groups this topic was not raised at all.

"Bonus points towards health and also the environment as well." (cyclist)

Parking

Parking was a major topic of discussion in the car users focus group (more than 18% of the text) and was at least mentioned in all other focus groups (coverage ranging from 3% to 8% of the text). Car users tended to be concerned with the availability of free parking;

"It's much quicker for me, and because I start early I always have the guarantee of a free car park at the moment." (driver)

or indeed, the availability of parking in general.

“... I used to go walking up in the Port Hills sometimes at lunchtime when it was a nice day. And now I can’t really do that cause ... I’ll lose my carpark if I leave; whereas in Dollan House ... you could find one really easily.”

(driver)

Before the move, participants reported that management of the agencies involved had been clear that there would be no staff parking at the new site and that parking in the CBD would be limited, or would incur a cost, in contrast to the situation at most previous workplaces. As one participant commented;

“there was a lot of talking about how hard parking was going to be for a very long time.”

(bus user)

When asked about the main differences between the commute to the old and the new offices, several drivers said that finding a park was now more difficult. However parking limitations may have also been overemphasised.

“I was very surprised with the amount of free parking that was available. We thought it would be a lot worse ... “

(driver)

Underlying all of the above discussion is the high value drivers place on their ability to park their car for free, close to work. Most drivers were willing to go to some lengths to avoid paying for parking, despite Christchurch parking charges being relatively modest (Figure 4-40). In fact, the cost of parking was the only financial topic discussed by the car user’s group. Other costs of commuting and car ownership such as petrol, registration and insurance were not mentioned by drivers, whereas they were discussed in other focus groups. In a car-dependent culture this can be due to these costs being ‘invisible’ because it is assumed that a car is required, and therefore the associated costs are simply accepted rather than strictly analysed (Mann & Abraham, 2006).

“...you can pay about \$5 a day (Driver 1)

How much? (Driver 2)

Yeah – Wilsons, about 5 bucks a day yeah, on Hereford St (Driver 3)

Yeah, but I can't see the point in paying five bucks a day when I walk another two hundred metres for free.” (Driver 1)

Figure 4-40: Parking costs discussion extract - car users focus group

In non-car focus groups, the reduced availability of parking was cited as a reason not to bring the car, along with the stress of finding a park.

“So the reason I shifted to catching the bus was initially, I thought it would be quite difficult to find a park ... “ (new bus user and driver)

“... if I drove ... then I've got to go 'Oh is that free parking? What does that sign say? Oh my God the stress! I don't know. What time is it? I'll go and park here. Can I park here? Is it OK? What do I pay? How do I pay?" Biking is much easier.” (cyclist)

Cost

The majority of cyclists and walkers pointed out that their commute is free at some point during discussion; thereby positioning cost as something to be avoided when commuting.

“I'm on a bus route as well, but it would cost me like \$5 a day or something, whereas I bike for free.” (cyclist)

Current bus users do not see the cost of the bus fare as an issue, referring to it as “cheap” or “the same as a close car park for my car”, whereas those who seldom caught the bus perceived bus fares to be expensive.

Some participants had used financial comparisons to make decisions about their commute, to the extent that they had decided that the costs of car ownership were not justified.

“It’s cheaper than owning a car. Personally I wouldn’t use a car otherwise, so I might as well cycle.”
(cyclist)

Remaining participants were already car owners, despite main commute mode, and in most cases compared only the additional ‘direct’ costs of commuting such as parking, bus fares, taxi or Uber fares. Overall however, such cost comparisons were much less frequent or detailed than comparisons of commute times; implying that other than for those who had decided against car ownership, cost considerations were not necessarily the most important factor in mode choice.

Safety

The safety of cyclists on Christchurch roads was a topic of discussion in all focus groups. Cyclists were concerned about safety, but also felt it could be managed, whereas non-cyclists used safety concerns as a reason to not cycle.

“I start early though, so I’m out there at seven, so there’s very little traffic and it’s quite slow moving. So, I feel safe on the way to work. On the way home’s a bit different depending on when I leave.”
(cyclist)

“... but with the current road safety and with the aggression on the roads and the dust around and so on, it’s just not, it’s just not a feasible option.”
(driver, discussing the feasibility of cycling)

The main contributors to the perceived lack of safety on the roads were the attitudes of other road users, volume of traffic and road works.

Safety was also a concern for other reasons, with one person being concerned about her safety when walking to her car in the still relatively deserted post-quake CBD.

“... the reason I continue to catch the bus is pretty much safety. I don't want to walk to my car in the dark. And the two days I catch it are the days that I work late.”
(new bus user and driver)

Habit

Only a few focus group participants (cyclists and public transport users) cited ‘habit’ as a reason for their commuting decisions, and they were usually referring to long-term behaviours or strong preferences that had influenced their commuting choices over many years.

“ Since I started going to university which was over 30 years ago I've biked. Yeah, habit's just stayed.”
(cyclist)

“I do have a drivers licence, but I don't have a car. That's for a number of reasons, not least of which is habit ... I grew up in the UK, and much as I'd like to think I've assimilated to being a Kiwi, one of the things that's still in my mind is that if you live in a city, you shouldn't really need a car.”
(bus user)

Summary

In summary, car users tended to view other modes as infeasible and spent a significant amount of time exploring why. Reasons given included time, inconvenient bus routes, lack of safe cycling routes and walking distance. Bus users initially took a similar approach, saying they caught the bus because they don't own a car or because parking is less available post-move. Active commuters by contrast, tended to describe why their chosen commute mode was feasible for them in terms of time or distance and then focussed on the positive aspects of their commute such as that it was free, fun or provided exercise. These findings are consistent with a socio-ecological model of decision-making by Alfonzo, based on Maslow's hierarchy of needs, that puts the perceived feasibility of making the journey by a particular mode at the top of the hierarchy, followed by considerations of accessibility, safety, comfort and pleasure (Alfonzo, 2006). Furthermore, in a car-dominated culture, attitudes to other modes often reflect the basic assumption that the car is the most feasible option for most people, most of the time. People who travel actively or by bus, on the other hand, have already

met their basic need for their journey to be feasible by this mode so they can then turn to other motivations to describe why they travel that way.

Despite the fact that New Zealanders do generally recognise the negative impact of transport activities on air quality and identify climate change as an important global environmental issue (Hughey, Kerr, & Cullen, 2013) environmental concerns were only raised infrequently as a reason to support individual travel choices. This is consistent with the literature finding pro-environmental attitudes have only a small effect on travel choice.

4.7. Research Question 5

Research question 5 reads “What are the main barriers and enablers that have emerged as significant in preventing or encouraging employees to change their commute to a more sustainable mode?” and is addressed primarily using survey data, combined with qualitative analysis of focus group discussion and open-ended survey questions.

4.7.1. Barriers and Enablers – Staff Survey

Of the 184 respondents employed at the time of the move, nearly half (48%) considered making a change to the way they travel to work before the move actually took place. Approximately 40% subsequently said that they had made some changes and a further 17% have at least tried a different way of commuting since the move: meaning 57% of those surveyed have tried a different commute mode at least once (Figure 4-41). This supports the hypothesis that moving office locations can provide an opportune time to encourage employees to consider changing commute mode.

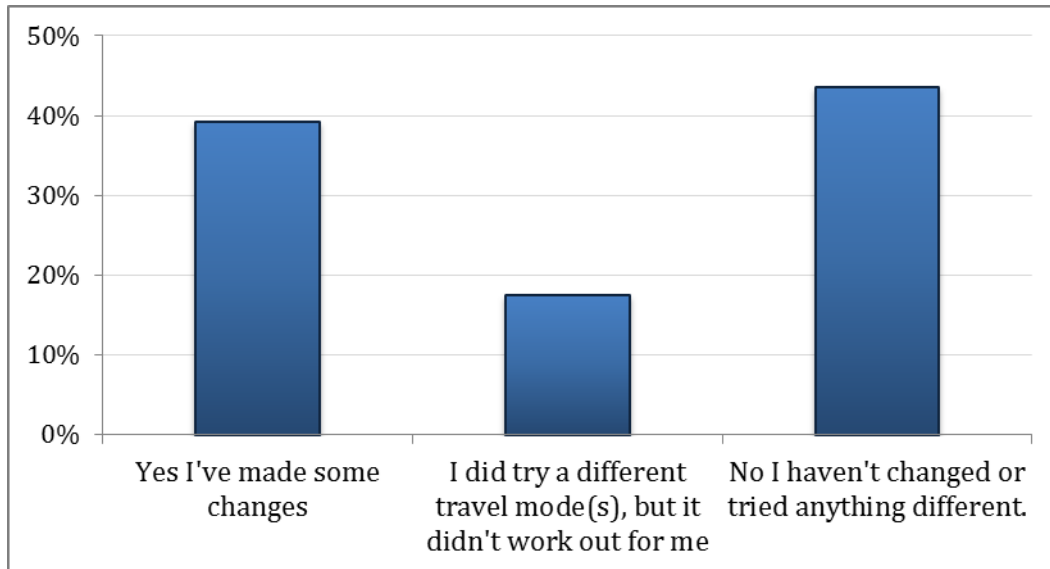


Figure 4-41: Survey responses: Since the move have you changed the travel mode that you use to get to work?

This section summarises the reasons respondents gave for and against the alternative commute methods they have tried (or are still using) in addition to their main commute mode. Any individual person only saw the questions relating to the commute modes they had used or selected. Questions on barriers for each mode were shown to individuals who had tried modes and then not continued with them, or who had selected the mode as one they might use in the future.

Understanding the factors that either enable people to use a particular commute mode or create barriers against it is different from seeking to understand the reasons for commuting choices. For example, many cyclists state that they cycle for health and fitness reasons, but a key enabling factor is that they can park their bike safely at work. Lack of safe cycle parking can conversely be viewed as a barrier to commuter cycling.

Charts in this section display the percentage of respondents who selected each option and show the number of respondents who answered the question in brackets following the chart title³². A brief summary of text answers to 'Other' appears below each chart.

³² Respondents could choose multiple answers.

Cycling

The majority of cyclists indicated that distance, access to safe bike parking facilities, the safety of the route and the convenience of cycling (due to parking constraints and traffic congestion) were all reasons that supported them to choose to cycle (more than 68% each, Figure 4-42). Time and having the facilities at work such as showers and lockers were also important (62% and 58% respectively). Further analysis of the comments reveals that ‘having enough time’ may mean the journey is quick enough or that cycling takes a predictable amount of time and avoids traffic congestion.

For those who are not currently cycling, the most commonly chosen barrier was weather (nearly 50%), with the need to do other tasks coming in second and having a safe route a distant third (Figure 4-43). It is important to remember that respondents only saw this question if they were already cyclists, or were considering cycling as a viable alternative commute method, so the usual barrier of safety concerns may have already been overcome to some extent.

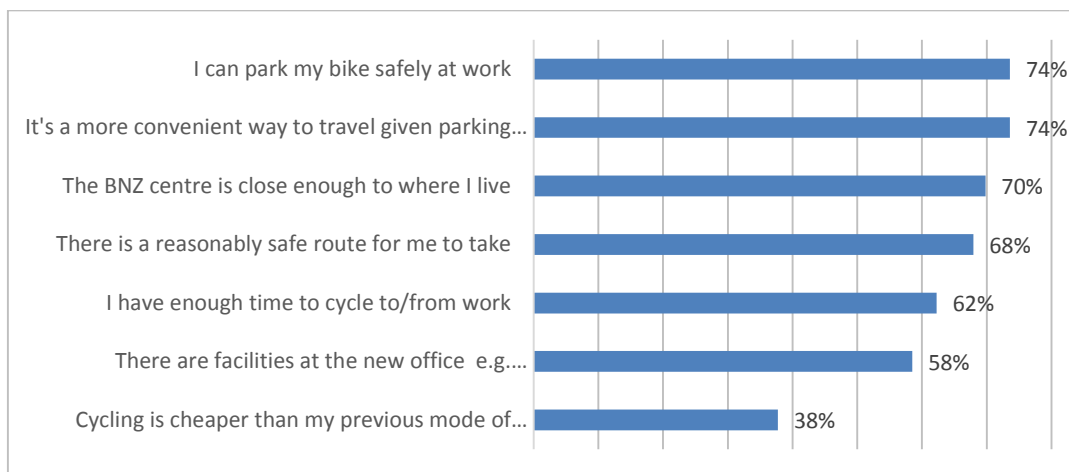


Figure 4-42: Cycling Enablers (53 responses)

Comments often expanded on the reasons why respondents cycled. Sometimes safety concerns came through even when respondents were focussing on what kept them cycling.

“ ... I also really enjoy cycling as it’s the best way to keep fit while going to/from work.”

“Paying for parking is not an option.”

“It is slightly closer to my home, but the route is still dangerous and scary.”

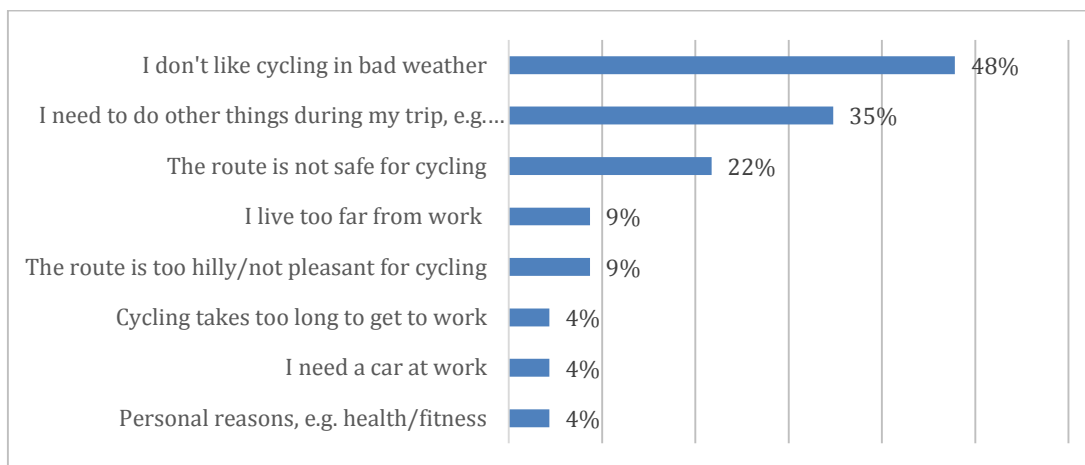


Figure 4-43: Barriers to Cycling (23 responses)³³

Walking

Relatively few people regularly walk or run to work but for those who do a key consideration is distance (74%) (Figure 4-44). Two thirds of respondents also selected the following options: there's a reasonably safe route, it's more convenient (given parking constraints or congestion), it's cheap, and I have enough time. Facilities at work are less important to walkers than cyclists (17%), but 40 percent of walkers appreciate the ability to reliably predict their commute time.

Time is also important to those who are thinking of walking, or would like to walk more often. The largest barrier to walking is that it takes too long (67%) (Figure 4-45). The next most common barriers were the weather and the need to do other tasks on the way to work (31%). Furthermore, some respondents don't yet feel safe walking in certain parts of the CBD.

³³ A survey error meant that text responses for this particular question were not captured.

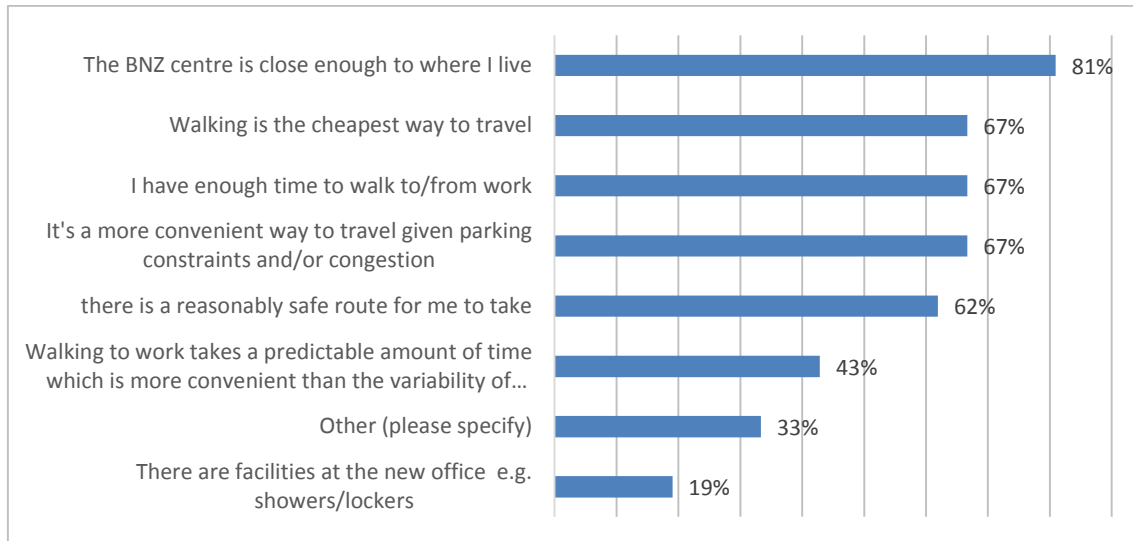


Figure 4-44: Walking Enablers (41 responses)

Additional reasons included in the comments included exercise, the weather, the environment and parking constraints:

“I like the exercise”

“Forced to walk from where I can park the car now for free as I pay a lot in petrol already to get into town; wouldn’t walk if I didn’t have to.”

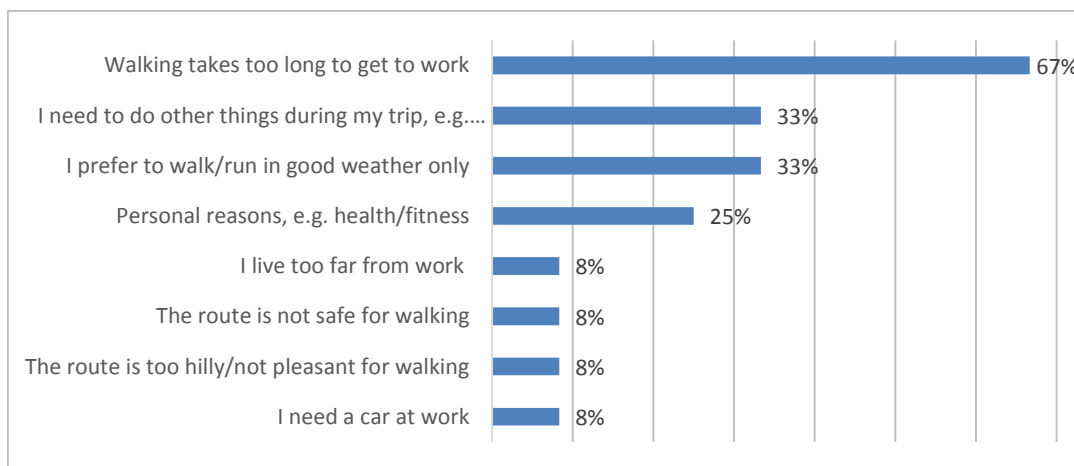


Figure 4-45: Barriers to Walking (12 responses)

Many respondents reiterated in the comments that they would walk more often if it did not take so long. Personal safety was also mentioned.

“Walking through/past too many building sites and through road works. As it gets darker earlier, walking alone does not feel safe.”

Catching a Bus

Most bus users said that the convenience of the bus routes is an enabling factor for bus commuting (86%, Figure 4-46). Furthermore half of the people who actually use buses said that they could get to work in a reasonable time and that buses are reliable enough, despite a general perception that buses are slow (47%, Figure 4-46). A similar proportion selected ‘convenience’; explaining that catching the bus avoids the cost and hassle of parking and enables them to relax and enjoy doing other things on the bus trip such as reading.

More than a quarter of all survey respondents (55 out of 191, 29%) answered the question on barriers to catching the bus (Figure 4-47), the majority of whom currently drive to work (73% of those replies). This may reflect a certain level of unmet demand for public transport amongst commuters to the CBD, or it may simply reflect the fact that buses are the only alternative to the private car in Christchurch for those living beyond walking or cycling distance from work. Figure 4-47 clearly shows that the main barrier to this group is that buses take too long (58%). The other reasons are more varied, with approximately a third of people choosing each of the following: timetable doesn’t work for me, I need to do other tasks on the trip, service is unreliable, service is too hard to use or it is too expensive. The comfort of the service is also important.

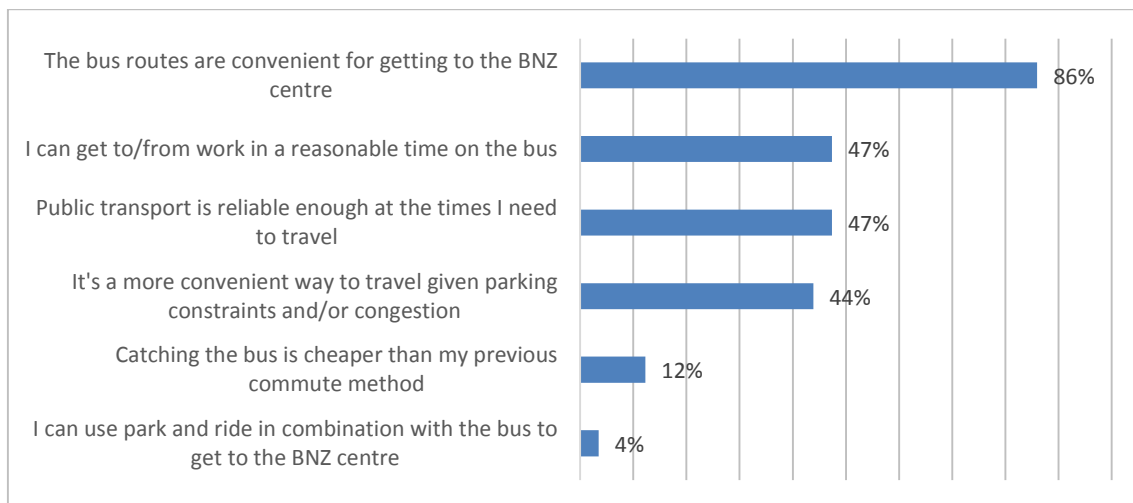


Figure 4-46: Bus Enablers (57 responses)

A larger group answered this question and many respondents mentioned that they enjoy their bus commute.

“I’d get into trouble if I read while driving a car 😊 Bus travel is great because I can relax on the journey – read, make plans or just gaze out the window.”

Parking is a reason for sometimes catching the bus, both the availability and cost.

“Hard to find a park after 9am, so if I want to start a little bit later than normal it’s better to bus, even it if takes 40 mins to get to work”

The new bus interchange is mentioned positively in 5 of the 21 comments.

“The bus exchange is really smart.”

“Bus interchange is very close”

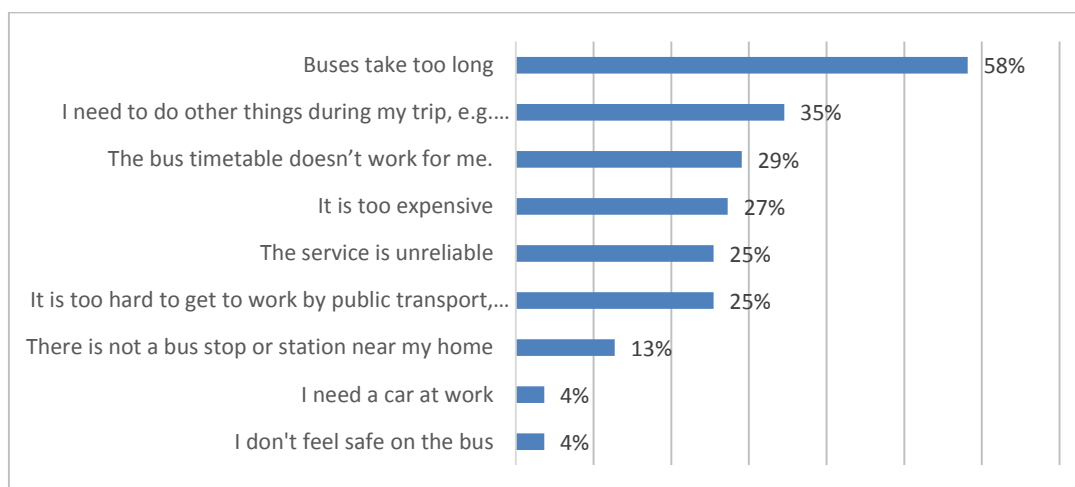


Figure 4-47: Barriers to catching the bus (55 responses)

Comments expanded on above reasons or explained why the bus was not convenient for them.

“On journey home buses too busy/crowded with school kids. Often have to stand as the kids do not free seats for adults – standing in bus to travel home not an alternative for me.”

Taking the Car

Factors that enable car use are very similar to the reasons chosen to support the choice to drive, namely commute time, commute distance, and meeting other obligations before or after work (Figure 4-48). Convenience was the next most commonly chosen reason (41%), while only one third of respondents chose parking (33%). Some comments explained why respondents brought their car to work when it was not their

main transport mode. Others took the opportunity to describe why their other commute options were infeasible.

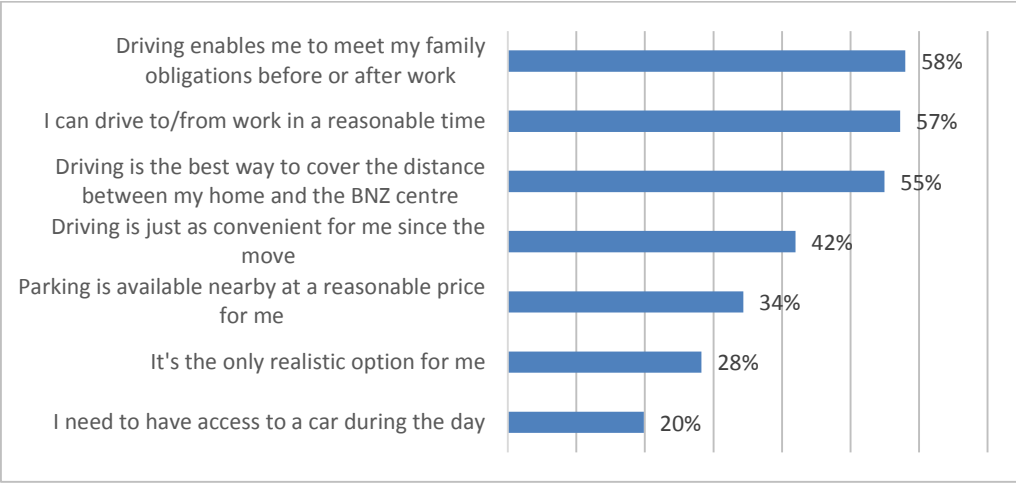


Figure 4-48: Car Enablers (131 responses)

The most common additional reason mentioned in comments was the need to have access to the car either before or after work.

“Only use the car when there is a reason, either during or after work to get somewhere”

4.7.2. Barriers and Enablers – Focus Groups

Focus group discussions gave further context to understand the barriers to and enablers of sustainable travel. This section outlines the main barriers and enablers that arose during the focus groups for travelling by bicycle, bus or on foot, paying particular attention to those that differ from commute reasons already discussed.

Cycling

Echoing previous results, key enabling factors for cyclists include being close enough to cycle and being able to cycle to work in a reasonable and predictable time, thereby making the journey feasible. In this study, the provision of a secure bike park facility at the BNZ Centre, used by nearly all participants who cycled, along with showers, changing rooms and locker facilities was another enabling factor.

“...it works for me. It’s a secure-ish facility and you’ve got the changing rooms downstairs, so you can get yourself in order.”
(cyclist)

While these facilities are well used they present challenges for some. Cyclists and non-cyclists alike spent significant periods of time discussing problems they had encountered with either the hanging bike racks or locker-use policy; problems that may be enough to deter others from cycling.

“It was designed for sporty bikes only, not really for commuting bikes.”
(owner of a heavy commuter bike with panniers and basket)

“... with the lockers as well, they go half the way of giving you good service and then because you have to remove everything out of the lockers every day ... no-one’s going to use them... Because if you’re going to cycle most days you’re going to want to have your shampoo and your soap and everything... left there ‘cause you don’t want to have to bring them in every day.”
(cyclist)

More generally, cycling infrastructure helps to enable cycling, where it exists and is perceived to increase riders’ safety, although for some cyclists it is enough that the roads are flat.

“...there’s a really nice cycle lane that comes into town from there so I’m more inclined to cycle from there than from my house which is actually closer ...”
(cyclist)

“...to me Christchurch is a dream for cycling. It’s flat. The streets are wide ...”
(cyclist recently moved to Christchurch from comparatively hilly Wellington).

The state of Christchurch roads after the earthquakes, and the slow progress towards extending Christchurch’s cycle networks were both mentioned as barriers to cycling for new cyclists, although regular cyclists have usually developed ways of coping.

“I haven’t done that (cycled) in the last two or three years because... too many roadworks, too much aggression on the roads ... I feel it’s sort of slowly getting better, but maybe still a way to go. And (I am) a bit disappointed that we are still not seeing cycleways and real attempts to make that work.”

(driver)

“the one problem I have is ... roadworks roadworks roadworks, and it's when the streets are narrowed. I don't like biking down narrow streets, and my normal route is now completely blocked. So I've had to use footpaths and that to get in, simply because I want to avoid the main roads which are often blocked.”

(cyclist)

Even regular cyclists will use other modes to get to work when they perceive that it’s impractical to cycle.

“So if I have to bring a lot of stuff to work or I’m running extremely late and I can’t bike ‘cause it’s raining, then I’ll uber ...”

(cyclist)

The attitudes of friends and family can act as a social barrier.

“My partner’s worried about the safety side of things. The fact that you might get hit and it might go really bad and that's why she doesn't really want me to bike as much.”

(cyclist)

Alternatively harnessing social support may help encourage others to cycle by talking to co-workers and sharing information on safe cycling, as suggested by existing cyclists during a discussion on how much they enjoy cycling. This enjoyment enabled cyclists to continue to commute by bike despite the often negative perceptions of others and the stress of riding in potentially unsafe environments.

“I think it’s important to note that a lot of people who cycle like that they cycle. We’re happy that we cycle. We’re not cycling because we have to.” (cyclist)

Catching the Bus

More than half of focus group participants had some experience with the buses in Christchurch, and these experiences informed both the discussion and individual perceptions of the bus service. As already discussed the primary barrier to catching the bus for most people is the journey time; although several participants expanded on this to explain that the problem is actually the waiting time.

“It’s the waiting that sucks, it’s not the bussing.” (driver)

Christchurch does have a real-time information system accessible online and at numerous bus stops. This service is valued but is not always viewed as reliable.

“Now that they’ve got the things [bus information screens] you can tell how quickly it’s coming. I find that really valuable ...” (cyclist)

“I have to say though, I’ve sat in that bus exchange and it [bus information screen] says two minutes and it’s more like six. So it sits on two minutes for quite a long time sometimes.” (bus user)

Recent network changes in Christchurch have increased the likelihood of having to transfer buses on some routes and this was mentioned in several focus groups as a significant barrier to bus use.

“When everyone moved away from the city they changed the bus routes, and now everyone is moving back they haven’t adjusted it, ... and lots of people we found won’t get the bus because they have to get two.” (driver)

For people who are new to catching the bus, not knowing where or how to access information on bus travel can be a barrier, and this is compounded by the social risk of appearing ignorant in front of others.

“...some people don’t even want to try the bus cause they might feel like a fool cause they don’t know how to catch one.” (cyclist)

The provision of a free bus pass, and associated information on local buses was enough to overcome some of these barriers for at least one participant.

“ ...it was the trigger for me. Oh I’ve got this pass now I’d better try it, and was pleasantly surprised ... ”
(bus user and driver)

Her subsequent positive experience of catching the bus enabled her to continue using it regularly.

“ ‘Cause the thing that sold me was actually trying it. You could have told me whatever you liked and it wouldn’t have made any difference. I had to prove to myself that it was something viable and workable and have been pleasantly surprised. So I’ve told a few people. It’s great catching the bus. ”
(bus user and driver)

Others had not had such a positive experience, confirming that for them at least the bus is still not a feasible option.

“I took the incentive... and I really intended to take the bus more often. In the morning, taking the bus, even at a very early hour takes me about three times as long, and on the way home because ... [there are] a lot of school kids on the buses, it probably takes me between four and five times [as long] ” *(driver)*

The characteristics of the bus service as experienced by users, such as the location of bus stops, frequency of the service, comfort of buses and directness of the route, are all critically important to people’s perception of the bus as a feasible option, and were most noticeable by their absence.

“...and the bus stops aren’t always practical to walk to either. They’re actually quite far. ”
(driver)

Conversely, existing bus users commented when these aspects of their journey were working well.

“I have great routes, ‘cause there’s two potential buses I can catch. One goes straight down Memorial Ave and into town and the other one ... comes right past the building.” (bus user)

The most obvious improvement to public transport infrastructure in Christchurch recently has been the opening of the new bus interchange near the BNZ Centre. Focus group participants commented on the resulting benefits for their bus commute.

“These days of course it’s easier with the bus station just there... You know it’s going to be light, safe, warm, dry, information on when the buses are, and given that I have two choices of bus, I can just sit there and get whichever one comes first.” (bus user)

Non-bus users are also positive about the proximity of the bus interchange, but this is not enough alone to justify catching the bus.

“Well in theory it could have [made bus travel easier], with the bus exchange there, but in practice the service just takes too long.” (driver)

Walking

The main enabler of walking for the few walking participants in the focus groups was proximity to work, meaning that the walk time is acceptable. For non-walkers similarly, time is the most common barrier.

“I like walking because it’s quite nice just to have half an hourish each side of work to just chill out and not do anything.” (walker)

“I actually would prefer to walk, but it does take 65 minutes.” (cyclist)

There was some discussion of the fact that the building work in the CBD and the roadworks in Christchurch contribute to an adverse environment for pedestrians.

“...some of the people that drive and then walk a few blocks to work, some places they can’t actually walk on the footpath. It’s either badly damaged, or coned off or fenced off, so they end up walking on the road. So, that’s not that safe.”

(cyclist)

4.7.3. Barriers and Enablers - Summary

Overall, there is evidence from both the survey and the focus groups that any mode which lengthens (or is perceived to lengthen) commute times faces a significant barrier to uptake. In this case study, longer commute times are a particular barrier to bus use and walking, as evidenced by multiple statements from the survey and focus groups. For walkers, commute time is dependent on commute distance whereas for bus users commute time can depend on a range of factors such as service frequency, reliability, route directness, route proximity to home and work, road conditions and traffic congestion. For buses, these factors are often mentioned as barriers in themselves, along with other characteristics of the service such as the uncomfortable seats or the presence of other passengers. Evidence from focus groups shows that bus users may also face social barriers, for example the potential embarrassment of not knowing how to access the bus service.

The major factors enabling bus use are almost identical to the main barriers, but are naturally perceived to add to the convenience of the journey rather than detract. Bus users are enabled to use the bus by having convenient routes nearby that are ‘fast enough’, reliable and allow people using the bus to relax and enjoy the relatively stress-free nature of the trip. Enablers of walking are related to the main barrier, in that walking is enabled primarily by proximity to the walking destination. However perceiving the route to be safe is also important and this may be lacking in Christchurch where abandoned buildings and empty lots are still common in the CBD years after the earthquakes.

Barriers to cycling reported in this study reflect the common concerns of non-cyclists that cycling is not safe or impossible in bad weather. Existing cyclists however often have an alternative commute mode that they use when they perceive cycling to be

infeasible for either reason. Many consider that bad weather is less of a barrier in itself than the effect of that bad weather on safety. So, while existing cyclists may not cycle on particular days due to weather or safety concerns they tend to manage or mitigate the situation rather than give up cycling as a result. The availability and type of facilities available at work to support cycling can throw up barriers if they are not well-designed to cater for all types of bicycles (including electric) or don't exist. Furthermore, policies on the use of facilities designed to enable active commuting can hinder people when unworkable, for example restrictions on locker use at the BNZ Centre.

One important theme to emerge from the focus groups was the impact of experiencing alternative modes on subsequent decisions to change to a more sustainable mode or not. For bus travel, an unexpectedly positive experience convinced one driver that catching a bus was feasible for her, while negative experiences on buses confirmed the opposite for other drivers. The provision of the bus pass as part of the incentive programme was mentioned as a reason to try the bus. Cyclists also said that experiencing the benefits of cycling when they started riding regularly to work enabled them to continue and one such benefit was that cycling is enjoyable. Participants who do not currently cycle were far less likely to talk about positive aspects of cycling that perhaps only become fully apparent once experienced.

5. Discussion and Conclusions

This study used a pragmatic, mixed-methods design to explore the principal research question and found that a move of employment from distributed suburban office locations back into the CBD **can** result in more sustainable employee commuting patterns. A range of factors contributed to the outcome of this case study. This chapter firstly discusses the main findings in terms of the literature and this study's contribution to the literature, taking into account the study's context. Secondly, this chapter critically reflects on the methods used to address each research question, outlining the strengths and limitations of this research. Thirdly, ideas for further research are suggested and these are followed by an overall conclusion.

5.1. Discussion of Research Findings

Some previous research into transport behaviour may have underestimated the impact of changes in spatial aspects such as commute distance, due to a focus on individual influences on behaviour rather than looking at those influences against a range of structural or other factors (Müggenburg et al., 2015). The present study has taken the opportunity to investigate the impact of a change in commute distance. The average distance travelled to work dropped by 4% after the office relocation studied³⁴. The proportion of short commutes to work (under 4km) increased and longer commutes correspondingly decreased. Most of this change is attributable to variations in the commute distance of people who used to travel out to more dispersed locations (at least 7km distant from the CBD). The commute destination after the move (namely the BNZ Centre) is geographically close to the centre of the city and therefore within a shorter distance of a larger number of residences. Interestingly this reduction in average commute distance occurred despite the general shift in the centre of gravity of the city to the north-west (where most new residential development has occurred) as a result of the 2010-11 earthquakes.

³⁴ For employees who did not move house at the time of the relocation and provided valid address details.

Canterbury commuters generally are heavily reliant on the car for their work commute, with car mode share approaching 90% in some surveys³⁵ (MOT, 2014a). Before the move to the BNZ Centre, car mode share in the study sample was 72%, while rates of cycling and bus use were higher than might be expected based on census figures. Even amongst this group of commuters, who were already using non-car modes more than is usual for Canterbury, there were substantial shifts away from car use after the relocation (main mode reported as car dropped from 72% to 58%) to catching the bus or cycling, with slight increases in walking and motorcycle use. Previous research links a rise in destination accessibility (which can be measured as a drop in distance to the CBD) to an overall drop in distance travelled (vkt/vmt), and also to decreases in motorised travel and increases in non-motorised travel (Ewing & Cervero, 2001, 2010). Therefore the drop in car use demand in this study is not unexpected given the drop in average commute distance.

Further evidence of the importance of the commute destination to mode choice is that the change in main commute mode was found to be proportionally the same for those who moved their office location from the more distant workplaces near the airport as for those who relocated a shorter distance. In other words, there was no relationship between ‘initial location’ (pre-move distance to the CBD) and the likelihood of changing commute mode after the move. It is more likely that such changes are the result of the new commute destination becoming more accessible to all commuters.

All long distance commutes in the present study (more than 20km) were made by car (both before and after the move) and the number of these commutes remained similar. Despite this, the average distance travelled by car increased. This is because proportionally more of the shorter distance commutes switched away from car use; a result consistent with the literature linking increased rates of active travel to shorter commuting distance. There was no correlation between an individual’s commute distance increasing or decreasing and their decision to switch to a more sustainable mode. However, it is likely that it is only those individuals who are commuting less than a particular distance who have a realistic choice to become active commuters. This

³⁵ Mode share of journey to work by region 2010-14, total of categories ‘car’, ‘car and walk’, ‘passenger’ for the Canterbury region.

office relocation therefore may have increased the feasibility of active commuting for a greater proportion of employees commuting to the BNZ Centre, some of whom may be encouraged to take up the resulting opportunity to reduce car use simply because they perceive that there is a greater possibility to do so (Abrahamse, Steg, Gifford, & Vlek, 2009).

This study was not set up to evaluate or measure in detail the impact of the incentive programmes offered by the agencies during the relocation. This is due to the difficulty of analysing the small number of commuters who did make a change to more sustainable modes (26 individuals) as well as the limited character of the incentives. However there is evidence that one of the interventions may have had a small effect on encouraging bus use after the move. While the literature surrounding the success of interventions to reduce car use is not conclusive, there is some evidence that interventions which reduce perceived barriers to action by reducing costs, such as the one offered in this case, can help to support mode shift at a time of change (Bamberg, 2006; Bamberg et al., 2003). In the present study, those who changed to a more sustainable mode (of any type) were far more likely to have also taken up the \$30 bus pass than those who did not make a change. Evidence from the focus groups and survey comments demonstrated that the bus pass enabled some people to try using the bus at no cost. Those who then had a relatively positive bus experience were more likely to continue using this as a regular form of transport, while those who had a negative experience tended to remain using their usual mode (often the car). If bus experiences had been more positive for more people it is possible that a larger shift to public transport could have been seen.

There was less evidence that the modest bike incentive had any direct impact. There was no significant difference in terms of mode change between those who took up the free bike lock and those who did not. Furthermore focus group discussion and survey comments tended to downplay the importance of the free lock, with participants stating it had made no difference to their decision to cycle. Overall, given that the participation rates in the incentive programmes were fairly high (approximately 40%), it is likely that both incentives helped to improve people's awareness of their transport options prior to the move and provoked discussion. It is possible that promotion of the incentives

contributed to the fact that nearly half of all survey respondents (48%) report that they considered making a change in the way they travel to work prior to the move. It is less likely that provision of such information alone was enough to encourage significant change.

The drop in average distance travelled combined with the drop in the number of car commuters significantly reduced average carbon emissions from the commute journey for the sample population in this study. It is estimated that emissions dropped by 16% while the average distance travelled dropped by 4%; this is because mode switching away from car travel to either public transport or active modes had a greater impact on emissions overall. Commuting to work is the main purpose of less than 40% of New Zealander's daily travel journeys (O'Fallon & Sullivan, 2005). The present study did not address non-work travel, however there is no reason to think that mode choice for non-work travel changed significantly as a result of the workplace relocation. Less than 2% of the study sample who moved house at the time of the relocation rated the relocation itself as an important factor in their decision.

If significant numbers of commuters could be encouraged, by a change in workplace or other cause, to make similar changes in their commute patterns to the ones seen in the present study, then the impact on New Zealand's carbon emissions within cities could be substantial. In this case study the combined impact of mode shift and reduced distance had a significant impact on emissions, supporting the premise that decarbonisation of the transport sector will require a range of strong and mutually supportive policies acting on both access and mode (Chapman & Boston, 2007; Sims et al., 2014). Encouraging and supporting mode shift away from the private car and improving accessibility is therefore a requirement for any city looking to seriously meet carbon reduction targets in the next few decade (Chapman, Howden-Chapman, Whitwell, & Thomas, 2017).

The findings on gender and mode choice show that amongst this group of commuters there are significantly more male cyclists than female, and more men report having access to a bike. This gender difference is further emphasised by model results reporting that active commuters are approximately seven times more likely to be men than

women compared to car drivers, when all other contributing factors are held equal. This is a common result in Western democracies where cycling rates overall are low (Heinen et al., 2010), and is comparable with New Zealand statistics that report only 30% of cycling trips in Christchurch are made by women (Shaw & Russell, 2016, p. 18). Although gender differences were not directly investigated in this study, the reasons given for not cycling are often related to safety concerns and similar concerns arise in gender differentiated overseas studies (Bopp, Child, & Campbell, 2014; Garrard, Rose, & Lo, 2008). For Christchurch this result implies there is a significant pool of ‘missing cyclists’ who are potentially within cycling distance of work but who are not cycling for other reasons. Cycling rates could rise quickly if women decided to, or were enabled to, take up commuter cycling at the same rates as their male colleagues; thereby contributing to the long and proud tradition of female cycling that started in Christchurch over 120 years ago, as reported in the Canterbury Times:

“...everyone cycles – both sexes, all ages, all ranks. Ladies make calls thirty miles out ... There were lady cyclists in Christchurch when they were practically unknown in other parts of the world ...”
(Kennett, 2004, p. 76)

While gender is a significant factor for cyclists, regression model results from the two different commute journeys show that socio-demographic factors alone are less powerful in categorising commute mode choice than a combination of socio-demographics, commute time, commute distance and environmental attitudes. Significant factors in the model are consistent across the two different commute journeys. They confirm the findings of international studies that commute distance is a significant factor in the decision of whether to commute actively, with shorter commutes far more likely to be made actively than longer ones once other factors are taken into account. Concurrently, active commuters are more likely to have a slightly longer commute time than car commuters when all other factors are held equal, which is consistent with the fact that active modes often take more time than driving. Other significant factors include gender and environmental attitudes. Bus users are similarly more likely to have a longer commute time, shorter commute distance and slightly more positive attitude to the environment than car users, although gender is no longer a significant factor. Bus users are also more likely to hold a lower educational

qualification than car users and be less likely to have children under 18 in the household.

Model results show that when all other factors are held equal, individuals with more positive environmental attitudes are slightly more likely to commute actively or by bus than be car users. However, the magnitude of the relationship is very modest compared to other factors. Also, after the move cyclists hold slightly more positive attitudes to the environment than other commuters. This result may indicate that when the feasibility of non-car commuting improves individuals with more positive attitudes to the environment may be slightly more likely to take up the opportunity to commute in a more environmentally friendly manner. However, if the feasibility of non-car commuting does not change, then holding more positive environmental attitudes may not be enough alone to encourage mode shift. Overall, model results support the hypothesis that the changing context of the commute (in terms of time and distance) is more significant to commute mode choice than a measure of attitudes to the environment. In theoretical terms, these results point to the importance of including contextual factors surrounding commute circumstances when modelling commute mode choice.

Commute time is often an important factor in mode choice according to the literature. In this particular case study people are spending slightly more time on average commuting than they did before the move, and this is despite the fact that the average commute distance is shorter. Several factors contributed to this result. Higher numbers of people are commuting actively or by bus and their journeys take longer than driving. Furthermore, there are fewer short-duration car journeys after the move (under 15 minutes). There are several reasons for this including the fact that most drivers can no longer park on-site and the extra time spent walking from their car park adds to their commute, but also it is these short duration car journeys that are more likely to have shifted to another slower mode. In general, taking all modes together there are fewer journeys of less than 15 minutes but more that are between 15 and 30 minutes.

If commuters are viewed as rational actors aiming to minimise commute time, then shifting to a slower mode may seem counter-intuitive. However, a commute time of up

to 30 minutes falls within the Marchetti constant of around one hour maximum travel time per day (Metz, 2008b; Zahavi & Talvitie, 1980). Therefore the fact that it is appears to be the shorter duration commutes that have shifted mode is consistent with Metz's hypothesis that people are more likely to consider journeys of a different mode to be feasible if the commute time falls within a reasonable 'travel time budget' (Metz, 2008a). Longer journeys of over one hour duration continue to be primarily car journeys both before and after the move. Christchurch's public transport system relies essentially on buses and bus travel times are currently affected by the same traffic congestion as cars. If an alternative existed that was faster than driving long distance (for example, rail, light rail or express buses) then it is possible that it would be more attractive to these long-distance car commuters, as has proved the case in Auckland with recent improvements to the public transport system (Reynolds, 2017). In fact a light rail system was proposed for Christchurch by the City Council during the early stages of planning immediately following the 2010/11 earthquakes; however all mention of light rail was subsequently dropped by the central government agency in charge of the rebuild due to cost and feasibility concerns (CCC, 2011; CERA, 2012; Salmon, 2015).

Focus group results highlight the impact of automobility in New Zealand. The car is still seen as the default mode of transport. Drivers tend to describe their decision to use the car by reference to their inability to use any of the alternative modes. Bus users and active commuters are far more likely to talk about why they enjoy their commute and what benefits they get from it than the downsides of alternative modes. Survey results confirm that commuting by car is seen as convenient and quick, which may explain why it is seen as the most feasible choice for many commuters; however it is not necessarily seen as enjoyable. Active commuters were far more likely to agree that they enjoyed their commute than drivers, and satisfaction ratings for the commute journey by active modes were at least as high as, or greater than for car journeys, a result consistent with overseas studies of mode satisfaction (Rissel, Crane, Wena, Greaves, & Standen, 2016; St-Louis, Manaugh, van Lierop, & El-Geneidy, 2014).

Parking has emerged as a significant factor in decision-making for this particular case study. In general, parking was perceived to be quite convenient for drivers before the move, but this changed with the relocation back to the CBD. Employees mentioned that

there had been a lot of discussion prior to the move about the lack of on-site parking available for staff in the BNZ Centre. The impact of this on commute choice can be seen in several key results. Firstly survey respondents were significantly more likely to agree that the availability of parking was a reason supporting their commute mode choice after the move than before. Breaking commute reasons down by main mode, car users were likely to agree on average that they commuted by car due to parking availability before the move, but after the move this dropped significantly and they were more likely to disagree. The ratings for parking by cyclists moved in the other direction, from disagreement to agreement. So parking became a more common reason for cyclists to cycle at the same time as it became a less common reason for car users to drive. Secondly parking stands out as the one commute factor in the survey that was correlated very differently with other factors after the move compared to before. Thirdly parking was a major topic of discussion in all focus groups and a number of people explicitly discussed the impact of parking availability on their commuting decisions. Several car users expressed their frustration at their loss of free on-site parking, while some non-car users mentioned reduced parking availability as a key consideration in their decision to either change modes or use alternative modes more often.

Overall, parking constraints, or perhaps more accurately the perception that parking became more constrained, had an impact on mode choice for this study. This is true even when the actual availability of parking within walking distance of the Christchurch CBD is still relatively abundant, and may have even increased since the 2010/11 earthquakes (Cropp, 2017). After the move to the CBD there were fewer car users in the present study, but the majority of those that remained still parked on the road in free parking spaces; very few parked in metered parking spaces. Free parking spaces within or close to the CBD are likely to decrease in number as the rebuild progresses, but they may also be replaced with paid parking spaces (either rented or metered). The high level of parking availability in or near the CBD continues to function as a disincentive to the use of other modes. Abundant free or under-priced parking enables the use of the private car while not taking into account the full costs of use, and decreases the feasibility or attractiveness of alternatives (Ewing & Cervero, 2001; Willson & Shoup, 1990). If the Christchurch City Council aims to decrease car use in the CBD and

encourage more commuters to commute actively or by bus then more stringent parking restrictions or increased parking costs will be required.

Understanding individual self-reported commute reasons can help to shed light on factors underlying commuting decisions. When broken down by main commute mode, analysis of commute reasons showed very different patterns emerging for each group of respondents, most of which are consistent across the two commute journeys (before and after the move) with the notable exception of parking as already discussed. In general however, results reinforce the idea that the car is perceived to be the most convenient and fastest way to travel. Car users in this study consistently agreed more strongly than any other group that commuting by car was convenient, fast and the best way to cover their commuting distance. Cyclists agreed that their commute was convenient while walkers agreed that their commute could be the best way to cover the distance, but the strongest agreement was found amongst car commuters. Cyclists by contrast most strongly agreed that they commuted by bike to maintain their health and fitness and for cost reasons. Walkers also walked for health and fitness reasons, and were the group to agree most strongly that they enjoyed their commute.

Looking at commute reasons overall, there were several key differences on average between the two commute journeys. These differences reflect the fact that more people commuted actively or by bus and fewer by car after the move. For instance, respondents were significantly less likely to agree post-move that their commute was the quickest way to get to work, that they needed to have access to their car during the day, or that they were trying to avoid the effects of the weather. Also, people were slightly more likely to agree after the move that they commuted the way they did for environmental reasons. Across all commute modes, respondents were less likely to agree that they commuted out of habit after the move to the BNZ Centre, a result consistent with the ‘habit discontinuity’ hypothesis which states that habits can be disrupted at a time of change such as an office relocation (Verplanken et al., 2008) and that travel habits, once disrupted, may take time to strengthen again (Walker et al., 2014).

There were only a small group of respondents who used to catch the bus regularly before the move, so results concerning bus use must be interpreted with caution.

However for this particular study it seems that before the move bus users disagreed that the bus was convenient, and this changed to agreement after the move, thereby providing some evidence to suggest that either public transport provision to the new location was more convenient in some way, or that those people who chose to catch the bus after the move were also those who found the service most convenient. Further evidence of this can be seen in the rise in satisfaction ratings for bus users after the move. Focus group discussions tended to support at least one aspect of this, with most bus users commenting on the increased convenience of being close to the new bus interchange. These results may also reflect the fact that public transport to outlying office locations was not simple, implying that respondents catching the bus may have had no other choice. Also focus group discussions implied that there is a perception in Christchurch that catching the bus, in contrast to driving, is a low-status activity. The narrative that public transport exists purely to provide a transport option for low socio-economic groups or students is echoed in official Christchurch documents from the mid-1960s all the way through to the 2000s referring to buses as ‘public transport for the disadvantaged’ (Imran & Pearce, 2015).

The present case study aimed to capture the different perspectives on barriers to and enablers of sustainable commute modes faced by individuals who were not commuting sustainably already, compared to those who were. The purpose of this is to shed light on ways to encourage those already using sustainable modes to continue, as well as to overcome barriers for those considering making a change. The international literature concurs that the most significant barriers to address are the ones that impact on the feasibility of the journey. Survey results did reflect this, with the most significant barriers mentioned by those considering public transport being related to the feasibility of the trip, e.g. the bus takes too long, or quality of service, e.g. ‘the timetable does not work for me’. The next most significant barriers related to cost and convenience, with bus travel in Christchurch generally being perceived by non-bus users as expensive or crowded at peak times. For those not already walking but considering it, the major barrier was the time it takes to walk, alongside the weather and personal safety. For those considering cycling there was less emphasis on feasibility barriers such as route safety or distance and instead the most significant barriers were a dislike of cycling in bad weather and the need to do other tasks on the way to or from work. However, the

latter result may be due to the structure of the survey which only presented the question on barriers to those who had either already tried cycling or were considering it in the near future and therefore were more likely to consider cycling as safe enough for them. Furthermore, this group of survey respondents were more likely to have access to a bicycle than the Canterbury average, the latter already being amongst the top three regions in New Zealand in this regard (MOT, 2014b).

Looking at enabling factors for those already commuting by sustainable modes tended to show that once feasibility factors have been met (commute time is reasonable, distance is not too great or the buses are reliable enough), other considerations such as cost, safety, comfort and convenience (the definition of which varies by mode and by individual) come into focus. Again this is consistent with the literature on barriers and enablers of sustainable transport, especially public transport (Batty et al., 2015) and cycling (Forsyth & Krizek, 2010). Active transport commuters valued the low cost nature of their commute, the predictability of their travel time and that they were able to find a 'safe enough' route to travel. In addition to this, and consistent with the literature (Hunt & Abraham, 2007), cyclists report the provision of facilities such as secure bike parking and showers at the BNZ Centre enabled them to cycle. The quality and useability of such facilities were important to respondents implying that it is worth taking care over details such as location, design and policies of use that could otherwise throw up unexpected barriers to some people, e.g. ensuring that secure bike parking is appropriate for heavy electric bikes, or providing long-term locker storage. When it comes to convenience, both active commuters and bus users tend to interpret this as the ability to avoid the hassles and stress that come with commuting by car, e.g. looking for a park and dealing with traffic congestion. Bus users also interpret convenience in terms of details of their bus route; for example having bus stops nearby. So the proximity of the BNZ Centre to the newly opened Christchurch bus interchange has been an enabling factor for some.

In light of the findings discussed above, there are policy approaches that can help to address some of these barriers. For public transport, making buses a more feasible option for higher numbers of commuters would require an approach that improves bus journey times and service quality. Such measures could include: continuing to review

the bus network as the rebuild progresses to improve efficiency; introducing bus priority measures such as bus lanes; improving bus comfort; and raising the quality and profile of public transport to address the outdated perception that buses cater for only lower socio-economic groups. It is possible, given the large proportion of employees who chose public transport as a possible alternative transport mode, that measures such as this could encourage significantly greater numbers of commuters to switch to public transport. Moreover, giving commuters a positive experience on the buses will be crucial to encourage long-term use.

For cycling, encouraging businesses to provide ‘cycle-friendly’ facilities to employees can help to enable commuter cyclists in particular workplaces. Furthermore, completion of the safe cycle networks that are already underway in Christchurch will contribute to an environment in which cycling is normalised and safety is improved. The latter is particularly important for less confident cyclists and may help to encourage greater numbers of females to commute by bicycle.

In this particular study, few individuals saw walking as a feasible alternative commuting option, primarily due to the distance between home and work. However, amongst those who did, personal safety in the Christchurch CBD was sometimes a concern. As the rebuild progresses, attention could be paid to ensuring that areas of the CBD still affected by the earthquakes are kept as attractive, well-lit and as safe as possible, especially as the land is redeveloped.

To summarise, the current study arose from a unique set of circumstances, namely the rebuild of a city following a natural disaster and, in particular, the city’s gradual recentralisation. However the results of this case study can reasonably be generalised to some extent. Employers make choices to relocate their places of business within cities on a regular basis for varying reasons, thereby requiring their employees to change their commuting patterns. Whether employers choose to move to inner-city or suburban locations impacts on the travel choices available to their employees. New Zealanders are predominantly urban dwellers and many major cities in New Zealand have a political mandate to create more vibrant high-quality compact cities for reasons including more efficient use of limited resources, limiting infrastructure costs and

revitalising the inner city (Early, Howden-Chapman, & Russell, 2015, p. 229). If cities are successful in these aims and the move towards more compact cities also results in significant recentralisation of employment, then it may help contribute to a reduction in New Zealand's carbon emissions from transport. That is, recentralisation of employment can provide an important opportunity for employees to reassess their commuting mode choice, and this study suggests that a significant number are likely to move to a more sustainable mode if commute distance or time is reduced and there are constraints on car use. Whether substantial mode shift is realised will depend on those cities providing employees and residents with transport systems and infrastructure to ensure there are feasible, efficient, safe and sustainable alternatives to driving a car to work.

5.2. Strengths and Limitations

This study was able to take advantage of a window of opportunity in Christchurch to study an uncommon natural experiment, namely the large-scale relocation of the jobs of several hundred employees from dispersed office locations back to a central city location. Thanks to the cooperation of the agencies involved the response rate to the survey was relatively high. Furthermore, the mixed-methods approach used was able to combine quantitative information on the changes that occurred with individual perspectives on the reasons why those changes did, or did not, take place, leading to a much more nuanced perspective on individual decision-making with regard to transport at a time of change.

Ideally, to address the research question surrounding how employees' travel choices changed over time, this research would include a baseline survey made before the office relocation to assess travel choices, with the survey being repeated after the move. In this particular case, due to timing of the study and the fact that the agencies involved had already performed their own, more limited, baseline study of employee travel choices, this form of longitudinal design was not possible. Instead, the collection of data on past travel choices was done retrospectively. Collection of longitudinal data retrospectively is a valid methodological choice in the social sciences, with the potential drawback that some individuals may not accurately recall their behaviour or attitudes at the earlier

time (Menard, 2004). However, the present study asked about behaviour occurring only approximately six weeks before; therefore accurate recall is unlikely to be a significant issue. This data collection method also missed gathering data from individuals who may have chosen to change their job rather than relocate to the CBD. While there are no detailed statistics available on staff turnover for the combined agencies, only seven replies to the survey out of 191 were from new staff members employed in the six weeks following the move (less than 4%), implying that the impact of this type of employment self-selection on the quality of the survey was likely to be low.

In an ideal experimental design, this study would be run alongside a study sampling a similar group of employees working in different locations in Christchurch who had not been subjected to their office relocating. This could help to estimate any impacts of other wider changes in the Christchurch context that may have hindered or supported people changing their work commute to more sustainable modes regardless of whether or not they are working in the CBD. For time and cost reasons, such a comparison was not possible for this particular project. However, as the study was performed only six weeks after the office move, it is unlikely that the wider transport situation in Christchurch changed significantly over that short period of time.

Employees surveyed for this study were all government employees and were much more highly educated and slightly older than the average for Canterbury, so the sample is not entirely representative of the general employed population. However no particular employee group will be ‘typical’ of the workforce as a whole, and this is unlikely to affect the general result that recentralisation of employment results in a drop in average commuting distance.

In this case study, the number of people who changed their main commute mode to be more sustainable, while not insignificant, was not large enough in absolute terms to allow for very detailed statistical analysis. Therefore, similar case studies may benefit from finding larger samples to work with. In Christchurch there are at least two more “All of Government” relocation projects involving government agencies moving back to the CBD during the next two years that may provide this opportunity (MBIE, 2016), as well as numerous private sector employers (McDonald, 2017).

There are further limitations to the scope of this research arising from the inherent time and resource constraints created by one person completing the study within the timeframe of a master's thesis. For example, it would have been interesting to survey staff again a few months after the first survey to determine whether the initial changes observed had been maintained over time. It is possible that some employees may revert to earlier travel modes over time as the impact of the move diminishes, but equally possible is that the example set by those making a shift to more sustainable modes encourages others to follow suit. However it was not possible to include a second survey within the timeframe of the current project.

5.3. Further Research

There are many opportunities for further research arising from this study. Firstly, case studies could be carried out on similar office relocations as the Christchurch rebuild continues. Having a series of similar studies could help to demonstrate whether the factors identified in this study are consistently important. One improvement that could be made would be to run any such studies longitudinally, with data captured both before and after the actual relocation. Furthermore, this research could be extended by following up staff at the same location to determine whether the changes identified in this study are long-lasting. Alternatively, there is the potential for a larger scale research project investigating long-term behaviour change across multiple office relocations occurring over the next few years.

Outside this case study, this research has found that relocating these employees back into the CBD has resulted in a change to more sustainable commuting patterns for several reasons, but also that there is potentially latent demand for further change. This is particularly true of public transport in Christchurch. Given that public transport patronage has yet to rebound to pre-earthquake levels, despite the consistent efforts of several local government agencies, a study designed to investigate the reasons for this in greater detail could be warranted.

In terms of active travel, this study has confirmed that gender is highly significant to commuter cycling. For New Zealand in general, and Christchurch in particular, with ambitions to lift cycling rates, further qualitative research could be done into the barriers and enablers either stopping, or supporting, women to take up commuter cycling. Such local, place-specific, contextual research could also help inform the current development of cycling infrastructure that is taking place across New Zealand.

5.4. Conclusion

The aim of this case study was to explore the impact of work location on the transport patterns of employees by investigating choices made at a time of change. This was done using a pragmatic mixed-methods approach to explore data collected from employees on their transport choices. The main research question to be answered was whether or not a relocation of employees working in suburban areas back into the CBD can result in more sustainable commuting patterns and what factors contribute to any change. This study extends the literature on the relationship between workplace relocation as a life event and employee travel behaviour, while also contributing more generally to the literature on the relationship between urban form, accessibility and transport choices.

The present study determined that such a shift can result in more sustainable commute patterns. The proportion of employees driving decreased (from 72 to 58 percent), the proportion of employees commuting actively and by public transport increased (from 27 to 39 percent), average commute distance decreased by four percent and carbon emissions related to commuting dropped by 16 percent. These results were attributable to a combination of factors, some of which are predictable and malleable and some of which are not. The most significant factor was the change in location itself as this not only decreased the average commuting distance for employees, but also slightly increased the number of employees within active commuting range of the office. Furthermore, the commute destination was slightly more accessible via public transport and parking availability was perceived to be more constrained. Overall, both the reduction in average commute distance, plus the shift away from use of the private car contributed to significant emissions reduction.

This study also confirmed that a time of change for employees can be an opportunity to encourage mode-shift as people are required to re-evaluate their commuting habits. Provision of information on more sustainable commuting options appears useful, but may not alone suffice to produce major changes in commute mode, as structural factors were found to be more important. The value of any incentives that may be provided to support change lies in the opportunity they provide for individuals to try different modes in a low-cost and supported way. This may result in some change, provided the experience is positive enough compared to alternatives. Overall, there need to be feasible, safe, efficient and sustainable commute modes available for people to use, as well as constraints on driving, such as reduced parking availability, to enable a significant shift away from use of the private car for commuting.

6. References

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Appendix A. Ethics Approval



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MEMORANDUM

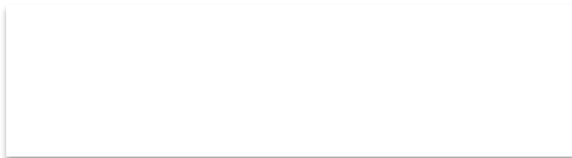
TO	Kate Whitwell
COPY TO	Ralph Chapman
FROM	AProf Susan Corbett, Convener, Human Ethics Committee
DATE	16 December 2015
PAGES	1
SUBJECT	Ethics Approval: 22515 Should I take the car? Factors impacting commuter travel mode choice when offices relocate

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 31 July 2016. 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.

Kind regards



Susan Corbett
Convener, Victoria University Human Ethics Committee

Appendix B. Online Staff Survey

Your Daily Commute: Personal Travel Survey

This survey is a follow up and builds on the Travel Survey we did last year looking ahead to our move to the BNZ Centre and our travel choices. It will provide valuable information which will be used to evaluate our Travel Plan. The overall purpose of this survey is to investigate whether changing the location of your workplace to the BNZ Centre affected your choice of how you travel to work. Please take the time to fill in this survey so that your views and experiences are included. Even if you didn't do last year's survey we still want your input now.

To evaluate the outcomes of the Travel Plan, the NZ Transport Agency is working with Kate Whitwell. Kate is a Master's student at Victoria University of Wellington and she has developed this survey as part of her thesis project. The survey consists of questions about your daily commute as well as how you used to commute to your previous office location. There are no right or wrong answers. We are interested in your opinions. The information you provide will be anonymous and confidential. The data collected will be stored in a password-protected file for up to five years, after which time it will be erased.

This project is being supervised by A/Professor Ralph Chapman, and has been approved by the Victoria University of Wellington Human Ethics Committee. You may withdraw your participation at any time while taking the survey.

By clicking the 'Next' button you are giving your consent to participate and confirm that you are over the age of 18.

There are several short sections in this survey. The main section should take no more than ten minutes to complete, with a few extra minutes required for those people who participated in the Travel Incentives offered at the time of the move.

If you have any questions regarding this study, please email Kate at Kate.Whitwell@vuw.ac.nz. If you have any concerns about the ethical conduct of this research, you may contact the Victoria University HEC Convenor: Associate Professor Susan Corbett. Email susan.corbett@vuw.ac.nz or telephone +64-4-463 5480.

Thank you for your participation.

Kind Regards,

Kate Whitwell

Victoria University of Wellington

Kate.Whitwell@vuw.ac.nz

Q2.1 Do you work ...

- ☐ Full Time (1)
- ☐ Part time (2)
- ☐ Casual Hours (3)

Answer If I work Part time Is Selected Or I work Casual Hours Is Selected

Q2.2 How many days a week (on average) do you commute to and from the BNZ Centre?

- ☐ I don't work at the BNZ Centre (1)
- ☐ One (2)
- ☐ Two (3)
- ☐ Three (4)
- ☐ Four (5)
- ☐ Five (6)

Q2.3 How many days a week (on average) do you work from home or off-site as opposed to at the BNZ Centre?

- ☐ I never work from home/off-site (1)
- ☐ Less than one (7)
- ☐ One (2)
- ☐ Two (3)
- ☐ Three (4)
- ☐ Four (5)
- ☐ I always work from home/off-site (6)

Q3.1 I would now like to ask you about your usual commute to work. Note: If you primarily work from home or off-site, then please answer these questions based on the occasions when you do travel into the BNZ Centre

Q3.2 What is your primary mode of transport for your usual commute to and from the BNZ Centre?

	bus (1)	bike (including e-bike) (2)	private car (alone) (3)	private car (shared with family/househ old members) (4)	walk/run (5)	carpool (6)	motorbike/ motorscooter (7)	Other (8)
To work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3.3 Why do you commute to work this way? To answer this, please rate how much you agree or disagree with the following statements.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
It's the most convenient option for me (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's the quickest option for me (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I commute this way for environmental reasons (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's the best way to cover the distance I need to travel to work (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To limit the cost of my commute (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
So my commute isn't affected by the weather (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to have access to my car when at work (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I commute this way to maintain my health and fitness (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel safe commuting to work this way (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy my commute (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's less stressful to commute this way (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To better meet my family obligations (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I commute this way out of habit (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My commute journey is reliable and predictable (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Because of parking availability (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3.4 Are there other reasons you commute to work this way?

Answer If What is your primary mode of transport for your usual commute to and from the BNZ Centre? - bike (including e-bike) Is Greater Than or Equal to 1 Or What is your primary mode of transport for your usual commute to and from the BNZ Centre? - car (driver) Is Greater Than or Equal to 1 Or What is your primary mode of transport for your usual commute to and from the BNZ Centre? - motorbike/ motorscooter Is Greater Than or Equal to 1 Or What is your primary mode of transport for your usual commute to and from the BNZ Centre? - carpool Is Greater Than or Equal to 1 Or What is your primary mode of transport for your usual commute to and from the BNZ Centre? - car (passenger) Is Greater Than or Equal to 1

Q3.5 If you DRIVE or CYCLE to and from work, where do you normally park? Select all that apply

- ☐ On-road metered parking (1)
- ☐ Off-road metered parking (2)
- ☐ On-road free parking (3)
- ☐ Off-road free parking (4)
- ☐ Off-road rented parking (5)
- ☐ Lockable bicycle storage - at the BNZ Centre (6)
- ☐ Lockable bicycle storage - off-site (10)
- ☐ Open air bicycle stands (7)
- ☐ Under cover bicycle stands (8)
- ☐ Other (9) _____

Q3.6 How long does it typically take you to commute to and from work?

	Less than 15 minutes (1)	Between 15 and 30 minutes (2)	Between 30 and 45 minutes (3)	Between 45 and 60 minutes (4)	Between 60 and 90 minutes (5)	More than 90 minutes (6)
To Work (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From Work (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3.7 How satisfied are you with the way you usually commute to work?

- ☐ Very Dissatisfied (1)
- ☐ Dissatisfied (2)
- ☐ Neutral (3)
- ☐ Satisfied (4)
- ☐ Very Satisfied (5)

Q3.8 What is your home address? Please note that all information collected is anonymous and will be kept confidential. The purpose of this question is to enable calculation of average commuting distances.

Address Line 1 _____(1)

Address Line 2 _____(2)

Suburb (3) _____

City (4) _____

Postcode (5) _____

Answer If What is your home address? Address Line 1 Is Empty And What is your home address? Address Line 2 Is Empty And What is your home address? Suburb Is Empty And What is your home address? City Is Empty And What is your home address? Postcode Is Empty

Q3.9 On a normal day what is the distance you travel to work? Please choose the distance that best represents a one-way commute from home to work.

- ☐ less than 2km (1)
- ☐ 2-4 km (2)
- ☐ 4-8km (3)
- ☐ 8-12km (4)
- ☐ 12-20 km (5)
- ☐ over 20 km (6)

Q4.1 Where did you work PRIOR to the move to the BNZ Centre?

- ☐ I have only started work with my current employer since the move to the BNZ Centre (15)
- ☐ I worked from home or off-site at all times prior to the move (6)
- ☐ Statistics NZ, Dollan House, 401 Madras Street (1)
- ☐ NZ Transport Agency, Airport Business Park, Unit C, 92 Russley Road (2)
- ☐ Department of Internal Affairs, 100 Orchard Road (3)
- ☐ Te Puni Kokiri, Rehua Marae, 79 Springfield Road, Saint Albans (4)
- ☐ Ministry of Pacific Island Affairs, 66A Magdala Place, Middleton (5)

If I worked from home or off-s... Is Selected, Then Skip To End of Block. If I have only started work wi... Is Selected, Then Skip To End of Block

Q4.2 I would now like to ask you about how you used to get to your PREVIOUS work location, i.e. before the move to the BNZ Centre.

Q4.3 Thinking about how you used to get to your PREVIOUS work location ...What was your primary mode of transport for your usual commute to and from that location?

	bus (1)	bike (including e- bike) (2)	private car (alone) (3)	private car (shared with family/ household members) (4)	on foot (5)	carpool (6)	Motorbi ke / motorsc ooter (7)	Other (8)
To work (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From work (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4.4 Why did you used to commute to your PREVIOUS work location this way? To answer this, please rate how much you agree or disagree with the following statements.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
It was the most convenient option for me (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was the quickest option for me (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I commuted this way for environmental reasons (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was the best way to cover the distance I needed to travel to work (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To limit the cost of my commute (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
So my commute wasn't affected by the weather (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I needed to have access to my car when at work (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I commuted this way to maintain my health and fitness (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt safe commuting to work this way (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoyed my commute (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was less stressful to commute this way (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To better meet my family obligations (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I commuted this way out of habit (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My commute journey was reliable and predictable (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Because of parking availability (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4.5 Were there other reasons you used to commute to your PREVIOUS work location that way?

Answer If Thinking about how you used to get to your PREVIOUS work location ... What was your primary mode... - bike (including e-bike) Is Greater Than or Equal to 1 Or Thinking about how you used to get to your PREVIOUS work location ... What was your primary mode... - car (driver) Is Greater Than or Equal to 1 Or Thinking about how you used to get to your PREVIOUS work location ... What was your primary mode... - carpool Is Greater Than or Equal to 1 And Thinking about how you used to get to your PREVIOUS work location ... What was your primary mode... - motorbike/ motorscooter Is Greater Than or Equal to 1 And Thinking about how you used to get to your PREVIOUS work location ... What was your primary mode... - car (passenger) Is Greater Than or Equal to 1

Q4.6 If you used to DRIVE or CYCLE to and from your PREVIOUS work location, where did you normally used to park? Select all that apply

- ☐ On-road metered parking (1)
- ☐ Off-road metered parking (2)
- ☐ On-road free parking (3)
- ☐ Off-road free parking (4)
- ☐ Off-road rented parking (5)
- ☐ Lockable bicycle storage (6)
- ☐ Open air bicycle stands (7)
- ☐ Under cover bicycle stands (8)
- ☐ Other (9) _____

Q4.7 How long did it typically take you to commute to and from your PREVIOUS work location?

	Less than 15 minutes (1)	Between 15 and 30 minutes (2)	Between 30 and 45 minutes (3)	Between 45 and 60 minutes (4)	Between 60 and 90 minutes (5)	More than 90 minutes (6)
To Work (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From Work (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4.8 How satisfied were you with the way you commuted to your PREVIOUS work location?

- ☐ Very Dissatisfied (49)
- ☐ Dissatisfied (50)
- ☐ Neutral (51)
- ☐ Satisfied (52)
- ☐ Very Satisfied (53)

Q4.9 Have you moved house recently: either just prior to or after the relocation to the BNZ centre?

- ☐ Yes (1)
- ☐ No (2)

Answer If Have you moved house recently: either just prior to or after the relocation to the BNZ centre? Yes Is Selected

Q4.10 How important was the change of work location to the BNZ centre in your decision to move house.

- ☐ Not at all Important (1)
- ☐ Somewhat Unimportant (2)
- ☐ Neither Important nor Unimportant (3)
- ☐ Important (4)
- ☐ Very Important (5)

Answer If Have you moved house recently: either just prior to or after the relocation to the BNZ centre? Yes Is Selected

Q4.11 After you moved house, have you found it quicker to get to your new work location at the BNZ Centre?

- ☐ Yes
- ☐ Maybe
- ☐ No

Q4.12 Please indicate if you participated in any of the following Incentive Programmes offered at the time of the move to the BNZ Centre. Please select all that apply.

- ☐ Bike Lock Incentive - I received one of the free bike locks offered to staff (1)
- ☐ Bussing Incentive - I received one of the Metrocards or Metrocard credits offered to staff (2)
- ☐ 'Let's Carpool' - I have signed up on the 'Let's Carpool' site under the 'BNZ Centre' option (3)
- ☐ I did not participate in any Incentive Programme (4)

Answer If Please indicate if you participated in any of the following Incentive Programmes offered at the t... I did not participate in any Incentive Programme Is Selected

Q4.13 Why didn't you participate in either Incentive scheme?

- ☐ The incentives offered weren't useful to me (1)
- ☐ I didn't hear about the incentives (2)
- ☐ The time frame for applications was too short (3)
- ☐ I applied for an Incentive but missed out (4)
- ☐ Other (5) _____

Q4.14 Prior to the move to the BNZ centre, did you consider changing the way you get to and from work? e.g. if you used to cycle that you might now walk, or if you used to catch the bus that you might now drive?

- ☐ Yes (1)
- ☐ No (2)
- ☐ I can't recall (3)

Q4.15 Subsequently, since the move, have you changed the travel mode that you use to get to work? e.g. sometimes walking, or now driving rather than cycling

- ☐ Yes I've made some changes: either for all trips, or just every now and then (1)
- ☐ I did try getting to work using a different travel mode(s), but it didn't work out for me (2)
- ☐ No I haven't changed or tried anything different. (3)

Answer If Subsequently, since the move, have you changed the travel mode that you use to get to work? e.g... I did try getting to work using a different travel mode(s), but it didn't work out for me Is Selected

Q5.1 In addition to your usual travel method, which of the following travel modes have you tried to get to or from the BNZ Centre? Select all that apply

- ☐ bus (1)
- ☐ bike (including e-bike) (2)
- ☐ private car (alone) (3)
- ☐ private car (shared with family/household members) (4)
- ☐ walk/run (5)
- ☐ carpool (6)
- ☐ motorbike/ motorscooter (7)
- ☐ Other (please specify) (8)

Answer If Subsequently, since the move have you made a change to your travel mode or tried getting to work using a different mode? Yes I've made some changes: either for all trips, or just every now and then Is Selected

Q5.2 Please select the other travel modes that you now use, even if only occasionally, to get to the BNZ Centre. Select all that apply.

- ☐ bus (1)
- ☐ bike (including e-bike) (2)
- ☐ private car (alone) (3)
- ☐ private car (shared with family/household members) (4)
- ☐ walk/run (5)
- ☐ carpool (6)
- ☐ motorbike/ motorscooter (7)
- ☐ Other (please specify) (8) _____

Answer If Subsequently, since the move, have you changed the travel mode that you use to get to work? e.g... No I haven't changed or tried anything different. Is Selected Or Where did you work PRIOR to the move to the BNZ Centre? I have only started work with my current employer since the move to the BNZ Centre Is Selected Or Where did you work PRIOR to the move to the BNZ Centre? I worked from home or off-site at all times prior to the move Is Selected

Q5.3 Would you be willing to consider using any of the following ways to get to work in the future, even for one or more days a week? Select all that apply

- ☐ No, I'm happy with the way I get to work now (8)
- ☐ bus (1)
- ☐ bike (including e-bike) (2)
- ☐ private car (alone) (3)
- ☐ private car (shared with family/household members) (4)
- ☐ walk/run (5)
- ☐ carpool (6)
- ☐ motorbike/ motorscooter (7)

Answer If What is your primary mode of transport for your usual commute to and from the BNZ Centre? - bike (including e-bike) Is Greater Than or Equal to 1 Or Please select the other travel modes that you now use, even if only occasionally, to get to the BNZ Centre. Select all that apply. bike (including e-bike) Is Selected

Q6.1 Thinking about cycling to work, what are the main reasons you have been able to either keep cycling to work or to start cycling more regularly or to give cycling a go? You can select as many as you wish.

- ☐ The BNZ centre is close enough to where I live (1)
- ☐ There is a reasonably safe route for me to take (2)
- ☐ There are facilities at the new office to support me to cycle to/from work, e.g. showers/lockers (3)
- ☐ Cycling is cheaper than my previous mode of transport (4)
- ☐ I have enough time to cycle to/from work (5)
- ☐ I can park my bike safely at work (6)
- ☐ It's a more convenient way to travel given the parking constraints and/or congestion of commuting to the CBD (8)
- ☐ Other (please specify) (7) _____

Answer If What is your primary mode of transport for your usual commute to and from the BNZ Centre? - walk/run Is Greater Than or Equal to 1 Or Please select the new travel modes that you are now using, or have tried, since moving to the BNZ... walk/run Is Selected

Q6.2 Thinking about walking/running to or from work, what are the main reasons you have been able to either keep walking/running to work, or start doing this more regularly or to give it a go? You can select as many as you wish.

- ☐ The BNZ centre is close enough to where I live (1)
- ☐ there is a reasonably safe route for me to take (2)
- ☐ There are facilities at the new office to support me to walk/run to/from work, e.g. showers/lockers (3)
- ☐ Walking is the cheapest way to travel (4)
- ☐ I have enough time to walk to/from work (5)
- ☐ Walking to work takes a predictable amount of time which is more convenient than the variability of travel time by other modes (e.g. driving/bus) (7)
- ☐ It's a more convenient way to travel given the parking constraints and/or congestion of commuting to the CBD (8)
- ☐ Other (please specify) (6) _____

Answer If What is your primary mode of transport for your usual commute to and from the BNZ Centre? - carpool Is Greater Than or Equal to 1 Or Please select the new travel modes that you are now using, or have tried, since moving to the BNZ... carpool Is Selected

Q6.3 Thinking about carpooling to/from work, what are the main reasons you have been able to either keep carpooling or to start carpooling more regularly or to give it a go? You can select as many as you wish.

- ☐ There are more options for joining carpools since the move (1)
- ☐ Carpooling is cheaper than my previous commute method (2)
- ☐ I can get to work in good time using my carpool (3)
- ☐ Carpooling has become more convenient since the move (4)
- ☐ Other (please specify) (5) _____

Answer If What is your primary mode of transport for your usual commute to and from the BNZ Centre? - bus Is Greater Than or Equal to 1 Or Please select the new travel modes that you are now using, or have tried, since moving to the BNZ... bus Is Selected

Q6.4 Thinking about using the bus to get to/from work, what are the main reasons you have been able to keep using or start catching the bus more regularly or to give it a go? You can select as many as you wish.

- ☐ The bus routes are convenient for getting to the BNZ centre (1)
- ☐ Catching the bus is cheaper than my previous commute method (2)
- ☐ I can get to/from work in a reasonable time on the bus (3)
- ☐ Public transport is reliable enough at the times I need to travel (4)
- ☐ I can use park and ride in combination with the bus to get to the BNZ centre (5)
- ☐ It's a more convenient way to travel given the parking constraints and/or congestion of commuting to the CBD (7)
- ☐ Other (please specify) (6) _____

Answer If What is your primary mode of transport for your usual commute to and from the BNZ Centre? - private car (alone) Is Greater Than or Equal to 1 Or What is your primary mode of transport for your usual commute to and from the BNZ Centre? - private car (shared with family/household members) Is Greater Than or Equal to 1 Or Please select the new travel modes that you are now using, or have tried, since moving to the BNZ... private car (alone) Is Selected Or Please select the new travel modes that you are now using, or have tried, since moving to the BNZ... private car (shared with family/household members) Is Selected

Q6.5 Thinking about using the car to get to/from work, what are the main reasons that you have been able to keep using the car, or have started using the car more regularly? You can select as many as you wish.

- ☐ Driving is the best way to cover the distance between my home and the BNZ centre (1)
- ☐ Driving is just as convenient for me since the move (2)
- ☐ I can drive to/from work in a reasonable time (3)
- ☐ Parking is available nearby at a reasonable price for me (4)
- ☐ I need to have access to a car during the day (5)
- ☐ Driving enables me to meet my family obligations before or after work (9)
- ☐ It's the only realistic option for me (7)
- ☐ Other (please specify) (6) _____

Answer If Would you be willing to consider using any of the following ways to get to work in the future, ev... bike (including e-bike) Is Selected Or In addition to your usual travel method, which of the following travel modes have you tried to ge... bike (including e-bike) Is Selected

Q7.1 Thinking about cycling to work, what are the main reasons that keep you from cycling or from cycling more regularly? You can select as many as you wish.

- ☐ I live too far from work or other places I need to get to (1)
- ☐ I need to do other things during my trip, e.g. grocery shopping, dropping off children at school (2)
- ☐ The route is not safe for cycling (3)
- ☐ The route is too hilly/not pleasant for cycling (4)
- ☐ Cycling takes too long to get to work (5)
- ☐ I don't like cycling in bad weather (6)
- ☐ I need a car at work (7)
- ☐ Personal reasons, e.g. health/fitness (8)
- ☐ Other (please specify) (9)

Answer If Would you be willing to consider using any of the following ways to get to work in the future, ev... walk/run Is Selected Or In addition to your usual travel method, which of the following travel modes have you tried to ge... walk/run Is Selected

Q7.2 Thinking about walking/running to work, what are the main reasons that keep you from walking/running to work or from walking/running more regularly? You can select as many as you wish.

- ☐ I live too far from work or other places I need to get to (1)
- ☐ I need to do other things during my trip, e.g. grocery shopping, dropping off children at school (2)
- ☐ The route is not safe for walking (3)
- ☐ The route is too hilly/not pleasant for walking (4)
- ☐ Walking takes too long to get to work (5)
- ☐ I prefer to walk/run in good weather only (6)
- ☐ I need a car at work (7)
- ☐ Personal reasons, e.g. health/fitness (8)
- ☐ Other (please specify) (9) _____

Answer If Would you be willing to consider using any of the following ways to get to work in the future, ev... bus Is Selected Or In addition to your usual travel method, which of the following travel modes have you tried to ge... bus Is Selected

Q7.3 Thinking about taking the bus to work, what are the main reasons that keep you from catching the bus or from catching the bus more regularly? You can select as many as you wish.

- ☐ There is not a bus stop or station near my home (1)
- ☐ The bus timetable doesn't work for me. (2)
- ☐ I need to do other things during my trip, e.g. grocery shopping, dropping off children at school (3)
- ☐ I need a car at work (4)
- ☐ The service is unreliable (5)
- ☐ Buses takes too long (6)
- ☐ It is too hard to get to work by public transport, e.g. need to take two different buses. (7)
- ☐ I don't feel safe on the bus (8)
- ☐ It is too expensive (9)
- ☐ Other (please specify) (10) _____

Answer If Would you be willing to consider using any of the following ways to get to work in the future, ev... carpool Is Selected Or In addition to your usual travel method, which of the following travel modes have you tried to ge... carpool Is Selected

Q7.4 Thinking about carpooling to work, what are the main reasons that keep you from carpooling, or from carpooling more regularly? You can select as many as you wish.

- ☐ I can't find a carpool group near where I live (1)
- ☐ I can't find a carpool that travels at the time I need to get to/from work (2)
- ☐ I need to have transport available during the day (3)
- ☐ Carpooling isn't reliable enough for me (4)
- ☐ Its too expensive (5)
- ☐ It's difficult for carpools to find a convenient parking place (6)
- ☐ Other (please specify) (7) _____

Q8.1 Please indicate your level of agreement with the following statements

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Human ingenuity will ensure that we do NOT make the earth unlivable. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The earth has plenty of natural resources if we just learn how to develop them. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plants and animals have as much right as humans to exist. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The balance of nature is strong enough to cope with the impacts of modern industrial nations. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Despite our special abilities humans are still subject to the laws of nature. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Human destruction of the natural environment has been greatly exaggerated. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The earth has only limited room and resources. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Humans were meant to rule over the rest of nature. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The balance of nature is very delicate and easily upset. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If things continue on their present course, we will soon experience a major ecological disaster. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9.1 Now a few questions about you .. Just a reminder, that all answers are anonymous and confidential

Q9.2 Are you ...

- ☐ Female (1)
- ☐ Male (2)
- ☐ Gender Diverse (3)

Q9.3 What year were you born?

- ☐ _____ (enable choice of year from 1920 to 1998)

Q9.4 Who lives in the same household as you? Please select ALL that apply or none if you live alone

- ☐ My husband, wife, civil union partner or de-facto partner (1)
- ☐ My child(ren) under the age of 18 (2)
- ☐ My child(ren) aged 18 and over (3)
- ☐ My extended family (parents/grandparents/siblings) (4)
- ☐ My flatmate(s) (5)
- ☐ Other (please specify) (6) _____

Q9.5 Which of these best describes your highest educational qualification?

- ☐ Secondary school, incomplete (1)
- ☐ NCEA, School Certificate or other secondary school qualification (2)
- ☐ Polytechnic qualification or Trade Certificate (3)
- ☐ Undergraduate Degree (4)
- ☐ Postgraduate Degree (5)

Q9.6 Do you have access to a car?

- ☐ Yes (1)
- ☐ No (2)

Q9.7 Do you have access to a functioning bike?

- ☐ Yes (1)
- ☐ No (2)

Q9.8 Do you have a physical condition that prevents you from walking/cycling?

- ☐ Yes (1)
- ☐ No (2)

Q9.9 Do you have any further comments to make regarding your commute to work?

Q10.1 This section of the survey is to collect your feedback on the Bussing Incentive you participated in. While participation in this section of the survey is optional, we value your feedback as we aim to use the collated information from the All of Travel survey and this Incentive survey to improve such Incentive programmes in the future.

Q10.2 Did you use the Good Travel Choice webpage to find information about bus travel before the move?

- ☐ Yes (1)
- ☐ No (2)

Answer If Did you use the Good Travel Choice webpage to find information on bus journeys to the BNZ Centre prior to the move? Yes Is Selected

Q10.3 How useful was the information on the Good Travel Choice webpage to you?

- ☐ Extremely useful (1)
- ☐ Very useful (2)
- ☐ Moderately useful (3)
- ☐ Slightly useful (4)
- ☐ Not at all useful (5)

Answer If Did you use the Good Travel Choice webpage to find information on bus journeys to the BNZ Centre prior to the move? Yes Is Selected

Q10.4 Do you have any further feedback regarding the bus information provided on the Good Travel Choice webpage?

Q10.5 Please select which incentive you received.

- ☐ \$30 top-up of existing Metrocard (1)
- ☐ Free new Metrocard with \$30 credit (2)

Q10.6 How useful has this incentive been to you?

- ☐ Extremely useful (1)
- ☐ Very useful (2)
- ☐ Moderately useful (3)
- ☐ Slightly useful (4)
- ☐ Not at all useful (5)

Q10.7 How often have you caught the bus to or from work since receiving your incentive?

- ☐ Always (1)
- ☐ Most of the time (2)
- ☐ About half the time (3)
- ☐ Sometimes/At least once (4)
- ☐ Never (5)

Q10.8 Has receiving this Incentive encouraged you to use the bus at least as often, or more often than you did prior to the move to the BNZ Centre?

- ☐ Yes (1)
- ☐ Maybe (2)
- ☐ No (3)

Q10.9 Looking forward into the future, how often do you intend to use the bus to travel to/from work from now on?

- ☐ Always (1)
- ☐ Most of the time (2)
- ☐ About half the time (3)
- ☐ Sometimes (4)
- ☐ Never (5)

Q10.10 Do you have any further comments on your experience of using the bus to get to or from work?

Q10.11 How easy was it to register for and then access your new Metro card credit / top-up to your existing card?

- ☐ Extremely easy (1)
- ☐ Somewhat easy (2)
- ☐ Neither easy nor difficult (3)
- ☐ Somewhat difficult (4)
- ☐ Extremely difficult (5)

Q10.12 Do you have any further feedback on this particular Incentive programme?

Q10.13 Do you have any suggestions for future bus incentive programmes?

Q11.1 This section of the survey is to collect your feedback on the Bike Incentive you participated in. While participation in this section of the survey is optional, we value your feedback as we aim to use the collated information from the All of Travel survey and this Incentive survey to improve such Incentive programmes in the future.

Q11.2 Did you use the Good Travel Choice webpage to find information on cycling to work before the move?

- ☐ Yes (1)
- ☐ No (2)

Answer If Did you use the Good Travel Choice webpage to find information on bus journeys to the BNZ Centre prior to the move? Yes Is Selected

Q11.3 How useful was the information on the Good Travel Choice webpage to you?

- ☐ Extremely useful (1)
- ☐ Very useful (2)
- ☐ Moderately useful (3)
- ☐ Slightly useful (4)
- ☐ Not at all useful (5)

Answer If Did you use the Good Travel Choice webpage to find information on bus journeys to the BNZ Centre prior to the move? Yes Is Selected

Q11.4 Do you have any further feedback regarding the cycling information provided on the Good Travel Choice webpage?

Q11.5 How useful has this incentive been to you?

- ☐ Extremely useful (1)
- ☐ Very useful (2)
- ☐ Moderately useful (3)
- ☐ Slightly useful (4)
- ☐ Not at all useful (5)

Q11.6 How often have you cycled to or from work since the move to the BNZ Centre?

- ☐ Always (1)
- ☐ Most of the time (2)
- ☐ About half the time (3)
- ☐ Sometimes/ at least once (4)
- ☐ Never (5)

Q11.7 Has receiving this Incentive encouraged you to cycle to or from work as often, or more often than you did prior to the move to the BNZ Centre?

- ☐ Yes (1)
- ☐ Maybe (2)
- ☐ No (3)

Q11.8 Looking forward into the future, how often do you intend to cycle to/from work from now on?

- ☐ Always (1)
- ☐ Most of the time (2)
- ☐ About half the time (3)
- ☐ Sometimes (4)
- ☐ Never (5)

Q11.9 Do you have any further feedback on this particular Incentive programme?

Q11.10 How easy do you find it to use the new lock and bike storage systems at the BNZ Centre?

- ☐ I haven't used it yet (6)
- ☐ Extremely easy (1)
- ☐ Somewhat easy (2)
- ☐ Neither easy nor difficult (3)
- ☐ Somewhat difficult (4)
- ☐ Extremely difficult (5)

Q11.11 Do you have any further comments on bike storage at the BNZ Centre?

Q11.12 Do you have any suggestions for future cycling incentive programmes?

Appendix C. Focus Group Questions

Focus Groups 1 & 2: Cyclists and Walkers

1. Given that you are all currently either cycling or walking to work, what is it about cycling or walking that works well for you? i.e. what do you love about it?
2. What doesn't work so well?
3. So, what was it that prompted you to start cycling/walking in the first place?
 - a. Are the reasons you started still relevant now?
4. How different is your commuting journey now from how it used to be prior to the move?
 - a. What prompted any changes you've made?
 - b. What keeps you travelling to work that way?
5. What did you think about the information/incentives that were offered to you at around the time of the move?
 - a. Did any of these influence you to try something different?
6. Some of you said that you do sometimes travel to work other ways, e.g. bus or car. What are the main reasons that you sometimes use these alternative means of getting to work?
 - a. How does that work for you?
7. Did you encounter any problems when you first started cycling/walking to work and if so, how did you overcome them?

Focus Group 3: Bus Users

1. Given that you are all currently mainly using the bus to get to and from work, how does this mode of travel work for you? i.e. what do you love about it?
 - a. What doesn't work so well?
2. What was it that prompted you to start catching the bus in the first place?
 - a. Are those reasons still relevant now?
3. How different is your commuting journey now from how it used to be prior to the move?

4. What did you think about the information/incentives that were offered to you at around the time of the move?
 - a. Did any of these influence you to try something different or were they a help to you?
5. Some of you said that you do sometimes travel to work other ways, e.g. driving or walking. What are the main reasons that you sometimes use these alternative means of getting to work?
 - a. What do you think about your journey when you do that?
6. Did you encounter any problems or hassles when you first started catching the bus to work and if so, how did you overcome them?

Focus Group 4: Car Users

1. Given that you are all currently mainly using the car to get to and from work, how does this mode of travel work for you? i.e. what do you like about it?
 - a. What doesn't work so well?
2. What was it that prompted you to start driving to work in the first place?
 - a. Are these reasons still applicable to your commute now?
3. How different is your commuting journey now from how it used to be prior to the move?
4. What did you think about the information/incentives that were offered to you at around the time of the move?
 - a. Did any of these influence you to try something different?
5. Some of you said that you do sometimes travel to work other ways, e.g. catching the bus or walking. What are the main reasons that you sometimes use these alternative means of getting to work?
 - a. What do you think about your commute when you do that?
6. The Travel Plan was aimed at encouraging people to try alternative modes to driving for various reasons. For those who are thinking about it, what would it be that could make the difference to you using another mode on a regular basis?
7. Thinking about it another way, what is the key thing that is stopping you from trying a different mode (if you are thinking about it)?

Appendix D. Distance Calculation

Address data provided in the survey was cleaned and mapped as per Table D-1. All addresses that could be mapped (n=170) were added to a GIS network database based on the street addresses (electoral) and road centre lines (electoral) databases (LINZ Data Service, 2016a, 2016b). Distance from the home addresses to the addresses of relevant office locations was calculated using the street network topography. The resulting network distance was a simple estimate using a shortest path analysis to determine distance across the network.

Table D-1: Survey Addresses Data Analysis Actions

Address Details Provided	Action taken	N (Survey)	GIS Distance Calculated
Full valid street address	Mapped to actual GIS location	139	Yes
Partial street address entered, e.g. Smith Ave, Burwood, Christchurch	Street mid-point mapped in GIS	31	Yes
Suburb entered only. e.g. Burwood, Christchurch	Address Distance Code value assigned	13	No
No address details. Address Distance Code selected instead ³⁶	None	8	No
Total		191	Yes = 170

³⁶ For the journey to the BNZ Centre only

Appendix E. Emissions definitions and sources

Table E-1 Emissions Equations Definitions and Sources

Element	Definition	Source
N	Sample size N=150	Survey respondents who have not moved house across the time of the office move, who were employed both before and after the move and who gave valid address details allowing commute distances to be calculated.
TD _{jk}	Total Distance for that particular journey type j.of mode k	
CD _{jki}	Commute Distance for person i for journey j by their main commute mode k	GIS Network Dataset of commute distances based on home address and the Christchurch road centre line dataset: source LINZ (LINZ Data Service, 2016a)
D _{ij}	Number of days per annum person i commutes to their place of work for each journey j. Commute Days per annum = (Number days employed – Number days worked from home) per week * 229/5	Number days employed and Number days work from home: sourced from survey 229 workdays per annum: source (2014).
EF _(car,bus)	EF _(car) = 0.23 kg CO ₂ / 1.59 = 0.1447 kgCO ₂ / passenger km EF _(bus) = 2.67 kg CO ₂ / (1/0.0365 km/L) = 0.09746 kgCO ₂ / passenger km	Car emissions per km = 0.23kg CO ₂ source: (Polkinghorne, 2013a) Car occupancy = 1.59 - the most recently reported average light four wheel vehicle occupancy for Canterbury ³⁷ : source (MOT, 2015) Diesel emissions per litre 2.67 kg CO ₂ : source (Polkinghorne, 2013b) Passenger km per litre(1/0.0365 km/L): source (Polkinghorne, 2013b)

³⁷ The commute category 'Car' may include car journeys made alone, or with others. Therefore the emissions factor is adjusted to account for average car occupancy.

Appendix F. Carbon Emissions: Calculation Details

			Total Commute Distance (TD _j) (km)	Number of commuters	Emissions (E _i) (tonnes CO ₂ per annum)
Before the Move	Car	To Work, j=1	216,796	105	31.8
		From Work, j=2	216,993	103	31.4
	Bus	To Work, j=3	8,930	7	0.9
		From Work, j=4	11,733	9	1.1
	All Other	To Work	Not calculated	38	
		From Work	Not calculated	38	
	TOTAL				65.2
After the Move	Car	To Work, j=1	176,941	86	25.6
		From Work, j=2	169,761	84	24.6
	Bus	To Work, j=3	23,371	16	2.3
		From Work, j=4	24,104	17	2.3
	All Other	To Work	Not calculated	48	
		From Work	Not calculated	49	
	TOTAL				54.8

Appendix G. Model Parameter Tables

Table G-1 Full Model Logistic Regression parameters – Commute to previous work locations

Commute Mode	Variables	Parameter Estimates				Odds Ratio: 95% CI	
		B	Std Error	Sig.	Odds Ratio	Lower Bound	Upper Bound
Active ^a	Intercept	8.29	3.48	0.02			
	Age (approx)	-0.02	0.03	0.36	0.98	0.93	1.03
	Distance (km)	-0.90	0.20	0.00	0.41	0.27	0.61
	NEP score	0.12	0.06	0.03	1.13	1.01	1.26
	Gender: Male	1.94	0.64	0.00	6.96	2.00	24.28
	Education: Secondary	-0.02	0.96	0.98	0.98	0.15	6.42
	Undergraduate	0.81	0.66	0.22	2.26	0.62	8.20
	Children under 18 in household: No	0.05	0.57	0.92	1.06	0.34	3.25
	Commute Time (mins): Less than 15	-12.07	2.90	0.00	0.00	0.00	0.00
	Between 15 and 30	-7.71	2.13	0.00	0.00	0.00	0.03
	Between 30 and 45	-4.69	1.78	0.01	0.01	0.00	0.30
Bus	Intercept	82.79	28650.7	1.00			
	Age (approx)	0.54	302.1	1.00	1.72	0.00	2.27E+257
	Distance (km)	-16.70	705.7	0.98	0.00	0.00	.c
	NEP score	0.36	715.6	1.00	1.43	0.00	.c
	Gender: Male	-16.82	4410.8	1.00	0.00	0.00	.c
	Education: Secondary	51.63	0.00	0.00	2.65E+22	2.65E+22	2.65E+22
	Undergraduate	74.18	4721.9	0.99	1.65E+32	0.00	.c
	Children under 18 in household: No	40.76	13813.7	1.00	5.02E+17	0.00	.c
	Commute Time (mins): Less than 15	-234.6	0.00	0.00	0.00	0.00	0.00
	Between 15 and 30	-163.9	8499.4	0.98	0.00	0.00	.c
	Between 30 and 45	-91.6	0.00	0.00	0.00	0.00	0.00

a. The reference category is: Car, statistically significant parameters highlighted (at 0.05 level)

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Table G-2 Full Model Logistic Regression parameters – Commute to the BNZ Centre

Commute Mode	Variables	Parameter Estimates				Odds Ratio: 95% CI	
		B	Std Err	Sig.	Odds Ratio	Lower Bound	Upper Bound
<i>Active</i> ^a	Intercept	-3.84	2.17	0.08			
	Age (approx)	-0.02	0.02	0.29	0.98	0.94	1.02
	Distance (km)	-2.83	0.77	0.00	0.06	0.01	0.27
	NEP score	0.13	0.04	0.00	1.14	1.04	1.24
	Gender: Male	1.91	0.50	0.00	6.73	2.53	17.86
	Education: Secondary	-0.93	0.77	0.22	0.39	0.09	1.77
	Undergraduate	-0.12	0.48	0.80	0.89	0.35	2.26
	Children under 18 in household: No	-0.70	0.47	0.13	0.49	0.20	1.25
	Commute Time (mins): Less than 15	-2.97	1.42	0.04	0.05	0.00	0.82
	Between 15 and 30	-1.62	1.18	0.17	0.20	0.02	2.02
	Between 30 and 45	-0.95	1.25	0.45	0.39	0.03	4.49
<i>Bus</i>	Intercept	-10.40	3.66	0.00			
	Age (approx)	0.03	0.02	0.22	1.03	0.98	1.08
	Distance (km)	-2.65	1.11	0.02	0.07	0.01	0.62
	NEP score	0.15	0.07	0.02	1.17	1.02	1.33
	Gender: Male	-0.45	0.73	0.54	0.64	0.15	2.67
	Education: Secondary	1.69	1.02	0.10	5.41	0.73	40.34
	Undergraduate	1.92	0.85	0.02	6.83	1.29	36.25
	Children under 18 in household: No	2.07	0.93	0.03	7.92	1.27	49.51
	Commute Time (mins): Less than 15	-2.05	1.54	0.18	0.13	0.01	2.65
	Between 15 and 30	-2.57	1.31	0.05	0.08	0.01	1.00
	Between 30 and 45	0.41	1.34	0.76	1.50	0.11	20.60

a. The reference category is: Car, statistically significant parameters highlighted (at 0.05 level)

Appendix H. Commute Reasons - Average Ratings Tables

Table H-1 Commute Reasons - Ratings by Main Commute Mode – Before the move

Reasons	Main Commute Mode - before the move (Count)									
	Bus (8)		Bike (33)		Car (134)		Walk/Run (7)		All (184)	
	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
It's the most convenient option for me	3.00	1.20	3.73	0.88	4.59	0.69	4.29	0.95	4.34	0.87
It's the quickest option for me	1.88	0.83	3.15	1.12	4.61	0.65	4.14	1.21	4.21	1.08
I commute this way for environmental reasons	3.75	0.71	3.82	0.92	2.10	0.82	3.43	0.98	2.55	1.13
It's the best way to cover the distance I need to travel to work	2.63	1.06	3.67	0.99	4.35	0.84	4.14	0.69	4.14	0.96
To limit the cost of my commute	3.50	1.31	3.88	0.99	3.18	1.07	3.71	1.11	3.34	1.10
So my commute isn't affected by the weather	2.38	1.19	2.15	0.80	3.81	1.06	2.29	0.76	3.36	1.24
I need to have access to my car when at work	1.63	0.74	1.94	0.76	3.24	1.23	2.14	0.90	2.88	1.27
I commute this way to maintain my health and fitness	2.88	0.99	4.30	0.73	2.15	0.92	3.86	1.07	2.65	1.24
I feel safe commuting to work this way	3.38	0.52	3.30	0.85	3.88	0.96	4.00	0.82	3.76	0.94
I enjoy my commute	3.00	1.07	3.88	0.65	3.22	1.05	4.43	0.79	3.38	1.03
It's less stressful to commute this way	3.63	0.92	3.48	0.87	3.82	1.03	4.57	0.53	3.78	1.00
To better meet my family obligations	2.75	0.89	2.53	1.14	3.71	1.20	2.71	0.95	3.40	1.27
I commute this way out of habit	3.00	1.31	3.64	1.06	3.09	1.12	3.57	0.79	3.20	1.13
My commute journey is reliable and predictable	3.25	1.04	3.97	0.73	4.07	0.97	4.43	0.79	4.03	0.94
Because of parking availability	1.88	0.99	2.88	1.19	3.93	1.23	2.57	1.27	3.57	1.35

Table H-2 Commute Reasons - Ratings by Main Commute Mode – After the move

Main Commute Mode to BNZ Centre (Count)										
Reasons	Bus (22)		Bike (43)		Car (111)		Walk/Run (10)		ALL (191)	
	Mean	StDev	Mean	StDev	Mean	StDev	Mean	StDev	Mean	StDev
It's the most convenient option for me	4.27	0.70	3.88	0.91	4.65	0.66	3.30	1.16	4.34	0.85
It's the quickest option for me	2.82	1.18	3.53	1.03	4.53	0.76	2.30	1.42	3.97	1.17
I commute this way for environmental reasons	3.50	0.96	3.81	1.01	2.03	0.78	3.00	1.41	2.70	1.22
It's the best way to cover the distance I need to travel to work	3.45	1.06	4.02	0.77	4.15	0.96	3.30	1.34	3.97	1.00
To limit the cost of my commute	3.32	1.09	4.02	0.87	2.94	1.08	4.00	1.15	3.31	1.13
So my commute isn't affected by the weather	2.55	1.14	2.05	0.85	3.54	1.15	1.60	0.84	2.97	1.27
I need to have access to my car when at work	1.82	1.26	1.50	0.67	3.08	1.19	1.70	0.95	2.48	1.30
I commute this way to maintain my health and fitness	2.59	1.01	4.28	0.59	2.10	0.96	3.90	1.20	2.79	1.29
I feel safe commuting to work this way	3.73	0.88	2.98	0.90	3.76	1.01	3.60	1.26	3.57	1.02
I enjoy my commute	3.64	0.95	4.16	0.81	3.14	1.03	4.00	0.67	3.49	1.04
It's less stressful to commute this way	3.73	1.03	3.60	1.00	3.79	1.01	3.80	1.03	3.74	1.00
To better meet my family obligations	2.41	1.10	2.60	1.15	3.79	1.24	2.10	1.20	3.24	1.35
I commute this way out of habit	3.00	1.23	3.30	1.21	2.82	1.16	2.30	0.95	2.93	1.17
My commute journey is reliable and predictable	3.73	0.83	4.14	0.77	4.06	0.99	4.00	0.94	4.03	0.92
Because of parking availability	3.36	1.22	3.67	1.18	2.81	1.26	3.60	1.51	3.11	1.31

Table H-3 Comparing Commute Reasons - Paired Sample Statistics

		Paired Differences					t	df	Sig. (2-tailed)
		Difference in Means	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	BNZ Reason Convenience - Prior Reason Convenience	0.000	.801	.059	-.117	.117	0.000	181	1.000
Pair 2	BNZ Reason Time - Prior Reason Time	-.214	1.099	.081	-.375	-.054	-2.630	181	.009
Pair 4	BNZ Reason Distance - Prior Reason Distance	-.153	1.063	.079	-.308	.002	-1.947	182	.053
Pair 3	BNZ Reason Environmental - Prior Reason Environmental	.123	.724	.054	.016	.230	2.271	178	.024
Pair 8	BNZ Reason Health - Prior Reason Health	.123	.934	.070	-.015	.261	1.760	178	.080
Pair 5	BNZ Reason Cost - Prior Reason Cost	-.050	1.128	.084	-.217	.116	-.596	178	.552
Pair 6	BNZ Reason Weather - Prior Reason Weather	-.371	1.178	.088	-.545	-.197	-4.200	177	.000
Pair 7	BNZ Reason Access to Car - Prior Reason Access to Car	-.378	.840	.063	-.501	-.254	-6.034	179	.000
Pair 9	BNZ Reason Safety - Prior Reason Safety	-.190	.826	.062	-.312	-.068	-3.075	178	.002
Pair 10	BNZ Reason Enjoyment - Prior Reason Enjoyment	.094	1.034	.077	-.058	.247	1.225	179	.222
Pair 11	BNZ Reason Less Stress - Prior Reason Less Stress	-.033	1.164	.087	-.204	.138	-.383	180	.702
Pair 12	BNZ Reason Family - Prior Reason Family	-.106	.862	.064	-.232	.021	-1.643	179	.102
Pair 13	BNZ Reason Habit - Prior Reason Habit	-.307	.978	.073	-.451	-.163	-4.205	178	.000
Pair 14	BNZ Reason Reliability - Prior Reason Reliability	0.000	.963	.071	-.141	.141	0.000	181	1.000
Pair 15	BNZ Reason Parking - Prior Reason Parking	-.472	1.851	.139	-.746	-.198	-3.402	177	.001

Highlighted rows are significant at $p \leq 0$.

