

Lincoln University Digital Dissertation

Copyright Statement

The digital copy of this dissertation is protected by the Copyright Act 1994 (New Zealand).

This dissertation may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- you will use the copy only for the purposes of research or private study
- you will recognise the author's right to be identified as the author of the dissertation and due acknowledgement will be made to the author where appropriate
- you will obtain the author's permission before publishing any material from the dissertation.

**What Policies Contribute to Active Transport Participation?
A Comparative Policy Analysis of Christchurch and Copenhagen**

A Dissertation
submitted in partial fulfilment
of the requirements for the Degree of
Master of Environmental Policy

at
Lincoln University
by
Michelle Ruske

Lincoln University
2014

Abstract of a Dissertation submitted in partial fulfilment of the requirements for the Degree of Master of Environmental Policy.

What Policies Contribute to Active Transport Participation?
A Comparative Policy Analysis of Christchurch and Copenhagen by
Michelle Ruske

Abstract

Increasing active transport participation in urban environments has a large body of academic support. Reasoning behind the push towards a cleaner, healthier, and more efficient mode of transportation is found in a range of disciplines including health science, in climate change and sustainability discussions, in economics, and in social science investigations into what creates a 'happy' urban environment.

Active transport refers to modes of transportation in which the traveller is 'active'; including both walking and cycling. This dissertation looks at what variables contribute to active transport, and identifies policy measures that low active transport cities should consider for future research. Using Christchurch, New Zealand and Copenhagen, Denmark as case studies (one low and one high active transportation city), the policies in each city are examined systematically using an outcomes based policy approach. The research identifies what variables can be changed by policy and further still which are changed by local policy.

Policy and planning documents from the last decade are examined and compared for both cities. A separate analysis of the city contexts is included. This provides a holistic and integrated approach which considers all variables with potential to influence active transport participation.

The research culminates in a list of policy recommendations that low active transport cities, like Christchurch, should consider to increase active transport participation. These include decreasing car parking spaces, increasing separated cycle paths, reconfiguring traffic intersections to give active transport modes priority, and increasing funding for active transport.

Keywords: active transport, environmental policy, urban planning, comparative policy analysis, Christchurch, New Zealand, Copenhagen, Denmark, variables, context, cycling, walking, local policy, transport planning

Acknowledgements

I would like to acknowledge my friends and family for their support and guidance in helping me throughout my studies and towards this dissertation.

I would like to express my deepest gratitude to my supervisor, Shannon Page, for his excellent guidance and enthusiasm for my research and for providing an 'open door' policy. I would also like to thank Ann Brower for her support throughout my five years at Lincoln University; and in assisting with the structure and methods used in this dissertation. Both Shannon and Ann helped ensure I did not lose doubt in myself amongst the challenges that one encounters researching.

I extend my thanks to Lincoln University as a whole and the NRE department who always made me feel welcome.

Special thanks to Tom Williams, fellow master's student also researching in the active transport space. Your assistance with bouncing ideas around and helping with GIS images was most appreciated. I also thank the 2014 Master of Environmental Policy students – particularly Ben and Florian who helped me 'refresh' with lunch breaks.

Thank you to my dear friends Amy, Emma, Monique, Alan, and Alice who ensured I had a balanced life throughout my post-graduate studies and never hesitated to message me with lovely words of support. Thanks also to my lovely work girls at The Fitting Room who are always so caring and encouraging.

I would like to thank Michael Ferigo at Christchurch City Council, Kate MacKenzie, and Jack Jiang for their external support with this research. I also thank Statistics New Zealand, New Zealand Transport Agency and Copenhagen Bike Share for their assistance in answering my questions and queries.

Lastly I would like to thank my parents for their support in my education over the years – whether this was in teaching me the value of hard work, buying computer ink, cooking hearty meals, listening to research presentations or watching me as I graduate. Thank you.

Contents

Abstract	ii
Acknowledgements	iii
Contents	iv
List of Tables	vii
List of Figures	viii
Chapter 1 Introduction	10
1.1 Climate Change Motivation	11
1.2 Broader Sustainability Motivation	11
1.3 Economic Benefits.....	11
1.4 Health Benefits.....	12
1.5 Air Pollution Reduction	13
1.6 Christchurch	13
1.6.1 Citizen Support for Active Transport.....	13
1.6.2 Potential for Christchurch to Move to Active Transport	14
1.7 Copenhagen	15
1.8 The Issue at Hand.....	15
Chapter 2 Literature Review.....	17
2.1 Factors Influencing Environmental Behaviour	17
2.1.1 Kollmus and Agyeman.....	17
2.1.2 Factors Influencing Cycling.....	18
2.2 Infrastructure and Policy Measures.....	19
2.2.1 The Urban Form	19
2.2.2 Safety	22
2.2.3 Mutually Reinforcing Policies.....	24
2.3 Comparative Analysis of Transport Policy	25
2.3.1 A Sydney and Melbourne Comparison	25
2.3.2 A Comparison of Denmark, Germany and the Netherlands	26
2.3.3 Megacities in India	27
2.3.4 New Zealand Regional Differences	28
2.3.5 Comparing Key Demographic Measures.....	28
2.4 Comparative Policy Analysis	29
2.4.1 Introduction to Comparative Policy Analysis	29
2.4.2 Importance of Context to Comparative Policy Analysis.....	29
2.4.3 Modern Comparative Environmental Politics.....	30
2.4.4 No Systematic Approach to Comparative Environmental Politics	31
2.4.5 Summary	31
2.5 Summary and Discussion	31
2.5.1 Comparisons.....	31
2.5.2 Political Context	31
2.5.3 Implementation	32
2.5.4 Connecting the Research and Recommendations	32
2.5.5 Context.....	33
2.5.6 Summary	33

Chapter 3 Research Question, Objectives and Methods	34
3.1 Research Question and Objectives	34
3.2 Addressing the Objectives	35
3.3 Objective One: Define all variables with potential to influence active transport participation.....	36
3.3.1 Information Extracted for the Matrix	38
3.3.2 Data Sources	39
3.3.3 Categorising the Variables	40
3.4 Objective Two: Identify differences between the low and high active transport cities.....	40
3.5 Objective Three: Identify the variables of difference that can be changed by city policy	41
3.6 Research Question: What policies should low active transport cities like Christchurch consider changing?	42
3.7 Research Context - Christchurch and Copenhagen	43
3.8 Summary of the Method.....	43
Chapter 4 Comparison of the Cities	44
4.1 Introduction	44
4.2 Active Transport History	44
4.2.1 Early History of the Bike.....	44
4.2.2 1950s.....	45
4.2.3 1960s.....	45
4.2.4 1970s.....	46
4.2.5 1980s.....	47
4.2.6 1990s.....	48
4.2.7 2000s.....	49
4.3 Cycling Motivation	50
4.4 Transport Culture.....	51
4.5 Comparison of City Layout.....	52
4.6 Political Comparison	54
4.7 Underlying Variables.....	55
4.7.1 Driver's Licence	59
4.7.2 Taxation.....	59
4.7.3 Petrol Tax	60
4.7.4 Weather	60
4.7.5 Financial Investment in Active Transport	61
4.7.6 The Christchurch Earthquakes	62
4.7.7 Cycle Helmets.....	63
4.8 Summary	63
Chapter 5 Results and Analysis.....	65
5.1 Introduction	65
5.2 All Variables with Potential to Influence Active Transport Participation	65
5.3 Differences Between the Low and High Active Transport Cities	67
5.3.1 Policy Measures Evident in Only One City	67
5.3.2 Variables with Differences between the Cities.....	68
5.4 Variables Changeable by City Policy	72
5.4.1 The Unchangeable Variable	72
5.4.2 The Changeable Variables.....	72

5.5	Policies low active transport cities like Christchurch should consider changing.....	85
5.6	Overall Differences in the Cities.....	86
5.6.1	Copenhagen	86
5.6.2	Christchurch	87
5.7	Summary	87
Chapter 6 Discussion and Conclusion.....		89
6.1	Limitations	89
6.1.1	Policy Analysis Time Frame	89
6.1.2	Translation	89
6.1.3	Informal and Formal Policy Measures	90
6.1.4	Lack of Reporting of Certain Statistics	90
6.2	Method Evaluation	90
6.2.1	The Influence of a Specific Variable	90
6.2.2	Additional Evaluation	91
6.3	Future Research	91
6.4	Unexpected Findings.....	92
6.4.1	Variables and Policy Measures Absent	92
6.4.2	Unexpected Variables and Policy Measures	93
6.4.3	Variables Present and Expected.....	94
6.5	Variables Requiring More Research.....	95
6.6	Discussion Summary	95
6.7	Conclusion.....	97
Appendix A Copenhagen Policy and Outcomes Table.....		99
Appendix B Christchurch Policy and Outcomes Table.....		113
Appendix C Variables Impacting Active Transport.....		129
Appendix D Policy Matrix Data Sources		144
Appendix E Christchurch City Travel to Work Trends 1976-2013.....		148
References		149

List of Tables

Table 1. Pucher and Buehler's 'Making Cycling Irresistible' 2008 table of the policies contributing to active transport modal participation (J. Pucher & Buehler, 2008, p. 512).....	27
Table 2. The Research Matrix for Policy Extraction	37
Table 3. Comparison on Contextual Variables	55
Table 4. New Zealand's Active Transport Expenditure from NZTA and other organisations (New Zealand Transport Agency, 2013c).	61
Table 5 Walking and Cycling Expenditure in Christchurch in the last decade. Data originally sourced from NZTA, accessible on the Intelligence IServer (accessed 28th August 2014).	62
Table 6. Policy Measures Only Evident in Copenhagen	67
Table 7 Policy Measures Only Evident in Christchurch City	67
Table 8 Summary Table of the Variables Impacting Active Transport as Assessed Against the Questions.....	69

List of Figures

Figure 1. The Christchurch Cathedral approximately 30 minutes after the February 2011 earthquake (Schwede66, 2011).....	13
Figure 2. Copenhagen - the city of cyclists (Heb, 2010).....	15
Figure 3. Comparison of Two Different Urban Layouts - low connectivity at the top, and high connectivity at the bottom (Spielburg, 1989).	19
Figure 4. Gasoline use per capita vs urban density adjusted to US income, vehicle efficiencies and gasoline prices (Newman & Kenworthy, 1989, p. 128).	20
Figure 5. Summary of the Research Approach.....	35
Figure 6. Identifying the Variables in the Intersection (highlighted in purple).....	36
Figure 7. Matrix Developed for the Systematic Analysis of the Variables	41
Figure 8. Cycles were a common sight in Christchurch (1959) (Douglass, 2000, p. 8).	45
Figure 9. The Increase in Car Free Streets and Squares in Copenhagen after 1962 when Strøget was pedestrianised (Directorate-General for the Environment, 2004, p. 16).....	45
Figure 10. Declining Christchurch Active Transport. Data source: Christchurch Census Data from 1976-2013.....	46
Figure 11. Pedestrian Improvements made to Cathedral Square (Douglass, 2000, p. 19).	46
Figure 12. Pedestrian Improvements on Cashel Street when the street became car free (Douglass, 2000, p. 19).	47
Figure 13. Cyclists demonstrate in Copenhagen in the 1980's (Arditti, 2013).....	47
Figure 14. Christchurch's Data on Cycle Lane Development (Christchurch City Council, 2004, p. 11).	49
Figure 15. Copenhagen's Continual Cycle Track Growth (Jensen, 2009).....	49
Figure 16. The network of cycle paths and cycle lanes in Christchurch in 2014 (T. Williams, 2014).....	50
Figure 17. Share the Bike Love Image (visitDenmark, 2012)	51
Figure 18. Percentage of Households with Bikes in 2013 (Ministry of Transport, 2013, p. 9)	52
Figure 19. Copenhagen's Urban Morphology Journey (Fertner, 2012, p. 18).	52
Figure 20. Christchurch's Circular Pattern on Urban Development and Growth (Douglass, 2000, p. 5). Each circle represents 2 kilometres from the centre of the city. The outer circle represents an 8km radius from the central city.	53
Figure 21. Christchurch City Layout. Inner city area 1-2 km ² (Gehl Architects, 2010, p. 23).....	53
Figure 22. Copenhagen City Layout. Inner city area 1-2 km ² (Gehl Architects, 2010, p. 23).....	53
Figure 23. Denmark and New Zealand Petrol Price and Taxation, May 2014.....	60
Figure 24. Christchurch Average Minimum and Maximum Temperatures Annually (World Weather and Climate Information, 2013a)	60
Figure 25. Copenhagen Average Minimum and Maximum Temperatures Annually (World Weather and Climate Information, 2013b).	60
Figure 26. Copenhagen and Amsterdam Bicycle Infrastructure Investment in Millions (DKK) (City of Copenhagen, 2013, p. 11).....	61
Figure 27 Independent Variables with the Potential to Influence Active Transport Participation...66	66
Figure 28. A Free Copenhagen Cycling Map Available Online (Technical and Environmental Administration, 2013).....	68
Figure 29 Summary Matrix of the Changeability of the Variables Conducive for Active Transport Participation.....	73
Figure 30. Advertising for the new Copenhagen bike share (GoBike, 2014).	74
Figure 31. An image of the car free section of Norrebrogade, Copenhagen (Maus, 2013).....	74
Figure 32. Satisfaction with the condition of cycle tracks and roads in Copenhagen (City of Copenhagen, 2013, p. 5).....	75
Figure 33. Post-earthquake Christchurch has seen many empty building sites turned into temporary car parks (Gates, 2013).....	78

Figure 34. The 2006 Bryggebroen Bridge for Cyclists and Pedestrians. Cyclists and Pedestrians are separated on the bridge (Wonderful Copenhagen).	78
Figure 35. Examples of the Green Cycle Network in Copenhagen (Danish Architecture Centre, 2014).	80
Figure 36. The Major Cycleways Network is expected to increase connectivity (Christchurch City Council, 2014d).	81
Figure 37. The Cycle Track Priority Plan 2006-2016 included an image of existing cycle tracks and lanes, as well as planned additions. (Arditti, 2013).	81
Figure 38. The Proposed PlusNet Network of Cycling Infrastructure. Source: Copenhagen Bicycle Strategy 2011-2025 (City of Copenhagen, 2011, p. 11).	82
Figure 39. A Network of Cycling Super Highways is planned for the Greater Copenhagen Area (Schiøtt & Madsen, 2011).	82
Figure 40. The Green Wave in Copenhagen. The image on the cycle track indicates that this cycle route is part of the green wave (Colville-Andersen, 2014c).	83
Figure 41. An example of a separated cycle path in Copenhagen (City of Copenhagen, 2013).	83
Figure 42. The Intersection Approach.....	97

Chapter 1

Introduction

“A bicycle is a truly great invention because it is part of the entire range of human existence from frivolity to necessity. A bicycle, if understood correctly and used to its full potential, is actually a key to a completely different, and in many ways more rewarding way of life. Sure, there are limits to the ways in which you can use a bicycle, but those limits are surprisingly few. A bicycle can give you the feeling of freedom and speed you get from riding a motorcycle, the sense of well-being and peace you get from meditating, the health benefits you get from an afternoon at the gym, the sense of self-expression you get from learning to play guitar, and the feeling of victory you get from completing a marathon” (E. Weiss, 2010, p. 11).

The private motor vehicle has dominated urban transport in many nations for almost half a century (Mees, 2000, pp. 11-12; Pardo, Jiemian, Hongyuan, & Mohanty, 2012, p. 3). However there is a current push by academics, city planners and policy makers towards increasing participation in active transport.

The push away from the private motor vehicle towards active modes of transportation is supported by a wide range of disciplines including health science (J. Pucher, Buehler, Bassett, & Dannenberg, 2010, p. 1986), in climate change and sustainability discussions (Lambert, 1998), in economics (Litman, 2014), and in social science investigations into what creates a ‘happy’ and enjoyable urban environment (Montgomery, 2013) The importance of transportation is reflected in the idea that “city life is as much about moving *through* landscapes as it is about being *in* them” (Montgomery, 2013, p. 181).

Active transport refers to modes of transportation in which the person travelling is being ‘active’ and includes both walking and cycling. This dissertation examines what variables contribute to active transport participation, and identifies which policy measures warrant a closer look by low active transport cities. Using Christchurch, New Zealand and Copenhagen, Denmark as case studies the policies in place for each city will be examined using an outcomes based policy approach.

1.1 Climate Change Motivation

Anthropogenic climate change is occurring (Institute of Physics, 2013), and key resources such as oil are no longer perceived as abundant as once thought (Strahan, 2008). Even with an infinitive quantity of oil and gas, civilisation cannot continue at the current rate of consumption without posing serious environmental consequences for the planet. The International Panel for Climate Change 'Fifth Assessment Report' emphasises the impacts of human actions on global warming and details the consequences such as sea level rise. The summary report for policy makers writes *"it is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together"* (Working Group, 2013, p. 15). As 47% of transport energy use worldwide in 2006, came from light-duty vehicles (including automobiles, light trucks, SUV's, and mini-vans) (International Energy Agency, 2009, p. 113), increased active modal share has a potential role to play in addressing climate change.

1.2 Broader Sustainability Motivation

Active transport is one method to help achieve sustainable transportation. Since the Rio Conference in 1992 sustainability (Lambert, 1998) and the consequences of the private motor vehicle, are better understood. Now that the pressures placed on a finite earth by a booming human population are understood, alternative 'greener' transport options have gained more attention.

Active transport is significantly more energy efficient than the private motor vehicle. *"The modern bike has the highest ratio of distance covered to energy input of any means of transport; at an average speed of 17 km an hour, a cyclist uses between three and four times less energy per kilometre than a pedestrian"* (Lambert, 1998). Additionally, *"it takes a hundred times less raw material and energy to make a cycle than it does to make a car"* (Lambert, 1998), and the only energy required is that provided directly by the traveller (J. Pucher & Buehler, 2008, p. 496). In summary, according to Mees and Groenhart, both walking and cycling are the *"only truly sustainable transport modes, producing no pollution"* (City of Copenhagen, 2004, p. 69).

1.3 Economic Benefits

Not only do bicycles require less energy but they are less expensive. The cost of a private motor vehicle must also include fuel costs, initial resources that make the car, and long term road maintenance costs (Lambert, 1998). *"The most auto-dependent cities are less wealthy than some other more transit-orientated cities"* as they have lower cost recovery in transit, higher road

construction and maintenance costs, spend a large percentage of their wealth on passenger transportation and end up with a comparable journey to work trip time, even though they travel longer distances (Kenworthy & Laube, 1999, p. 691). Thus potential economic savings provide additional motivation to investigate active transport.

International research has looked at the full cost of car transport including the external benefits and costs. These include the impacts of air pollution, climate change, congestion costs and parking requirements (Jakob, Craig, & Fisher, 2006). A 2005 study considered this for Auckland, the largest city in New Zealand. External costs are those *“not directly paid by car users, but are caused by them”* (Jakob et al., 2006, p. 56). The study noted that in 1996 Transit New Zealand knew little about the external effects of transport; and road funding in New Zealand is generally based on a formal cost benefit analysis. The study concluded that economic savings and more environmentally and integrated decisions can be made to produce a city designed for people (their mobility, their quality of life and for future generations), rather than a city designed for cars (Jakob et al., 2006, p. 65).

1.4 Health Benefits

Cross sectional studies have identified a correlation between walking and cycling for transport, and improved health and longer life spans (J. Pucher et al., 2010, p. 1986). A study based in Copenhagen found that those who cycle to work have a *“28% lower risk of mortality”* (Tin Tin, Woodward, Thornley, & Ameratunga, 2009, p. 65). A 1992 British Medical Association report also highlighted that cycling is a simple and effective way to keep fit (British Medical Association, 1992) (Lambert, 1998). Brisk walking has been identified as *“protective of physical health, independent of the benefits of more vigorous activity, particularly if it is done consistently”* (Saelens, Sallis, & Frank, 2003, p. 80).

In New Zealand, just a 5% shift to bicycling for trips less than or equal to 7km in length, is predicted to reduce national deaths by 116 people a year due to increased physical activity (Woodward & Lindsay, 2010, p. 60).

Additionally, as far as exercise is concerned, walking and cycling are admirable as they can be used for multiple use purposes, unlike other exercise forms which are only completed for recreation and exercise (Saelens et al., 2003, p. 80).

1.5 Air Pollution Reduction

Air quality also benefits from active transport. Between 1991 and 2006, New Zealand road transport emissions increased by 66.69% (Tin Tin et al., 2009, p. 71). For Christchurch, a city with geography conducive to poor air quality and with a long air pollution history this is an especially topical point (Gehl Architects, 2010).

Research undertaken in Christchurch on the impact of air pollution for different transport modes concluded that car drivers are exposed more to traffic pollution than cyclists (Woodward & Lindsay, 2010). Although cyclists experience greater air pollution extremes, on average car drivers are exposed to greater levels (Woodward & Lindsay, 2010, p. 9). Separated cycling paths were identified as a mechanism to reduce air pollution exposure. Locating a cyclist just 5-7m away from a road results in a reduction of air pollution exposure of 20-40% (Woodward & Lindsay, 2010, p. 84).

1.6 Christchurch

Christchurch, New Zealand illustrates a city where transportation is dominated by the private motor vehicle (Statistics New Zealand, 1996-2013). However given the reasons above, the city is aspiring to have a higher active transport modal share (Canterbury Earthquake Recovery Authority, 2013; Christchurch City Council, 2011a, 2012). Following the earthquakes of 2010 and 2011 which caused large scale disruption and destruction to the city's urban form (figure 1) and transport networks, Christchurch is investigating policy measures that should be introduced post-quake. If new policy, infrastructure and active transport initiatives are to be introduced, then it is as the city recovers that these changes should be made.

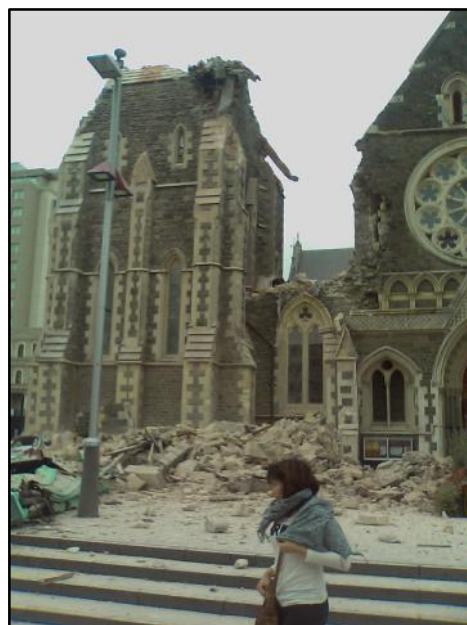


Figure 1. The Christchurch Cathedral approximately 30 minutes after the February 2011 earthquake (Schwede66, 2011).

1.6.1 Citizen Support for Active Transport

Following the earthquakes, the Christchurch City Council conducted a unique and highly talked about public consultation exercise in which local citizens were invited to share their vision for a rebuilt Christchurch city. Titled 'Share an Idea', the campaign was a ground up way of asking and acknowledging what the community wished to see in the future of their city. Overall 100,000 ideas were received (Christchurch City Council, 2011a, p. 5).

The council identified key linking statements to do with common themes amongst the ideas. One recurring statement was that of

“Interconnectivity made easy and enjoyable between activities, such as shopping and socialising and the streetscape, and between different locations across the Central City. Integrated affordable transport networks with pedestrians as the priority and including a range of options such as walkways, cycleways and public transport that moves people easily into and around the Central City” (“Central City Plan: Draft Central City Recovery Plan For Ministerial Approval December 2011: Technical Appendices 1 of 3,” 2011, p. 6).

This highlights that active transport options are desired by a wide portion of the community who felt strongly enough to ‘share their idea’. Other common transport statements received were also supportive of active transport including ‘no parking buildings in the city’, ‘integrated, affordable public transport’, ‘plentiful cycle parks’ and ‘car free central city or restricted access’ (“Central City Plan: Draft Central City Recovery Plan For Ministerial Approval December 2011: Technical Appendices 1 of 3,” 2011, p. 7). These statements hold even more weight when one considers that comments surrounding a car orientated city were largely absent, except for those around affordable car parking (Christchurch City Council, 2011a, p. 7).

Additionally, *“a 2005 survey in Christchurch found that 27% of non-cyclists were keen to cycle”* (Kingham & Koorey, 2011, p. 17). (Preval, Chapman, & Howden-Chapman, 2010, p. 17), suggesting that there is a group of would-be cyclists whom might be encouraged to cycle with the correct policies and infrastructure in place. The share an idea campaign and potential would-be cyclists in Christchurch provide motivation to determine what policies are effective at encouraging active transport.

1.6.2 Potential for Christchurch to Move to Active Transport

Whilst the benefits of active transport are recognised, active transport is not currently catered for, or used to its full potential. Christchurch has potential to be an active transport city. It is flat, has a relatively mild climate, and before the earthquakes a large percentage of residents lived within a 2.4km radius of the city centre (Gehl Architects, 2010, p. 39). The streets are generous at widths of 20 metres (Gehl Architects, 2010, p. 22) and there is potential for small linking lanes to be converted into good quality spaces that pedestrian life can enjoy (Gehl Architects, 2010, p. 28). Additionally, the travel to work trip is on average 7km long (Ministry of Transport, 2014b) (well within cycling distance). Furthermore, *“of all the trips made by residents, 40 per cent are less than 2km in length,*

making these journeys ideal for walking and journeys of 1km, to 10km ideal for cycling” (Christchurch City Council, 2012, p. 16).

Using New Zealand census trip to work data (Statistics New Zealand, 1996-2013), Christchurch had a low trip to work active transport modal share of 9.6% in 2013. Thus, there is reason to consider why active transportation modes are not well-used, despite knowledge on how beneficial they are.

1.7 Copenhagen

Copenhagen (figure 2) is a city that not only aspired to have high levels of active transport, but achieved this. An established cycling city and self-proclaimed ‘City of Cyclists’ (City of Copenhagen, 2005, 2013; Gossling, 2013), Copenhagen has a high trip to work active transport modal share (58%)¹



Figure 2. Copenhagen - the city of cyclists (Heb, 2010).

and extensive urban infrastructure designed to support and encourage cycling. Copenhagen is considered the second best cycling city in the world (narrowly surpassed by Amsterdam) by the Copenhagenize Index 2013 of Bicycle Friendly Cities² (Copenhagenize Design Co, 2013b).

1.8 The Issue at Hand

Shifting from cars to bicycling or walking will never be a direct replacement as cars have a multitude of functions that a person walking or cycling can only wish to carry out. Instead, there is desire for a shift towards a transport modal split where active transport comprises a larger percentage of trips than it does today.

The issue is that whilst the benefits of cycling and walking as modes of transport are well known, few industrialised cities have a high active modal share. In Christchurch and most of the industrialised world (J. Pucher & Buehler, 2008, p. 495), walking and cycling remain ‘marginal’ modes of commuter transport (Tin Tin et al., 2009, p. 72). There is a need to identify what high active transport cities like Copenhagen do that low active transport cities like Christchurch should.

¹ 58% (using National Travel Survey Data averaged for 2011-2013) (Danish Department of Transport, 2014).

² This index assesses cities on 13 different categories including bicycle culture, gender split, modal share for bicycles, perception of safety, modal share increase since 2006, urban planning, politics and traffic calming (Copenhagenize Design Co, 2013b).

This leads to the question of whether specific active transport policy can assist a city such as Christchurch, New Zealand move in a direction that encourages more active transport participation. To consider what low active transport cities should do, I start by reviewing the literature on relevant topics. This will include what variables influence human behaviour, the infrastructure and policy measures identified as relating to active transport, and the methods used to undertake comparisons.

Chapter 2

Literature Review

This literature review is collated into four sections. Section one covers the factors which influence behaviour. Section two covers policies identified with potential to increase active transport in an urban environment. Section three covers comparative active transport policy analysis studies undertaken and section four covers the method of comparative policy analysis.

2.1 Factors Influencing Environmental Behaviour

Section one outlined why active transport participation is considered a desirable thing by many disciplines. This section looks at the factors which influence environmental behaviour as it is individual behaviour that all policy measures in relation to active transport are trying to change.

2.1.1 Kollmus and Agyeman

Kollmus and Agyeman (2002) undertook a meta-analysis of a range of studies considering what changes behaviour. Specifically, they used their research to identify what variables influence environmental behaviour (Kollmuss & Agyeman, 2002). They identified the following:

1. Demography: gender, years of education (Kollmuss & Agyeman, 2002, p. 248)
2. Infrastructure: is cycling possible, is public transport available? If the services or infrastructure are poor, then people are less likely to use them (Kollmuss & Agyeman, 2002, p. 248)
3. Economics: identified as an important variable. However, they noted that people's behaviour is not predictable solely on economics – it is intertwined with social, infrastructural and psychological factors (Kollmuss & Agyeman, 2002, p. 249)
4. Social and Cultural factors: Cultural norms play a role in shaping behaviour (Kollmuss & Agyeman, 2002, p. 249)
5. Motivation: this can be abstract (i.e. to stop climate change) or concrete (to get to work on time) (Kollmuss & Agyeman, 2002, p. 250). These motivations can be in opposition to one another.
6. Environmental knowledge and awareness. This explains approximately 20% of behaviour, with the other 80% explained due to situation and internal factors (Kollmuss & Agyeman, 2002, p. 250).
7. Values and attitudes: These have a varying, usually very small impact on behaviour (Kollmuss & Agyeman, 2002, p. 252)

8. Priorities: do they match values? Priorities may be different to our values as we “prioritize our responsibilities” (Kollmuss & Agyeman, 2002, p. 256).
9. Emotional involvement (Kollmuss & Agyeman, 2002, p. 255).
10. Locus of control: “People with a strong internal locus of control believe that their actions can bring about change” (Kollmuss & Agyeman, 2002, p. 243). This is like voting - how much influence one feels their actions will have on the outcome will impacts their behaviour.
11. Habits and old behavioural patterns (Kollmuss & Agyeman, 2002, p. 257).
12. Desire for comfort and convenience (Kollmuss & Agyeman, 2002, p. 256).
13. Personality (Kollmuss & Agyeman, 2002, p. 256)

These variables help explain why policy measures work in some situations, and why they may not be as effective in others.

2.1.2 Factors Influencing Cycling

More specifically, Kingham and Koorey (2011) identified a range of factors that influence an individual’s decision to cycle. These shared similarities with those identified by Kollmuss and Agyeman including convenience, behavioural patterns, economics, social cultural factors, and demography. The factors identified specific to cycling in New Zealand are (Kingham & Koorey, 2011):

1. distance
2. weather
3. topography
4. cost of transport
5. availability of motor vehicles and public transport
6. exposure to fumes
7. convenience
8. gender
9. previous experience of cycling and riding ability
10. expectations of dress
11. attitudes to health and fitness
12. awareness of, and perceived responsibility for, environmental issues
13. physical exertion
14. necessity of a motor vehicle for desired tasks
15. social norms and cycling culture
16. land-use density
17. transport infrastructure
18. availability of parking and related facilities at the destination

19. road safety
20. fear of accident and resulting injury
21. cultural attitudes to safety

2.2 Infrastructure and Policy Measures

This section outlines the factors identified in the literature as influencing active transport participation. It includes both policy measures and infrastructure considered conducive to active transport.

2.2.1 The Urban Form

The built environment, such as the infrastructure provided for walking and cycling, contributes to active transport participation. Certain neighbourhood characteristics are considered relevant to active transport participation (J. Pucher et al., 2010, p. 1986) and Sealens, et al (2003, p. 84) set these out as mixed land use, connectivity, and population density. Length of trip has a negative correlation with the likelihood of cycling and walking (Saelens et al., 2003, p. 84), stressing the importance of urban design in encouraging active transport.

Urban Form Paradigms

Two urban form approaches exist on layout. Streets with low connectivity are often linked to urban sprawl, whilst high connectivity streets (road with linkages at both ends, which tend to have a grid-like appearance) provide shorter trip distances. Figure 3 from Spielberg (1989) illustrates these two approaches in urban form layout.



Figure 3. Comparison of Two Different Urban Layouts - low connectivity at the top, and high connectivity at the bottom (Spielburg, 1989).

Preval, et al (2010) looked at the influence of urban form by comparing VMT (vehicle miles travelled) in compact development urban environments compared with sprawling environments. The research concluded that *“based on the urban planning literature reviewed...it appears that compact development has the potential to reduce VMT per capita by anywhere from 20-40 percent relative to sprawl”* (Ewing, Bartholomew, Walters, Winkelman, & Anderson, 2010, p. 29). This reduction would depend on the five d’s of urban design - density, diversity (of different land uses), design, destination accessibility and distance to

transit (Ewing et al., 2010, p. 22). The five d's all relate to urban form and the importance of urban form for active transport is a reoccurring theme.

High energy use occurs at lower densities, whilst higher densities correlate with lower energy use. This is best demonstrated by Newman and Kenworthy (1989) who researched 32 cities over four different continents and found a negative correlation between gasoline use per capita and urban density (figure 4). This suggests density should be given priority in urban planning and policy (Mindali, Raveh, & Salomon, 2004, p. 146).



Figure 4. Gasoline use per capita vs urban density adjusted to US income, vehicle efficiencies and gasoline prices (Newman & Kenworthy, 1989, p. 128).

Traffic Signals for Walkers

Vallyon and Turner (2011) researched pedestrian priority to determine what measures are effective at reducing pedestrian delay at traffic signals. This was motivated by the fact that pedestrians are often the last to be considered in transport policy and little attention is given to pedestrians except in regards to safety (Vallyon & Turner, 2011, p. 11). The study found that the current traffic signal system in New Zealand, which is weighted in favour of vehicles, slows all road users at intersections (cars included). This is especially the case at lunchtime when pedestrian traffic is at its maximum and car vehicle use its minimum (Vallyon & Turner, 2011, p. 9).

Car Dominated City

Gehl architects conducted a study in 2009, looking at public spaces in Christchurch's central business district (Gehl Architects, 2010)³. Vehicle traffic dominates the central city and this was identified as a challenge. *"The car is king, and the pedestrians and cyclists have to wait and move on the premises of the cars. The streets are dominated by car parking....The invitation to walk is missing"* (Gehl Architects, 2010, p. 16). Further challenges identified included the incomplete nature of the cycle lanes and pedestrian walkways in existence and that *"no public space network connecting the open spaces and the main pedestrian routes"* (Gehl Architects, 2010, p. 29) existed. The study highlighted that Christchurch displayed a mentality of "no obstructions to traffic please". Consequently there is an incentive for drivers to cut through the city centre as a short cut to avoid major metropolitan roads (Gehl Architects, 2010, p. 32).

The large amount of car parking in the centre city given the cities size was a further issue. *"A total of 13,180 parking spaces (on-street and in structures) equally spread in the centre"* (Gehl Architects, 2010, p. 34) existed in Christchurch prior to the earthquakes. Other estimates put the pre-earthquake quantity even higher at approximately 28,000 car parks. If accurate, this represents 17% of the Christchurch CBD's land area (Genter, 2014). The average utilisation of car parks in the city was approximately 60% (Genter, 2014).

Planning for People

Gehl Architects recommended Christchurch develop a pedestrian network with both attractive, pleasant walking routes and car-free streets. They also recommended appealing building facades to encourage pedestrians (Gehl Architects, 2010). They outline that cities should plan for people, re-ordering the way different transport modes are prioritised so that pedestrians are the 1st priority, cycling the 2nd priority, public transport 3rd and finally vehicles (Gehl Architects, 2010, p. 87). The study recommended encouraging cycling by reducing car-parking in the city centre, connecting cycle routes, promoting cycle festivals and ensuring bicycle facilities such as cycle parks are provided (Gehl Architects, 2010).

Every Street is a Cycle and Walking Street

Macbeth et al, 2005 looked at walking and cycling policy internationally to identify best practice in both areas (Macbeth, Boulter, & Ryan, 2005). They identified the need for policy strategies for active transport. In 2005, many local authorities in New Zealand did have active transport strategies in

³ Gehl Architects have undertaken studies of many cities including Copenhagen, Melbourne, Sydney and Wellington. The Christchurch City Council commissioned them to use the same method and apply it to Christchurch. The study is based in architecture, but is relevant to urban planning.

place but Ewing et al, stressed that successful implementation of those strategies requires hard work, perseverance, and collaboration between key stakeholders (Macbeth et al., 2005, p. 1). *“Writing or revising a walking and cycling strategy, with the participation of stakeholders, is a powerful step in the right direction towards improving conditions for walking and cycling”* (Macbeth et al., 2005, p. 1). The report emphasised that *“every street is a cycling and walking street”* (Macbeth et al., 2005, p. 29) and needs to be considered as such by planners when considering urban design.

2.2.2 Safety

Vulnerable Road User Laws

Vulnerable Road User Protection Laws are laws that rule in favour of cyclists or pedestrians in the event of a traffic accident. The study investigating the applicability of this policy measure concluded that there are flaws in applying the concept to New Zealand (H. Weiss & Ward, 2013). Motivated by the increasing numbers of cycle injuries in New Zealand over the last ten years, the research concluded that although the concept seemed logical, and people sympathise with “perceived justice” (H. Weiss & Ward, 2013), laws which protect vulnerable road users are hard to quantify for their effectiveness. It stressed that a law itself will be unlikely to “Copenhagnize” the New Zealand transport system (H. Weiss & Ward, 2013). Although these laws help promote an attitude change towards active transport, Weiss and Ward stress that Vulnerable Road User Protection Laws are not the only way to start that change.

Cycle Helmets

Pucher and Buehler (2008) looked at the issue of cycle helmets in Denmark, Germany and the Netherlands. These countries are all considered successful cycling nations yet rarely use cycle helmets (J. Pucher & Buehler, 2008, p. 496). Planners interviewed in the cycle nations *“adamantly oppose laws to require the use of helmets, claiming that helmets discourage cycling by making it less convenient, less comfortable and less fashionable”* (J. Pucher & Buehler, 2008, p. 509). Helmets pose an interesting contradiction. Designed to enhance safety amongst cyclists, they may not be required if cycling is safe. In *“the Netherlands, with the safest cycling of any country, less than 1% of adult cyclists wear helmets”* and a small fraction (3-5%) of children wear them (J. Pucher & Buehler, 2008, p. 509). In contrast, New Zealand law requires cycle helmets (New Zealand Transport Agency, 2013a) and Land Transport Safety Association figures show a 32% reduction *“in head injuries after the introduction of the cycle helmet law in 1994”* (Povey, Frith, & Graham, 1999). A Transit New Zealand study also found *“ninety percent of those respondents involved in minor collisions who hit their heads thought that wearing a helmet reduced the injury”* (Transit New Zealand, 1991, p. vi).

In contradiction a study undertaken twelve months before New Zealand legislation requiring a helmet came into force found that helmets achieved little in cycle injury prevention. Increased helmet wearing percentages prior to the legislation showed no significant reduction in serious cycle injuries (Mees & Groenhart, 2014). Further studies have highlighted that the compulsory helmet law coincided with a reduction in cycling participation by as much as 51%. Additionally, the reluctance of people not to cycle, and hence not exercise, is estimated to have contributed to as many as 53 premature deaths per year in New Zealand (Clarke, 2012).

Safety in Numbers

Safety is a reoccurring issue and the more people involved in active transport, the safer it becomes. This is contrary to logic whereby one would assume the more people involved in walking and cycling, the more people with potential to be injured. However, Jacobsen found that more cyclists and walkers results in less accidents and injuries (Jacobsen, 2003). This can be explained by a “behaviour modification” of motorists whom then anticipate or expect people to be walking and cycling (Jensen, 2009, p. 208). Pucher and Buehler (2008) have found the phenomenon of ‘safety in numbers’ holds consistently across cities and countries (J. Pucher & Buehler, 2008, p. 508). Thus once policies help to create a certain threshold number of cyclists and walkers, according to Jacobsen’s theory this will also increase safety.

Slow Vehicle Zones

The New Zealand Transport Agency investigated the effectiveness of slow vehicle zones as a policy measure to slow traffic. The study had inconclusive results as to their effect at decreasing vehicle flow or increasing active transport activity. There was no evidence of a resulting change in modal use as a result of slow vehicle zones (O’Fallon & Sullivan, 2011).

In contrast, a study looking at potential measures to improve the safety of walking and cycling in American cities identified slow vehicle zones as one of six measures that could reduce fatalities and injuries by active transport users, and encourage walking and cycling (J. Pucher & Dijkstra, 2003). *“The most important safety impact of traffic calming is the reduced speeds of motor vehicles. This is crucial not only to the motorist’s ability to avoid hitting pedestrians and bicyclists but also to the survival of non-motorists in a crash”* (J. Pucher & Dijkstra, 2003, p. 1513). A study of The Netherlands, Denmark, Great Britain and Germany found that traffic injuries decreased on average 53% in traffic-calmed neighbourhoods (where vehicles are limited to 30 km per hour) (J. Pucher & Dijkstra, 2003, p. 1513).

Walking School Buses

Walking school buses are recommended as a policy measure by Fyhri et al (2011) to help encourage school children to walk to school and a study undertaken on Christchurch walking school buses is alluded to. This voluntary initiative is considered beneficial as it enhances *“better social connections, enhancement of children’s health, time savings (parents not having to escort children to school every day), got children into the habit of walking, and in that way increased, their independence”* (Fyhri, Hjorthol, Mackett, Nordgaard Fotel, & Kytta, 2011, p. 709).

Barriers to Cycling in New Zealand

The New Zealand Transport Agency conducted an assessment between 2008 and 2011 on the type of cycling infrastructure required to attract or encourage new cyclists (Kingham & Koorey, 2011). This followed the statistic that 40% of all work commutes in New Zealand are for journeys of less than 10km (Kingham & Koorey, 2011, p. 17) and hence a distance suitable for active transport. Using literature, survey questionnaires and focus groups comprised of potential cyclists; the research found safety is the most significant barrier to cycling (Kingham & Koorey, 2011, p. 11). After safety, a lack of facility access (such as showers), enjoyment, and the perception that car drivers are not considerate (which links to safety) are the other main barriers (Kingham & Koorey, 2011, p. 9).

The report emphasised that all cycling facility options considered are better than current ‘non’ options and that the current urban environment poses a huge policy challenge given it is orientated towards motor vehicles that create many obstacles for cycling (Kingham & Koorey, 2011, p. 1). The recommendations were in line with other international literature and included separating cyclists from traffic, low-speed zones and conducting cycling infrastructure trial types (Kingham & Koorey, 2011, p. 10). They reiterated as other researchers have that a combination of policies (both hard and soft) is the best approach (Kingham & Koorey, 2011, p. 40).

2.2.3 Mutually Reinforcing Policies

Pucher and Buehler (2008) concluded that *“the success of cycling does not depend on poverty, dictatorial regimes or the lack of motorized transport options to force people onto bikes”* (J. Pucher & Buehler, 2008, p. 497). Instead, they identified that successful nations (Denmark, Germany and the Netherlands) have a coordinated and integrated approach to policy so that cycling and active transport is encouraged in a multi-faced approach with *“mutually reinforcing policies”* (J. Pucher & Buehler, 2008, p. 495). Not one policy is required for success, but multiple policies which deal with

different issues. For example a combination of mixed use development to produce shorter trip distances, pro-bike policies to encourage and promote cycling, and anti-car policies such as vehicle taxes, car parking restrictions and more to discourage vehicle use is required (J. Pucher & Buehler, 2008, p. 495). Mees and Groenhart (2014) also stress the importance of introducing cycling policies that compliment instead of compete with walking policies (City of Copenhagen, 2004, p. 70) thus further supporting the idea of 'mutually reinforcing policies'.

Copenhagen did not always enjoy active transport success. It is since the 1970's that a reversal in planning policies took place (J. Pucher & Buehler, 2008, p. 496). The policy change involved restricting and increasing the cost of car use whilst simultaneously, improving bicycling infrastructure (J. Pucher & Buehler, 2008, p. 502) to encourage a transition of behaviour.

2.3 Comparative Analysis of Transport Policy

This section presents the review of comparative studies of transport policy undertaken to ascertain the policies considered important for increasing active transport and how comparisons have been undertaken historically.

2.3.1 A Sydney and Melbourne Comparison

A comparative analysis of the bicycling trends and policies between Sydney and Melbourne was undertaken by Pucher and Buehler (2008). Comparisons were made for a range of variables including;

- attitudes towards cyclists
- availability of bicycle parking
- existence of bicycle programs, promotions and advocacy initiatives
- existence of urban land use policies encouraging greater densities
- existing and planned cycling infrastructure
- history and cycling culture
- integration of bicycle parking with public transport
- petrol prices
- political will and support for environmental change and active transport
- speed limits in place
- the cycling conditions
- traffic calming initiatives
- whether full service bike facilities were in place

The research found that as well as more favourable geography, Melbourne had a greater amount of cycling infrastructure, cycling programmes, advocacy and cycling promotional events. These were also better integrated with the transport system, combining to explain why Melbourne had a cycling participation level of almost double Sydney's (John Pucher, Garrard, & Greaves, 2011, p. 332). Lastly, they note that *"although the Australian Government officially endorses the goal of increased cycling, it has played a limited role in actively supporting cycling programs"* (John Pucher et al., 2011, p. 332).

Pucher et al (2011), acknowledge several underlying factors that could contribute to Melbourne's higher cycling modal share. They consider *"a range of basic, underlying factors inherent to each city's location, size, and overall structure"* as well as an examination of the factors related *"specifically to transport policies and programs in each city"* (John Pucher et al., 2011, p. 336). They also looked at the historical context of both cities and emphasised that the first bicycles to reach Australia were imported to Melbourne in the 1890s (John Pucher et al., 2011, p. 339).

The method combined statistical information with *"published reports and consultation with a panel of 22 bicycling policy and planning experts in Australia to provide a qualitative, contextual assessment of differences in cycling levels and policies in the two cities"* (John Pucher et al., 2011, p. 332). Census data dating back to 1976 was the main statistical source of information (John Pucher et al., 2011, p. 339).

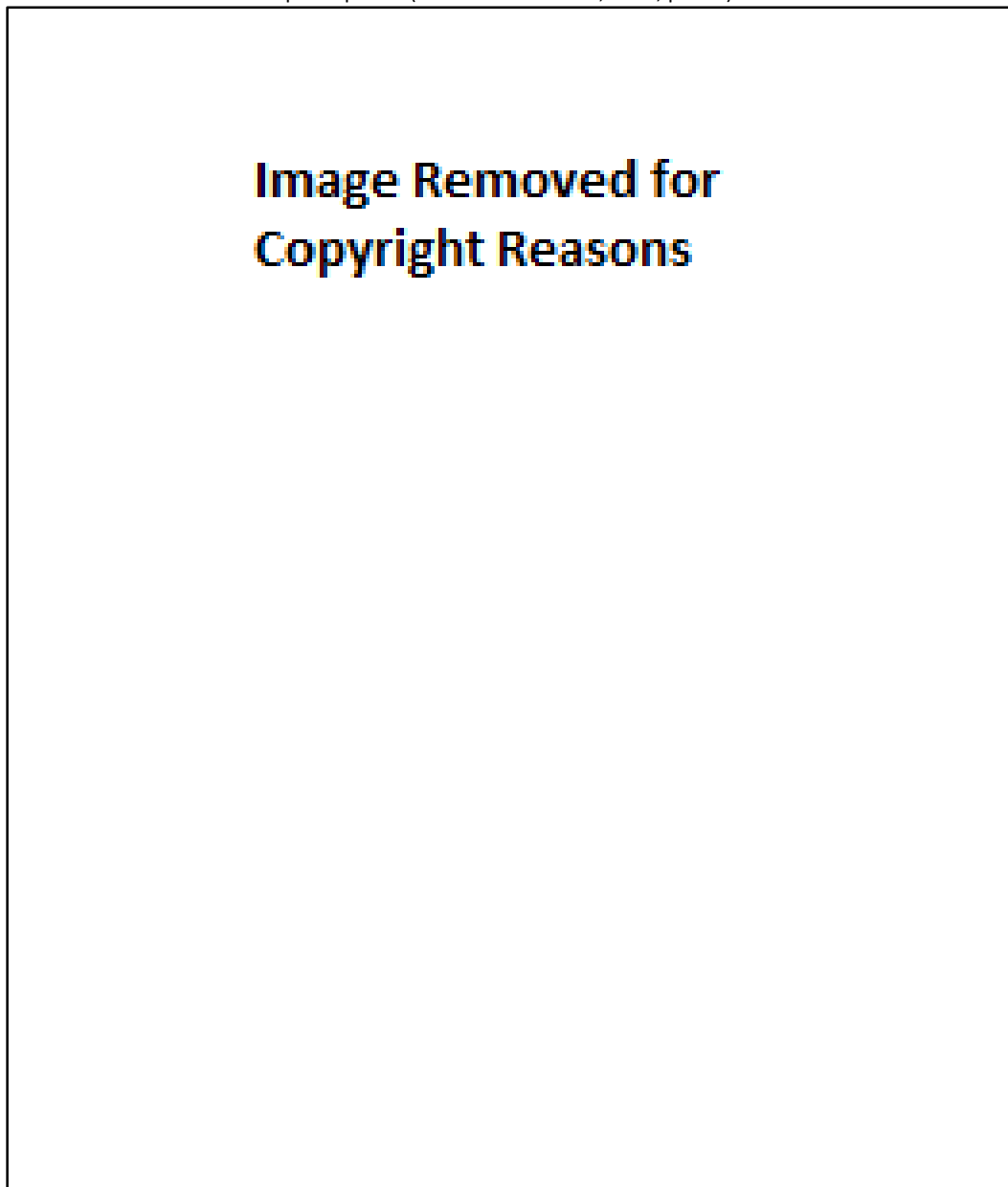
The authors found it difficult to compare the cities. *"The lack of an extensive, disaggregate database precludes any sort of advanced multivariate analysis of cycling determinants in the two cities"* (John Pucher et al., 2011, p. 343). They also found it challenging to measure differences in policy since quantitative measures did not exist. Despite this they concluded that their evidence suggested the policies, and underlying environmental structural factors examined favoured Melbourne more than Sydney (John Pucher et al., 2011, p. 343).

2.3.2 A Comparison of Denmark, Germany and the Netherlands

Pucher and Buehler looked at Denmark, Germany and the Netherlands in 2008 and compared bicycle mode shares, trip share, car ownership, the percentage women cyclists, safety and injury statistics, trip length and the percentage of cycle trips used for recreation. Key policy initiatives identified included bicycle paths and lanes, traffic calming, bicycle parking, vulnerable road user protection laws and fewer car parks (J. Pucher & Buehler, 2008). Further measures identified in

relation to increasing safety are presented in Table 1. Two additional tables were produced of a similar nature in the article to provide a multitude of potential policies to make cycling irresistible.

Table 1. Pucher and Buehler's 'Making Cycling Irresistible' 2008 table of the policies contributing to active transport modal participation (J. Pucher & Buehler, 2008, p. 512).



2.3.3 Megacities in India

Primarily descriptive, Reddy and Balachandras' 2012 article offered a comparative analysis of transport in megacities in India from 1981 to 2005. This study looked at the annual per capita person kilometre miles (PKM) to indicate how mobile the population was in a given city (Reddy & Balachandra, 2012). The article recommends using public transport as the way to sustainably meet transport demand in cities, adopting next-generation technologies and fuels. They stress that an

integrated, single, overall transport system is needed to be successful (Reddy & Balachandra, 2012, p. 163) and that transport cannot be treated in isolation.

2.3.4 New Zealand Regional Differences

Tin Tin, et al (2009) conducted a New Zealand based study looking at regional and individual city differences for cycling and walking to work (Tin Tin et al., 2009). Data from a fifteen year period of the census 'main means of travel to work' question was used. As completing the census is required by law, the response rate was 96.3% of New Zealand in 2006 (Tin Tin et al., 2009, p. 67). The limitation of the research included that the census question is phrased so that only the main means of transport can be included, not multiple transport modes (Tin Tin et al., 2009, p. 70). Tin Tin, et al found a *"steady decline in cycling and walking to work from 1991 to 2006, with two regional exceptions"* (Tin Tin et al., 2009, p. 64). Nelson and Wellington were the exceptions and this correlated with substantial investments in local infrastructure to promote active transport. It was unclear whether the investment in local infrastructure were the only differences between the policies in the two regions that were exceptions to the declining participation trend. Tin Tin, et al (2009) commented that further research is required to investigate the effectiveness of the active transport strategies and investment in place in Nelson and Wellington (Tin Tin et al., 2009, p. 72).

2.3.5 Comparing Key Demographic Measures

Percentage of Women Cyclists

Pucher et al's 2011 article considered aspects of active transport environments including the percentage of women that make up the cycling population (John Pucher et al., 2011, pp. 335-336). Pucher and Beuhler highlighted in 2008 that in the developed world, cycling is generally unevenly distributed amongst society with young men most dominant, women far less and the elderly barely at all (J. Pucher & Buehler, 2008, p. 496). They note that key cycling nations (Denmark, Germany and the Netherlands) had women cycling percentages between 45% and 55% (J. Pucher & Buehler, 2008, p. 502). They stress that the Netherlands, Denmark and Germany are all exceptions to the worldwide trend, and have a more even social distribution of cyclists including gender, age and income (J. Pucher & Buehler, 2008, p. 496).

Children's Level of Mobility

The level of active travel amongst children can also be a measure of active transport success. A study was undertaken looking at children's mobility in Denmark, Finland, Great Britain and Norway (Fyhri et al., 2011). The study was approached in three steps. Firstly, the mobility of each nation was

compared, then the social trends of that nation were considered and compared, before lastly looking at how the countries approach the various challenges that they face (Fyhri et al., 2011, p. 704). The research concluded that a holistic approach is required to address declining child mobility worldwide (Fyhri et al., 2011, p. 709).

Time Lag Between Policy and Results

Changes in Western Europe policy began in the 1970s and began to take real effect in the 1990's, a whole 20 years later. It was then that a cycling revival was experienced in countries such as Denmark. Thus it is likely *"a significant investment in cycling in New Zealand could have a result in 10-15 years, but the current, reactive, piecemeal approach will not have a significant impact on cycling rates"* (Preval et al., 2010, p. 16).

2.4 Comparative Policy Analysis

2.4.1 Introduction to Comparative Policy Analysis

Comparative Policy Analysis is used to compare different policies across cities, regions, and nations. Since the 1970s it has been identified as important for comparing *"different policies, inputs, and outcomes across institutional settings"* (Gupta, 2012, p. 11). It is based on the logic that *"if you have two systems that are similar but diverge on the dependent variable, you should look to the small number of differences in order to establish the reason for the divergence. By contrast, if you two systems that are very different, but have experienced similar policy outcomes, you should look to the small number of similarities as potential explanation for their similarity"* (Gupta, 2012, p. 12). The method was used frequently in the 1970s and early 1980's but suffered criticism in the late 1980's before again establishing itself as a popular method (Deleon & Resnick-Terry, 1998). Understanding the reasons behind its demise helps identify the limitations and strengths of a Comparative Policy Analysis approach.

Comparative Environmental Politics (CEP) is another name for the method, given to describe the systematic approach used to compare how different settings deal with environmental problems (Kamieniecki & Kraft, 2012, p. ix).

2.4.2 Importance of Context to Comparative Policy Analysis

Comparative Policy Analysis was critiqued as an unreliable method in the 1980's. This was because it was acknowledged that the context a policy took place in is crucial. It was highlighted that *"the contextuality of the specific problem – really did make a difference, indeed, such a difference that*

seemingly 'simple' comparisons were, upon reflection, seriously problematic" (Deleon & Resnick-Terry, 1998, p. 11). A difference in policies, and how they are administered, was considered to relate to the basic cultural, and political differences between countries. Secondly, determining how much weight to give to those influences was not clear (Cyr & Deleon, 1975, p. 376). This highlighted the significance of choosing locations and contexts that can be compared (Deleon & Resnick-Terry, 1998, p. 18) and explains why most comparative policy studies "*cross national, but not basic cultural, boundaries*" (Cyr & Deleon, 1975, p. 381).

Further criticisms included the difficulty in isolating one or two critical variables amongst an often diverse number of other variables influencing the outcome (Cyr & Deleon, 1975, p. 376). Likewise, studying more than one nation can cause problems when gathering and analysing data (Cyr & Deleon, 1975, p. 376). Despite the criticisms, the approach was highlighted as having many benefits including that "*comparative policy analysis raises the possibility of much richer insights concerning the influence of cultural milieu, political competition, and government structures themselves on the characteristics of public policy*" (Cyr & Deleon, 1975, p. 378).

2.4.3 Modern Comparative Environmental Politics

Comparative policy analysis is again today a respected method, with the subfield of comparative public policy "booming" (Gupta, 2012, p. 20). The methods resurgence is linked to globalisation. Now the world is a "global village" it is considered acceptable that policy scholars turn overseas as a source of inspiration, "policy pinching" (Deleon & Resnick-Terry, 1998, p. 15) and insight. Improved communications between nations, a linked economy, and the removal of ideological barriers between nations (Deleon & Resnick-Terry, 1998, p. 13) has combined to result in frequent, swift exchanges of information between nations and has addressed the problem identified in 1975 around the difficulties of gathering data (Cyr & Deleon, 1975, p. 376).

Today comparative environmental politics acknowledge context and Steinberg and Vandever (2012) highlight this writing that "*the actual impact of political institutions on environmental and political outcomes - figures prominently in the CEP literature*" (P. F. Steinberg & S. D. VanDeveer, 2012, p. 41). They emphasise that the "*study of values, culture and knowledge plays a central role in CEP research precisely because social responses to environmental problems are shaped by predominant cultural understandings*" (P. F. Steinberg & S. D. VanDeveer, 2012, p. 42).

2.4.4 No Systematic Approach to Comparative Environmental Politics

Steinberg and VanDeveer (2012) observe that whilst there is a vast array of literature on comparative environmental politics, no systematic or theoretical approach can be universally applied (P. Steinberg & S. VanDeveer, 2012). This is similar to Cyr and Deleon's observations in 1975 that more conceptual work was required developing a solid methodologically for comparative policies (Cyr & Deleon, 1975, p. 383).

2.4.5 Summary

In summary, the criticisms surrounding the method of comparative policy analysis were primarily associated with ignorance or inappropriate acknowledgement of the important role that context plays in policy measures and their implementation. In the 21st century, comparative policy analysis is again a well-respected and valued method of policy analysis.

2.5 Summary and Discussion

2.5.1 Comparisons

Comparisons have been undertaken between various Australian cities, between regions and cities in New Zealand, and between cities in Europe in the active transport research space. However, few studies have compared nations from different geographical locations. This may be linked to the 1980s critique of comparative analysis that context is important and hence that the geography and political systems of a place should be similar.

The study by Gehl Architects was an exception, considering Christchurch's central city public space to other cities studied using the same method. Importantly, this was undertaken prior to the earthquakes in Christchurch, and only considered the central city business district, not the city as a whole.

2.5.2 Political Context

A theme arising from the literature is the importance of political support and political context. Political support can span numerous levels – central government, right through to local government - and determines the availability of resources towards a certain cause (funding, knowledge and more). The implementation of policies needs to be incorporated into policy analysis as this helps determine whether a policy measure is symbolic or in fact making a difference to the desired outcome.

2.5.3 Implementation

Despite the correlation of implementation and how this relates to political support, the effectiveness of policy implementation was not present in the literature. Although, ample information surrounds different policies to encourage active transport, minimal discussion and research has taken place considering the implementation of such policies.

2.5.4 Connecting the Research and Recommendations

The literature review reveals that a significant amount of research undertaken worldwide looked at not only the benefits of active transport, but the policies considered beneficial for increasing active transport participation. The literature has made a significant contribution to the discourses knowledge on what infrastructure and policy measures are in place in various cities. However, the policy analysis in majority of the studies does not carefully take into account the context of the cities, and this is important as highlighted by the critiques on comparative policy analysis. Furthermore, exactly how methodical the connection between comparing policies and listing recommendations was unclear. Policies identified as successful were often identified after descriptions about a location, with no apparent policy analysis justifying why these policies were considered best.

For example Pucher's 2008 article includes statistical data to back up its conclusions on policy (J. Pucher & Buehler, 2008) but it is unclear how the connection was made between various policies and an increase in cycling. The article simply concludes that because the three nations doing well have certain policies in place, it must be those policies that are the reason for the success. Reddy and Balachandra (2012) are another example as their article does not explain how the policy measures recommended were linked to the data discussed previously in the article. This could be a confusion between correlation and causation, assuming a correlation equals a causation between policy measures and outcomes.

Mutually re-enforcing policies which include a combination of car restrictive and pro-bike policies (J. Pucher & Buehler, 2008, p. 525) were a reoccurring notion. A possible reason for this could be related to the difficulty in measuring the success of only one policy measure given that numerous uncontrollable factors are at play. Unfortunately, one cannot isolate the impacts of a specific policy measure when considering transportation statistics and thus attributing an increase or decrease in active transport modal share to a policy measure is almost impossible.

2.5.5 Context

Whilst comparative policy analysis critiques highlight the importance of context (Deleon & Resnick-Terry, 1998, p. 11), active transport studies considered in the literature tended to rely either too heavily on context, did not consider the influence that context had or attributed most outcomes to context. This places doubt on the effectiveness of the policy recommendations. Regardless of what cities a comparative policy analysis compares, there will always be differences in their context. The key consideration is to recognise and be aware of what the differences are.

2.5.6 Summary

This literature review has identified that active transport is a popular field. Studies have recognised specific policy measures considered conducive to active transport; comparisons have been made between cities domestically, and internationally; and comparative policy analysis is, after a period of criticism, considered a respected and useful approach for comparing and identifying successful policy measures. This literature leads to the research questions identified in the next section.

Chapter 3

Research Question, Objectives and Methods

3.1 Research Question and Objectives

Building on the substantive and methodological literature review, this research asks:

‘What policies should low active transport cities like Christchurch consider changing?’

A comparative policy analysis between a high and low active transport city will be used to determine the policies that cities like Christchurch should consider changing. In addition context (highlighted as important in the literature) is incorporated in the three research objectives.

The Objectives:

1. *Define all variables with potential to influence active transport participation*
2. *Identify differences between the low and high active transport cities*
3. *Identify the variables of difference that can be changed by city policy*

3.2 Addressing the Objectives

This section outlines the method which involves four steps (highlighted in figure 5).

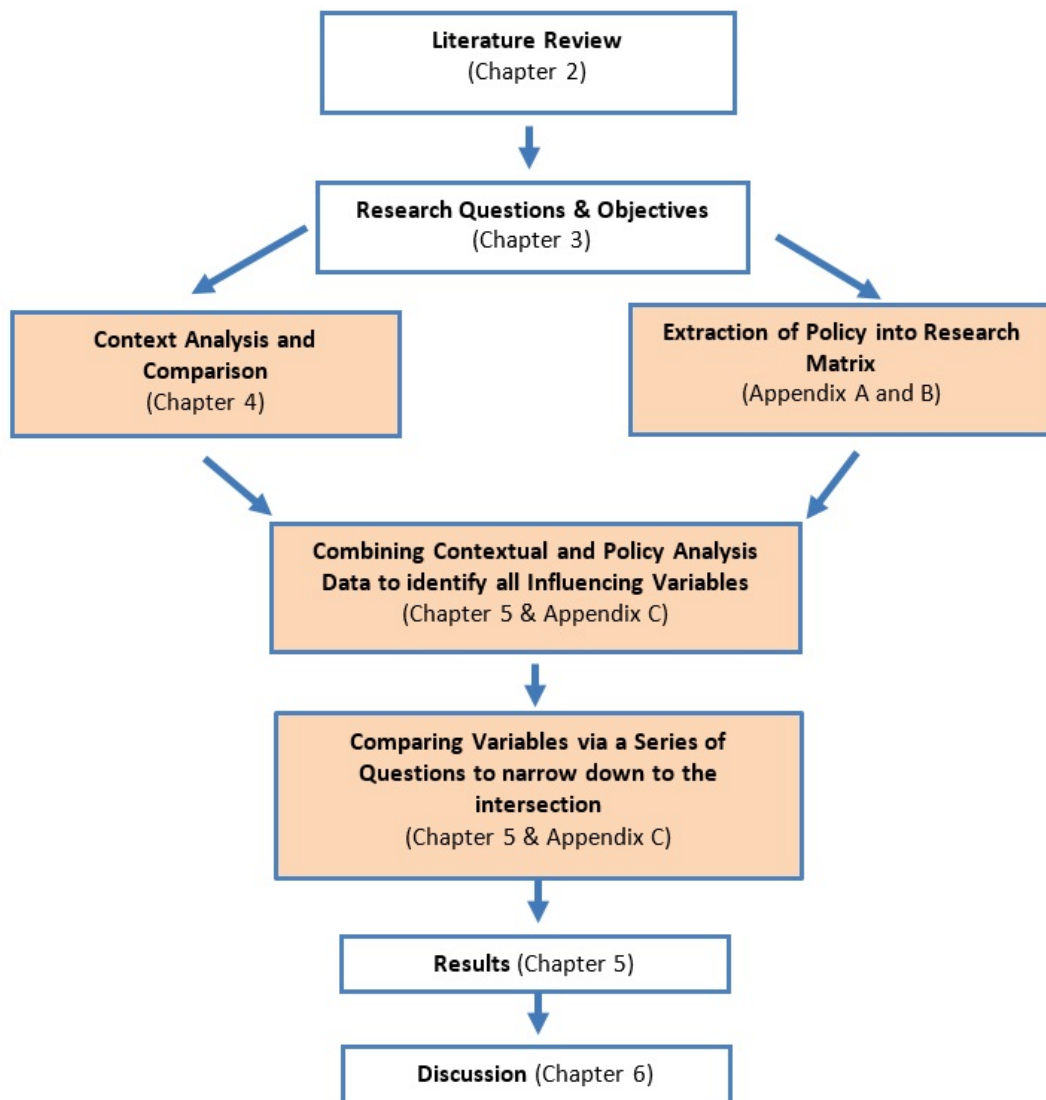


Figure 5. Summary of the Research Approach

This research does not hope to identify those policy measures guaranteed effective at increasing active transport participation. Instead, it aims to identify variables and measures situated in the intersection identified in purple in the figure 6.

The variables with potential to influence the dependent variable of active transport participation will be narrowed down using a series of intersections. The final intersection will locate variables that have potential to influence active transport participation; that demonstrate a difference between the two case cities; are changeable by public policy; and changeable locally. These are the variables and policy measures that low active transport cities should consider for further research as they can be changed locally.

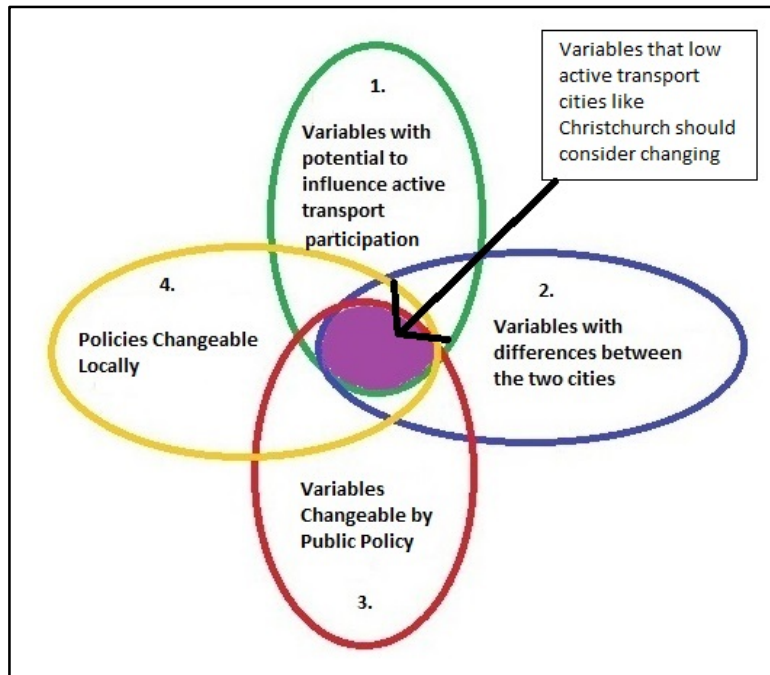


Figure 6. Identifying the Variables in the Intersection (highlighted in purple).

In summary, the intersection will identify those policy measures which warrant greater attention by cities wishing to increase active transport participation.

3.3 Objective One: Define all variables with potential to influence active transport participation

Objective one builds on the work of previous studies researching the relationship between policy, infrastructure, and active transport participation. This research uses a more holistic and integrated approach to consider all variables with potential to influence active transport participation. Thus although primarily policy analysis research, a number of variables (including those that form part of a cities context such as weather) will also be considered.

Objective one is addressed in three steps. To address the deficiencies identified surrounding comparative policy analysis in regards to context (Deleon & Resnick-Terry, 1998, p. 11), the potential influences or ‘swamping factors’ will be considered and compared for each city⁴. This will identify the similarities and differences between the cities.

Defining all variables acknowledges that a wide range of factors influence behaviour (Kollmuss & Agyeman, 2002). Consequently in addition to context, the full suite of policy measures (infrastructure, enforcement, fiscal measures etc.) will also be analysed.

⁴ This is similar to the approached used by Fyhri et al., (2011) outlined in Section 2.2.4).

A range of variables were distilled from the literature as influencing active transport. It is hypothesised that additional variables will be identified throughout the research to establish a more complete list. The literature identified the following variables:

- Bicycle Infrastructure – lanes, separated bike tracks
- Car Ownership
- Car Parking – Cost and Quantity
- Cycle Helmets
- Density
- Perception of Safety Walking and Cycling
- Petrol Price
- Price of Cars
- Topography
- Traffic Calming
- Trip Length
- Vehicle Registration Tax
- Vulnerable Road User Protection Laws
- Weather

Following the context analysis the policy from Christchurch and Copenhagen will be compiled and compared. The extraction of policy data is inspired by Pucher et al's 2008 analysis which compared a number of measures including bicycle mode share percentages, levels of car ownership, safety and injury statistics and trip length. Other policy variables will be included as they are identified when analysing the policy documents. The policy findings will be organised by a research matrix (depicted below):

Table 2. The Research Matrix for Policy Extraction

Relevant Literature Source	Policy Measure	Rule/Policy & Year	Form Education; Enforcement; Engineering; Encouragement/ Voluntary; Budget Decision; Study/Further Research; Aspiration	Additional Information on the policy measure	Relevant Information	Outputs/ Implemented	Outcomes Measurement of the Policy Analysis
----------------------------	----------------	--------------------	---	---	-----------------------------	-----------------------------	---

3.3.1 Information Extracted for the Matrix

The research matrix enables not just the policies in each city to be recorded, but accompanying detail to assist the comparison.

The column 'Relevant Literature Source' details information on where the policy measure was first identified— whether it was informed from the literature review, or arose when analysing the policy documents.

In the 'Form column', there is scope to identify the different policy form. The categories are summarised below:

- *Education*
This involves policies that work to educate the public to transform behaviour through awareness. An example is road safety advertisements.
- *Enforcement*
This includes policies enforceable by rules that have consequences when not followed. Examples include taxes and fees.
- *Engineering*
Engineering policies are defined as infrastructure projects. Examples include the creation of a cycle pathway or the installation of a traffic light system.
- *Encouragement/Voluntary*
'Encouragement' describes a policy that doesn't do anything without relying on 'goodwill'. An example would be to offer "support" to a programme with no clear economic or resource support specified.
- *Budget Decision/Study/Further Research*
This policy form includes policies that indicate a commitment to find out more information, to research an issue, or to allocate funding.
- *Aspiration*
An aspiration policy sets out a vision for achievement, but does not articulate how that vision will be realised. Aspiration policies tend to be in high level strategic documents.

The column 'Additional Information' allows for information relevant to the policy measure to be recorded. This may be useful in comparing the policies. A column is also provided to record relevant information on the policy measure in general and historic information.

Lastly, the matrix contains columns to record the outputs and outcomes of the policy measures. An example of an output would be that five intersection crossings have been modified since the policy measure was put in place, whilst the outcome column would record whether the modification of the intersections resulted in less accidents, and whether there was a change in the number of pedestrians and cyclists using the intersections. This is best described by Mills-Scofield (2012) when she writes that "*outcomes are the difference made by the outputs: better traffic flow, shorter travel times, and fewer accidents*" (Mills-Scofield, 2012).

The final column ensures this research is outcomes, not outputs, focused. Thus, regardless of how many people like the idea of active transport, support active transport investment, or the amount of policy documents mentioning 'cycling' or 'walking', the research will always be related back to the outcome of active transport participation.

3.3.2 Data Sources

A range of data sources will inform the policy matrices on Copenhagen and Christchurch. The main sources are identified below, whilst a full list is found in Appendix D.

Copenhagen Sources

- Cycle Policy 2002-2012, City of Copenhagen
- Bicycle Accounts – Copenhagen City of Cyclists Biannual Bicycle Account (2002-2012)
- Traffic and Environment Plan 2004, City of Copenhagen
- Traffic Safety Plan 2007-2012, City of Copenhagen
- Sustainable Transport – Better Transport (2008), The Danish Government
- Good, Better, Best: The City of Copenhagen's Bicycling Strategy 2011-2025, City of Copenhagen
- The Danish Transport System: Facts and Figures (2012), Ministry of Transport

Christchurch Sources

- Pedestrian Strategy for Christchurch City "A Step in the Right Direction" (2001), Christchurch City Council.
- Christchurch Cycling Strategy (2004), Christchurch City Council.
- Christchurch City Plan (2005), Christchurch City Council.
- Getting there - on foot, by cycle: A strategy to advance walking and cycling in New Zealand Transport (2005), Ministry of Transport.
- Christchurch Road Safety Strategy 2006, Christchurch City Council.
- 2020 Safer Journeys: New Zealand's Road Safety Strategy 2010-2020, Ministry of Transport.
- Canterbury Regional Land Transport Strategy 2012-2042, Canterbury Regional Transport Committee.
- Christchurch Transport Strategic Plan 2012-2042: Keep Christchurch Moving Forward by providing transport choices to connect people and places (2012), Christchurch City Council.
- An Accessible City - Christchurch Central Recovery Plan: Replacement transport chapter - October 2013. (2013), Canterbury Earthquake Recovery Authority.
- Christchurch Cycle Design Guidelines 2013, Christchurch City council.

3.3.3 Categorising the Variables

After the policy extraction has been undertaken, the next step will be to distil all policy measures in the policy extraction matrices, and all variables identified in the systematic analysis of context. This will identify all variables and drivers with potential to influence the dependent variable of active transport participation. The variables will be categorised as follows.

- *Sociological and Historical Variables* - those variables that work to change behaviour and influence lifestyle. These include marketing and car ownership levels which impact context and culture.
- *Economic factors* - those variables which impact the affordability of transport options and consequently include pricing, and taxation.
- *Transport Infrastructure* - all variables relating to infrastructure such as bicycle lanes and car parking. This category is generally characterised by physical changes to the landscape in which active transport occurs.
- *Geographical factors* - variables and factors relating to the geography and environment of an urban area in which active transport takes place. This includes natural geographical features such as weather and topography, as well as urban factors such as density.
- An *implementation factors* category is included for those factors that relate to the implementation of policies.

3.4 Objective Two: Identify differences between the low and high active transport cities

The second objective considers that it is assumed to be the variables of difference that are contributing to the dissimilarity in active modal share participation between Christchurch and Copenhagen. All variables with potential to influence active transport will be compared between a low active transport city (Christchurch), and a high active transport city (Copenhagen) to identify whether there is a difference between the cities.

The comparison of the large list of variables will be organised using a series of questions to enable systematic analysis of the compiled data. The questions will identify which of the variables demonstrate a difference between the two cities, and also are changeable by public policy (3.3).

The questions used to narrow the variables to those in the intersection are:

1. Is there a difference between the two cities?
2. Is the difference conducive for Copenhagen’s Active Transport Participation?
3. Are the differences changeable? Could public policy be utilised to the change the differences?
4. Were the policies implementable and have they been implemented?
5. How can the policies change (locally or nationally) and what is the timeframe for this?

Figure 7 presents the matrix developed to answer the questions outlined above.

Variables Impacting Active Transport					
Independent Variables	Is there a difference between the cities?	Is the difference conducive for Copenhagen’s Active Transport Participation?	Can public policy change the difference?	Are the policies implementable?	How the policies change and what is the timeframe?

Figure 7. Matrix Developed for the Systematic Analysis of the Variables

Questions one (column two) identifies the differences between Christchurch and Copenhagen and thus the variables that need to be looked at closely. If there was a difference between Copenhagen and Christchurch for a certain variable it is considered as a potential influence on active transport modal share. If the difference is favourable to Christchurch (whilst Copenhagen has the higher active transport participation), it will be ruled out under column three as it is no longer considered contributing to the high active transport success of Copenhagen. This basic logic test will rule out variables no longer worthy of investigation. Christchurch’s active transport participation is nowhere near as successful as Copenhagen and hence variables favourable to Christchurch are not considered required for active transport success.

3.5 Objective Three: Identify the variables of difference that can be changed by city policy

This third objective ensures the research identifies not just what variables which influence active transport can be changed by policy, but which are able to be changed locally. This considers that there are likely to be some variables that cannot be changed, some that can be changed only through national government policy, and others that are changeable by local government.

Columns Three and Four (Questions Three and Four) of the systematic comparison identify the changeable variables that low active transport cities could change to be more reflective of the environment in Copenhagen. Question Five determines where that change would need to occur and gives an indication of the length of time the change would take. Answering how the policies change (whether the policies are changed locally or nationally), will be informed by the policy extraction data which will indicate at what document level (national or local) various policy measures appear. For example, if a policy appears in a national strategy it is assumed to require a national policy change, whilst if a measure appears in a city plan it is considered to be changed locally.

The time indication is based on:

- **Short Term:** Measures that can be changed quickly (within a couple of months) and do not require any construction or infrastructure changes. This category includes financial decisions (i.e. altering the price of something) and changes implemented in a short time frame such as altering the speed limit of an area.
- **Mid-Term:** Mid-term measures generally require infrastructure changes (construction or deconstruction) and are likely to take up to a couple of years to implement.
- **Long-Term:** Long Term measures require multiple policies and regulations to integrate and coordinate to create a change. Changes are likely to take anywhere from five years and longer to implement.

The time frame offers an indication only. Whether a policy can be changed locally or nationally is likely to alter for different countries as the locus of control for specific variables and policies may differ.

3.6 Research Question: What policies should low active transport cities like Christchurch consider changing?

The research question will identify what low active transport cities like Christchurch can change. Christchurch is an example of a city with high potential but currently low active transport participation. This question requires the research to conclude with a series of recommendations for what policy low active transport cities should consider investigating further. The objectives outlined enable a systematic approach to identify those variables and policy measures that warrant closer attention.

3.7 Research Context - Christchurch and Copenhagen

Christchurch, New Zealand and Copenhagen, Denmark are chosen to provide an international comparison of two cities with different active transport success. Copenhagen is an established cycling city and a self-proclaimed 'City of Cyclists' (City of Copenhagen, 2005, 2013; Gossling, 2013), whilst Christchurch currently displays low active transport participation.

3.8 Summary of the Method

The method can be summarised into four stages. First, the context of each case study will be analysed and compared. Then the policy documents of each city will be analysed, with key policy information extracted, organised by a research matrix. Finally, the information gathered from the contextual analysis and the policy analysis will be combined to identify all potential variables impacting active transport participation. These variables will then be narrowed down to a smaller list of variables considered conducive to active transport, and changeable by local policy measures. This will be achieved through the use of a series of questions to organise the findings. At the conclusion, a list of policy measures located within the intersection identified in figure 6 will be identified.

Chapter 4

Comparison of the Cities

4.1 Introduction

Copenhagen, Denmark is older than Christchurch, which by global standards, is new. Copenhagen became the capital of Denmark in 1445 (Editors of Encyclopaedia Britannica, 2014), before New Zealand was even discovered by European settlers. This chapter compares the context of Christchurch and Copenhagen to ascertain the similarities and differences between the cities. This comparison looks at such factors as the political systems, population, history, topography, and climate. It begins with a history of active transportation in each city.

4.2 Active Transport History

4.2.1 Early History of the Bike

Cycling established as a mode of transportation in both cities in the 1880s and 1890s, coinciding with the invention of the typical bicycle around the 1880's which saw a chain and sprocket used to drive the rear wheel and pneumatic tyres (Mud Sweat n Gears, n.d.). Cycling numbers rose by 10% in Copenhagen between 1890 and 1910 (from 3,000 to 30,000 cyclists) (Santos Canals, Pinaud, & Janneau, 2006, p. 10). Following this, the first separated bike path opened in 1910 (VisitDenmark, 2012).

Cycling took off in Christchurch in the 1880s with the first bicycle club established in 1879. The 'Pioneer Bicycle Club' was open only to men and in 1892 a female club was also established (Christchurch City Council Traffic and Transportation Division, 1979, p. 9). In the 1880's the city council received complaints about 'furious riding' and by 1887 a by-law was introduced limited cycles to 8 miles per hour (13km/hr) in the city (Christchurch City Council Traffic and Transportation Division, 1979, p. 9).

During World War II (1939-1945), the Danish government financed cycle routes and recreational cycle tracks to reduce unemployment in Copenhagen (Santos Canals et al., 2006, p. 10) starting the investment in cycling infrastructure in the city.

Overall, both cities had a similar early history of cycling. It is the 1960s and 1970s that the differences become apparent.

4.2.2 1950s

Although cycles were a common sight in Christchurch (figure 8), once the ‘cycling capital’ of New Zealand (Ministry of Foreign Affairs of Denmark, 2014a, p. 2), active transport declined after World War Two (as it did in many cities worldwide). In the 1950s the last cycle manufacturer in the city, Cycleworths, closed (Christchurch City Council Traffic and Transportation Division, 1979, p. 17).

Walking trips also declined in the 1950s and 1960s in

Christchurch (Douglass, 2000, p. 31) and by 1959 less than 10% of all daily trips made by those within the built up area of the city (approx. 130km²) were by pedestrians (Christchurch Regional Planning Authority, 1965, p. 24).

4.2.3 1960s

Cycling declined in Christchurch and Copenhagen in the 1960s (a global trend), with urban sprawl and widespread availability of the private motor vehicle (J. Pucher & Buehler, 2008, p. 502). However, the car revolution did not impact Denmark as much as other nations. *“The car revolution began slowly in Denmark because cars were not affordable... also, the motor lobby has never been as strong as in other countries”* (Santos Canals et al., 2006, p. 10).

Despite a decline in active transport participation it was in the 1960s and 1970s that Copenhagen began a policy reversal aimed at decreasing the transition to the car.

Since 1962, the city has used policy in favour of active transport to reduce car parking and encourage cycle lanes (Lambert, 1998). Pucher and Buehler (2008, p. 496), stating that cycling levels plummeted in Denmark between 1950 -1975 and *“it was only through a massive reversal in transport and urban planning policies in the mid-1970s that cycling was revived to its current successful state”* (J. Pucher & Buehler, 2008, p. 496).

In 1962, Copenhagen created the world’s longest pedestrian shopping street ‘Strøget’ (VisitDenmark,

2012). By 2004, more space had been pedestrianised and Copenhagen had *“over 96 000 m² (of which 33% is street and 67% city squares) of car-free space”* (figure 9) (Directorate-General for the Environment, 2004, p. 16).

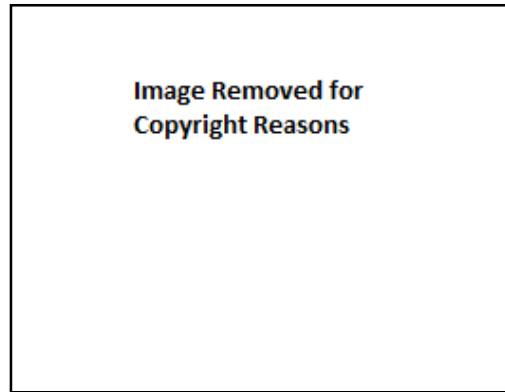


Figure 8. Cycles were a common sight in Christchurch (1959) (Douglass, 2000, p. 8).



Figure 9. The Increase in Car Free Streets and Squares in Copenhagen after 1962 when Strøget was pedestrianised (Directorate-General for the Environment, 2004, p. 16).

4.2.4 1970s

In the 1970s active transport continued to decline in Christchurch and this has continued since the New Zealand Census included 'travel to work' as a question in 1971 (figure 10) (Statistics New Zealand, 1971-2013). A more detailed figure can be found in Appendix E.

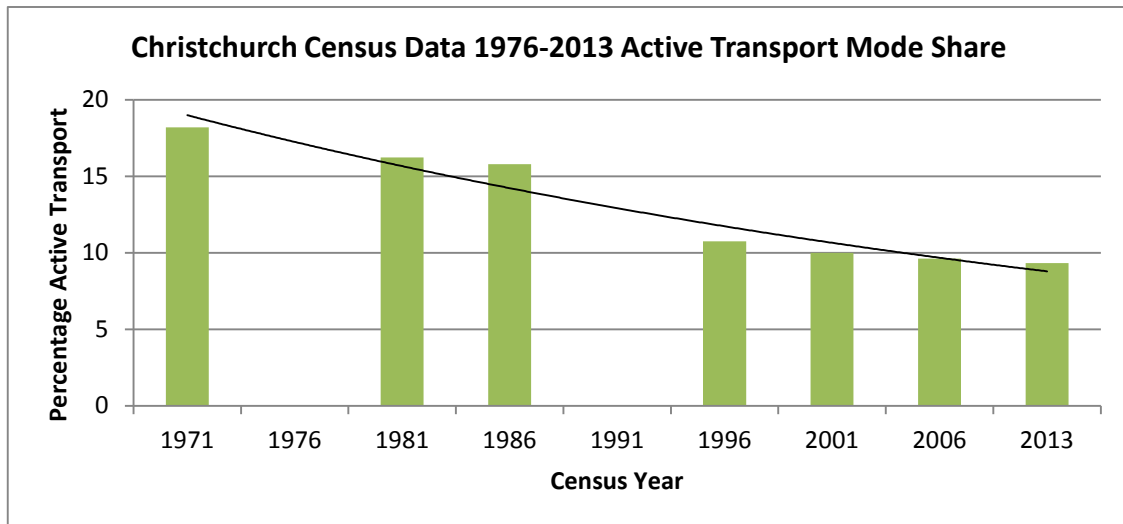


Figure 10. Declining Christchurch Active Transport. Data source: Christchurch Census Data from 1976-2013.

In the 1970s cycling lost prominence in Christchurch with a report stating *“cyclists are a silent minority and as far as specific suggestions are concerned; even this report was unsuccessful in unearthing many positive suggestions”* (Christchurch City Council Traffic and Transportation Division, 1979, p. 7). The Christchurch City Council Traffic and Transportation Division identified that *“unfortunately, it is virtually impossible to create separate cycleways in and adjacent to the centre of the city. The degree of development of property is too great to justify the acquisition of property and the creation of cycleways”* (Christchurch City Council Traffic and Transportation Division, 1979, p. 27).

Christchurch created pedestrian spaces in the 1970s and 1980s to give pedestrians priority in sections of the city. Cathedral Square (figure 11) and the pedestrian conversion of Cashel Street (commonly referred to as City Mall) (figure 12) are two examples.

**Image Removed for
Copyright Reasons**

Figure 11. Pedestrian Improvements made to Cathedral Square (Douglass, 2000, p. 19).

**Image Removed for
Copyright Reasons**

Figure 12. Pedestrian Improvements on Cashel Street when the street became car free (Douglass, 2000, p. 19).

4.2.5 1980s

In the 1980s, in addition to the policy reversal already enacted, Copenhagen citizens voiced their support for active transport and their discontent at the private motor vehicle. They held cyclist demonstrations (figure 13) to raise public awareness, and influence the decision makers, engineers and city planners (Jensen, 2009; Santos Canals et al., 2006, p. 11). A number of developments followed including the release of the first cycle track plan in 1981 (Jensen, 2009).



Figure 13. Cyclists demonstrate in Copenhagen in the 1980's (Arditti, 2013).

In 1980 Christchurch released a Cycle Plan (City Engineer's Department, 1980) that identified main arterial routes such as Papanui, Lincoln and Ferry Roads as potential carriers of cyclists (City Engineer's Department, 1980). The plan noted intersection layouts as a major hazard (City Engineer's Department, 1980) and set out a number of projects including the Papanui Cycleway and the Annex Road cycle underpass. In 1980, \$47,000 had been allocated towards these for the year⁵ (City Engineer's Department, 1980).

Despite the volatility of the future of cycling in Christchurch, cycling continued as the main mode of transportation for students commuting to school. In 1979 school cycle traffic was near its practical limit (City Engineer's Department, 1980) and as many as 25,000 school pupils in greater Christchurch cycled to and from school regularly. In intermediate and secondary schools between 70 and 80% of the school population (Christchurch City Council Traffic and Transportation Division, 1979, p. 26) cycled to school.

⁵ In contrast, in 2014 the Christchurch City Council allocated \$34 million just for the thirteen major cycleways in the Christchurch City Three Year Plan 2013-16 (Christchurch City Council, 2014b). The remainder of funding for the major cycle ways is to be allocated in 2017 and 2018.

High cycling rates amongst students did not continue and Burnside High School is one such example. In 1979, the school had a roll of 2063 pupils of which more than 75% cycled to school, 19% walked and only 3% took a car (either as a driver or passenger). The school provided 1500 open cycle park spaces (Christchurch City Council Traffic and Transportation Division, 1979, p. 94). Today, Burnside High School has a roll of approximately 2550 students and bicycle parking for 500 cycles. The first term of the year (in summer) sees an average 250 students cycle and this declines in winter to 130-150 students (Lauder, 2014). Thus even in the summer, less than 10% of students' cycle to school today compared to 75% in 1979. This is likely to be representative of the decline in cycling to school city wide⁶.

4.2.6 1990s

The 1990s brought a new level of determination towards increasing active transport in Copenhagen (Gossling, 2013, p. 206). In 1995, the Bicycle Account was launched. This biannual document publicly reports on the progress that Copenhagen has made in achieving its objectives set forth in cycle policy (City of Copenhagen, 2005) and surveys resident perceptions on progress.

In 1996 the Danish government released an Action Plan for Reduction of the CO₂ emissions for the Transport Sector and outlined the need to encourage land use planning that aimed to *“create a framework for the reuse of the growing number of areas ready for renewal, as well as increased density for the less utilized area which are conveniently situated for bicycle, pedestrian and public transport”* (Danish Ministry of Transport, 1996, p. 14). The government also aspired to see short trips undertaken by cars transferred to bicycles and the promotion of combined bicycle and public transport trips (Danish Ministry of Transport, 1996, p. 18).

In Christchurch the 1990s saw active transport participation decline further (Statistics New Zealand, 1996-2013) as witnessed in other Western countries including Australia, the United States and the United Kingdom where transportation is dominated by the private motor vehicle (Garrard, 2009, p. 2). 400,000 fewer pedestrian journeys were taken a day in New Zealand in 1998 compared with 1990 (Ministry of Transport, 2005, p. 4). Cycling also fell 19% between 1990 and 1998 (Jakob et al., 2006, p. 56). The decline in walking and cycling was most prevalent in young people (Ministry of Transport, 2005, p. 4).

⁶ The percentage breakdown of students that travel to school by foot, and in cars (either as a passenger or driver) is unknown.

By 1995 there were 579 bicycle parking spaces in the city centre at 48 locations, but this had not reached capacity (Christchurch City Council, 1995, p. iii & 19). By 1996 cycling trips made to work in the city centre had dropped from 28% in 1959 to 8% (Douglass, 2000, p. 7.3). The same year, Christchurch was one of the first New Zealand cities to adopt a Cycling Strategy⁷ (Christchurch City Council, 2004, p. 1). Christchurch cycle lane⁸ development increased in the ten years following the cycle strategy⁹ (figure 14).

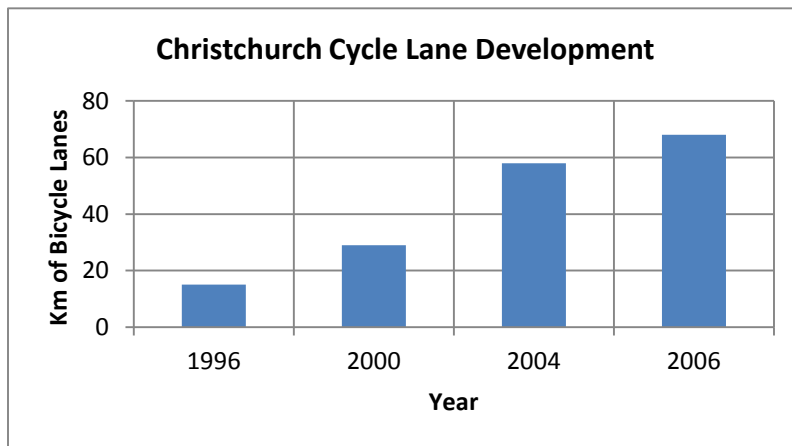


Figure 14. Christchurch's Data on Cycle Lane Development (Christchurch City Council, 2004, p. 11).

4.2.7 2000s

A green cycle route plan was launched in Copenhagen at the start of the new millennium and by 2002 the city had a cycle policy in place outlining quantitative (numbers), and qualitative goals (general aspirations) (Jensen, 2009).

Copenhagen was on the brink of bankruptcy in the mid-1990s but by 2004 had undergone rapid growth, economic boom and major urban development (City of Copenhagen, 2004, p. 12). This growth put increased pressure on the traffic system. By 2005 politicians used cycling as a campaign issue (Jensen, 2009) and this is illustrated by the fact that the Mayor of Technology and Environment for Copenhagen from 2006-2010, was nicknamed "bicycle mayor" (Gosling, 2013, p. 203). By 2005, Copenhagen had 330 kilometres of cycle tracks¹⁰, following investment over many years (figure 15).



Figure 15. Copenhagen's Continual Cycle Track Growth (Jensen, 2009)

⁷ By 2004, the city had released subsequent cycle strategy outlining the vision of creating a 'cycle friendly city' (Christchurch City Council, 2004, p. 1).

⁸ Cycle lanes are identified by a painted line, or coloured lane on the road but are not separated from traffic.

⁹ Data on cycle lane (on-road cycling infrastructure) development in Christchurch stops at 2006. This coincided with the Christchurch City Council moratorium on new cycle lanes following doubt over whether painted lines were a safe cycling solution (C. Williams, 2013). Instead, councillors entered a debate on how they could improve cycle safety in the city.

¹⁰ Cycle tracks are those separated from cars by kerbs and of 2.5m in width.

In 2008 further car free streets were developed in Copenhagen in Nørrebrogade and Strograde. “Nørrebrogade was reconstructed with bus-only priority lanes, cycle tracks that are 16-feet wide in some sections, and improved sidewalks. There is no on-street auto parking” (Maus, 2013).

In contrast, by the new millennium Christchurch had a transport system dominated by the car. In 2002 three out of four trips in New Zealand were completed using the private motor vehicle, and for half of these the driver was the sole occupant of the car (Jakob et al., 2006, p. 56). This followed an increase in motor vehicle ownership between 1986 and 2001, which saw the number of households with more than one car grow from 36% to 46% (Christchurch City Council, 2004, p. 10). Figure 16 shows the current cycle lane and cycle path layout in Christchurch in 2014. Cycle paths (separated from traffic) are shown in green, and cycle lanes are in blue.

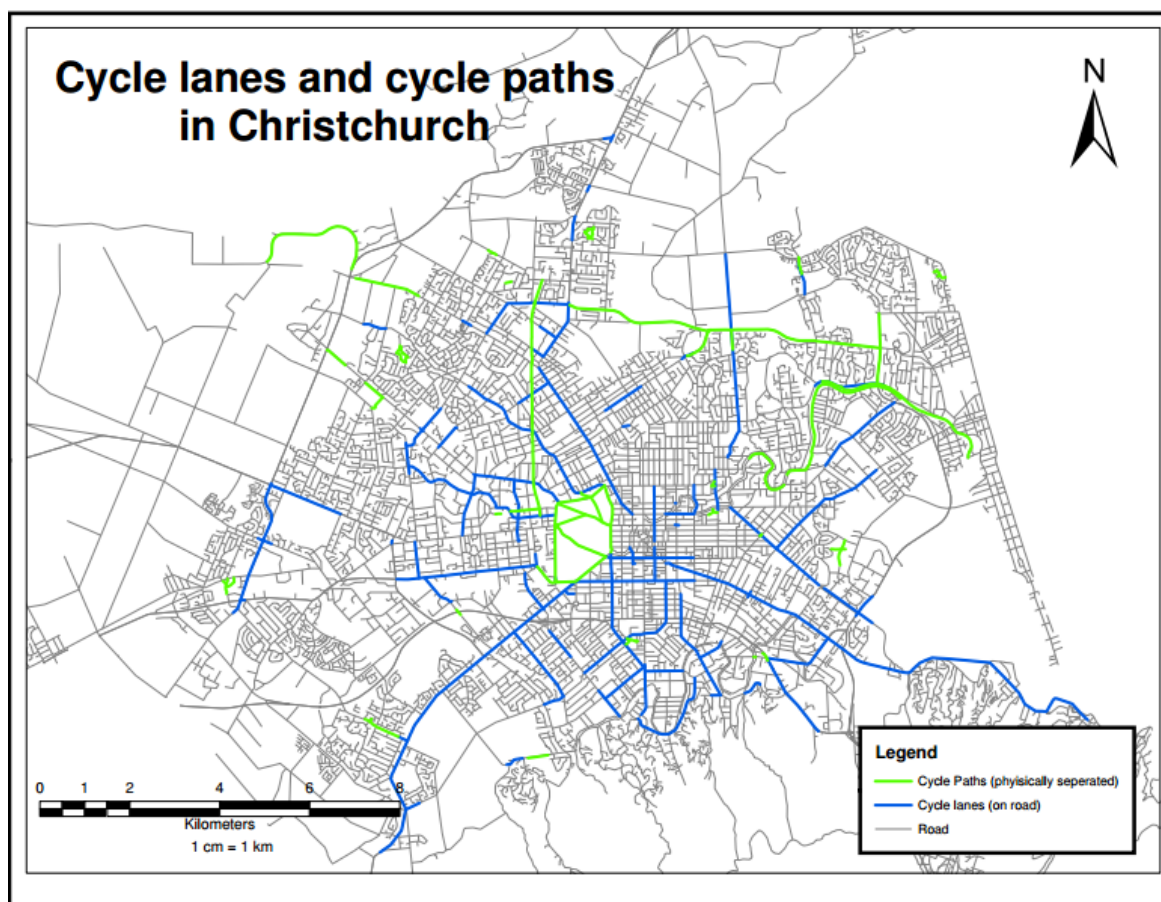


Figure 16. The network of cycle paths and cycle lanes in Christchurch in 2014 (T. Williams, 2014).

4.3 Cycling Motivation

Copenhagen residents do not cycle primarily due to environmental or economic reasons as one would expect. Instead, they attribute their cycling to convenience:

- 54% cycle primarily because it is easy and fast
- 19% cycle as it is exercise
- 6% cycle because it is price competitive

- 7% cycle as they see it as convenient
- 1% cycle as they see benefits for the environment (Jensen, 2009, p. 30)

Additionally, the reasons given for cycling to work or education in the 2012 Bicycle Account Copenhagen Survey were consistent with this:

- 56% cycle because it is fast
- 37% cycle as it is more convenient
- 29% cycle as it is cheap
- 26% cycle as it is healthy
- 12% cycle for well-being
- 9% cycle for a new job/relocation
- 5% cycle for environmental/climate concerns (City of Copenhagen, 2013, p. 12)

In 1991 a New Zealand Transit report looked at the profile of cyclists in Christchurch (Transit New Zealand, 1991, p. v). The research, involving questionnaires and field surveys, found that most adult cyclists used cycling to commute to work or an educational institution. Adult cyclists were more likely to be male than female (Transit New Zealand, 1991, p. v) and the main reason for cycling was economic.

4.4 Transport Culture

Images such as the one pictured (Figure 17), highlight that a strong cycling culture exists in Copenhagen (Jensen, 2009, p. 33). Specifically, the 'I Bicycle Copenhagen' image written in the format of the infamous 'I love New York Design' has featured in campaigns for cycling in the city (Gossling, 2013, p. 202). Additionally, city motorists are support measures that restrict cars. In 2012 "69%



Figure 17. Share the Bike Love Image (visitDenmark, 2012)

of all motorists residing in Copenhagen approve of municipalities actively restricting car traffic in the city and only 14% disapprove" (City of Copenhagen, 2013, p. 21).

In contrast, New Zealand has a strong car culture which is a long term trend (Douglass, 2000, p. 8). In 1929 "New Zealand had one car for every 10 people, second only to the US (1:5) and ahead of Australia (1:15) and Britain (1:47)". In 1959 Christchurch had 54,000 cars and an average ration of 3.25 people per vehicle (Christchurch Regional Planning Authority, 1965, p. 65). By 2002, there were 0.69 vehicles per person and by 2010, this had increased to 0.75 vehicles per person (New Zealand Transport Agency, 2010, p. 3)

There are no current studies of bicycle ownership in New Zealand but the Ministry of Transport produced Figure 18 showing that 77% of individuals living alone in cities in 2013 did not own a bicycle (Ministry of Transport, 2013). Although this is a national statistic, it is assumed reflective of Christchurch.



Figure 18. Percentage of Households with Bikes in 2013 (Ministry of Transport, 2013, p. 9)

4.5 Comparison of City Layout

Copenhagen, has been subject to urban sprawl over the last fifty years (figure 19) and is described by some as a 'city without limits' (Fertner, 2012, p. 19).



Figure 19. Copenhagen's Urban Morphology Journey (Fertner, 2012, p. 18).

Copenhagen's suburbs developed significantly since the 1960's but this slowed in the 1980s as a result of slower economic and population growth. Christchurch has also been subject to urban sprawl. It has a road network that radiates out from the CBD grid formation (Douglass, 2000, p. 5) (Figure 20).

Christchurch CBD is about 1-2 km² (figure 21), and Copenhagen is comparable with an inner city area of 1-2km². The difference between Copenhagen and Christchurch is that in 2008 Christchurch had approximately 2000 residents living within the city centre, where as Copenhagen had 7,600 residents living within the inner centre in 2005 (Gehl Architects, 2010, p. 25). Also in 2008 Copenhagen's inner city serviced 1.2 million residents living in the metropolitan area, whilst Christchurch served approximately 382,000 residents (Gehl Architects, 2010, p. 23).

With an inner city area of 1-2km (figure 22), it has been commented that *"Copenhagen's size and demography [in the city] means that almost everyone can cross the town in about an hour, whatever means of transport is used (see Figure 29). During the rush hour however this can only be done by bike!"* (Technical and Environmental Administration, 2007, p. 4).

Urban growth in Christchurch is limited by the Port Hills (Christchurch Regional Planning Authority, 1965, p. 35) but the population is widely dispersed around the city, creating a problem for alternative modes such as economically viable public transport (Christchurch City Council, 2012, p. 16; Christchurch Regional Planning Authority, 1965, p. 164). Whilst a number of suburbs have only '10 households per hectare', majority of the city is within an 8km radius of the central city (Douglass, 2000, p. 5). In the central CBD, one can walk the radius in approximately 6 minutes (Gehl Architects, 2010, p. 22).



Figure 20. Christchurch's Circular Pattern on Urban Development and Growth (Douglass, 2000, p. 5). Each circle represents 2 kilometres from the centre of the city. The outer circle represents an 8km radius from the central city.



Figure 21. Christchurch City Layout. Inner city area 1-2 km² (Gehl Architects, 2010, p. 23)



Figure 22. Copenhagen City Layout. Inner city area 1-2 km² (Gehl Architects, 2010, p. 23).

Preval, et al identify the desire of New Zealanders to own a free standing home as an issue for active transport. Recent results suggest that while New Zealanders *“still often aspire to suburban stand-alone homes, preferences may be starting to drift towards smart growth housing, except for people in their 30s and 40s with children”* (Preval et al., 2010, p. 46). Thus this barrier is potentially diminishing with time.

4.6 Political Comparison

A political comparison was undertaken as part of the context of each city. Political context is important as it has the ability to influence the variability of the variables.

Political Systems

Both New Zealand (Weidekampsgade, n.d p. 132) and Denmark (Wilson, 2010) are constitutional monarchies (the queen is head of state) and are unicameral, after abolishing their second house in the 1950’s (Department of Internal Affairs, n.d., p. 16 & 19). Each has an Ombudsman who monitors public administration and can critique authorities (Folketinget, 2012, p. 6; Office of the Ombudsman, 2014) and bills go through three readings before they become law (Folketinget, 2012, p. 9; Wilson, 2010, p. 147).

In both nations one has to be 18 to vote (Electoral Commission, 2013a; Folketinget, 2012, p. 5). Both countries also have proportional representation systems but they run different. In Denmark a party must win a minimum 2% of the party vote to secure a seat in parliament (Folketinget, 2012, p. 5), whilst in New Zealand parties must get a minimum 5% of the party vote or win an electorate seat (Electoral Commission New Zealand, 2014).

Denmark has a four year election term (Folketinget, 2012, p. 5), compared to New Zealand’s three year term (Electoral Commission, 2013b).

Constitutions

Denmark has a written constitution which sets out rights such as *“all Danish citizens enjoy a range of basic rights, such as freedom of speech, freedom of assembly and freedom of political activity”* (Folketinget, 2012, p. 3). In contrast, New Zealand has no entrenched, written constitution, but instead has a number of unwritten constitutional conventions and the Constitution Act 1986 (Cabinet Office, 2004). Like New Zealand’s independent judiciary (Stockley, 2010, p. 125), section 62 of Denmark’s constitution sets out that the courts must be independent of the government and the public administration – they have a tripartite division of power (The Communications Section, 2014, p. 34).

Transparency

Government Reports are publicly available in both nations. In addition, all government agencies in New Zealand are subject to the Official Information Act and any citizen may request official information. This is designed to *“increase the availability of official information to promote more effective public participation in the making and*

administration of laws and policies; to promote the accountability of Ministers of the Crown and government officials; and protect sensitive information where necessary in the public interest or to preserve personal privacy” (Ministry of Justice, 2014)

In Denmark there is the Access to Public Administration Files Act of 1985 which applies to most public agencies. However, this Act has stricter provisions than those in the New Zealand legislation and contains an *“exhaustive list of information which is not subject to disclosure. Examples include documents prepared by an authority for internal use; intra-agency correspondence (between units within one and the same authority); and correspondence between a local government council and its committees departments and other bodies, or between these bodies”* (2004-2014 OSCE Office for Democratic Institutions and Human Rights, 2014).

It is noted that some departments, such as the Technical and Environmental Administration in Copenhagen, undertake voluntary progress reporting on their activities (i.e. the biannual bicycle account reports on their active transport efforts) (Technical and Environmental Administration, 2011). This suggests a best practice approach in transparency and public reporting.

Summary

As the political systems of both cities are very similar, a comparative policy analysis of the two nations can be undertaken without concern about the impact that different political systems may have on the outcome of active transport participation.

4.7 Underlying Variables

Table 3 compares numerous variables that may influence active transport modal share including topography, climate, density, vehicle taxation and petrol price.

Table 3. Comparison on Contextual Variables

Comparison of Copenhagen and Christchurch		
Point of Comparison	Copenhagen, Denmark	Christchurch, New Zealand
Geography		
Average Max Summer Temp.	20 °C – July <i>(ClimateData, 2014)</i>	22.5 °C - January <i>(Christchurch City Council, 2003, p. 2; World Weather and Climate Information, 2013a)</i>
Average Winter Temperatures	Maximum: 2 °C - January Minimum: -2°C - January <i>(ClimateData, 2014)</i>	Maximum: 11.3 °C – July Minimum: 1.9 °C – July <i>(Christchurch City Council, 2003, p. 2; World Weather and Climate Information, 2013a)</i>
Average Annual Rainfall and No. of Rain Days	613 mm and 113 days <i>(ClimateData, 2014)</i>	648 mm and 85 days <i>(Christchurch City Council, 2003, p. 2)</i>

Average Wind Speed	Between 4 and 6 m/s (WeatherSpark, n.d.; World Weather and Climate Information, 2013d)	Between 4 and 5 m/s (Canterbury Power Solutions, n.d.). Between 3 and 4.5 m/s (World Weather and Climate Information, 2013c).
Topography	Flat land (Key Transport Consultants Ltd, 2013)	Flat (apart from the Port Hills area)
Population and Density		
Density	62 (population per ha) (2013) (6200/km ²) (Statistics Copenhagen - Copenhagen City, 2013a)	240.48 people per km ² in Christchurch City Council Land Area (including Banks Peninsula) (2013 census) ¹¹ 620/km ² – Urban Density 260/km ² - Density (June 2013 estimates) ("Christchurch," 2014).
Population	1,246,611 (2014 – Copenhagen) (Ministry of Foreign Affairs of Denmark, 2014c)	341,475 Christchurch City Selwyn – 44,598, Waimakariri – 49,986 2013 Census Results (Bayer, 2013). Greater Christchurch Total – 436,059
Population Distribution	53 children and elderly per 100 adults (2010) (Gapminder)	50 children and elderly per 100 adults (2010) (Gapminder).
Population Growth	0.44% annual population growth (2007) (Gapminder)	1% annual population growth (2007) (Gapminder)
Children per woman 2012 (total fertility)	1.7 (Gapminder)	2.1 (Gapminder).
Life Expectancy 2012	Female - 81 Male – 77 (Gapminder)	Female - 83 Male – 79 (Gapminder)
Political System		
Local Govt. Political System	Proportional Representation (Local Government Denmark (LGDK), 2009, p. 7).	First Past the Post (The Department of Internal Affairs, 2014).
Democratic Government	Constitutional monarchy and unicameral (bicameral abolished 1950s) (Keldorff, 2014, p. 16 & 19).	Constitutional monarchy and unicameral (bicameral abolished 1950s) (Keldorff, 2014, p. 16 & 19).
National Political System	Proportional Representation (Folketinget, 2012, p. 5)	Proportional Representation (Electoral Commission New Zealand, 2014).
Vote % Required for a Party to Secure a Seat	2% (Folketinget, 2012, p. 5)	5% or an electorate seat (Electoral Commission New Zealand, 2014).
Election Term	4 years (Folketinget, 2012, p. 5)	3 years (McNulty, 2014).
Voting Age	18 years old (Folketinget, 2012, p. 5).	18 years old (Environment Canterbury Regional Council, 2014).
Employment, Income and Taxation		
Average Income	261,000 DKK (2010) (Approx. \$55,600 NZD converted 23/5/2014)	Average Canterbury Income (2013): \$785 weekly. \$40,820 yearly.

¹¹ Density was calculated using the total Christchurch City Council land area of 1,420 km² with the 2013 census results of (including Banks Peninsula) to get a density of 240.48 people per km².

	<i>(Statistics Copenhagen - Copenhagen City, 2010)</i>	<i>(Statistics New Zealand, 2013).</i>												
Income Tax	-Minimum tax rate for adults is 42% scaling to over 60% - 2014 marginal tax rate is approx. 55.6 % <i>(Technical and Environmental Administration, 2013).</i>	<table border="1"> <thead> <tr> <th>Income</th> <th>Tax rate</th> </tr> </thead> <tbody> <tr> <td>\$0 – \$14,000</td> <td>10.5%</td> </tr> <tr> <td>\$14,001 – \$48,000</td> <td>17.5%</td> </tr> <tr> <td>\$48,001 – \$70,000</td> <td>30%</td> </tr> <tr> <td>Over \$70,000</td> <td>33%</td> </tr> <tr> <td colspan="2">No-notification rate 45%¹²</td> </tr> </tbody> </table> <i>(Land Transport New Zealand, 2014).</i>	Income	Tax rate	\$0 – \$14,000	10.5%	\$14,001 – \$48,000	17.5%	\$48,001 – \$70,000	30%	Over \$70,000	33%	No-notification rate 45% ¹²	
Income	Tax rate													
\$0 – \$14,000	10.5%													
\$14,001 – \$48,000	17.5%													
\$48,001 – \$70,000	30%													
Over \$70,000	33%													
No-notification rate 45% ¹²														
Average Monthly Disposable Salary (After Tax)	4,033.41 NZ\$ <i>(Numbeo, 2014)</i>	2,664.60 NZ\$ <i>(Numbeo, 2014)</i>												
VAT or GST Tax	25% (Wikipedia)	15%												
Employment Rate (% employed aged 15 plus)	63% - 2007 <i>(Gapminder)</i>	65% -2007 <i>(Gapminder)</i>												
Taxation on Transport														
Vehicle Tax	180% tax on vehicle registration (only paid the first time a vehicle is registered) Green Tax (Grønne afgifter) is also paid 6 monthly by car owners. It is based on the fuel economy or energy class of the car (measured according to the EU standard <i>(Michael, 2012)</i>).	Vehicle Licensing Fee for a Petrol Private Driven Car is \$280.55 NZD annually <i>(NZ Transport Agency, 2013)</i>												
Vehicle Road Worthiness Tests	Compulsory biannually for cars over 4 years old <i>(Angloinfo, n.d.; Michael, 2012)</i> . Costs approximately DKK 500 [NZD \$1080] <i>(Michael, 2012)</i> . (Converted 31/10/14)	Warrant of Fitness – required annually or 6 monthly with the price varying from station to station but approximately \$40-\$60 ¹³ <i>(NZ Transport Agency, 2014)</i> .												
Petrol Price (92 Unleaded pr. L) - Average	11.94 DKK [NZD \$2.55] (23 rd May 2014) <i>(Copenhagen Portal - Tourist Site and Cultural Guide 2014)</i> . (converted 23/5/14),	\$2.17 NZD (as at 16 th May 2014) <i>(Stockdale, 2014)</i>												
Petrol Taxation	Approximately \$1.13 (NZD) per litre ¹⁴ on Gasoline (2012) <i>(EY, 2013, p. 169)</i>	\$0.67 (NZD) per litre on petrol ¹⁵ <i>(AA Motoring, 2014b)</i> .												
Transport Infrastructure														
Bicycle Parking Quantity	48,000 spaces on roads and pavements in 2010 city wide <i>(Technical and Environmental Administration, 2011, p. 7)</i>	1995 - 579 cycle parks in the central city <i>(Christchurch City Council, 1995, p. 19)</i>												

¹² New Zealand's taxation highest income rate (including the compulsory Accident Compensation Corporation (ACC) levy) is 34.45 cents for every dollar earned over \$70,001 *(Land Transport New Zealand, 2014)*.

¹³ From 1 July 2014, vehicles first registered anywhere in the world on or after 1 January 2000 require annual WoF inspections for their lifetime. For new vehicles, after an initial inspection, another WoF is not required until the 3rd anniversary of their first registration. Vehicle registered before 2000 require a 6 monthly inspection *(NZ Transport Agency, 2014)*.

¹⁴ 2012 Denmark Taxation of Gasoline *(EY, 2013, p. 169)*(NZD pricing shown): Energy Tax - €0.54/liter (\$1.10 NZD/litre); Carbon dioxide tax - €0.052/liter (\$0.03/litre); Sulfur tax - €2.96/kg content of sulphur; Nitrogen oxide tax - €0.006/liter

¹⁵ Motorists are charged GST on the petrol excise, which amounts to a tax on a tax *(AA Motoring, 2014)*. The fuel excise portion includes: 56.524 cents - National Land Transport Fund; 9.90 cents - ACC Motor Vehicle Account; 0.66 cents - Local Authorities Fuel Tax; 0.045 cents - Petroleum or Engine Fuels Monitoring Levy

Separated Bike Paths	346 km in 2010 <i>(Technical and Environmental Administration, 2011, p. 7)</i>	61 km (off-road/separated tracks) in 2014 <i>(T. Williams, 2014)</i>
Bicycle Lanes (on-road)	23 km in 2010 <i>(Technical and Environmental Administration, 2011, p. 7)</i>	108km in 2014 <i>(T. Williams, 2014)</i>
Transport Facts and Figures		
Active Modal Share Trip to Work	58% <i>(using National Travel Survey Data averaged for 2011-2013) (Danish Department of Transport, 2014).</i>	9.6% <i>(using 2013 Census Data Statistics NZ) (Statistics New Zealand, 1996-2013).</i>
Trip Length	Average distance for Copenhagen commute in 2013 was 12.5km <i>(Nielson, 2014)</i>	Average distance for Christchurch journey to work 2009-2012 was 7km <i>(Ministry of Transport, 2014b)</i> . (This was the same between 2007 and 2010) ¹⁶ <i>(Ministry of Transport, 2014a)</i>
Minimum Driving Age	18	16
Public Reporting on Active Transport Participation Progress	Copenhagen council publicly report on their progress on cycling in the biannual 'Bicycle Account' <i>(City of Copenhagen, 2005)</i>	No comparison found.
Vehicle and Bicycle Ownership		
No. of Passenger Vehicles for Private Use	179 passenger cars for every 1000 inhabitants (2011) in Copenhagen <i>(Statistics Copenhagen - Copenhagen City, 2013b)</i> Denmark Wide 2010 – 383 passenger cars for every 1000 inhabitants <i>(Ministry of Transport Denmark, 2012a, p. 26).</i>	607 (2005) cars for every 1000 inhabitants New Zealand wide ¹⁷ <i>(New Zealand Transport Agency, 2010, p. 3).</i>
Vehicle Insurance	Compulsory. Owners must have at least 'liability insurance' <i>("Getting a Driving Licence in Denmark," 2014)</i> , (third party insurance).	No requirement for insurance, but strongly recommended.
Bicycle Ownership	95% of the population own a bicycle <i>(Ministry of Transport Denmark, 2012a, p. 27).</i>	"Only 40 percent of couples have one or more bicycles in the house and 77 percent of those living alone have no bicycle" <i>(Ministry of Transport, 2013).</i>
Transport and the Environment		
Kyoto Protocol	Denmark Ratified 2002 <i>(United Nations Framework Convention on Climate Change, 2014).</i>	New Zealand Ratified 2002 <i>(United Nations Framework Convention on Climate Change, 2014).</i>
Transport Sector Contribution to GHG Emissions	Transport contributed 23% of greenhouse gas emissions during 2008-2012 <i>(ICIS, 2013).</i>	Approximately 20% of NZ's annual Green House Gas Emissions come from transport <i>(Ministry of Transport, 2014c).</i>

¹⁶ The continuity in the average trip distance for Christchurch between the years in the Ministry of Transport's Household Travel Survey suggests that average trip distance was not impacted by displacement of work places and residential homes following the 2010 and 2011 earthquakes.

¹⁷ Data on Christchurch car ownership limited despite comments that Christchurch has the highest car ownership of any New Zealand city (Jones, 2009, p. 5). In 2010 there were 427,144 motor vehicles licensed for the Christchurch postal district (includes Christchurch City, Selwyn, Waimakariri, Hurunui, and Ashburton Districts) (Christchurch City Council, 2010)

Further detail is provided on some of the underlying variables that contribute to the different environments in Christchurch and Copenhagen.

4.7.1 Driver's Licence

Obtaining a driver's licence in Denmark appears harder than in New Zealand. New drivers must complete at least seven hours of traffic related first aid lessons, 28 theory lessons, 16 driving lessons in traffic, four lessons on an advanced slippery track and four practical manoeuvre lessons. These lessons must be taken with a driving school ("Getting a Driving Licence in Denmark," 2014). Buehler and Pucher note that *"driver's training is expensive in western Europe, where obtaining a driver's license typically costs between €1,000 and €2,000"* (Buehler & Pucher, 2012, p. 22). In New Zealand, getting a drivers licence (from learners through to full without any lessons) costs \$334.80 (New Zealand Transport Agency, 2012). Lessons in Christchurch cost approximately \$75 for a 60 minute lesson (AA Motoring, 2014a) but there is no requirement to undertake lessons.

4.7.2 Taxation

Denmark has higher taxation on car ownership than New Zealand with car owners required to pay two types of tax. Vehicle Registration Tax is applicable to all passenger vehicles and paid once. All newly registered vehicles are taxed at 180%¹⁸ to deter car ownership (LifeinDenmark, 2014), an impact that filters down to the price of used cars (Russell, 2013).

Secondly, green owner tax is applicable. This is an annual tax, calculated on the fuel consumption of the vehicle to help minimise the environmental damage resulting from cars (Angloinfo, 2014). Fuel efficient cars are eligible for a tax reduction (Angloinfo, 2014).

Vehicle Road Worthiness Tests or Warrant of Fitness (WoF) charges also act as a deterrent against car ownership. In Denmark every car older than three years is required a check every two years at an approximate cost of NZD \$1080. In comparison, even if a New Zealand passenger vehicle requires the strictest WoF testing (6 monthly) then over the two year period this would cost approximately \$160-240 in total.

High vehicle taxation in Denmark has been credited as contributing to the nation's reductions in CO2 emissions (Ministry of Transport Denmark, 2012b, p. 9). Car ownership is much cheaper in New Zealand (Christchurch City Council, 2004, p. 10), and consequently the nation has high car ownership. In 2005 there were 607 cars per 1000 inhabitants (New Zealand Transport Agency, 2010, p. 3) in New Zealand whilst Denmark had 383 passenger cars for every 1000 inhabitants. The 2006 OECD Comparison ranked New Zealand as having the third highest for vehicle ownership per person (New Zealand Transport Agency, 2010, p. 3).

¹⁸ "The registration tax for cars (not more than one year old) is calculated as 105 per cent of the normal import value including VAT up to DKK 79,000 (\$170,265 NZD) and 180 per cent of the value in excess of this. Various deductions apply to environmentally acceptable cars and cars with adequate safety measures (LifeinDenmark, 2014).

4.7.3 Petrol Tax

Denmark has one of the highest petrol taxations in the world and the highest gasoline price in the European Union (EU) (Massey, 2014; Randell, 2014). Denmark taxes petrol at \$1.13 per litre (EY, 2013, p. 169) (NZD), whilst in New Zealand petrol tax is \$0.6713 per litre (plus GST) (figure 23).

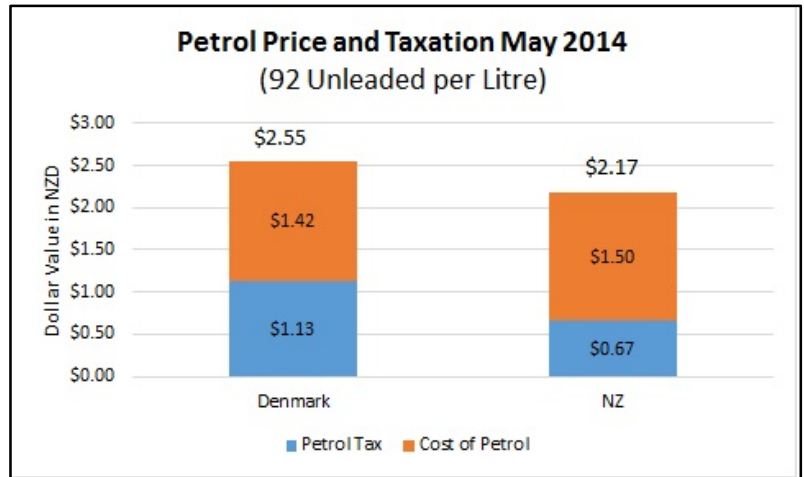


Figure 23. Denmark and New Zealand Petrol Price and Taxation, May 2014

4.7.4 Weather

Copenhagen is cooler than Christchurch. In winter the city has an average maximum temperature 8 degrees cooler (2°C) than Christchurch's winter temperature (10°C) (figures 24 and 25).

**Image Removed for
Copyright Reasons**

Figure 24. Christchurch Average Minimum and Maximum Temperatures Annually (World Weather and Climate Information, 2013a)

**Image Removed for
Copyright Reasons**

Figure 25. Copenhagen Average Minimum and Maximum Temperatures Annually (World Weather and Climate Information, 2013b).

Average wind speed and rainfall quantities do not differ significantly but Copenhagen endures more days with precipitation than Christchurch (World Weather and Climate Information, 2013a, 2013b).

4.7.5 Financial Investment in Active Transport

Denmark has greater funding for active transport than New Zealand. In 2012, the national government in Denmark funded 86 ongoing national and local projects covering city biking, bicycle parking, establishment of new infrastructure, school biking, leisure activities, bicycle campaigns and knowledge projects (Ministry of Transport Denmark, 2012b, p. 22). The 2012 Bicycle Account included a figure showing the investment in bicycle infrastructure made in millions since 2007 (figure 26).

Image Removed for
Copyright Reasons

Figure 26. Copenhagen and Amsterdam Bicycle Infrastructure Investment in Millions (DKK) (City of Copenhagen, 2013, p. 11).

In New Zealand nationwide funding for active transport measures has been variable over the last decade (table 4) ranging from \$5 million (NZD) in the 2003/2004 financial year to \$30 million in 2009/2010 (New Zealand Transport Agency, 2013c). Less than 1% of the total national transport budget is spent on active transport but Local Government also contributes funding. Table 5 shows the funding contributions for Christchurch, where over the past decade, \$7.5 million has been funded by city and regional councils, and \$6 million by central government.

Table 4. New Zealand's Active Transport Expenditure from NZTA and other organisations (New Zealand Transport Agency, 2013c).

			Funding in \$m									
			2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cycling Facilities	Cycle Facilities	Expenditure - All	3.7	4.56	5.27	5.2	12.28	16.77	21.37	15.30	10.78	9.08
	Cycle-way Maintenance	Expenditure - All	4	1.45	0.45	0.68	1.02	1.23	2.0	1.24	1.38	1.35
Walking Facilities		Expenditure - All	0.95	0.6	1.27	3.2	7.6	9.15	7.69	6	5.05	2.22
Total			5.06	6.59	7	9.09	20.92	27.05	30.25	22.48	17.21	12.64

Table 5 Walking and Cycling Expenditure in Christchurch in the last decade. Data originally sourced from NZTA, accessible on the Intelligence IServer (accessed 28th August 2014).

Christchurch City		
Walking and Cycling Expenditure		
Year		Dollar Value (\$)
2003/04	Expenditure - NZTA	379,330
	Expenditure - Local	419,436
2004/05	Expenditure - NZTA	590,572
	Expenditure - Local	600,059
2005/06	Expenditure - NZTA	491,220
	Expenditure - Local	451,266
2006/07	Expenditure - NZTA	191,485
	Expenditure - Local	197,084
2007/08	Expenditure - NZTA	190,535
	Expenditure - Local	228,095
2008/09	Expenditure - NZTA	335,429
	Expenditure - Local	353,565
2009/10	Expenditure - NZTA	700,957
	Expenditure - Local	679,057
2010/11	Expenditure - NZTA	1,082,698
	Expenditure - Local	2,712,826
2011/12	Expenditure - NZTA	978,630
	Expenditure - Local	913,624
2012/13	Expenditure - NZTA	1,098,468
	Expenditure - Local	1,010,880
Total NZTA Expenditure 2003-2013		6,039,324
Total Local Expenditure 2003-2013		7,565,892

In New Zealand local councils are influenced by central government expenditure decisions, but can allocate expenditure as they wish. Whilst the Christchurch City Council is influenced by the GPS (government policy statement on transport) and other areas, it is autonomous and decides spending based on its own set of community outcomes (Ferigo, 2014). This explains the vast difference in spending between local and NZTA in the 2010/2011 financial year on active transport measures in Christchurch (figure 5). Whilst district and city councils can invest well outside of what the New Zealand Transport Agency will support (Ferigo, 2014), in practice many projects are subsidised by central government. These are worked through by staff at many levels - NZTA (New Zealand Transport Agency), local authorities and so on (Ferigo, 2014).

4.7.6 The Christchurch Earthquakes

Not only did the 2010 and 2011 series of earthquakes in Christchurch provide motivation for studying Christchurch, but they form part of the context of Christchurch. Following the earthquakes individuals and

families were forced to relocate following unrepairable damage to their homes and properties, and many businesses relocated from the Central Business District to outlying suburbs in Christchurch. Although this is not expected to influence the outcomes of the research, it is acknowledged that for many the journey to work has changed. However these changes have not yet impacted the overall average distance for commuting in Christchurch which has remained at 7km (Ministry of Transport, 2014b).

4.7.7 Cycle Helmets

New Zealand cyclists are required to wear a helmet (New Zealand Transport Agency, 2013a), whilst those in Copenhagen are only encouraged (City of Copenhagen, 2005, p. 4). Despite no requirement to wear a helmet in 2004 8% of cyclists in Copenhagen over the age of 16 wear a helmet and 61% of cyclists under 16 wear a helmet (City of Copenhagen, 2005, p. 4).

4.8 Summary

This chapter has provided a comparison of the contexts of Christchurch and Copenhagen as it is acknowledged that context can play a significant role in the effectiveness of a policy measure at changing behaviour.

The comparison has shown that the political systems in both nations are similar and that consequently if policy is found to be effective in Copenhagen but not in Christchurch then the political system is unlikely to be the reason for this difference. Both nations have ratified the Kyoto Protocol and have transport emissions which contribute similar percentages to their greenhouse gas emissions. Thus there is similar political motivation in each nation to reduce transport emissions.

Additionally both nations have a similar population distribution, up with elderly and children comprising a similar percentage in both nations. They also have similar life expectancy, fertility and employment rates.

Thirdly, the context has shown that Christchurch is the city most suited to active transport. It has a better climate with less rain and warmer average temperatures. It also has the shorter average trip distance (7km compared with 12.5km in Copenhagen). Wind speeds are similar and both cities are flat, both factors consequently not considered an important part of the comparison. Copenhagen has a much higher density than Christchurch (ten times greater) which generally means it is more conducive to active transport but Christchurch still has the shorter average trip distance.

A big difference exists around the cost of owning a vehicle. In Denmark cars are expensive as a result of very high taxation on car ownership. Additionally, insurance is compulsory and road worthiness tests are more expensive than in New Zealand. New Zealand has a considerably higher car ownership rate than Denmark (607 cars per every 1000 inhabitants compared to 383 cars), whilst Denmark has the higher bicycle ownership rate.

Petrol taxation is also higher with residents in Denmark paying almost double the taxation per litre of petrol that one would pay in New Zealand.

A further difference is the motivation for cycling in. Whilst Copenhagen citizens primarily cycle because it is faster and more convenient, Christchurch cyclists do so for economic reasons.

Lastly it was found that the cities were similar in their early histories of cycling but it was in the 1960s and 1970s that each city responded differently to the rise of the private motor vehicle and urban sprawl. Whilst policy in Copenhagen worked to 'reverse' the changes occurring as a result of the car, in Christchurch active transport participation continued to decline through to the new millennium.

In summary there are both contextual similarities and differences between Christchurch and Copenhagen. It is the contextual differences that are important and need to be considered appropriately to enable the results from the policy comparison to have validity.

Chapter 5

Results and Analysis

5.1 Introduction

This chapter answers the research question. Firstly all variables with potential to influence active transport participation are identified in section 5.2. This combines the extraction of policy data (Appendix A and B) and the contextual comparison (Chapter Four).

Section 5.3 identifies the variables of difference between the two cities. Section 5.4 narrows down the variables to only those with a difference conducive to Copenhagen's active transport and changeable by policy. This is then narrowed further to those changeable by local policy. These are the variables identified as occurring in the intersection (figure 6 in Section 3). Additional detail is provided on the variables which warrant closer attention. Finally, section 5.5 answers the research question, identifying policies that low active transport cities like Christchurch should consider changing.

5.2 All Variables with Potential to Influence Active Transport Participation

All policy measures identified in the policy extraction matrices were distilled, along with a systematic analysis of the context analysis to identify all potential influencers of active transport participation in each city (objective one). This identified a wide range of variables including geographical, infrastructural and economic factors¹⁹ (Figure 27). Majority of the variables are categorised as infrastructural, followed by economic. This suggests it is in these areas where the most changes can be made to create an environment supportive of active transport.

¹⁹ The categorisation is explained in Section 3.3.3.

Independent Variables	
Geographical Factors	Economic Factors
Density	Average Income
Mixed Use Development	Purchasing Power
Population and population growth	Employment Rate
Topography	Income Tax
Urban Consolidation	GST or VAT Tax
Weather – max & min temperatures, rainfall	Cost of Central City Car Parking
Trip Length	Petrol Tax + Price
Transport Infrastructure Factors	Smart Road Pricing
Bicycle Highway	Vehicle Registration Tax/High taxes on car ownership
Bicycle Lanes	Cost of Vehicle Road Worthiness Tests
Bicycle Parking Quantity and Quality	Funding for Active Transport Measures
Bicycle Streets	Sociological Factors
Bike Rentals Coordinated with Public Transport	Advertising, Maps - Behaviour
Bike Share System	Bike Surveillance – sense of security
Car Parking	Cycle Helmets
Car Sharing systems	Cycle Safety Education
Car-Free Streets	Encouraging Walking School Buses
Centre Medians	Life Expectancy
Cycle Shortcuts	Safer Vehicle Design
Cycle Track Maintenance and Cleaning	Traffic Calming i.e. car free days
Cycle Track Widening	Vulnerable Road User Protection Laws
Enabling Cycling Two-Ways in One-Way Streets	Work Place Facilities i.e. showers & lockers
Green Cycle Routes	Attractive Streetscapes
Lighting for biking and walking – Safety	Car Ownership
Linking cycle and walking tracks -one coordinated network	Historical Context
Reconfiguring Traffic Intersections	Minimum Driving Age
Separated Bike Paths	Implementation
Shared Cycling and Pedestrian Footpaths	Actively Enforcing Rules
Slow Vehicle Speed Zones	Cooperation and Integration between policies
Turn Restrictions for Cars	Design Guidelines
	Maps/Signs
Key	
Variables that can be changed by Active Transport Policy	
Variables that can be changed by Other Transport Policy	
Variables that can be changed by Other Policy	
Variables that cannot be changed	

Figure 27 Independent Variables with the Potential to Influence Active Transport Participation

5.3 Differences Between the Low and High Active Transport Cities

Firstly, the policy extraction identified measures found in only one city. Following this, a comparison of all variables considered with potential to influence active transport participation is presented. This comparison (5.3.2) identifies the variables of difference.

5.3.1 Policy Measures Evident in Only One City

Policy Present Only in Copenhagen

The initial policy matrices highlighted that Copenhagen featured policies not found in Christchurch (Table 6).

Table 6. Policy Measures Only Evident in Copenhagen

Policy Measures Only Evident in Copenhagen
Bicycle Highways
Bike Rentals Coordinated with Public Transport
Car Sharing Systems
Centre Medians
Cycle Helmet Education and Encouragement
Cycle Shortcuts
Cycle Track Cleaning
Cycle Track Widening
Cycling Two Ways in One-Way Streets
Green Cycle Routes
High Taxes and Fees on Car Ownership
Smart Road Pricing
Traffic Calming

Policy Present Only in Christchurch

The analysis identified policy measures only evident in Christchurch (Table 7).

Table 7 Policy Measures Only Evident in Christchurch City

Policy Measures Only Evident in Christchurch
Walking School Buses
Land beyond already build up areas off limit for development
Work Place Facilities
Mixed Use Development
Maps
Cycle Safety Education
Attractive Streetscapes
Planning Guidelines
Shared Cycling and Pedestrian Footpaths
Safer Vehicle Design Advocating
Actively enforcing rules
Study/Steering Groups
Integrated Transport Modes

Informal Policy

Not all policy is formal. Policy measures found only in Christchurch can still be in place in Copenhagen without the need for formal policy. This may also be the case for measures found in Copenhagen but not Christchurch. However it is assumed that informal policy measures are more likely to exist in Copenhagen as policies like ‘encouraging work place facilities’ lose relevance in a city with an active transport trip to work modal share of 58%. Instead work places with facilities that support cycling becomes standard practice without the need for it to be articulated in policy. This also relates to context as once something establishes itself as inherent in the cultural environment it can become an informal practice.

Maps are an example. In Christchurch policies were extracted detailing the use of maps as an accompanying tool for active transport infrastructure (Canterbury Earthquake Recovery Authority, 2013, p. 19). Despite Copenhagen not containing policies on maps and signage, both cities had cycle maps available. For example, the Cycling Map of Copenhagen (Figure 28) is free for anyone to access (Technical and Environmental Administration, 2013).



Figure 28. A Free Copenhagen Cycling Map Available Online (Technical and Environmental Administration, 2013).

‘Centre medians’ are used in Copenhagen to aid pedestrian crossing to occur in two stages to improve safety (City of Copenhagen, 2004, p. 37). In Christchurch, centre medians are also used, along with pedestrian islands in the middle of the road to aid safe pedestrian crossing. Despite no mention in the policy documents; pedestrian crossings are found throughout Christchurch including on Main South Road, Greers Road and Fendalton Road.

In summary some policy measures were located in one city. Caution needs to be taken as informal policy may impact the validity of these results.

5.3.2 Variables with Differences between the Cities

The list of variables identified (section 5.2), can be reduced to those with a difference between the cities. The difference is informed by both the context analysis undertaken in Section 4 and the Policy Extraction (Appendix A and B). The differences are identified below in column two of table 8. A full copy of the document review can be found in Appendix C.

Table 8 Summary Table of the Variables Impacting Active Transport as Assessed Against the Questions

Variables Impacting Active Transport					
Independent Variables <i>Things that I hypothesis will make a difference to the dependent variable (active transport modal share)</i>	Is there a difference between the cities	Is the difference conducive for Copenhagen's High Active Transport Participation?	Can public policy change the difference?	Are the policies implementable?	How the policies change and the time frame for change
Sociological Factors					
Advertising and Marketing	Yes.	No.	n/a	n/a	n/a
Bike Surveillance	No.	No.	n/a	n/a	n/a.
Cycle Helmets	Yes.	Yes.	Yes.	Yes.	National Mid Term.
Cycle Safety Education	Yes.	No.	Yes.	Yes.	Local and National. Short Term.
Walking School Buses	Yes.	No.	Maybe.	No.	Local Change. Short Term.
Life Expectancy	Yes.	No.	n/a	n/a	n/a
Safer Vehicle Design	Yes.	No.	Yes.	No.	National or even International Regulations. Longer Term.
Traffic Calming i.e. car free days	Yes.	No.	n/a	n/a	Local
Vulnerable Road User Protection Laws	No.	No.	n/a	n/a	National.
Work Place Facilities i.e. showers, lockers, changing rooms	Yes.	No.	n/a	No.	Local or National. Mid Term
Attractive Streetscapes	Yes.	No.	N/a	n/a	n/a
Car Ownership	Yes.	Yes.	Yes.	N/a	National Long Term.
Historical Context	Yes.	Yes.	No.	n/a	n/a.
Minimum Driving Age	Yes.	Yes.	Yes.	Yes.	National. Mid Term
Infrastructure/Physical Factors					
Bicycle Highway	Yes.	Yes.	Yes.	Yes.	Local. Long Term.
Bicycle Lanes	Yes.	No.	Yes.	n/a	Local. Shorter term.
Bicycle Parking (Quantity and Quality)	Yes.	Yes.	Yes.	Yes.	Local. Mid Term
Bicycle Streets	No.	No.	n/a	n/a	Local. Short Term.
Public Transport and Bikes	Yes.	No.	Maybe	Yes	Local Short Term.
Bike Share and Public Transport	Yes.	Yes.	Yes.	Unsure.	Local Short Term.
Bike Share System	Yes.	Yes.	Yes.	Unsure.	Local. Short Term.
Car Parking - Quantity	Yes.	Yes.	Yes.	Yes.	Local Mid Term

Free Car Parking at Shopping Malls	No.	No.	n/a	n/a	n/a
Car Share	Yes.	No.	Maybe.	No.	n/a.
Car-Free Streets	Yes.	Yes.	Yes.	Yes.	Local. Short Term.
Centre Medians	Yes.	No.	Yes.	Yes.	Local. Short Term.
Cycle Shortcuts	Yes.	Yes.	Yes.	Yes.	Local. Mid –Term.
Cycle Track Maintenance and Cleaning	Yes.	Yes.	Yes.	Yes.	Local. Short Term.
Cycle Track Widening	Yes.	Yes.	Yes.	Yes.	Local. Mid Term.
Enabling Cycling Two-Ways in One-Way Streets	Yes.	Maybe.	Yes.	No.	Local. Mid Term.
Green Cycle Routes	Yes.	Yes.	Yes.	Yes	Local. Mid Term.
Lighting for biking and walking	No.	n/a	n/a	n/a	n/a
Linking cycle and walking tracks -one coordinated network	Yes.	Yes.	Yes.	Yes.	Local. Mid Term.
Reconfiguring Traffic Intersections	Yes.	Yes.	Yes.	Yes.	Local. Mid Term.
Separated Bike Paths	Yes.	Yes.	Yes.	Yes.	Local. Mid Term
Shared Cycling and Pedestrian Paths	Yes.	No.	Yes.	Yes.	N/A
Slow Vehicle Speed Zones	Yes.	Yes.	Yes.	Yes.	Local. Short Term.
Turn Restrictions for Cars	No.	No.	n/a	n/a	n/a
Economic Factors					
Average Income	Yes.	No.	No.	n/a	n/a
Cost of Central City Car Parking	Yes.	Yes.	Yes.	Yes.	Local. Short Term.
Purchasing Power	Yes.	No.	No.	n/a	n/a
Employment Rate	Yes.	No.	n/a	n/a	n/a
Income Tax	Yes.	No.	n/a	n/a	n/a
GST or VAT Tax	Yes.	Maybe.	Yes	n/a	National. Long Term.
Consumer Petrol Price	Yes.	Yes.	Yes.	Yes.	National. Short Term
Petrol Tax	Yes.	Yes.	Yes.	Yes.	National. Short Term.
Smart Road Pricing	Yes.	No.	Yes.	No.	National. Long Term
Vehicle Registration Tax/ Taxes on car ownership	Yes.	Yes.	Yes.	Yes.	National. Mid Term
Vehicle Road Worthiness Tests (Cost)	Yes.	Yes.	Yes.	Yes.	National. Mid Term
Active Transport Funding	Yes.	Yes	Yes.	Yes.	National and Local Short Term.
Geographical Factors					
Density	Yes.	Yes	Yes.	n/a	Local and National.

					Long Term.
Mixed Use Development	Yes.	No	Yes.	No.	Local. Mid-Term.
Population	Yes.	Yes.	Maybe.	n/a	National. Long Term.
Topography	No	n/a	n/a	n/a	n/a
Urban Consolidation	Yes.	No.	Yes.	No	Local. Mid Term.
Weather	Yes.	No.	No.	n/a	n/a
Trip Length	Yes.	No.	N/a	n/a	n/a
Implementation					
Actively Enforcing Rules	Yes.	No	n/a	n/a	n/a
Policy Integration	Yes.	No.	n/a	n/a	n/a
Design Guidelines	Yes	No.	n/a	Yes.	n/a
Maps and Signage	Yes.	No.	N/a	n/a	n/a

Key	
Difference Conducive to Copenhagen	
Difference Can Be Changed by Public Policy	
Policies Changed Local	
National Change	
Short Term Change	
Mid Term Change	
Long Term Change	

Variables Conducive to Active Transport in Copenhagen

The differences between the two cities identify what Copenhagen has done that Christchurch has not. In addition, some of the variables considered different between the cities are not considered influential to Copenhagen's Active Transport Success. Consequently the variables are narrowed further in column 3.

As outlined in Section 3.4, determining whether the difference was conducive to Copenhagen's high active transport used a basic logic test. For example, the difference in average trip to work distance between the two cities is not considered conducive to Copenhagen's high active transport participation as the trip distance for Copenhagen was longer, despite the higher active transport modal share. If a variable is supportive towards Christchurch, not Copenhagen, then because of the far lower active transport participation in Christchurch it is ruled out as worthy of further investigation.

Cycle Safety Education is an example. Since 1997 the Cycle Safe Christchurch programme has been considered successful as a training initiative for Year 6 school children. In contrast Copenhagen has no policy on cycling education. Despite this it has greater active transport participation and a high percentage of children cyclists.

“Around 55 % of all school children cycle to school on a regular basis either alone or with a parent” (Technical and Environmental Administration, 2011, p. 14).

A further example is bicycle lanes. Whilst Christchurch has more bicycle lanes in place²⁰, Copenhagen has greater active transport participation. Thus this measure was ruled out of further investigation as high active modal share is not considered dependent on bicycle lanes.

Other variables ruled out included purchasing power, smart road pricing, income taxation, weather, shared cycling and pedestrian footpaths, walking school buses, car share and attractive streetscapes. Both contextual variables and policy measures identified in the policy extraction were ruled out under the basic logic test. Full justification is provided in Appendix C. Importantly, if a variable was ruled out under this step it does not mean it is not related to active transport, just that it is not deemed essential for active transport success.

5.4 Variables Changeable by City Policy

Some variables considered conducive to Copenhagen’s success are not changeable (5.4.1). However, this research focuses on identifying the variables which are changeable which is more important for low active transport cities. This section presents those variables identified as conducive to active transport (section 5.3) and changeable by the public policy.

5.4.1 The Unchangeable Variable

The historical background of each city (Section 4.2) cannot be changed, irrespective of how influential it is at encouraging active transport participation. Historical context, including previous events and culture impacts how one views the world. “*Cultural norms play a very important role in shaping people’s behavior*” (Kollmuss & Agyeman, 2002, p. 249). In terms of policy recommendations this might explain why certain policies found in Copenhagen are effective and politically palatable. Unfortunately the impact of the differences in the cultural history of each city on future policy recommendations is unknown. It might be that some policies effective and palatable in Copenhagen will not be so in Christchurch.

5.4.2 The Changeable Variables

The changeable variables were identified in columns four and five of the document review (Table 8). The matrix below shows the variables identified as conducive to active transport that can be changed and at what level this change takes place (national or local). The anticipated general timeframe for change is incorporated.

²⁰ Christchurch had 108km of cycle lanes 2014 (T. Williams, 2014)) whilst Copenhagen had 23 km in 2010 (Technical and Environmental Administration, 2011, p. 7).

Categorisation of the Variables Conducive for Active Transport

		Locus of Change		
		<i>National Level</i>	<i>Local Level</i>	<i>National & Local Level</i>
Time Frame For Change	Short Term	- Petrol Tax - Consumer Petrol Price	- Bike Share and Public Transport - Bike Share System - Car Free Streets - Cycle Track Maintenance and Cleaning - Slow Vehicle Speed Zones - Cost of Central City Car Parking	- Active Transport Funding
	Mid Term	- Cycle Helmets - Vehicle Registration Tax - Minimum Driving Age - Vehicle Road Worthiness Tests Costing	- Bicycle Parking – Quantity and Quality - Car Parking Quantity - Cycle Shortcuts - Cycle Track Widening - Enabling Cycling Two-Ways in One-Way Streets - Green Cycle Routes - Linking Cycle and Walking Tracks: One Coordinated Network - Reconfiguring Traffic Intersections - Separated Bike Paths	
	Long Term	- GST or Vat Tax - Population - Car Ownership	- Bicycle Highway	- Density

Figure 29 Summary Matrix of the Changeability of the Variables Conducive for Active Transport Participation

The matrix highlights that many of the variables identified in the intersection are changeable either by investment in infrastructure, or by changing economic incentives and deterrents. This reinforces that not one policy measure is attributed to active transport success – it requires varying and supporting policy.

Those policy measures which work to change the contextual variables identified as conducive to active transport tend to be changeable at the national level (i.e. car ownership and taxation on petrol). Measures changeable locally are predominantly infrastructural (the cost of central city car parking and funding for infrastructural measures are exceptions). The variables identified as changeable by city policy are detailed below.

Local Variables Changeable by Policy in the Short Term

Bike Share and Public Transport

Copenhagen has a bike share system designed in coordination with public transport to allow for a continuous journey to be made without requiring a car. A new bike share system introduced in 2014 locates a number of docking stations close to train stations. This requires local authorities to exemplify integration and coordination with public transport providers for success. This measure is likely to encourage only a small amount of active transport participation, with the previous Copenhagen bike not well utilised. Additionally, the new bike share system is expensive, with the electric bikes costing “US\$ 8,482 to

buy and maintain” (Alter, 2013) (figure 30). Despite this, bike share systems are identified as a policy measure in the intersection and warrant further attention. Installing a bike share system ensures cycles are visible around the city, doubling as a marketing tool for active transport.



Figure 30. Advertising for the new Copenhagen bike share (GoBike, 2014).

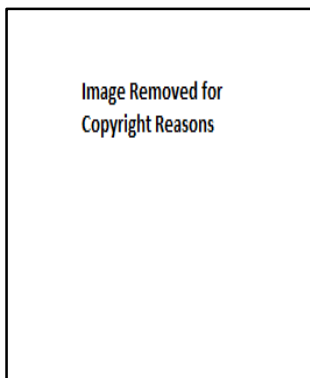


Figure 31. An image of the car free section of Norrebrogade, Copenhagen (Maus, 2013).

Car-Free Streets

The establishment of car-free streets is another measure identified in the intersection. Although this did not appear in policy and planning documents, it was identified in the context analysis. Copenhagen has car free streets in place in neighbourhoods and central city areas. The Norrebrogade area (figure 31) was made car-free in 2008 and considered a success (Colville-Andersen, 2013). The decision to make Norrebrogade car-free was a direction that came straight from the former traffic mayor, ‘Klaus Bondam’ (Colville-Andersen, 2013) “*who had the guts to push a revitalization of this previously lackluster thoroughfare that put people above auto capacity”* (Maus, 2013).

Cycle Track Maintenance and Cleaning

Cycle Track Maintenance is a valued cycling investment in Copenhagen. In 2002, over half the cities cyclists were dissatisfied with cycle track maintenance (City of Copenhagen, 2002, p. 36). Following this, the council aimed for less than 5% of cycle track surfaces to be considered unsatisfactory by 2012 (City of Copenhagen, 2002, p. 36). Funding for cycle track maintenance increased from \$3.9 million DKK in 1995, to \$9.9 million DKK [\$2.15m NZD]

in 2004 (City of Copenhagen, 2005, p. 7), and an extra \$7.5 million DKK was allocated in 2001 specifically to repair uneven sections of track (City of Copenhagen, 2002, p. 31).

Christchurch also increased its maintenance of cycle tracks in the first decade of the new millennium with annual budget set aside since 2004 (Christchurch City Council, 2004, p. 25).

Whilst both cities have policies on cycle track maintenance, the difference is that Copenhagen specifies the dollar amount allocated, Christchurch does not. Copenhagen also measure the success of maintenance efforts in the biannual bicycle account, which motivates implementation. Figure 32 shows increased funding towards maintenance has contributed towards how satisfied Copenhageners feel. From 2002 to 2012 satisfaction with the condition of cycle tracks in Copenhagen rose from 45% to 61%. At the same time as the percentage of those that cycle to work or education rose from 32% to 36% (City of Copenhagen, 2013, p. 6).

**Image Removed for
Copyright Reasons**

Figure 32. Satisfaction with the condition of cycle tracks and roads in Copenhagen (City of Copenhagen, 2013, p. 5).

Slow Vehicle Speed Zones

By 2009 Copenhagen had areas in the central city and in the area of Christianshavn slowed to 30kph or 40kph (Torslov, 2010, p. 11) to prevent cut-through traffic through the Central Business District. Additionally, all residential local streets were limited to speed limits of 40 kph (City of Copenhagen, 2004, p. 6). Between 2008-2012 perceptions of cycle safety in Copenhagen rose by 50% (City of Copenhagen, 2013) and the slow vehicle speed zones might be contributing to this.

Christchurch implemented areas of slow vehicle speed zones (40 kph) around schools as part of a trial in 2000. The Ministry of Transport considered it successful and the Land Transport Safety Authority authorised its national application. By 2004, 12 zones were put in place in Christchurch around 15 schools (Ministry of Transport, 2005, p. 23). Since then, except for the slow school zones Christchurch has not implemented any other slow zones.

However recent city planning documents include policies to reduce speeds in the inner zone of the Central Business District. Although these policies have not yet been implemented, consultation on a proposed 30kph permanent speed limit is currently taking place (AAC Transport Projects, 2014). There is no plan to extend this speed limit wider than the central city. Neighbourhood streets remain at a permanent speed limit of 50 kph.

Cost of Central City Car Parking

Central city car parking in Copenhagen is more expensive than Christchurch. In Copenhagen general city car parking is priced in three zones with the zone closest to the city most expensive. The cheapest zone is 11 kroner an hour (approx. \$2.30 NZD) and the dearest is 30 Kroner (\$6.37 NZD) an hour (Wonderful Copenhagen, 2014c). In Christchurch, post-earthquake parking is currently priced low to help entice consumers and residents back into the Central Business District as it is rebuilt. The 'ReStart Mall' car park for example charges just \$1 NZD/hour (Christchurch City Council, 2014a). A new car parking building opened in 2014 on Victoria St charging \$2 NZD/hour and \$5 all day (Transport and Greenspace, 2014).

As car parking contributes to the costs involved with driving, high costs can make other modes seem economically attractive. However as noted in the context section, Copenhagen residents have a higher purchasing power (by about 40%) than those in Christchurch and despite this still have far lower car ownership levels than Christchurch. Thus the impact that cost has on behaviour and on encouraging active transport participation is unknown.

Active Transport Funding

Copenhagen has greater funding for active transport measures and has for many years. In 2012, the city spent DKK 165 [NZD \$35.70] per resident a year on cycling alone (City of Copenhagen, 2013, p. 11). If this is applied to Christchurch with a population of 341,475, the city should have spent approximately \$12 million on cycling in 2012.

Copenhagen spent more than New Zealand's entire active transport budget at approximately \$80 million DKK [\$17.3m NZD] in 2012 on bicycle infrastructure alone (excluding pedestrian investment) (City of Copenhagen, 2013, p. 11). In addition, in 2013 \$50 million was spent towards achieving the goal of bicycle travel comprising up 50% of trips in the city (Cycle Safety Panel NZTA, 2014, p. 10).

In New Zealand it is proposed that between 2015/16 and 2017/18 the nation will spend between 0.44% and 1% of the total national transport budget on walking and cycling (equates to between \$13m and \$36m NZD)(New Zealand Government, 2014a, p. 25). Additionally, in last three years funding for active transport has reduced. In the 2012-2013 period expenditure was \$12.6 million, down from \$17.21 million in 2011/12 and \$22.5 million in 2010/11. This highlights that advances in funding are easily changed by successive governments.

Locally, funding for active transport measures has improved with the decision to fund \$70 million towards the major cycle routes approved in the Christchurch City Three Year Plan 2013-2016 (Cycle Safety Panel NZTA, 2014, p. 16). This implies that funding is increasing in Christchurch, irrespective of the national funding allocations. However, it is long term sustainment of funding that is likely to have made the difference in Copenhagen.

Local Measures that can be Changed in the Mid Term

Bicycle Parking – Quantity and Quality

Copenhagen has more cycle parking than Christchurch, but given it has about triple the population this is to be expected. Copenhagen had a total 48,000 (2010) bicycle parking spaces on roads and pavements (Technical and Environmental Administration, 2011, p. 7), whilst Christchurch had 579 (1995)²¹ (Christchurch City Council, 1995, p. iii).

Copenhagen requires under the 2011 Municipal Plan that new buildings cater for bicycle parking and cargo bike parking (City of Copenhagen, 2011, p. 14). Cargo Bike Parking is specifically identified as 17% of Copenhagen families use a cargo bike to transport children and shopping as an alternative to the car (City of Copenhagen, 2011, p. 14). Bicycle parking continues to increase in the city with the redesign of Svanemøllen Station and Nørreport Station to include more bicycle parking and easier access to it (City of Copenhagen, 2011, p. 18).

In Christchurch cycle parking features in the new central city transport plan and cycle parking is planned at convenient locations including the new bus exchange, and new ‘super stops’ to link in with public transport. These are to be secure and covered where possible (Canterbury Earthquake Recovery Authority, 2013, p. 10). Christchurch also has minimum cycle parking requirements in place for the central city (Christchurch City Council, 2005a). It will be interesting to consider the outcomes of this in 5-10 years to see how the policies have been implemented.

In summary, Copenhagen currently has more bicycle parking (and more per capita) than Christchurch.

Car Parking Quantity

Copenhagen had a policy between 1999 and 2009 which annually reduced 2-3% of inner city parking a year. The additional space gained was used to create wider footpaths and cycle lanes (Gehl Architects, 2010, p. 35). The city also had plans to provide free parks for shared cars and to move parking off-street to help calm traffic flow (City of Copenhagen, 2004, p. 10). The low amount of car parking might be linked to the high bike to car ratio in the city of approximately 5.2 bikes for every car in 2012 (City of Copenhagen, 2013, p. 13).

Despite a push to reduce car parking in 2010 three automated car parking buildings opened adding 840 new car parks to the city (Torslov, 2010, p. 12). This has been reflected in comments that ‘Copenhagen is currently suffering stagnation from City Hall’ (Cycle Safety Panel NZTA, 2014, p. 10).

Following the earthquakes Christchurch has a car parking maximum in the central city business zone (Canterbury Earthquake Recovery Authority, 2013, p. 18) and the ‘Accessible City Plan 2013’ aims to reduce car parking. Both on-street and off-street car parking buildings are to be reduced and smaller than before the earthquakes

²¹ Unfortunately, an updated statistic on car parking quantity in the city has not been published.

(Canterbury Earthquake Recovery Authority, 2013, p. 18). In contrast, no policy documents pre-2012 considered a reduction in car parking.



Figure 33. Post-earthquake Christchurch has seen many empty building sites turned into temporary car parks (Gates, 2013).

It remains to be seen how the new documents will be implemented and whether a total net car parking reduction will eventuate. The Christchurch City Council acknowledges that currently car parking in the central city exceeds demand with 8000 car parks (5000 on street and 3000 off street). They stress that many of these are temporary following the earthquakes (see figure 33) (Christchurch City Council, 2014b). Despite plans to reduce off-street car parking in December

2013, the council committed to providing at least the same number of parks available previously in the rebuilt Lichfield and Crossing Car Parks (Christchurch City Council, 2014b).

Overall, car parking quantity is identified as a measure warranting closer attention. Car parking in Copenhagen is considered rare and expensive, compared to Christchurch which has historically had a high quantity of car parks. It appears that Christchurch looks set to have a similar parking quantity to that prior to the earthquakes despite the rebuild documents wishing to reduce this. The retention of a similar quantity of car parking in the city is likely related to the high car ownership levels and dominant car culture identified in the contextual analysis.

Cycle Shortcuts

Cycle shortcuts are a policy measure used only in Copenhagen. Shortcuts are offered to ensure cycling is efficient and the Good, Better, Best Cycling Strategy outlined that more shortcuts are to be in place 2025 to reduce travel times. The Bryggebroen Bridge, a combined cyclist and pedestrian bridge over the harbour, is an example (figure 34). Built in 2006, it is 190m long (Wonderful Copenhagen) and between 2006 and 2010 its usage increased from 3,500 bicycle trips a day to 9000 (City of Copenhagen, 2011, p. 9). Cycling shortcuts relate to the main reason people cycle in the city - it is fast and convenient. Shortcuts ensure this remains the case.



Figure 34. The 2006 Bryggebroen Bridge for Cyclists and Pedestrians. Cyclists and Pedestrians are separated on the bridge (Wonderful Copenhagen).

Cycle Track Widening

The widening of cycle tracks was another measure only found in Copenhagen. There are plans for 80% of the cities PLUSnet cycle route to facilitate 3 lanes of cycle track in either direction by 2025 (City of Copenhagen, 2011, p. 11). The 2011 Bicycle Strategy also outlined plans to increase capacity of cycle tracks to accommodate an anticipated additional 60,000 cyclists by 2025 (City of Copenhagen, 2011, p. 4).

Cycle track widening was spurred on by surveys showing that Copenhagen citizens felt that cycle track congestion was a major problem as a result of high cycle volumes (City of Copenhagen, 2004, p. 19). In 2011, wider cycle tracks were implemented at the Nørrebrogade and Store Kongensgade (City of Copenhagen, 2011, p. 27). A design manual sets out the design guidelines for the city and includes that cycle tracks (in a separate lane) are to be at least 2.4-2.5m wide (Christchurch City Council, 2013, p. 20; Colville-Andersen, 2014b).

In 2013, Christchurch released cycle design guidelines which refer to the 'Copenhagen separated cycle paths' requiring a 2.4m width to enable safe passing (Christchurch City Council, 2013, p. 20). The Christchurch design guideline also recommends that when paths are shared (pedestrian and cyclists) that they are at least 3.5m wide (Christchurch City Council, 2013, p. 56). Thus whilst Christchurch has no policy measure in place on widening cycle tracks it deems wide cycle tracks successful, copying Copenhagen's dimensions into recently developed design guidelines. Notably, the Christchurch design guidelines are not technical standards (simply outlining best practice). Without any requirement for implementation or enforcement their effectiveness is questioned.

Enabling Cycling Two-Ways in One-Way Streets

Policy enabling cycling two-ways down an otherwise one-way street was found in Copenhagen. The city has a strategy to eliminate one-way streets for cyclists by 2025 and approval was granted for funding for this to take place on a series of smaller streets in 2011 (City of Copenhagen, 2011, p. 23). In the historic city centre, Gothersgade is a one way street that has been modified so that there are wider footpaths and so cyclists can travel in both directions ("Gothersgade and the Two-way Cycle Track," 2013).

There are currently no plans for cyclists to be permitted to cycle in both directions down Christchurch's one-way street network. This policy measure is similar to cycle shortcuts discussed above in that it relates to the main reason people cycle in Copenhagen – it is convenient.

Green Cycle Routes

Green Cycle Routes (figure 35) are cycling routes that transgress through green areas, offering wide cycle paths and views of parks and waterways. Found only in Copenhagen, the routes avoid major traffic routes and offer safe intersection crossings (Niels, 2010). This engineering policy measure has been in place for over a decade. By 2010 41 kilometres of green cycle routes existed, up from 29km in 1995. Although growth in green cycle route infrastructure has been smaller than other cycling infrastructure in recent years, the main stretches of the routes

are used by between 5000 and 7000 cyclists a day and the Cycle Track Priority Plan 2001-2016 aims for a total of 100km of routes by 2016 (City of Copenhagen, 2002).

**Image Removed for
Copyright Reasons**

Figure 35. Examples of the Green Cycle Network in Copenhagen (Danish Architecture Centre, 2014).

Linking Cycle and Walking Tracks: One Coordinated Network

Whilst both cities aim to have a connected and integrated network of cycle and walking tracks that maximise direct routes for active transport, Copenhagen is further ahead than Christchurch. Copenhagen is already working to eliminate gaps in the cycle network and have a strategy in place to eliminate missing links on arterial routes (City of Copenhagen, 2011, p. 23).

Christchurch has policy aspirations to create a connected cycle network with radial routes from the centre, connected by ring links. The network is to include a range of different cycle ways including the proposed 13 flagship cycle routes. A complete network of cycling routes is a policy measure featured in three documents – the 2004 Christchurch Cycling Strategy (Christchurch City Council, 2004, p. 25), the Canterbury Regional Land Transport Strategy 2012-2042 (Canterbury Regional Transport Committee, 2012, p. 14) and the 2013 An Accessible City Plan (Canterbury Earthquake Recovery Authority, 2013, p. 5). The expected outcomes of a complete cycle network include improved health, reduced congestion and an improved overall transport network (Canterbury Regional Transport Committee, 2012, p. 14). Thirteen planned major cycle ways are expected to improve the connectivity of the Christchurch cycling network as shown in figure 36.

**Image Removed for
Copyright Reasons**

Figure 36. The Major Cycleways Network is expected to increase connectivity (Christchurch City Council, 2014d).

In contrast, Copenhagen already has an extensive cycling network (see figure 37), with plans to further connect and integrate it. Most infrastructure additions identified in the policy documents add to the connectivity of the existing cycle network.

**Image Removed for
Copyright Reasons**

Figure 37. The Cycle Track Priority Plan 2006-2016 included an image of existing cycle tracks and lanes, as well as planned additions. (Arditti, 2013).

Additionally figures 38 and 39, show plans for various different types of cycling infrastructure to be networks themselves, as well as part of a holistic cycling network. The PLUSnet for cyclists in Copenhagen is a network that will consist of chosen Green Routes, Bicycle Superhighways and the congested bicycle routes. It is to be in place by 2025 (City of Copenhagen, 2011, p. 11). The purple sections in Figure 38 indicate bike routes where minor adjustments are required, blue sections indicate bike routes where more space is needed, and orange sections indicate bike routes targeted for large-scale improvement or required to be started from scratch. The black semi-circles indicate new bridge or tunnel shortcuts for cyclists and pedestrians.

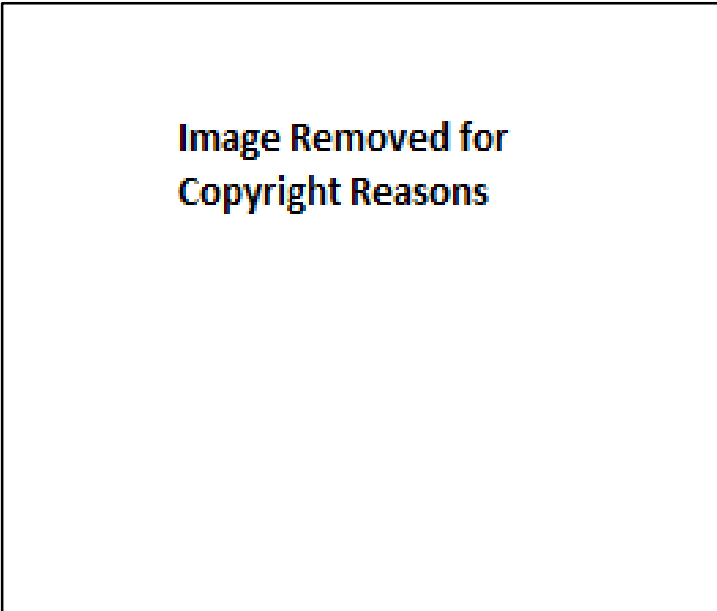


Figure 38. The Proposed PlusNet Network of Cycling Infrastructure. Source: Copenhagen Bicycle Strategy 2011-2025 (City of Copenhagen, 2011, p. 11)



Figure 39. A Network of Cycling Super Highways is planned for the Greater Copenhagen Area (Schjøtt & Madsen, 2011).

Reconfiguring Traffic Intersections

Copenhagen have reconfigured traffic intersections to improve traffic safety. The 2004 Bicycle Account highlighted a 28% decrease in cyclist casualties at signalised intersections²² from 2002 following efforts to improve intersection safety (City of Copenhagen, 2005, p. 4). Likewise, in 2009 following a focus on redesigning intersections, there were 70 fewer traffic accidents (both those killed and seriously injured) than in 2008 (Torslov, 2010, p. 7).

Copenhagen identifies two main ways to improve safety at intersections – set-back lines for cars (which place a stop line for cars approximately 4m from the pedestrian crossing making cyclists more visible), and white or blue marked crossings for cyclists to indicate where cyclists should ride (City of Copenhagen, 2002, p. 30).



Figure 40. The Green Wave in Copenhagen. The image on the cycle track indicates that this cycle route is part of the green wave (Colville-Andersen, 2014c).

They also introduced the 'Green Wave' (figure 40) and plan to implement more (City of Copenhagen, 2011, p. 7). A green wave established on the Nørrebrogade ensures that cyclists travelling at 20kph have a continuous run through intersections (Ministry of Foreign Affairs of Denmark, 2014b). The direction of the wave changes for morning and afternoon traffic flow and the measure is considered a success with travel 12% quicker (Danish Ministry of Transport, 2014, p. 37).

In Christchurch, post-earthquake policy documents such as the Christchurch Transport Strategic Plan 2012-2042 and the Accessible City 2013 Plan introduce the idea of intersection reconfiguration (Christchurch City Council, 2012, p. 33; Canterbury Earthquake Recovery Authority, 2013, p. 10). Unfortunately, no specification is given on what measures will be used to improve intersection crossing safety.

This policy measure which has been identified in the intersection of this research consequently warrants closer attention in Christchurch and other low active transport cities.

Separated Bike Paths

There are vast differences in the bicycle infrastructure provided in Copenhagen and Christchurch including the quantity of separated bike paths (figure 41).

Christchurch has approximately 61 km of cycle tracks (off-road/separated) (Williams, 2014), whilst in 2012 Copenhagen had 359 km (City of Copenhagen, 2013,



Figure 41. An example of a separated cycle path in Copenhagen (City of Copenhagen, 2013).

²² Signalised intersections are those intersection in which traffic signals or lights operate.

p. 359). These paths separate cyclists from traffic, ensuring they feel safe. They are for cyclists only, not shared with pedestrians, as is the case with the off-road tracks in Christchurch (Keldorff, 2014).

Copenhagen has been investing in separated bicycle paths over time. In 1980 there was 240km of cycle tracks in place (Jensen, 2009, p. 5), and by 2001 this had risen to 307 km of cycle tracks (City of Copenhagen, 2002, p. 22). Additionally, separated bicycle paths are highlighted as a measure that will encourage motorists in the city to transfer to cycling. *“37% of motorists named separated bicycle tracks as a measure important to them for shifting from car to bicycle for short trips”* (City of Copenhagen, 2013, p. 20).

Copenhagen not only has more separated cycle paths, but the policy surrounding these is a lot more precise – listing measurable goals to be achieved. In the policy matrix the form of the policy considered for separated cycle paths for Copenhagen was engineering, whilst in Christchurch the policy form was a combination of engineering and future research. An example is The Cycle Track Priority Plan which lists a goal of building 51km of cycle tracks between 2001 and 2016. Christchurch policy is more aspiration based containing policy that will use *“separated paths where possible”* (Canterbury Earthquake Recovery Authority, 2013, p. 10). This is harder to implement and measure for progress.

Despite the lack of clear policy directions for separate tracks in Christchurch, Colombo Street is proposed to have a separated cycle track built next year (2015). However this will only run for two blocks (between St Asaph Street and Lichfield Streets) (AAC Transport Projects, 2014, p. 10) and not connect the whole length of the street.

In summary there are differences between the quantity of separated paths and the specificity of the policy surrounding future cycle path investment. This is a policy that warrants closer attention by low active transport cities both in terms of quantity and in designing policy with measureable outcomes.

Local Measures that can be Changed in the Long Term

Bicycle Highway

Bicycle Highways were only evident in Copenhagen policy. Plans exist for completed highway routes to cover 300km, to make cycling easier in the city (City of Copenhagen, 2014). The first cycle super highway opened in 2012 – ‘Albertslundruten’, a 17.5km length (City of Copenhagen, 2013, p. 15) that connects the suburban town of Albertslund with central Copenhagen. The Bicycle Superhighway network is designed to offer cyclists a safe, smooth ride that eliminates as many stops as possible (City of Copenhagen, 2014). *“The project intends to expand, improve and link existing cycle lanes in Greater Copenhagen”* (City of Copenhagen, 2014). Coordination was required for the establishment of the Bicycle Highway between 22 municipalities in total in the Greater Copenhagen area (City of Copenhagen, 2014), implying that this policy initiative whilst local, requires high collaboration for success.

As this policy measure has only been recently introduced to Copenhagen its success is yet to be measured. Consequently it is a measure that low active transport cities should watch for its future outputs and outcomes.

Density

Copenhagen has a higher density than Christchurch (more than 10 times greater)²³. Density was located in the intersection as there is a large difference between the two cities and the difference is favourable to Copenhagen. Density can be changed by public policy and this change can occur locally but it is classed as a long term change. This is because urban density can only increase over a long period of time with multiple, coordinated and integrated policies in place that aid a shift towards higher density. The fact that density is in the intersection reflects the literature that if density increases then this will make mobility much easier as “*the best transport plan is a great land-use plan*” (Toderain, 2014).

5.5 Policies low active transport cities like Christchurch should consider changing

Returning to the research question, low active transport cities like Christchurch should consider making changes to a range of different policies to increase active transport participation. Cities have control over a few variables. Those variables that can be changed by local policy, and identified as measures that warrant further attention are presented below.

Of the measures located in the intersection, those implementable in the near future are:

- Increase Local Active Transport Funding. Lobby the central government for greater national funding for active transport measures
- Increase the Cost of Central City Car Parking
- Implement Slow Vehicle Speed Zones
- Introduce Car Free Streets to areas where pedestrian and cycling activity should be encouraged
- Introduce a Bike Share System
- Coordinate Bicycle Sharing and general cycle parking with the Public Transport System
- Increase cycle track maintenance and cleaning to ensure infrastructure already built in a city remains well-maintained

Additional variables were identified requiring longer implementation. These generally require greater planning and integration, as well as large scale infrastructure upgrades:

- Increase the quantity of separated bicycle paths
- Decrease central city car parking in the city to make cars less convenient
- Increase bicycle parking quantity in the city
- Increase shortcuts to make cycling and walking more efficient and convenient

²³ Copenhagen had an urban density 6,600/km² whilst Christchurch an urban density of 620/km² in 2014.

- Identify gaps in the cycling and walking network. Work to fill these in to create a connected, integrated network for active transport
- Reconfigure busy traffic intersections so that they are safer for pedestrians and cyclists and so that they have priority over cars
- Increase the provision of active transport infrastructure that is aesthetically pleasant (i.e. next to greenery, water etc.)
- Widen cycle infrastructure so that cyclists feel safe to pass one another and so that cyclists can ride side by side socially
- As with short cuts – enable cyclists to cycle two-ways in streets that are one-way for other modes of transport

Lastly, there are measures that will take longer to implement and require extensive cooperation amongst local authorities and between local authorities and central government:

- Change planning policy to increase density over time. This might occur through restricting greenfield developments, removing density planning limits and encouraging mixed use development
- Bicycle Highways – over time implement a network of bicycle routes greater than the city boundaries so that outlying suburban areas are encouraged to cycle as a viable transport mode.

5.6 Overall Differences in the Cities

This section provides a summary of the overall feel of each city following the analysis and comparison.

5.6.1 Copenhagen

Copenhagen is a city with a holistic approach to active transport – from infrastructure, advertising to regular maintenance and cleaning (i.e. sweeping cycle tracks from snow). They publicly measure the outcomes and implementation of their policy decisions with the biannual Bicycle Account published since 1996. Although numbers can be politicised the notion that the city publicly measure their progress suggests a high level of political commitment to active transport.

Copenhagen, and Denmark as a whole, use mutually reinforcing policies to encourage active transportation. They implement policies designed to deter the private motor vehicle and car ownership through measures such as high car ownership taxes; as well as policies to encourage active transport. Copenhagen aspires to increase the convenience of cycling (the main motivation for cycling in the city). Installing shortcuts for cyclists is an example of this.

Lastly, Copenhagen is not immune to the pressures of the automobile. In 2010 the city opened three new fully automated car park buildings with 840 car parks (Torslov, 2010, p. 12). This is contrary to many policy documents and press releases surrounding Copenhagen. It suggests that politicisation and the importance of balancing competing different interests surrounding active transport, does not get easier with time.

5.6.2 Christchurch

Christchurch is recovering from the earthquakes of 2010 and 2011. As a result, many policy and planning documents have been produced in the post-earthquake environment. Typically, these show more promise towards active transport than those prior to the earthquakes but they have not yet been implemented or their outcomes measured.

Christchurch, in contrast to Copenhagen, lacks public reporting on the effectiveness of different plans and policy provisions. As a result majority of the policy matrix completed on Christchurch lacks comment in the outcomes column.

Additionally Christchurch policies generally do not exemplify the same legal ‘teeth’ that the Copenhagen policies do. This is shown in the ‘form’ column of Appendix A and B. For example the 2013 ‘An Accessible City’ outlines that CERA and CCC will develop design guidelines on separated bike paths following the plan release, indicating that they were not already in place. This places an immediate delay on the implementation of the plan.

The vocabulary used in the policies was also less precise. Words commonly found in Christchurch’s policies included those such as ‘may’, ‘encourage’, ‘it is hoped’, ‘guidelines will be developed’, ‘carry out research’. These are hard to measure for effectiveness and the time at which they are implemented.

Uniquely, Christchurch policy included a policy dedicated to rule enforcement - *“Enforce road code rules so that drivers and cyclists have a higher anticipation of being apprehended by the police”*. This highlights that despite rules being in place, there was a gap in implementation as the explicit statement of the need to enforce rules was deemed necessary.

Lastly, Christchurch and New Zealand have done little to deter the private motor vehicle, despite implementing measures to encourage active transport modes. This renders bicycle policy less effective as it is the combined approach of car restrictive and pro-active transport policies in Copenhagen that is different to Christchurch. Until the appeal of the private motor vehicle is restricted and the policy approaches occur together, any substantial change in active transport modal share is unlikely to take place.

5.7 Summary

In summary, whilst a multitude of variables were considered as potential influencers of the active transport participation levels in both Christchurch and Copenhagen, only some were identified as different between the two cities. Of those, less were identified as conducive to Copenhagen’s high active transport participation. These were narrowed down further to only those controllable by policy and further still to policies controllable at the local level.

The research identified that those variables and policies that are active transport encouraging (pro-bike) are mainly changeable at the local level. However generally the policies that are car restrictive require changes to be made at the national level (vehicle registration tax, driver licencing, petrol taxation and active transport national funding). Cities have less control over these variables. Cities can deter vehicles by providing less car parking, charging more for parking, and ensuring that active transport modes are prioritised in transport so that they are more convenient than driving.

Chapter 6

Discussion and Conclusion

This chapter acknowledges the limitations of this research, evaluates the method, suggests where this research may lead to, and lastly comments on the results in relation to the literature review. A conclusion is provided at the end of this chapter.

6.1 Limitations

6.1.1 Policy Analysis Time Frame

The policy documents analysed for Copenhagen and Christchurch (in Appendix A and B) were restricted to those from the years 2000-2013. Documents considered prior to this are included as historical context. The analysis was limited to this timeline as undertaking a desktop study meant Copenhagen policy and planning documents became harder to access further back in time.

To overcome this limitation the historical context of each city was considered which allowed historical events such as demonstrations against the car in Copenhagen in the 1980s to form part of the analysis. This was important as it is since the 1970's that clear differences between Christchurch and Copenhagen began to appear. Despite the inclusion of the historical context, the timeframe does limit the applicability of the results as the impact of some policy measures may not yet be evident.

6.1.2 Translation

A second limitation was the issue of comparing nations with different languages. Thankfully most Danish policy and planning documents are published in both English and Danish. However there were a few documents and webpages only available in Danish which posed difficulties for an English speaking researcher. These documents were translated using 'Google translate' and consequently document interpretations rely on the accuracy of this tool.

The Copenhagen Cycle Track Priority Plan 2006-2016 was only available in Danish and unfortunately translation applications were unable to translate this document. In the absence of an English translation, this document was left out of the policy analysis. The impact of this is unknown but future research involving interviews with key municipal planning staff could help reduce this limitation.

6.1.3 Informal and Formal Policy Measures

The method, although an improvement on previous analysis approaches, did not enable informal policy measures to be considered unless the researcher had prior knowledge of the measures existence. As a consequence, a gap in the policy matrices of Appendix A and B, does not mean that no policy exists.

Additionally due to language and accessibility limitations (particularly in regards to Copenhagen's policies), a policy measure may be formalised and but not located in this research. Further still, a gap or missing policy measure may indicate ineffective policy implementation.

To improve the method, interviews with planners and policy makers in both cities and in the relevant central government departments could help ascertain informal policy measures in place. Visits to each location would also help identify the full range of policy measures.

6.1.4 Lack of Reporting of Certain Statistics

For some aspects of the comparison there was a lack of reporting, measuring and monitoring available. For example ascertaining the total length of bike lanes, separated bicycle tracks, shared (bicycle and pedestrian tracks) and recreational cycling tracks in Christchurch was difficult. The Christchurch City Council has data on the length of cycle lanes in the city but this is not publicised. Additionally, they are unable to separate out the lengths of shared cycling tracks, separated bike paths and recreational tracks in the city. As a consequence, there is uncertainty about the specific differences in cycle lane lengths and separated cycle tracks in Christchurch.

6.2 Method Evaluation

6.2.1 The Influence of a Specific Variable

The method is unable to pinpoint how much a change in active transport participation can be isolated to one policy measure as changes do not take place in a controlled environment. Despite efforts to consider other outcomes indicative of active transport participation (i.e. how a policy contributed to safety), it remains impossible to know how much a specific measure contributes to active transport participation.

To improve understanding of the relationship between specific variables and active transport participation, a number of case study cities should be studied using the same approach. This would help confirm that the variables and policy measures identified in the intersection in the research consistently arise as policy measures in the intersection when comparing other locations. This would add justification that these are the variables that warrant closer attention in low active transport cities. Unfortunately this was outside the scope of a dissertation but a PhD project could incorporate addition high active transport cities such as Amsterdam & Utrecht in the Netherlands (Copenhagenize Design Co, 2013a), Vancouver in Canada ("Report shows major shift to sustainable

transportation," 2013), and low-active transport cities such as Auckland (Watson, 2014) and Melbourne (John Pucher et al., 2011).

Alternatively, the method could be improved by undertaking quantitative testing on variables in the intersection. Intersection variables were identified systematically and logically but they could be narrowed down and prioritised further using quantitative research. If possible, this would help ascertain their specific influence on the dependent variable.

6.2.2 Additional Evaluation

The method helped bridge some of the observed weaknesses in the literature identified around the 1980's critiques of comparative policy analysis; that being the inadequate consideration of context. This method treats context separately to the policy analysis to acknowledge and consider the potential influences or swamping factors for each city.

Considering context separately helped acknowledge that a multitude of variables such as weather are a part of context and do not vary. This approach proved useful for identifying a lot of similarities (political system, topography etc.) but also differences between the contexts of the cities. Comparative policy analysis is a method that can be used by cities and nations our global world to learn from one another – both mistakes and successes. Considering context separately allows for this knowledge to be shared, but in a way that reflects that individual locations will respond differently to policy, given context.

6.3 Future Research

In addition to the suggestions on further research made in sections 6.1 and 6.2, future research should consider the implementation of the post-earthquake planning documents in Christchurch. This would ascertain the effectiveness of policy measures once implemented. Unfortunately it is too early to comment on outcomes from plans like the 'Accessible City' given that the initial stages have only just commenced public consultation (AAC Transport Projects, 2014).

Additionally as this analysis includes policy from 2000-2013, future research should incorporate new documents that have been published. The 'Denmark-up on the bike' national cycling strategy released in Denmark in July 2014 (Transportministeriet, 2014) is one example.

This research identified that the variables that can be changed locally by policy are mainly active transport encouraging. Further research could try to identify a city that was pro-active at creating an environment conducive to active transport, despite little support from national government policy measures and funding. This

would be useful case study at determining just how much control and success a city can achieve towards assisting an increase in active transport participation, despite a reluctant central government. It would also indicate how successful a city can be without car restrictive policies in place. Copenhagen is not like this, with the Government of Denmark supporting active transport measures.

Lastly, future research could consider the impacts of the earthquake on residential and business displacement in Christchurch. This impacts trip distance and whilst the 2009-2012 rolling average of the Household Travel Survey showed no change in average trip distance in Christchurch, many residents in the red-zone of Christchurch have now relocated. A rolling average of post-earthquake years (i.e. 2011-2014) would give a better impact of trip distance changes and future transport implications.

6.4 Unexpected Findings

There were some unanticipated findings that deserve a comment. There were variables and policy measures not identified in the intersection that were surprising (6.4.1). Additionally, there were policy measures located in the intersection that were unexpected following the literature review (6.4.2). Lastly there were policy measures expected (6.4.3).

6.4.1 Variables and Policy Measures Absent

There were variables and policy measures that were expected to be located in the intersection following the literature review that were absent. These are identified below.

Firstly, underlying factors such as trip distance and weather (Kingham & Koorey, 2011) did not appear in the intersection. Copenhagen has a longer trip distance than Christchurch and a climate less suited to outdoor cycling, yet has significantly higher active transportation participation regardless. Unexpectedly, Christchurch has the shorter trip distance, even though trip distance is considered to have a negative correlation between walking and cycling (Saelens et al., 2003, p. 84).

Vulnerable Road User Protection Laws were identified in the literature (J. Pucher & Buehler, 2008, p. 512; H. Weiss & Ward, 2013) but missing from the policy and context analysis. This measure where by motorists are responsible for any collision with a cyclist, even if the cyclist is wrong (J. Pucher & Buehler, 2008, p. 520); acts as a deterrent against driving. Despite not locating this measure, it is recommended that low active transport cities consider this measure for future research. Copenhagen is proactive towards making cyclists and pedestrians feel safer irrespective of whether they have Vulnerable Road User Protection Laws or not and sense of cycle safety rose between 2008 and 2012 by 50% (City of Copenhagen, 2013, p. 2).

Car free days and bicycling advocacy events (John Pucher et al., 2011) were also absent. Although identified in the policy extraction matrix for Copenhagen these events have not been repeated. This suggests the city found them to have limited success.

Additionally, it was expected there would be policies on providing full service bicycle facilities (i.e. puncture repair kits, tyre pumps and seat adjustment tools) on popular cycle tracks (John Pucher et al., 2011). Further to this, work place facilities such as showers and changing rooms (Kingham & Koorey, 2011) were also absent. This may be indicative of an informal policy measure. Despite not being located in the intersection, these measures should also be considered by low active transport cities.

I expected to find the cost and availability of car parking at shopping malls in the two cities to be different. However both the quantity and cost of car parking in mall complexes (of similar shop quantities) was similar. Both cities offer free car parking at shopping malls and have a comparable ratio of car parks to the number of shops. This was surprising as one of the key policy initiatives found by Pucher and Buehler (2008) was that reduced car parking supports active transport.

Traffic education (Kollmuss & Agyeman, 2002; J. Pucher & Buehler, 2008), attractive streetscapes (Gehl Architects, 2010, p. 84), turn restrictions on cars (J. Pucher & Buehler, 2008, p. 522), and mixed use development (J. Pucher & Buehler, 2008, p. 495) were also absent from the intersection.

The absence of these measures likely relates to Kollmuss and Agyeman (2002), and Kingham and Koorey (2011) that a multitude of factors influence behaviour and cycling. For example education may not feature as environmental knowledge and awareness is attributed to only 20% of behaviour (Kollmuss & Agyeman, 2002, p. 250). This also likely relates to the idea that measures that are important in one location, may not be required to influence behaviour in another.

6.4.2 Unexpected Variables and Policy Measures

Variables and policy measures were identified in the intersection that were unexpected following the literature review.

It was expected that shared cycling and pedestrian paths would be present in Copenhagen as they are in Christchurch (i.e. throughout Hagley Park). However in Copenhagen they separate active transport modes from motor vehicles and also from each other. The city has no shared paths for walking and cycling (Keldorff, 2014).

The cost of vehicle road worthiness testing was also unexpected as it had not been identified in the literature. However, the contextual analysis identified large differences in the test costs between the two nations as part of efforts to deter car ownership.

The installation of a bicycle highway was a further unexpected policy measure. This is most likely because this is a new measure (the first super highway opening in Copenhagen in 2012). Consequently it has not yet featured in academic publications on active transport policy measures.

Further unexpected measures identified in the intersection of those policies changeable by policy are:

- GST
- Population
- Cleaning of cycle tracks
- Cycle track Widening
- Minimum driving age

Lastly, that 1970s demonstrations against the demise of cycling by Copenhagen citizens was unanticipated. This historical context, gave an understanding of the political activism present in the city in support of active transportation. Culture does have a role to play and in Copenhagen cycling has become part of its identity on the world stage. As urbanist Brent Toderain stated “you want to get to a point where biking is a part of ‘place-making” (Toderain, 2014).

6.4.3 Variables Present and Expected

In addition to the unexpected findings, there are also variables and policy measures located in the intersection that were expected following the literature review. These are:

- Bicycle Parking – Quantity and Quality (J. Pucher & Buehler, 2008, p. 512 & 518)
- Biking and Public Transport (J. Pucher & Buehler, 2008)
- Car Free Streets (J. Pucher & Buehler, 2008, p. 514)
- Car Ownership (J. Pucher & Buehler, 2008)
- Car Parking Quantity (Gehl Architects, 2010)
- Cycle Helmets (J. Pucher & Buehler, 2008, p. 496).
- Cycle Shortcuts (J. Pucher & Buehler, 2008, p. 512)
- Cycle Track Maintenance (J. Pucher & Buehler, 2008, p. 512)
- Density (Saelens et al., 2003)
- Enabling Cycling Two-Ways in One-Way Streets (J. Pucher & Buehler, 2008, p. 514)
- Funding (Tin Tin et al., 2009)
- Green Cycle Routes – relates to attractive streetscapes and experiences (Gehl Architects, 2010, p. 84)
- Linking Cycling and Walking Tracks – one coordinated network (Gehl Architects, 2010)
- Petrol Price (John Pucher et al., 2011, p. 502)
- Petrol Tax (John Pucher et al., 2011, p. 502)

- Reconfiguring Traffic Intersections (Vallyon & Turner, 2011)
- Separated Bike Paths (Furth, 2012; Kingham & Koorey, 2011; J. Pucher & Buehler, 2008, p. 511)
- Slow Vehicle Speed Zones (Kingham & Koorey, 2011; J. Pucher & Buehler, 2008, p. 512)
- Vehicle Registration Tax (J. Pucher & Buehler, 2008, p. 495)

This research thus adds further support that these are policy measures, already identified in the literature, warrant close attention by cities and nations whom aspire to increase active transport participation.

6.5 Variables Requiring More Research

The impact of requiring cycle helmets in New Zealand, but not in Copenhagen is a continual issue of debate. Unfortunately, the benefits of wearing or not wearing a cycle helmet are unable to be ascertained by this research. There are inconclusive findings on the impact of helmets on active transport participation. Cycle helmets and their contribution to active transportation participation is a research area valid in its own rights. The requirement to wear helmets in New Zealand is seen as a fashion deterrent (Kingham & Koorey, 2011, p. 25), whilst car drivers also tend to undertake more risky manoeuvres around cyclists wearing helmets compared to those that are not.

An anomaly was found between the relationship of trip distance and density. Whilst Copenhagen is approximately ten times more dense, it also has the longer average trip to work distance (12.5km (Nielson, 2014) compared to 7km (Ministry of Transport, 2014b)). This is in contrast to the literature, which suggests that the denser a city, the shorter the trip distance. One possible explanation could be the different mixed use zoning in the cities but this was outside the scope of detailed examination in this research.

Lastly, whilst this research had a specific objective of identifying those variables that are changeable by local policy, it also identified by way of elimination those that are changeable nationally (figure 29). Consequently, the variables that warrant further attention nationally include vehicle taxation, petrol taxation, and the cost of vehicle road worthiness tests.

6.6 Discussion Summary

This study was limited primarily by three aspects. The time frame in which the policy analysis was undertaken (2000-2013), the requirement to translate Copenhagen policy from Danish to English, and the difficulty in determining whether informal policy measures were in place in either city.

The method inspired by the 1980's critiques on comparative policy analysis, systematically and logically uses comparative transport policy analysis to identify variables and policy measures located in the intersection (section 3.2) that warrant further attention by low active transport cities. The method could be improved by

increasing the sample size of the cities studied to provide weightier justification for the variables and policy measures located in the intersection.

Future research could compare post-earthquake policy and planning documents in Christchurch (including their implementation) with those prior. Future research could also locate an example of a city with high active transport participation, despite a non-supportive central government to research the policy measures in place.

Lastly, this research identified many variables located in the intersection that were expected. This offers further support for these measures when hoping to create an environment conducive to active transport.

6.7 Conclusion

This dissertation looked at the variables contributing to active transport participation using a low active transport city (Christchurch, New Zealand) and a high active transport city (Copenhagen, Denmark) as case studies. Using comparative policy analysis, a systematic approach identified the variables and policy measures of difference between the two cities.

This research asked *'What policies should low active transport cities like Christchurch consider changing?'* To address this a substantial list of policies and variables were identified as having potential to influence active transport participation. This was then narrowed to a list of variables demonstrating a difference between the two cities; reduced further to those with a difference conducive to Copenhagen's high active transport success; and further again to those changeable by public policy. It was narrowed once more to those able to be changed locally. These are the policies located in the intersection in purple in figure 42.

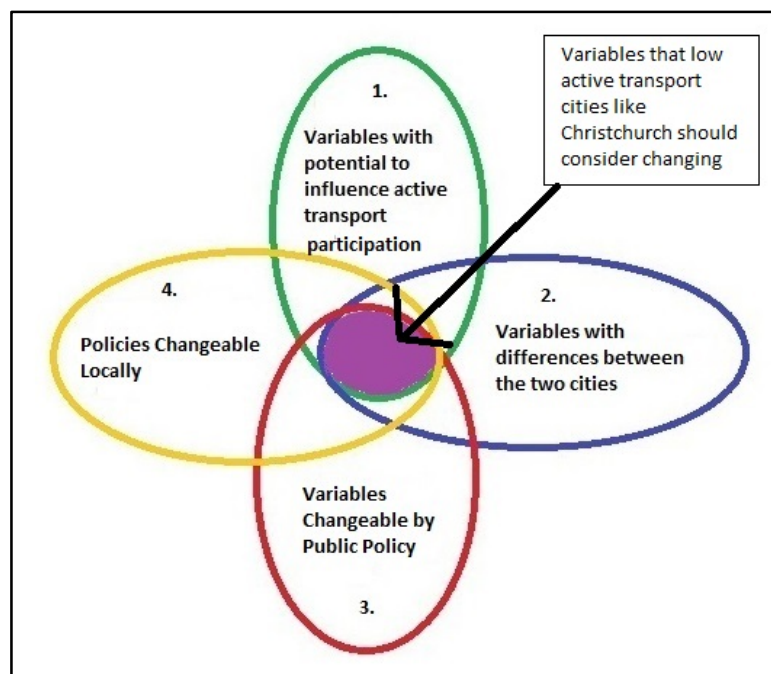


Figure 42. The Intersection Approach

The transport measures influenced by policy identified in the intersection are:

- Active Transport Funding
- Bicycle Highway
- Bicycle Parking – Quantity and Quality
- Bike Share and Public Transport
- Bike Share System
- Car Free Streets
- Car Parking Quantity
- Cost of Central City Car Parking
- Cycle Shortcuts

- Cycle Track Maintenance and Cleaning
- Cycle Track Widening
- Density
- Enabling Cycling Two-Ways down One-Way Streets
- Green Cycle Routes
- Linking Cycling and Walking Tracks into One Coordinated Network
- Reconfiguring Traffic Intersections
- Separated Bicycle Paths
- Slow Vehicle Speed Zones

In summary, the research identified that many of the variables and policies that encourage active transport (pro-bike) are changeable at the local level. It is the policies that are car restrictive that require changes at the national level (vehicle registration tax, driver licencing and petrol taxation). Cities have less control over these variables. Irrespective of what is taking place nationally, the intersection approach suggests that low active transport cities should consider the following measures.

- Increasing active transport funding in the local authorities budget. Lobby the national government for greater funding for active transport measures
- Increasing the Cost of Central City Car Parking
- Implementing Slow Vehicle Speed Zones
- Introducing Car Free Streets to areas where pedestrian and cycling activity should be encouraged
- Introducing a Bike Share System
- Coordinating Bicycle Sharing and general cycle parking with the Public Transport System
- Increasing cycle track maintenance and cleaning to ensure infrastructure already built in a city remains well-maintained
- Increasing the quantity of separated bicycle paths (not cycle lanes)
- Decreasing central city car parking in the city to make the private motor vehicle less convenient
- Increase bicycle parking quantity in the city and its quality (i.e. well-lit to increase the perception of safety)
- Increasing shortcuts to make cycling and walking more efficient, convenient modes of transport
- Identifying gaps in the cycling and walking network and work to fill these in so that a connected, integrated network for active transport exists
- Reconfiguring busy traffic intersections so that they are safer for pedestrians and cyclists and so that they have priority over cars
- Increasing the provision of active transport infrastructure that is aesthetically pleasant (i.e. next to greenery, water etc.)
- Widening cycle infrastructure so that cyclists feel safe to pass one another and so that cyclists can ride side by side socially
- Enabling cyclists to cycle two-ways in streets that are one-way for other modes of transport
- Changing planning policy to increase density over time.
- Establishing over time a network of bicycle routes greater than the city boundaries (Bicycle Highways) so that outlying suburban areas are encouraged to cycle as a viable transport mode.

Appendix A

Copenhagen Policy and Outcomes Table

Copenhagen, Denmark							
Policy Source	Policy	Rule/Policy and Year	Form	Additional Info on the policy measure	Relevant Information	Outputs/ Implemented	Outcomes: Measurement of the Policy Analysis
Denmark Literature (J. Pucher & Buehler, 2008, p. 512) and NZ study (Kingham & Koorey, 2011)	Slow Vehicle Zones	City of Copenhagen: Traffic and Environment Plan 2004. Action Plan 9 – “Establish 40km/h speed limits on local streets in all residential areas” (City of Copenhagen, 2004, p. 6)	Enforcement	Slowing down streets is aimed at preventing cut-through traffic and ensuring traffic is diverted away from local streets (City of Copenhagen, 2004, p. 9)		By 2009 zones of 40kph and in some cases 30 kph had been set up in the Inner City and the area of Christianshavn (Torslov, 2010, p. 11).	By 2009 the Northwest quarter of the city had lower accident numbers which dropped from 36 to 21 accidents annually (Torslov, 2010, p. 11). 2008-2012 – sense of cycle safety rose by 50% (City of Copenhagen, 2013, p. 2).
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Reconfiguring Traffic Intersections	1. City of Copenhagen: Traffic and Environment Plan 2004. Action Plan 6 – improve traffic safety by reconfiguring intersections and road sections. Provide safer routes to school (<i>City of Copenhagen, 2004, p. 6</i>) 2. Good, Better, Best: The City of Copenhagen’s Bicycle Strategy 2011-2025. Strategy that by 2025 an intelligent traffic system on the regional network of bicycle highways will give priority to cyclists by registering the number of cyclists at an intersection and adjusting the traffic	Engineering Engineering	1. This policy is designed to focus on improving safety measures for cyclists and walkers. Aim to maintain traffic safety through physical infrastructure measures, safe routes to school and educational campaigns (City of Copenhagen, 2004, p. 9). 2. Technological solutions to detect groups of cyclists are planned to be tested in 2011-2013 in the first Bicycle Superhighway (City of Copenhagen, 2011, p. 22). 3. The green wave enables cyclists travelling at 20kph	There are two ways identified to improve safety at intersections – set-back lines for cars (which place a stop line for cars approximately 4m from the pedestrian crossing making cyclists more visible), and white or blue marked crossings for cyclists to indicate where a cyclists should ride (City of Copenhagen, 2002, p. 30)		In the 2004 Bicycle Account – there was a 28% decrease in cyclist casualties at signalised intersections from 2002 showing that efforts to improve intersection safety are working (City of Copenhagen, 2005, p. 4). In 2009 following a focus on redesigning intersections, there were 70 fewer traffic accidents (both those killed and seriously injured) than in 2008 in Copenhagen. 79% of those injured were pedestrians, cyclists and moped riders (Torslov, 2010, p. 7).

		<p>lights to give green lights to groups of cyclists (City of Copenhagen, 2011, p. 22).</p> <p>3. Good, Better, Best: The City of Copenhagen's Bicycle Strategy 2011-2025. Implementing more 'green waves' for cyclists (City of Copenhagen, 2011, p. 7). In 2012-2013, a Green Wave for cyclists will be implemented on Østerbrogade (City of Copenhagen, 2011, p. 22).</p> <p>4. Traffic Safety Plan 2007-2012. Mass Actions Identified for the plan as actions which attack common traffic accidents with "relatively cheap, preventative mass actions" including giving cyclists and pedestrians a green signal before vehicles at intersections (<i>Technical and Environmental Administration, 2007, p. 14</i>)</p>	Engineering	<p>to have a continuous run through at intersections (Ministry of Foreign Affairs of Denmark, 2014b). The direction of the green wave changes for the differences in morning and afternoon traffic flow demands.</p> <p>4. "The relative cheapness of these actions would mean that they could be put into practice on a larger scale at places in traffic where there is a higher risk of accidents of that specific type" (Technical and Environmental Administration, 2007, p. 14)</p>			<p>The green wave has been considered a successful policy measure: "Establishment of green waves on Nørrebrogade have previously shown significant travel time improvements of 12 per cent" (Danish Ministry of Transport, 2014, p. 37)</p>
<p>Denmark Literature (J. Pucher & Buehler, 2008, p. 509) and (Nelson, n.d., p. 13)</p>	<p>Advertising/Bicycling Advocacy</p>	<p>1. City of Copenhagen: Traffic and Environment Plan 2004. Action Plan 7 – working to influence travel to work modal choice to more environmentally friendly options (City of Copenhagen, 2004, p. 6)</p> <p>2. 'Traffic Environment Week' held in Copenhagen in September (City of Copenhagen, 2004, p. 39)</p>	<p>Education + Encouragement</p> <p>Encouragement</p>	<p>1. This policy attempts to change behaviour (City of Copenhagen, 2004, p. 9)</p> <p>2. Traffic Environment Week aims to put public focus on transport. It consists of community events, and provides the space to test specific traffic measures</p>	<p>Since 1995 cycling campaigns have been carried out. Including the 'We Bike to Work' campaign introduced in 1996 which is continued as an annual event with the Danish Cyclist Federation (City of</p>	<p>Work to influence behaviour has included handing out rolls for breakfast to cyclists and issuing bicycle lights (Torslov, 2010, p. 11).</p> <p>In 2001, the environmental transportation week ended with a "car-free" weekend (City of</p>	<p>Between 1995 and 2005 – bicycle traffic grew by 41% in Copenhagen, whilst motor traffic rose by 18% (City of Copenhagen, 2005, p. 2). Also in this time the million km cycled per day in the city rose from 0.8 to 1.13 million km (City of Copenhagen, 2005, p. 7). By 2012 this had risen again to 1.27 million km (City of Copenhagen, 2013, p. 8).</p>

		3. 2011 and 2012 – ‘ Karma Campaign ’ a behavioural campaign aimed at improving cyclist behaviour (City of Copenhagen, 2013, p. 7).	Education + Encouragement	(City of Copenhagen, 2004, p. 39)	Copenhagen, 2002, p. 33). Anticipated cost of Traffic Environment Week is DKK 4 million a year (City of Copenhagen, 2004, p. 39).	Copenhagen, 2002, p. 33). In 2005 – there were three car free days (Grimar, 2006, p. 4).	The bicycle market share was roughly stable from 2004 – (36%) through to 2009 (37%). Also from 2008-2009 there was a 3% increase in the number of private cars in the city (Torslov, 2010, pp. 3-4). 2008-2012 – sense of cycle safety rose by 50% (City of Copenhagen, 2013, p. 2).
Denmark Literature (J. Pucher & Buehler, 2008, p. 512).	Cycle Track Maintenance	Extra Appropriation towards cycle track maintenance was granted 2000-2002 following the cycle track surface strategy not considering maintenance City of Copenhagen, 2002, p. 31). Goal – “Cycling comfort shall be improved so that cycle track surfaces deemed unsatisfactory shall not exceed 5% (City of Copenhagen, 2002, p. 36).	Budget Decision + Engineering	As of 2002 it was reported that close to half of all cyclists in Copenhagen were dissatisfied with cycle track maintenance. However, even more were dissatisfied with road maintenance (City of Copenhagen, 2002, p. 19).	The 2000 Bicycle Account expressed that cyclists were unhappy with cycle track maintenance (City of Copenhagen, 2002, p. 31), also the Roads and Parks Development estimated that the surface of 10% of tracks as unacceptable.	An additional DKK 2.5 million in 2000 and 7.5 million extra was allocated in 2001 to replace uneven sections of tracks with smoother asphalt surface. (City of Copenhagen, 2002, p. 31). May 2010 a website has been introduced in which cyclists can tip off where minor repairs need to be undertaken along the routes. www.kk.dk/givetpraj. (Technical and Environmental Administration, 2011)	Bicycle Account: cycle track maintenance increased to 9.9 DKK million in 2004 from 3.9million in 1995 (City of Copenhagen, 2005, p. 7).
Denmark Literature (J. Pucher & Buehler, 2008, p. 512 & 518)	Bicycle Parking	City of Copenhagen: Cycle Policy 2002-2012: An action plan for bicycle parking will be drawn up (City of Copenhagen, 2002, p. 29). Municipal Plan 2011: New requirements for bicycle parking for new buildings have been included in the Municipal 2011 Plan – including	Further Research Enforcement		Cargo Bike Parking has been identified as important for the future with 17% of Copenhagen families having a cargo bike (they are used to transport children, shopping etc.) and are often an alternative to a car	The redesign of Nørreport Station includes easier access and more bicycle parking (this is anticipated to finish 2014) (City of Copenhagen, 2011, p. 18).	Between 2001 and 2004 another 400 more bicycle parks were established in the city centre of Copenhagen (City of Copenhagen, 2004, p. 26). Bike parking at Svanemøllen Station was improved in 2011 (City of Copenhagen, 2011, p. 18).

		developing and implementing more cargo bike parking in 2012-2013 (City of Copenhagen, 2011, p. 14).			(City of Copenhagen, 2011, p. 14).		2010 Bicycle Account lists 48000 bicycle parking spaces on roads and pavements (Technical and Environmental Administration, 2011, p. 7)
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 511).	Bicycle Lanes	City of Copenhagen: Traffic and Environment Plan 2004. Details listed more in the Cycle Track Priority Plan 2006-2016.	Engineering	The Cycle Track Priority Plan 2006-2016 identifies the new cycle tracks and cycle lanes to be created in Copenhagen between 2006-2026 It states the order in for almost 70 kilometres of new cycle tracks and cycle lanes to be established. Not available in English.	In 2002 it was estimated that the average cost of reinforced cycle lanes (where road marked cycle lanes, are combined with traffic islands, bus tracks to physically separate) was DKK 1.6m per km. In contrast a traditional cycle track was estimated as DKK 6.2 million per km and these are for only one side of the road! (City of Copenhagen, 2002, p. 22).	Annual budget for Cycle Track Priority Plan was set at DKK 8 million (resulting in a 20-25yr time horizon to expand the network) (City of Copenhagen, 2004, p. 24). 2009 construction of Oresundsvej and Carl Jakobsens Vej cycle tracks and a number of other tracks were designed ready for construction (Torslov, 2010, p. 10)	Bike lanes increased from 6km of cycle lanes in 1998 to 14 km in 2004 (City of Copenhagen, 2005, p. 7).
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 511) and NZ study (Kingham & Koorey, 2011) and (Furth, 2012, p. 108)	Separated Bike Paths	City of Copenhagen: Traffic and Environment Plan 2004. Details listed more in the Cycle Track Priority Plan 2006-2016. First Cycle Track Plan was established in 1981 (Jensen, 2009, p. 4).	Engineering	The Cycle Track Priority Plan 2006-2016 identifies the new cycle tracks and cycle lanes to be created in Copenhagen between 2006-2026 It states the order in for almost 70 kilometres of new cycle tracks and cycle lanes to be established. Not available in English.	By 1980 – 240 km's of cycle tracks (Jensen, 2009, p. 5). 2001 – 307 km of cycle tracks (City of Copenhagen, 2002, p. 22) 2005 – 330 kms of cycle tracks (Jensen, 2009, p. 5)	Cycle Track Priority Plan 2001-2016: 51km of cycle tracks will be laid out over the 15 years (City of Copenhagen, 2002, p. 22).	The average in 2008-2010 was that bicycles had a 36% modal share for trips to work or educational institutions (the highest modal share of all forms of transport) (City of Copenhagen, 2011, p. 8).
Europe Literature (J. Pucher & Buehler, 2008, p. 522).	Reduction in Car Parking	City of Copenhagen: Traffic and Environment Plan 2004. <i>Action Plan 12 – “Draw up a new parking strategy that will ensure sufficient parking</i>	Study/ Further Research	The parking strategy is proposed to include marking special, free parking spaces for shared cars and shifting parking from on the street			

		capacity, calm urban spaces and help reduce motorized traffic.” (City of Copenhagen, 2004, p. 6)		parking to parking structures to calm traffic flow (City of Copenhagen, 2004, p. 10).			
Christchurch and Copenhagen Literature (Gehl Architects, 2010)	A joined network of cycle tracks/Connected Cycle Routes	Good, Better, Best: The City of Copenhagen’s Bicycle Strategy 2011-2025 Strategy to eliminate missing links on main arterial groups to ensure direct routes (City of Copenhagen, 2011, p. 23).	Study/ Further Research Engineering				
Denmark Literature (J. Pucher & Buehler, 2008, p. 512 & 522). Also NZ study on traffic priority (Fyhri et al., 2011).	Traffic Priority for Cyclists/Pedestrians	City of Copenhagen: Traffic and Environment Plan 2004. Action Plan 18 – “Initiate new studies of pedestrian travel patterns, mobility, congestion, etc. To serve as the foundation for treating pedestrian traffic on a par with other traffic modes when organizing the city’s spaces” (City of Copenhagen, 2004, p. 6)	Study	This action is aimed at creating better conditions for pedestrians following the basis that walking is acknowledged as a pollution free travel mode (City of Copenhagen, 2004, p. 11)			More than 50% of Copenhagen cycle on a daily basis – and bicycle traffic rose by 40% between 1994 and 2004. Has resulted in congestion on certain cycle tracks and a lack of cycling parking space (City of Copenhagen, 2004, p. 16).
Europe Literature (J. Pucher & Buehler, 2008, p. 522). (Gehl Architects, 2010, p. 35).	Reduce Central City Car Parking		Enforcement		<i>Parking Policy existed where by 2-3% of inner city car parking was removed each year between 1999-2009 and road space was used for cycle lanes and for wider footpaths</i> (Gehl Architects, 2010, p. 35).	Three new fully automated car parking building with a total of 840 car parks were due to open in 2010 as car usage in the city increases (Torslov, 2010, p. 12). This is in contrast to ‘reducing central city car parking’.	In 2012 – Copenhagen residents owned approximately 650,000 bicycles compared to 125,000 cars (approximately 5.2 bikes to every car) (City of Copenhagen, 2013, p. 13).
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Bike Share System	Good, Better, Best: The City of Copenhagen’s Bicycle Strategy 2011-2025. Copenhagen aims to have a bike share system by 2025 as an integral part of the public transport system (City of Copenhagen, 2011, p. 18).	Aspiration	The first public bike system was called City-Bike and was active in Copenhagen in 1995 (Santos Canals et al., 2006, p. 37). 1997-there were 2000 bicycles and in 2006 still 2000 bicycles (the Municipality was happy with that number for	Aim for a new bike share system to be operating by Spring 2013 and in 2011 the process for inviting bids for the system had begun (City of	Designs were shortlisted and the finalised bike was with Go Bike.dk.	New system in place with bicycles with tablets on the front. The first 250 bikes of the new system were launched at the end of March 2014 (Aargaard, 2014). Will have 1260 bicycles at 60 stations around the city(Colville-

				given the low use of bikes) (Santos Canals et al., 2006, pp. 37-38)	Copenhagen, 2011, p. 18)		Andersen, 2014a). Many stations are located near train and metro stations (Wonderful Copenhagen, 2014b).
Denmark Literature (J. Pucher & Buehler, 2008, p. 514)	Car Free Streets		Enforcement	A policy related to traffic calming, car free streets or car free zones are designed to make it close to impossible for cars to use the centre city as a shortcut across town Denmark Literature (J. Pucher & Buehler, 2008, p. 514).	Copenhagen has Strøget – which is a car free zone in the city.	In 2008 Norrebrogade, a significant radial street in Copenhagen was trialled with a number of changes – including forbidding cars to pass at two points (Grimar & Jensen, 2010).	Nørrebrogade has been considered a success and many of the trial measures made permanent. Since 2008 car traffic has fallen from 15,000 to 6,000 a day and bicycle use has increased by 25% (Colville-Andersen, 2013). Also shutting off the street has seen a fall of 10% car traffic in the entire neighbourhood (Colville-Andersen, 2013)..
Copenhagen Only							
Denmark Literature (J. Pucher & Buehler, 2008, p. 512 & 514)	Traffic Calming	City of Copenhagen: Traffic and Environment Plan 2004. Action Plan 11 – study traffic calming options for the city centre (City of Copenhagen, 2004, p. 10)	Study	This policy reflects plans for a major urban development in Havnestaden, Sydhavn, Nordhavn and Nordostamager which the authorities anticipate will place increasing pressure on the existing road network (City of Copenhagen, 2004, p. 10.)		A study was undertaken in 2005 which involved having three car free days in the central city (not all traffic could be stopped i.e. deliveries and bus services) which was to determine the success of this as a traffic calming measure (Grimar, 2006)	Hard to find a concrete conclusion from the study- “with regard to future perspectives for the city centre, the conclusion is that there is widespread support for calming a section of the city centre, but many different views on the means to achieve such traffic calming” (Grimar, 2006, p. 11).
Copenhagen (Nelson, n.d., p. 13)	Green Cycle Routes	Cycle Track Priority Plan 2001-2016 A total of 100 km to be established of routes with travel through green areas with wide cycle paths (City of Copenhagen, 2002, p. 24).	Engineering	Length of the routes will vary between 2km – 8km (City of Copenhagen, 2002, p. 24). “The order in which the routes are to be established was decided upon by the City of Copenhagen’s Technical and Environmental Committee in 2006” (Niels, 2010).	“The Green Cycle Routes of Copenhagen are a cohesive network of long distance cycle and pedestrian routes through open, recreational areas such as parks and waterfront areas as well as along minor roads. The routes	The bicycle route along the old Amager railway will be completed in 2013, along with another few key ‘green cycle’ routes (City of Copenhagen, 2011, p. 26). Increase between 1995 – 2004 from 29km of green cycle routes to 37 km	By 2010, 41 kilometres were in place and on its main stretches, the routes are used about 5000-7000 cyclists a day (Niels, 2010).

					avoid roads with heavy traffic, crossing them safely and comfortably by means of bridges or special traffic signs and signals” (Niels, 2010).	(City of Copenhagen, 2005, p. 7).	
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Cycle Shortcuts	Good, Better, Best: The City of Copenhagen’s Bicycle Strategy 2011-2025. Strategy to have more short cuts over water, railways, squares etc. to improve travel times by 2025 (City of Copenhagen, 2011, p. 23).	Engineering		The Bryggebroen bridge was placed to increase accessibility to new urban developments in Copenhagen – route is important (City of Copenhagen, 2011, p. 9).	A bicycle shortcut through Vendersgade to make cycling more efficient has been made permanent and this is now used by 2400 cyclists daily (City of Copenhagen, 2013, p. 16). It is noted that two of the three bridges outlined in the bicycle strategy are facing delays (originally penned to open in February 2013), are now due to open 2015 following a bankruptcy of the contractors. The Inderhavnsbroen bridge is expected to open end of 2014 (Wenande, 2014).	The Bryggebroen bridge is a pedestrian and bicycle bridge that has created a shorter trip for active transport modes. Its usage has increased from approximately 3,500 bicycle trips a day in 2006 to 9000 bicycle trips a day in 2010 (City of Copenhagen, 2011, p. 9). A bicycle shortcut through Vendersgade to make cycling more efficient has been made permanent and this is now used by 2400 cyclists daily (City of Copenhagen, 2013, p. 16)
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 514)	Cycling Two-Ways on One-Way Streets	Good, Better, Best The City of Copenhagen’s Bicycle Strategy 2011-2025. By 2025 most one-way streets will be eliminated (City of Copenhagen, 2011, p. 23). Also - 2011 “Countraflow cycle tracks are being implemented, in among other streets, Bremerholm and Gothersgade and funding has been approved for eliminating one-	Engineering+ Budget Decision			In the historic city centre, Gothersgade is a one way street that runs past Rosenborg Castle and the Kings Gardens at a hasty 50 km/h, and has been modified so that there are wider footpaths and so that cyclists can travel in both directions. The two way tracks were still under construction in	

		way streets for cyclists in a series of smaller streets" (City of Copenhagen, 2011, p. 23).				2013 for some parts of Gothersgade ("Gothersgade and the Two-way Cycle Track," 2013).	
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Bike Rentals joined with public transport	Good, Better, Best The City of Copenhagen's Bicycle Strategy 2011-2025.	Engineering	Bikes available to rent at public transport hubs so that cycling is coordinated with public transport.		Bids invited to establish a new bike share system in conjunction with public transport (City of Copenhagen, 2011, p. 18). Designs were shortlisted and the finalised bike was with Go Bike.dk.	New system in place with bicycles with tablets on the front. Will have 1260 bicycles at 60 stations around the city (Colville-Andersen, 2014a). Many stations are located near train and metro stations (Wonderful Copenhagen, 2014b).
Not requiring a helmet – Denmark (J. Pucher & Buehler, 2008, p. 509)	Cycle Helmets		Voluntary		2004 bicycle account - 8% of cyclists over the age of 16 wear a helmet, whilst 61% of cyclists under 16 wear a helmet (City of Copenhagen, 2005, p. 4).	The City Traffic Council held a campaign which included handing helmets out to all city 3 rd grade pupils via schools (Torslov, 2010, p. 11).	
Denmark Literature (J. Pucher & Buehler, 2008, p. 502)	High taxes and fees on car ownership	Sustainable Transport – Better Infrastructure 2008 – Plan to introduce green taxes on vehicles to ensure Danes think about the environment when buying a car (The Danish Government, 2008, p. 1).	Enforcement + Research	The plan would "effect a fundamental restructuring of the taxation of cars" by shifting the tax to make it cheaper to buy an energy efficient car (The Danish Government, 2008, p. 2).		180% registration tax. Expensive to have a privately owned vehicle in Denmark.	Low car ownership. In 2010 Denmark had 383 passenger cars registered for every 1000 inhabitants and 41% of households did not have a car available for use, whilst just 46% had a single vehicle available per household (Ministry of Transport Denmark, 2012a, p. 26).
Christchurch Only							
Europe Literature (J. Pucher & Buehler, 2008, p. 522)	Land beyond already built up areas off limit for development		Enforcement		Trying to reduce urban sprawl and hence trip distance.		

Denmark and Europe Literature but refers to New Zealand (Fyhri et al., 2011, p. 709)	Walking School Buses		Voluntary			
New Zealand Literature (Kingham & Koorey, 2011)	Work Place Facilities				A lack of work place facilities (showers, changing facilities, safe cycle parking) has been identified as a barrier to Cycling in New Zealand (Kingham & Koorey, 2011)	
General Literature (Saelens et al., 2003). Also Europe Literature (J. Pucher & Buehler, 2008, p. 522).	Mixed Use Development		Enforcement		Urban design and land use policies are designed to minimise sprawl and reduce trip distances (J. Pucher & Buehler, 2008, p. 522).	
Denmark Literature (J. Pucher & Buehler, 2008, p. 513)	Maps		Education + Encouragement		Detailed maps of cycling facilities to aid users to plan their journeys/route	
Denmark Literature (J. Pucher & Buehler, 2008, p. 519).	Cycling Safety Education		Education		School children complete traffic safety courses at school and are tested by real police officers (J. Pucher & Buehler, 2008, p. 519).	
Copenhagen Literature (Gehl Architects, 2010, p. 84) (Gehl, 1987, p. 133)	Attractive Streetscapes		Engineering		Attractive facades, alleys and streetscapes will encourage pedestrians.	
Policy's Found in Both Cities but Not Expected						

	<p>Cooperation between Policies</p>	<p>1. Traffic Safety Plan 2007-2012 Cooperation between national and local policies has been attributed to helping the improvement of traffic safety (Technical and Environmental Administration, 2007, p. 6)</p> <p>2. Traffic Safety Plan 2007-2012 “The City of Copenhagen has entered into a partnership with the neighbouring Municipality of Frederiksberg in a traffic safety council, where politicians, planners and engineers, the police, teachers and civil society organisations discuss and develop ideas for traffic safety campaigns” (Technical and Environmental Administration, 2007, p. 16).</p>	<p>Enforcement</p> <p>Budget Decision + Education</p>	<p>2.”The City Councils have decided to grant € 0.5 per citizen per year to the activities of the traffic safety council” (Technical and Environmental Administration, 2007, p. 16)..</p>			
	<p>Redesigning Road Sections</p>	<p>Traffic Safety Plan 2007-2012. Redesigning roads to ensure safer environments for pedestrians – “A number of road sections will be designated for remodelling between 2007-2012” (Technical and Environmental Administration, 2007, p. 13)</p>	<p>Engineering</p>	<p>Road sections with problems of excessive speed or where many pedestrians wish to cross will be highly prioritised for such remodelling .One important element is a mid-section in the road, which can be used both for islands ensuring the safety of crossing pedestrians, as well as turning lanes (<i>Technical and Environmental Administration, 2007, p. 13</i>).</p>			

Policies found but not expected - Copenhagen							
	Bicycle Highway	City of Copenhagen's Bicycle Strategy 2011-2025 Establish 2011-2013 in the first Bicycle Superhighway Network (City of Copenhagen, 2011, p. 22) .	Engineering			Albertslundruten, the first cycle super highway opened in 2012 and was inaugurated as a test route of 17.5km length (City of Copenhagen, 2013, p. 15). This links the suburban town of Albertslund with the central city and offers a safe, smooth ride with as few stop as possible (City of Copenhagen, 2014). Traffic signals along the route are timed to give cyclists a 'green wave' (City of Copenhagen, 2014).	
	One-way streets	Good, Better, Best: The City of Copenhagen's Bicycle Strategy 2011-2025. Strategy to eliminate one-way streets for cyclists by 2025 (City of Copenhagen, 2011, p. 23).	Engineering	Approval was been granted for funding eliminate one-way streets for cyclists in a series of smaller streets in 2011 (City of Copenhagen, 2011, p. 23).			
	Cycle Track Cleaning	City Plan 2001 - Action plan to improve cycle track cleaning will be drawn up. (City of Copenhagen, 2002, p. 32). Good, Better, Best: The City of Copenhagen's Bicycle Strategy 2011-2025 – Snow clearance has a high priority especially for the new PLUSnet cycling network. Funding for snow clearing has been increased.	Engineering + Budget Decision	Cycle tracks are to be swept more frequently – i.e. especially those tracks near places of weekend entertainment and majority of cycle tracks are to be cleared from snow before morning rush hour traffic (7.30am) (City of Copenhagen, 2002, p. 32)	It is anticipated that annual spending on cycle track cleaning will amount to DKK 5 million (City of Copenhagen, 2002, p. 32), whilst the cost to clear majority of the cycle tracks annually would be DKK 4.2 million. .	2011 – Funding for annual snow clearance on cycle tracks increased by DKK 2 million (City of Copenhagen, 2011, p. 18). 2011 – General track maintenance funding has increased by DKK 10 million a year (City of Copenhagen, 2011, p. 18).	

	Cycle Track Widening	<p>1. Good, Better, Best: The City of Copenhagen's Bicycle Strategy 2011-2025 Plan to increase capacity of cycle tracks to the city centre to accommodate an extra 60,000 cyclists by 2025 (City of Copenhagen, 2011, p. 4).</p> <p>2. Good, Better, Best The City of Copenhagen's Bicycle Strategy 2011-2025. PLUSnet – a network of cycle routes to be established by 2025 with the goal of 3 lanes in each direction on 80% of the network (City of Copenhagen, 2011, p. 11)</p>	Aspiration + Engineering	Sparked on by the notion that polls from the pre Traffic and Environmental Plan for Copenhagen 2004 showed that Copenhagen citizens felt that cycle track congestion was a major problem as a result of high cycle volumes (City of Copenhagen, 2004, p. 19)	Cycle tracks need to be wide enough that cyclists can overtake one another to ensure that cycle traffic flow can be maintained (Nelson, n.d., p. 14)		<p>In 2011 – wider cycle tracks on Nørrebrogade and Store Kongensgade (City of Copenhagen, 2011, p. 27).</p> <p>2012 – 4.1 million kilometres cycled between each serious accident (three times better than in 1995) showing greater safety (City of Copenhagen, 2013, p. 8).</p>
	Centre Medians	<p>City of Copenhagen: Traffic and Environment Plan 2004. Establishing centre medians enabling pedestrians to cross roads in two stages to improve safety (City of Copenhagen, 2004, p. 37).</p>	Engineering				Established medians on Frederikssundsvej (City of Copenhagen, 2004, p. 37).
	Car Sharing Systems	<p>City of Copenhagen Traffic and Environment Plan 2004. Objective that “the environmental impact of traffic must be reduced without impairing mobility”(City of Copenhagen, 2004, p. 38)</p>	Aspiration	Inexpensive means to reduce car travel and influence travel mode	In 2004 only 0.5% of commuters had signed up to the car share site in Copenhagen (City of Copenhagen, 2004, p. 38).	Establishment of internet-based commuter database – pendlernet.dk that is a collaboration between a few Danish municipalities (City of Copenhagen, 2004, p. 38).	
	Smart Road Pricing	<p>Sustainable Transport – Better Infrastructure 2008 – Plan to introduce smart road pricing which would make it expensive to drive in rush hour in the cities of Denmark and</p>	Enforcement				

		less expensive to drive in the rural areas (The Danish Government, 2008, p. 2).				
Policies Found but Not Expected - Christchurch						
	Planning Guidelines					
	Well Integrated & Transport Modes					
	Shared Cycling and Pedestrian Footpaths					
	Subdivision development to include cycling infrastructure					
	Business Case to Support Funding					
	Walking Network					
	Walking Safety Measures					
	Study /Steering Groups					
	Funding					
	Advocate for Safer Vehicle Design					
	Enforcing Rules					
Policies Expected but Not Found in Either City						
Europe Literature (J. Pucher & Buehler, 2008, p. 521).	High Fees and Strict Driver Licensing	Enforcement	High fees for driver licensing is designed to make car ownership expensive (J. Pucher & Buehler, 2008, p. 521).			
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Bicycle Streets	Engineering	Narrow Streets which are designed so that bicycles have the absolute priority over cars (J. Pucher & Buehler, 2008, p. 512). Cyclists do not need to keep to the left of the street and cycle anywhere on it (J. Pucher & Buehler, 2008, p. 514).			
International Literature (John Pucher et al., 2011)	Full Service Bike Facilities					

Europe Literature (J. Pucher & Buehler, 2008, p. 522). (Gehl Architects, 2010, p. 35)	Replacing Car parks with Cycle Parks	Engineering	<i>Car Parking Policy Existed where by 2-3% of inner city car parking was removed each year between 1999-2009 and road space was used for cycle lanes and for wider footpaths (Gehl Architects, 2010, p. 35).</i>		
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Narrow Roads – designed to slow cars	Engineering			
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 502)	Petrol Taxes	Enforcement	Placing high tax on petrol to discourage automobile use (J. Pucher & Buehler, 2008, p. 522)		
Europe Literature (J. Pucher & Buehler, 2008, p. 522)	Turn restrictions for cars but not for cyclists	Enforcement			
Denmark Literature (J. Pucher & Buehler, 2008, p. 512).	Vulnerable Road User Protection Laws	Enforcement	The motorists are responsible for any collisions with cyclists even if the cyclists are in the wrong (J. Pucher & Buehler, 2008, p. 520).		
General Active Transport Literature (Saelens, et al., 2003, p. 84)	Housing Density	Enforcement	Population density is one characteristic that has been noted as being particularly relevant to active transport. The length of trip has a negative correlation to the likelihood of cycling and walking (Saelens, et al., 2003, p. 84).		
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Bike Park Surveillance and Lighting	Encouragement			
Literature on Denmark, Netherlands and Germany (J. Pucher & Buehler, 2008, p. 521).	Park and Ride	Engineering + encouragement	Where those who park their car at a distance and bike the rest of the way get a discount bike rental fee (J. Pucher & Buehler, 2008, p. 521).		

Appendix B

Christchurch Policy and Outcomes Table

Christchurch, New Zealand							
Relevant Literature Source	Policy Measure	Rule/Policy and Year	Form	Additional Info on the policy measure	Relevant Information	Outputs/ Implemented	Outcomes: Measurement of the Policy Analysis
<p>Denmark Literature (J. Pucher & Buehler, 2008, p. 512) and NZ study (Kingham & Koorey, 2011)</p>	<p>Slow Vehicle Zones</p>	<ol style="list-style-type: none"> 1. Getting There – on Foot, by cycle (Strategy). Christchurch 40km/hour temporary school speed zone trial in 2000 (Ministry of Transport, 2005, p. 23) 2. An Accessible City 2013 “<i>Vehicle speeds will be slowed to a maximum of 30km/hr in the Inner Zone</i>” of the CBD (Canterbury Earthquake Recovery Authority, 2013, p. 6). 3. An Accessible City 2013 – Victoria and Colombo Streets will be considered ‘Main Streets’ and slowed to 30km hour to prioritise walking and cycling (Canterbury Earthquake Recovery Authority, 2013, p. 11). 4. Christchurch Transport Strategic Plan 2012-2042 “Neighbourhood streets will be slower” to create a safe system (Christchurch City Council, 2012, p. 54). 5. Safer Journeys 2010-2020 Increase the adoption of lower speeds in urban areas and nationally support will be given to local authorities trying to create 30 km/hr or 40km/hr speed zones (Ministry of Transport, 2010, p. 23). Increased coverage of temporary 	<p>Enforcement</p>	<p>2. Reducing vehicle speeds will help ensure pedestrian safety and promote a pedestrian core to the central city (Canterbury Earthquake Recovery Authority, 2013, p. 8).</p>			<ol style="list-style-type: none"> 1. Trial was considered a success with 96% of people noticing lower speeds around the zones and the Land Transport Safety Authority authorised a nationwide application of the programme in 2002. By 2004 – 12 zones were in place in Christchurch, impacting 15 schools (Ministry of Transport, 2005, p. 23)

		<p>low speeds around schools (Ministry of Transport, 2010, p. 39).</p> <p>6. Christchurch Road Safety Strategy 2006. Develop residential speed zones with zones slower than 50km/hr (Christchurch City Council, 2006, p. 22).</p>				
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Reconfiguring Traffic Intersections	<p>5. An Accessible City 2013 Prioritised intersections for cyclists along key cycling routes in the CBD will improve safety from turning vehicles (Canterbury Earthquake Recovery Authority, 2013, p. 10).</p> <p>6. Christchurch Transport Strategic Plan 2012-2042. Appropriate safety measures will be introduced at intersections to ensure safe crossings on the local cycle network (Christchurch City Council, 2012, p. 33)</p> <p>7. Safer Journeys 2010-2020 'Review the effectiveness of give way rule changes for pedestrian safety (Ministry of Transport, 2010, p. 4).</p>	<p>Engineering</p> <p>Engineering</p> <p>Further Research</p>	<p>2. The Christchurch Transport Strategic Plan document does not identify what measures will be used to improve intersection crossing safety.</p>	<p>3. Number of pedestrian's involved in intersection crashes has increased by 88% since 2000 and many of these involved a turning vehicle (Ministry of Transport, 2010, p. 17)</p>	<p>3. The New Zealand Give Way Rules changed 25th February 2012 - it is considered that the effectiveness on intersection safety will only be able to be measured in a few years' time.</p>
Denmark Literature (J. Pucher & Buehler, 2008, p. 509) and (Nelson, n.d., p. 13)	Advertising/ Advocacy	<p>1. Getting There – on Foot, by cycle (Strategy). "A co-ordinated and effective mix of programmes and initiatives will support development of a strong walking and cycling culture, and proactively encourage and support people to choose walking and cycling more often" (Ministry of Transport, 2005, p. 39).</p> <p>2. Christchurch Transport Strategic Plan 2012-2042. It is planned that an education and promotion programme will accompany the improvements made in Christchurch when establishing a cycle network (Christchurch City Council, 2012, p. 34)</p> <p>3. Pedestrian Strategy for Christchurch City 2001. "Support the Road Safety for Schools Steering group and encourage the continued development of the Safe</p>	<p>Aspiration</p> <p>Education + Encouragement</p> <p>Encouragement</p>	<p>1. A range of activities already existed including walking school buses, 'Push Play' promotion of active lifestyles, National Cycle to Work Day etc. (Ministry of Transport, 2005, p. 39)</p>	<p>It has been commented that activities such as specially organised events e.g. Bike to Work, are successful at raising awareness but that they are not sufficient to change perceptions or behaviours (Christchurch City Council, 2004, p. 14).</p>	

		<p>Routes to School Programme” (Christchurch City Council, 2001, p. 18).</p> <p>4. Christchurch Transport Strategic Plan 2012-2042. Safe Routes to School Programme is in place and emphasis is on safe, convenient school walking routes (Christchurch City Council, 2012, p. 40)</p> <p>5. Pedestrian Strategy for Christchurch City 2001. “Lobby for the greater inclusion of pedestrian safety issues into the official road code and the inclusion of pedestrian safety issues into the licensing and re-licensing of drivers” (Christchurch City Council, 2001, p. 18).</p> <p>6. Pedestrian Strategy for Christchurch City 2001. Continue to promote walking benefits and recreational walking (including walking groups and support promotions like Walk a Child to School Day (Christchurch City Council, 2001, p. 20).</p> <p>7. Christchurch Cycling Strategy 2004 ‘Share the Road’ Campaign to raise awareness of cyclists needs (Christchurch City Council, 2004, p. 27).</p> <p>8. Safer Journeys 2010-2020 continue to support and promote the ‘Share the Road’ culture (Ministry of Transport, 2010, p. 39).</p> <p>9. Christchurch Cycling Strategy 2004 The Press Cycling Page which was a monthly column feature included information on infrastructure, events and cycling stories. (Christchurch City Council, 2004, p. 30).</p> <p>10. Christchurch Road Safety Strategy 2006 Promote cycle lights, correctly fitting helmets and highly visible clothing to cyclists. Also encourage cyclists and car drivers to practice consideration towards each other on the</p>	<p>Education</p> <p>Encouragement</p> <p>Education</p> <p>Education</p> <p>Budget Decision</p> <p>Education</p> <p>Encouragement</p>	<p>9. The Press Cycling Page was in its sixth year in 2004 – it has since been discontinued.</p>		
--	--	---	--	--	--	--

		road (Christchurch City Council, 2006, p. 27).					
Denmark Literature (J. Pucher & Buehler, 2008, p. 512).	Cycle Track Maintenance	<p>Canterbury Regional Land Transport Strategy 2012-2042 “High quality paths and cycle parking facilities are maintained” (Canterbury Regional Transport Committee, 2012, p. 33).</p> <p>Christchurch Cycling Strategy 2004. From July 2004 the council annual budget has put finances aside to allow the sweeping of the popular cycle routes (Christchurch City Council, 2004, p. 25).</p> <p>Christchurch Road Safety Strategy 2006. Maintain cycling facilities to a high standard (Christchurch City Council, 2006, p. 27).</p>	<p>Aspiration +Engineering</p> <p>Budget Decision + Action</p> <p>Engineering</p>	<p>Long term aspiration in the strategy.</p> <p>To keep cycling lanes free of glass, rubbish and other hazards.</p>			
Denmark Literature (J. Pucher & Buehler, 2008, p. 512 & 518)	Bicycle Parking	<p>1. An Accessible City 2013 Cycle parking at convenient locations and is planned at the new Bus Interchange and “super stops” on Manchester Street and near Manchester Street (Canterbury Earthquake Recovery Authority, 2013, p. 10).</p> <p>2. Christchurch Transport Strategic Plan 2012-2042 Providing cycle parking facilities (Christchurch City Council, 2012, p. 30).</p>	<p>Engineering + Encouragement</p>	<p>1. The plan outlines that the parking facilities will be covered and secure where possible (Canterbury Earthquake Recovery Authority, 2013, p. 10).</p> <p>2. Believed that by providing key cycle facilities such as parking that this will help to support a cycling culture (Christchurch City Council, 2012, p. 30).</p>			<p>In 1995 there was space for 579 cycles (at 48 locations) to be parked (Christchurch City Council, 1995, p. iii). It was noted that in 1995 the use of the central city stands provided by the council (48) had not reached capacity (Christchurch City Council, 1995, p. 19)</p>
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 511).	Bicycle Lanes	<p>Christchurch Transport Strategic Plan 2012-2042 It is anticipated that local cycleways which will include on-road cycle lanes, will connect to major cycle routes in the network. “<i>Work will focus on completing existing cycle lanes and filling in the gaps in the network</i>” (Christchurch City Council, 2012, p. 33).</p>	<p>Aspiration + Engineering</p>				<p>On-road cycle lanes in Christchurch were 15km in 1996 (Christchurch City Council, 1995, p. ii), by 2000 this had increased to 29km and by 2004 was at 58km (Christchurch City Council, 2004, p. 11).</p> <p>By 2011 – Christchurch had 330 kilometres of on and off road cycle-ways. Information is</p>

							lacking on the break down is between both (Christchurch City Council, 2011b). In 2004 the on and off road cycle-ways was 131 km (Christchurch City Council, 2004, p. 11).
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 511) and NZ study (Kingham & Koorey, 2011) and (Furth, 2012, p. 108)	Separated Bike Paths	<p>1. An Accessible City 2013 – “Key cycling routes will be prioritised for cycling and have separated paths were possible” (Canterbury Earthquake Recovery Authority, 2013, p. 10).</p> <p>2. Also noted that ‘design guidelines for cycling will be developed by CERA and CCC by December 2013 (Canterbury Earthquake Recovery Authority, 2013, p. 11).</p> <p>3. Christchurch Transport Strategic Plan 2012-2042 the major cycle ways to the cycle network (many of which will be ‘flagship’ cycle ways) will be off-road, separated cycle routes, cycle boulevards and have safe crossing points (Christchurch City Council, 2012, p. 32).</p>	<p>Engineering</p> <p>Further Research + Voluntary (guidelines)</p> <p>Engineering</p>	<p>1. To improve safety for cyclists and provide comfortable routes. Suggestions for a separated bike path include using a kerb or a rumble strip to separate (Canterbury Earthquake Recovery Authority, 2013, p. 10).</p> <p>3. It is envisaged that the major cycle ways will link key destinations such as the University of Canterbury or key activity centres and that they will be designed suit the ability of a child 10 years and over (Christchurch City Council, 2012, p. 32). It is also considered that some routes of the proposed major off-road may undergo transitional treatments before popularity ensures they stay permanent (Christchurch City Council, 2012, p. 32).</p>	Off road paths include paths that run parallel to major expressways or recreational paths that cut through paths or along river banks (Christchurch City Council, 1995, p. 18)	Design Guidelines for Cycling have been developed (Christchurch City Council, 2013)	<p>Off-road paths have increased with 43 km in 1996, 51km by 2000 and 73 km in 2004 (Christchurch City Council, 2004, p. 11).</p> <p>By 2011 – Christchurch had 330 kilometres of on and off road cycle-ways. Unsure what the break down is between both (Christchurch City Council, 2011b). But in 2004 the on and off road cycle-ways was 131 km in total so this is a substantial increase (Christchurch City Council, 2004, p. 11).</p> <p>2013 – CCC invested \$600,000 to redesign Ilam Road near Canterbury University as a trial for the future and modified a 500m stretch of road to include a separated bike path in both directions (Yardley, 2013).</p>

<p>Europe Literature (J. Pucher & Buehler, 2008, p. 522) (Gehl Architects, 2010, p. 35)..</p>	<p>Reduction in Car Parking</p>	<p>1. An Accessible City 2013 A car parking maximum has been proscribed to manage the numbers of vehicles in the Central City Business Zone (Canterbury Earthquake Recovery Authority, 2013, p. 18).</p> <p>2. An Accessible City 2013 On-street parking will be reduced due to anchor projects, cycleways, urban design enhancements and street improvements (Canterbury Earthquake Recovery Authority, 2013, p. 18).</p> <p>3. An Accessible City 2013 Off-street parking buildings will be smaller post-earthquake (Canterbury Earthquake Recovery Authority, 2013, p. 18).</p> <p>4. Canterbury Regional Land Transport Strategy Review of policy surrounding parking policy and district plan requirements (Canterbury Regional Transport Committee, 2012, p. 34).</p> <p>5. Canterbury Regional Land Transport Strategy <i>“Overtime, amount of long stay parking in urban centres is reduced and prices are set to encourage high turnover to support businesses and access by walking, cycling and public transport”</i> (Canterbury Regional Transport Committee, 2012, p. 34).</p> <p>6. Christchurch Transport Strategic Plan 2012-2042 The council will continue to monitor supply and demand of car parking. Also “where a shared priority corridor is identified through the new road classification system, there may be a need to reprioritise road space for public transport and active transport on priority corridors ...where road space is limited” (Christchurch City Council, 2012, p. 59).</p> <p>7. Christchurch Transport Strategic Plan 2012-2042 Off-street parking requirements for developers will be more</p>	<p>Enforcement</p> <p>Engineering + Budget Decision</p> <p>Engineering</p> <p>Further Research</p> <p>Aspiration</p> <p>Further Research</p> <p>Encouragement</p>	<p>4. Off Street Parking in Christchurch – has been reduced following the earthquakes.</p> <p>5. Review of the district plan requirements and policy to take place in the short term (i.e. 2012-2015).</p> <p>6. Vision over the long term (years 13-30 of the strategy) (Canterbury Regional Transport Committee, 2012, p. 34).</p>	<p>Christchurch Car Parking in the City Centre grew quickly between 1959 -1998. For example in 1959 the city centre had a total of 12,100 car parks but by 1998 this had risen to 33,700 car parks (Douglass, 2000, p. 29).</p>	<p>As of July 2013 the CCC had granted 16 new car parks in the city centre following the earthquakes (Gates, 2013). CCC acknowledge that car parking currently exceeds demand with 8000 car parks available in the central city (5000 on street and 3000 off street) – however, many of these have been identified as temporary following the earthquake (Christchurch City Council, 2014c). Also in December 2013 the council confirmed it would commit to providing at least the same number of parks available previously at the Lichfield and Crossing Car Parks when rebuilt (Christchurch City Council, 2014c). On street parking will be reduced post-quake (Christchurch City Council, 2014c).</p>
---	--	--	---	--	---	--

		flexible to encourage better parking and the potential for shared use (Christchurch City Council, 2012, p. 59).					
Christchurch and Copenhagen Literature (Gehl Architects, 2010)	A joined network of cycle tracks/Connected Cycle Routes	<p>1. An Accessible City 2013 – <i>“Prioritised cycle routes connected to the wide Christchurch cycle network will provide good access to the central city and the Core”</i> (Canterbury Earthquake Recovery Authority, 2013, p. 5).</p> <p>2. Canterbury Regional Land Transport Strategy 2012-2042 <i>Over the life of the strategy it is hoped that a complete cycle network will make cycling more attractive</i> (Canterbury Regional Transport Committee, 2012, p. 14).</p> <p>3. Christchurch Transport Strategic Plan 2012-2042 Creation of a connected cycle network across the city which will include “key flagship cycleways” (Christchurch City Council, 2012, p. 7) and have a range of different types of cycleways (Christchurch City Council, 2012, p. 30). Funding for the network will be part of the Council’s next Long Term Plan (Christchurch City Council, 2012, p. 31).</p> <p>4. Christchurch Cycling Strategy 2004 “To ensure the continued development of a cycle network in Christchurch” (Christchurch City Council, 2004, p. 24). A network will consist of radial routes from the city centre, connected by ring links (Christchurch City Council, 2004, p. 25).</p>	<p>Engineering</p> <p>Aspiration</p> <p>Engineering + Budget Decision</p> <p>Engineering</p>	<p>1. The expected outcomes of a complete cycle network include cycling improving health, reducing congestion and improving the overall transport network (Canterbury Regional Transport Committee, 2012, p. 14)</p> <p>3. It is expected that by developing major cycle ways that access and choice of a range of modes of transport will take place and also increase the resilience of the transport network (Christchurch City Council, 2012, p. 12). The policy acknowledges that different cyclists require different cycleways. Including flagship cycleways and recreational cycleways (Christchurch City Council, 2012, p. 30).</p> <p>4. Network plan which will include safe-cycling bubbles around schools, aspiration that no domestic residence in certain urban concentration areas of the city is further than 1km from a link in the network (Christchurch City Council, 2004, p. 25).</p>			

Denmark Literature (J. Pucher & Buehler, 2008, p. 512 & 522). Also New Zealand study on traffic priority (Fyhri et al., 2011).	Traffic Priority for Cyclists/ Pedestrians	<p>1. An Accessible City 2013 – <i>Some streets may be 'pedestrian only' – such as the Retail Precinct on either side of Cashel Street</i> (Canterbury Earthquake Recovery Authority, 2013, p. 8).</p> <p>2. An Accessible City 2013 – <i>“Key cycling routes will be prioritised for cycling”</i> (Canterbury Earthquake Recovery Authority, 2013, p. 10).</p> <p>3. An Accessible City 2013 – <i>Victoria and Colombo Streets will be considered 'Main Streets' and slowed to 30km hour to prioritise walking and cycling</i> (Canterbury Earthquake Recovery Authority, 2013, p. 11).</p>	Engineering + Enforcement				
Denmark Literature (J. Pucher & Buehler, 2008, p. 514)	Car Free Streets	An Accessible City 2013 – <i>“The Retail Precinct in the blocks on either side of Cashel Street will be for pedestrians only”</i> (Canterbury Earthquake Recovery Authority, 2013, p. 8).	Enforcement + Engineering		Christchurch historically had Cashel Street and High Streets (City Mall), Cathedral Square and New Regent Street closed off to car access.		
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Bike Share or Bike Hire System	Christchurch Transport Strategic Plan 2012 -2042 Provide cycle hire schemes to help encourage cycling. (Christchurch City Council, 2012, p. 30 &34).	Engineering + Encouragement	Belief that providing cycle hire schemes will help to support a cycle culture in the city (Christchurch City Council, 2012, p. 30).			
Copenhagen Only							
Denmark Literature (J. Pucher & Buehler, 2008, p. 512 & 514)	Traffic Calming						
Copenhagen (Nelson, n.d., p. 13)	Green Cycle Routes		Engineering				
Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Cycle Shortcuts		Engineering				
Copenhagen Literature (J. Pucher & Buehler, 2008, p. 514)	Cycling Two-Ways on One-Way Streets						

Denmark Literature (J. Pucher & Buehler, 2008, p. 512)		Bike Rentals joined with public transport				
Not requiring a helmet – Denmark (J. Pucher & Buehler, 2008, p. 509)		Cycle Helmets				
Denmark Literature (J. Pucher & Buehler, 2008, p. 502)		High taxes and fees on car ownership	Enforcement			
Christchurch Only						
Europe Literature (J. Pucher & Buehler, 2008, p. 522)	Land beyond already built up areas off limit for development	Christchurch Transport Strategic Plan 2012-2042. <i>“There is a focus on intensification around centres, including the Central City, to reduce the impact of sprawl on the Canterbury Plains and the cost of infrastructure”</i> (in the Urban Development Strategy which sets the long-term growth pattern for greater Christchurch) (Christchurch City Council, 2012, p. 17)	Enforcement + Encouragement			
Denmark and Europe Literature but refers to New Zealand (Fyhri et al., 2011, p. 709)	Walking School Buses	Pedestrian Strategy for Christchurch City 2001. Support Walking School Bus (Christchurch City Council, 2001, p. 20).	Encouragement	Walking School Bus is a concept design to promote walking for children, and it aims to increase numbers of children walking to school.		The council has produced a guidance booklet for parents which includes advice such as ensuring there is one ‘driver’ or adult for every six children walking to school and this includes a roster template (Christchurch City Council, 2011c).

New Zealand Literature (Kingham & Koorey, 2011)	Work Place Facilities	Canterbury Regional Land Transport Strategy 2012-2042 <i>Workplaces will be encouraged to adopt policies that provide for facilities such as showers, lockers and changing rooms</i> (Canterbury Regional Transport Committee, 2012, p. 13)	Encouragement				
General Literature (Saelens et al., 2003). Also Europe Literature (J. Pucher & Buehler, 2008, p. 522).	Mixed Use Development	<p>1. Getting There – on Foot, by cycle (Strategy). <i>Future land use, planning and urban design will result in new communities and developments that provide a wide range of destinations within walking and cycling distance and environments that invite people to walk and cycle</i> (Ministry of Transport, 2005, p. 27).</p> <p>2. Christchurch Transport Strategic Plan 2012-2042. Integration of land use (Christchurch City Council, 2012, p. 45) and the idea of building developments right the first time so that transport infrastructure does not need to be retrofitted at a later date (Christchurch City Council, 2012, p. 52). Activities designed to support this are Outline Development Plans (ODPs) which consider how connections to surrounding transport networks will work and Integrated Transport Assessments which are more detailed than ODP's (Christchurch City Council, 2012, pp. 52-53).</p>	Aspiration + Enforcement	<p>2. Based on the idea that spaces where people live, work, shop and play will contribute to the most influence on modal choice (Christchurch City Council, 2012, p. 45). It is anticipated that transport policies be integrated during the Christchurch District Plan review and that the changes will promote mixed use development (Christchurch City Council, 2012, p. 52).</p>	Based on the idea that if land use activities are well located and well-designed then less travel is required as people “live closer to their main destinations for work and play” (Canterbury Regional Transport Committee, 2012, p. 23).		
Denmark Literature (J. Pucher & Buehler, 2008, p. 513)	Maps & Signage	<p>1. Getting There – on Foot, by cycle (Strategy). <i>Outlining the Lyttelton Pedestrian maps and signs as a best practice example of highlighting and providing pedestrian-friendly information.</i> (Ministry of Transport, 2005, p. 42).</p> <p>2. An Accessible City 2013 –New bilingual signage (English and Te Reo Maori), way finding systems, interpretation mapping and information about the car parks available will be developed to help</p>	Education	<p>1. Included information such as walking shortcuts, locations of particular destinations and expected walking time. Was launched in October 2004 (Ministry of Transport, 2005, p. 42).</p> <p>2. The ‘way finding’ will include walking and</p>			

		<p><i>motorists, cyclists find their way around the central city</i> (Canterbury Earthquake Recovery Authority, 2013, p. 19).</p> <p>3. Christchurch Transport Strategic Plan 2012-2042. Way finding will be included, consistent with the Christchurch Central Recovery Plan and will include signage, mapping and publications for a range of transport modes (Christchurch City Council, 2012, p. 46)</p> <p>4. Christchurch Cycling Strategy 2004 20,000 free maps provided illustrating cycling facilities (Christchurch City Council, 2004, p. 27)</p>	Encouragement	cycling signage on the routes.			
Denmark Literature (J. Pucher & Buehler, 2008, p. 519).	Cycling Safety Education	<p>1. Getting There – on Foot, by cycle (Strategy). <i>Cycle Safe Christchurch initiative began 1997 to train Year 6 primary school children (age 10-11 year olds) on cycle maintenance,, safe riding and includes an individual on-road test.</i> (Ministry of Transport, 2005, p. 47).</p> <p>2. Christchurch Cycling Strategy 2004 Continue to improve the Cycle Safe Programme for schools (Christchurch City Council, 2004, p. 26).</p>	Education + Budget Decision	2. Practical skill based training for Year 6 school students provided by the city council (Christchurch City Council, 2004, p. 26).		Positive evaluation given by the Injury Prevention Unit at Auckland University (Ministry of Transport, 2005, p. 47). In 2003-2004 over 3,700 pupils went through the programme and this reached over 90 schools (Ministry of Transport, 2005, p. 47).	Ministry of Transport consider that the programme has led to an increase in cycling and that children who have undertaken the programme are less likely to crash. "The benefits of the programme outweigh the costs by almost eight to one" (Ministry of Transport, 2010, p. 39).
Copenhagen Literature (Gehl Architects, 2010, p. 84) (Gehl, 1987, p. 133)	Attractive Streetscapes	1. Christchurch Transport Strategic Plan 2012-2042. One of the principles for the new road classification system proposed in the plan is "attractive streetscapes for walking, improving safety and reducing conflict with all other modes" (Christchurch City Council, 2012, p. 26).	Engineering				

		<p>2. Christchurch Transport Strategic Plan 2012-2042. The council proposes to seek opportunities to lead walking projects and initiatives to create vibrant commercial centres which include streetscapes with 'attractive' footpaths (Christchurch City Council, 2012).</p> <p>3. Pedestrian Strategy for Christchurch City 2001. "Encourage good land use planning including the development of subdivisions and communities to a "human scale" (Christchurch City Council, 2001, p. 17).</p>	<p>Aspiration</p> <p>Voluntary</p>				
Policy's Found in Both Cities but Not Expected							
	Cooperat ion between Policies	<p>Getting There – on Foot, by cycle (Strategy) <i>Implementing Getting there – on foot, by cycle will also contribute to a variety of other Government strategies and policies including: - New Zealand Health Strategy, Sustainable Development for NZ Programme of Action, New Zealand Energy Efficiency and Conservation Strategy...</i>" (Ministry of Transport, 2005, p. 9)</p> <p>Getting There – on Foot, by cycle (Strategy) <i>Walking and cycling are to be effectively integrated into transport planning, strategies and policies</i> (Ministry of Transport, 2005, p. 16)</p>	Aspiration	In total thirteen government strategies and policies are included in this strategy as being linked to as well the New Zealand Transport Strategy 2002.			
	Redesign ing Road Sections	<p>1. Getting There – on Foot, by cycle (Strategy) <i>'Living Streets' Redesign in Christchurch of busy Christchurch roads to benefit walking and cycling</i> (Ministry of Transport, 2005, p. 18).</p> <p>2. CCC City Plan 2005 'Providing road environments that appropriately</p>	Engineerin g	Creyke Road in Christchurch is used as an example of a street where redesigning which narrowed the road, introduced a cycle lane,			The strategy does not outline what benefits took place as a result of the 'living street' approach to Creyke Road as at the time this was yet to be completed (Ministry of Transport, 2005, p. 19)

	accommodate pedestrians and cyclists” (Christchurch City Council, 2005b, p. 7.9.2). Plan updated 2013 following the Accessible City. 3. Canterbury Regional Land Transport Strategy 2012-2042 “Some road space within urban areas will be relocated for safe use of active modes and efficient and active public transport” (Canterbury Regional Transport Committee, 2012, p. 7)		widened the foot path and placed public art near but not obstructing the pedestrian flow (Ministry of Transport, 2005, p. 18). 2/3 of street parking was also removed and significant tree planting took place (Ministry of Transport, 2005, p. 18).			
Policies found but not expected - Copenhagen						
	Bicycle Highway					
	One-Way Streets Elimination					
	Cycle Track Cleaning					
	Cycle Track Widening					
	Centre Medians					
	Car Sharing Systems					
	Smart Road Pricing					
Policies found but not expected - Christchurch						
Planning Guidelines	<p>Getting There – on Foot, by cycle (Strategy) <i>A set of guidelines has been created with the aim of promoting “effective planning and design for cycling and walking in New Zealand transport”</i> (Ministry of Transport, 2005, p. 21).</p> <p>An Accessible City 2013 Design guidelines will be firstly developed for the “functional requirements for movement, barrier-free access, pathways, cycling, road widths, speed management” etc. (Canterbury Earthquake Recovery Authority, 2013, p. 20).</p>	<p>Voluntary</p> <p>Further Research + Voluntary</p>	<p>1. Examples of the guidelines include:</p> <ul style="list-style-type: none"> - Cycle Network and Route Planning Guide 2004 aiming to promote best practice approach. - Pedestrian Network Planning and Facilities Design Guide (publication was expected 2005) 		<p>2013 Christchurch Cycle Design Guidelines released to accompany the ‘Christchurch Transport Strategic Plan (Christchurch City Council, 2013).</p>	

	Christchurch Transport Strategic Plan 2012-2042. Guidelines will be developed to “identify the range of tools and infrastructure standards to guide the development of the cycle networks” outlined in the plan (Christchurch City Council, 2012, p. 34)		- Guidelines for Facilities for Blind and Vision Impaired Pedestrians (Ministry of Transport, 2005, p. 21)			
Well Integrated & Transport Modes	Christchurch Transport Strategic Plan 2012-2042. Local connections will be made on the strategic network (primarily used for vehicles and freight) so that modal choice is improved (Christchurch City Council, 2012, p. 28). Proposed super bus stops will include improved walking access and cycle parking facilities (Christchurch City Council, 2012, p. 39).	Engineering Encouragement	Well-integrated connections with walking, cycling and public transport to ‘strategic’ roads (Christchurch City Council, 2012, p. 28)		Bikes can be taken on some buses (2 at a time)(Environment Canterbury Regional Council, 2014).	
Shared Cycling and Pedestrian Footpaths	1. Christchurch Transport Strategic Plan 2012-2042. Creating more shared footpaths across the city will improve access for cycling to key facilities in the community such as schools (Christchurch City Council, 2012, p. 30). 2. Christchurch Transport Strategic Plan 2012-2042. Shared paths will be an option for local cycleways which will be used as connections between the major off-road cycleways (Christchurch City Council, 2012, p. 33).	Aspiration + Engineering				
Subdivision development to include cycling infrastructure	1. Christchurch Transport Strategic Plan 2012-2042. “Cycle lanes will be encouraged in new subdivisions” (Christchurch City Council, 2012, p. 33).	Voluntary	It is expected that this would aid connectivity in growth areas of the city and greater Christchurch.			
Business Case to Support Funding	1. Christchurch Transport Strategic Plan 2012-2042. A business case is to be developed to recognise the wider benefits of active transport and to assist with future funding applications (Christchurch City Council, 2012, p. 34).	Further Research				

Walking Network	1. Christchurch Transport Strategic Plan 2012-2042. Network planning will be undertaken to determine where improvements to current walking core routes and connections could be made (Christchurch City Council, 2012, p. 40)	Further Research				
Walking Safety Measures	Pedestrian Strategy for Christchurch City 2001. Carry out research on the methods which can be used to improve safety and access, research the best locations and facilities to aid pedestrians to cross roadways (i.e. the pedestrian facilities) (Christchurch City Council, 2001, p. 16 & 17). Pedestrian Strategy for Christchurch City 2001. Review lighting provision in pedestrian areas) (Christchurch City Council, 2001, p. 17).	Further Research Further Research	It is noted that the Pedestrian Strategy was going to be followed up with a 'detailed implementation plan' (Christchurch City Council, 2001, p. 31).			
Study /Steering Groups	1. Pedestrian Strategy for Christchurch City 2001. Establish a Pedestrian Safety Steering Group (Christchurch City Council, 2001, p. 18). 2. A Cycle Steering Group was established to initiate and compile the first Christchurch Cycle Strategy 1996 (Christchurch City Council, 1995, p. i; 2004, p. 6).	Further Research	2. The Cycle steering group included CCC staff, ECAN staff, and councillors, reps from the Automobile Association and Land Transport Safety Authority and cycle advocates (Christchurch City Council, 2004, p. 6).		2. The Cycle Steering Group has provided cycle advice since 1996 and updated the 1996 strategy in 2000 (Christchurch City Council, 2004, p. 6).	
Funding	Metropolitan Christchurch Transport Statement has led to an increase in funding for cycling. Proposed an increase of 40% in budget for the financial years of 2004-05 and 2005-06 (Christchurch City Council, 2004, p. 15).	Budget Decision		Between 1996 and 2004 council cycling expenditure was consistent at between \$750,000 and \$1 million a year (Christchurch City Council, 2004, p. 16).		
Advocate for Safer Vehicle Design	Christchurch Road Safety Strategy 2006. Advocate for national policies that will "lead to the design of vehicles that will cause less	Encourage				

	<i>injury to pedestrians in the event of a collision” (Christchurch City Council, 2006, p. 28)</i>					
Enforcing Rules	Christchurch Road Safety Strategy 2006. <i>Enforce road code rules so that drivers and cyclists have a higher anticipation of being apprehended by the police(Christchurch City Council, 2006, p. 27).</i>	Enforcement				
Policies Expected but Not Found In Either City						
High Fees and Strict Driver Licensing Europe Literature (J. Pucher & Buehler, 2008, p. 521).	Enforcement	High fees for driver licensing is designed to make car ownership expensive (J. Pucher & Buehler, 2008, p. 521).				
Bicycle Streets Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Engineering + Enforcement					
Full Service Bike Facilities International Literature (John Pucher et al., 2011)	Encouragement					
Replacing Car parks with Cycle Parks Europe Literature (J. Pucher & Buehler, 2008, p. 522). (Gehl Architects, 2010, p. 35)	Enforcement + Engineering					
Narrow Roads – designed to slow cars Denmark Literature (J. Pucher & Buehler, 2008, p. 512)	Engineering					
Petrol Taxes Copenhagen Literature (J. Pucher & Buehler, 2008, p. 502)	Enforcement					
Turn restrictions for cars but not for cyclists Europe Literature (J. Pucher & Buehler, 2008, p. 522)	Enforcement					
Vulnerable Road User Protection Laws Denmark Literature (J. Pucher & Buehler, 2008, p. 512).	Enforcement	In New Zealand cyclists were found to have the primary responsibility in only 25% of all cyclist-vehicle crashes in which the cyclists was injured or killed (Ministry of Transport, 2010, p. 38).				
Housing Density General Active Transport Literature (Saelens, et al., 2003, p. 84)						
Bike Park Surveillance and Lighting Denmark Literature (J. Pucher & Buehler, 2008, p. 512)						
Park and Ride Literature on Denmark, Netherlands and Germany (J. Pucher & Buehler, 2008, p. 521).	Engineering + Encouragement					

Appendix C

Variables Impacting Active Transport

Variables Impacting Active Transport					
Independent Variables <i>Things that I hypothesis will make a difference to the dependent variable (active transport modal share)</i>	Is there a difference between the cities	Is the difference conducive for Copenhagen's Active Transport Participation?	Can public policy change the difference?	Are the policies implementable?	How the policies change and the time frame for change
Sociological Factors					
Advertising and Marketing	<p>Yes. Copenhagen has carried out numerous campaigns since 1995 and includes a Traffic Environment Week every September (puts a focus on transport and the opportunity to trial different measures). Both cities have advertising working to change behaviour of cyclists, pedestrians, and motorists. Chch has bike to work, walk to school and road safety campaigns and a range of activities, including the push play promotions have been utilised.</p>	<p>No. It has been noted that activities and events are not sufficient to change behaviour but do raise awareness.</p>	n/a	n/a	<p>n/a</p> <p>Local and National.</p> <p>Short Term.</p>
Bike Surveillance	No.	<p>No. No bicycle surveillance policies found in either city.</p>	n/a	n/a	<p>n/a</p> <p>Local.</p> <p>Short Term.</p>
Cycle Helmets	<p>Yes. Compulsory in New Zealand for cyclists and only encouraged in Copenhagen.</p>	<p>Yes. Can be seen as a deterrent for fashion conscious travellers. There are also studies suggesting that drivers are more aggressive towards cyclists with helmets as they are perceived as 'safe and protected'.</p>	Yes.	Yes.	<p>National Govt.</p> <p>Mid Time Frame. Could be done quickly and have effect immediately but in NZ's case would require a change of legislation which</p>

					is likely to take time as it goes through the normal consultative process.
Cycle Safety Education	Yes. Christchurch Only.	No. The Cycle Safe Chch programme has been considered successful since its adoption in 1997 as a training initiative for Year 6 school children. Has been linked to increased cycling and lower crash rates. Although no policy found, Copenhagen has a high percentage of child cyclists and 'it is generally taken for granted that children will learn to cycle at home' (Ministry of Foreign Affairs of Denmark, n.d.). "Around 55 % of all school children cycle to school on a regular basis either alone or with a parent" (Technical and Environmental Administration, 2011, p. 14)	Yes.	Yes. Can measure how many school children have gone through the programme etc.	Local Govt and National Govt. Short Time Frame.
Walking School Buses	Yes. Christchurch Only	No. Appears to be successful at encouraging children to walk to school and at ensuring parents feel that this is undertaken in a safe manner. NZ walking school buses been referred to in Europe Literature indicating it is considered successful	Maybe. Public Policy can only work to encourage walking school buses. For example the 2011 Chch Pedestrian Strategy aims to support walking school buses.	No. Hard to measure the effectiveness of 'support' or 'encouragement'.	Local Change. Short Time Frame.
Life Expectancy	Yes.	No. As of 2012 New Zealanders live approx. 2 years longer – not considered a large difference.	n/a	n/a	n/a
Safer Vehicle Design	Yes. Christchurch Only.	No. 2006 Chch strategy to advocate for safer national vehicle design standards in	Yes.	No. No outcomes found, resulting from the policy.	National or even International Regulations.

		event of collisions with a pedestrian.		NZ does have a 'Used Car Safety Rating' for vehicles which rank how well each vehicle protects its driver from death or serious injury in a crash as well as protection to other road users such as pedestrians and cyclists (New Zealand Transport Agency, 2013b).	Longer time frame.
Traffic Calming i.e. car free days	Yes. Policy measures only found in Copenhagen.	No. Inconclusive results on the effectiveness of car free days as a traffic calming measure and the policy was not repeated.	n/a	n/a	Local i.e. appeared in the City of Copenhagen Traffic and Environment Plan 2004. Short time frame.
Vulnerable Road User Protection Laws	No.	No. No vulnerable road user protection laws found. Mention of 'strict liability' laws was made on blog postings on Denmark.	n/a	n/a	National. Mid-Term
Work Place Facilities i.e. showers, lockers, changing rooms	Yes. Policy on this only found in Christchurch.	No. Policy was only to encourage workplaces to provide for facilities	n/a	No.	Local or National. Mid Time Frame. Need time to incentivise and encourage businesses to provide facilities.
Infrastructure/Physical Factors					
Bicycle Highway	Yes. Only in Copenhagen.	Yes. Plans for the completed highway route to cover 300km to make cycling easier (City of Copenhagen, 2014).	Yes.	Yes. Newly opened, the success of the highway has not had much time to be measured thus far.	Local. "A total of 22 municipalities in the Greater Copenhagen area have all collaborated to build the new network of cycle routes" (City of Copenhagen, 2014). Long Term. Requires a lot of prior planning.
Bicycle Lanes	Yes. Copenhagen has a less cycle lanes than Christchurch (often	No. Copenhagen has significantly less cycle lanes, yet a	Yes.	n/a	Local. Shorter term.

	distinguished by painted lines on the road. As at 2010 Copenhagen had 23km of cycle lanes (Technical and Environmental Administration, 2011, p. 7). Christchurch currently has approximately 108.1 km of cycle lanes (on road) (T. Williams, 2014).	much higher cycling modal share. Cycle lanes are better than no cycle lanes in Christchurch but they are not conducive to Copenhagen's active transport success.			
Bicycle Parking (Quantity and Quality)	Yes. Copenhagen has put in place new building bicycle parking requirements and this includes developing more cargo bike parking. Christchurch has minimum cycle parking requirements in place for the central city in its city plan (Christchurch City Council, 2005a). Christchurch also has policy for cycle parks at new 'super stops' to link in with public transport and to provide cycle parking facilities.	Yes. Copenhagen currently has a greater quantity of cycle parking. The 2010 Bicycle Account lists 48000 bicycle parking spaces on roads and pavements (Technical and Environmental Administration, 2011, p. 7).	Yes. Transport policy measure as well as urban policy planning whereby the developers take responsibility to provide cycle parks.	Yes. Christchurch's recent documents have not had time to be implemented and assessed. Copenhagen has increased parking for bicycles at the Svanemøllen station and Nørreport stations.	Local. Local authorities create the parking regulations. Mid Term Change Would take a long time before the impacts of new regulations were enjoyed.
Bicycle Streets	No.	No. No policies on bicycle streets found in either city.	n/a	n/a	Local. Short Term.
Public Transport and Bikes	Yes. On an S-train ride in Copenhagen one can take their bike along with them for free (Norman & McOmish, 2014; VisitDenmark). If one would like to take their bike along on the regional trains around Copenhagen or on the metro, they need to buy an extra bike ticket, as well as their fare (VisitDenmark).	No. To take a bike on the metro in Copenhagen costs 13 kroner (NZD \$2.76) but they are not allowed in rush hour (Norman & McOmish, 2014). Bikes are allowed on the 's-line' but are not permitted to be taken through the Nørreport station during peak hours (Monday to Friday 07:00 – 08:30 and 15:30 – 17:00) (Norman & McOmish, 2014). Bikes are permitted on buses in Copenhagen but "each bus is limited to two bikes even if the space isn't taken up by prams and other people and it's	Maybe	Yes	Local – requires authorities to collaborating with public transport providers. Short Term.

		up to the discretion of the bus driver. Generally, people do not travel with their bikes on buses in Copenhagen” (Norman & McOmish, 2014). In Christchurch bikes can be taken on some buses, but this only operates on some buses and like Copenhagen is limited to two bikes per bus (Environment Canterbury Regional Council, 2014)			
Bike Share and Public Transport	Yes. Only in Copenhagen	Yes. The bike share system in Copenhagen coordinates Cycling in with public transport.	Yes. Investment can encourage bids for best design as was the case in Copenhagen.	Unsure. New ‘GoBike’ bike share system in place with many docking stations close to train stations. Copenhagen’s funding and goal was followed through. Popularity of the new system not yet known or measured. Previous bike share was not well utilised.	Local – requires authorities to collaborate with public transport providers. Short Term.
Bike Share System	Yes.	Yes. Copenhagen has had a system in place since 1995, with the new system introduced 2013. Christchurch in contrast plans to provide cycle hire schemes in the future to encourage cycling and support a cycling culture. Nothing has been established thus far (mainly an aspiration thus far). Effectiveness of the system unknown - previous bike share in Copenhagen was not well utilised.	Yes. The policy needs to be enforced and measurable however - i.e. Christchurch policy does not include any action or timelines. Investment can encourage bids for best design as was the case in Copenhagen.	Unsure. New ‘GoBike’ bike share system in place with many docking stations close to train stations. Copenhagen’s funding and goal was followed through. Popularity of the new system not yet known or measured. Previous bike share was not well utilised. Yet to see whether Christchurch follows through with funding and investment.	Local. Short Term.
Car Parking - Quantity	Yes. Christchurch has now placed a car parking maximum in the central city business zone and the new accessible city plans to reduce car parking. Off-street car	Yes. Copenhagen has been reduce car parking since the beginning of the new millennium, whilst Christchurch is only	Yes.	Yes. Copenhagen parking is considered rare and expensive. Although Copenhagen has recently opened up	Local. Local authorities regulate parking

	<p>parking buildings are to be smaller than pre-quake.</p> <p>Copenhagen had a policy about reducing 2-3% of inner city parking a year and using it for wider footpaths, cycle lanes etc. They also had plans for a parking strategy to provide free parks for shared cars and to move parking off-street.</p>	<p>just starting to talk about it.</p> <p>Both cities are now aiming to reducing 'on-street' car parking.</p>		<p>a new car parking building for 840 car parks in 2010.</p>	<p>Mid Term Change</p>
<p>Free Car Parking at Shopping Malls</p>	<p>No.</p> <p>Shopping malls in both Christchurch and Copenhagen have an extensive array of car parks.</p>	<p>No.</p> <p>The Fisketorvet Shopping Centre 'Copenhagen Mall' in Copenhagen has 120 shops with 2000 car parks of which the first 3 hours of car parking is free (Wonderful Copenhagen, 2014a). In Christchurch, Northlands shopping mall has 112 shops with 1700 free car parks (Kiwi Income Property Trust, 2014) and Riccarton mall has 193 stores with 2400 car parks (McNulty, 2014).</p>	<p>n/a</p>	<p>n/a</p>	<p>n/a</p> <p>Local – could change consent approvals so that a condition of consent was fewer car parks permitted.</p>
<p>Car Share</p>	<p>Yes.</p> <p>Copenhagen Only.</p>	<p>No.</p> <p>Only evidence of minor sign up rates (i.e. 2004 only 0.5% of commuters were signed up to the car share site which was a collaboration between different municipalities).</p>	<p>Maybe.</p> <p>Policy could help to establish a car sharing system but private investors could also see merit in the concept.</p>	<p>No.</p> <p>Hard to find information about the outcomes of the 2004 aspiration. Much harder to find information on the 'car share' programme in Copenhagen, compared to the 'bike share'.</p>	<p>n/a.</p> <p>Local Authorities could investigate management of this but it is likely to come from a private or public-private partnership investment.</p>
<p>Car-Free Streets</p>	<p>Yes.</p> <p>Copenhagen have car free streets in place in neighbourhoods such as Norrebrogade and not just the central city area like Christchurch.</p>	<p>Yes.</p> <p>Significant evidence of the success of the 2008 improvements to Norrebrogade and Strograde seen as a success. Please note – no actual policy found on this but implementation evidence located.</p>	<p>Yes.</p>	<p>Yes.</p> <p>Hard to know what the policy related was. With the Norrebrogade change it appears to have been a decision which came directly from the former traffic Mayor, Klaus Bondam (Colville-Andersen, 2013).</p>	<p>Local.</p> <p>Short Term.</p>
<p>Centre Medians</p>	<p>Yes.</p> <p>Only written in Copenhagen policy</p>	<p>No.</p> <p>Although only written in Copenhagen policy – this is also common practice in</p>	<p>Yes.</p>	<p>Yes.</p>	<p>Local.</p> <p>Short Term.</p>

		Christchurch with many centre medians in place which assist safe pedestrian crossing (i.e. Fendalton Rd, Deans Ave etc.			
Cycle Shortcuts	Yes. Only in Copenhagen	Yes. They have been seen as effective at reducing times for active transport modes - being well utilised once built.	Yes. Policy can outline more shortcuts.	Yes. In Copenhagen a number of bridges and shortcuts have been built to improve cycling efficiency and these are well utilised. I.e. the Bryggebroen bridge had over 9000 cycle trips a day in 2010.	Local. Mid –Term. Would require some planning and construction time lags.
Cycle Track Maintenance and Cleaning	Yes. Christchurch policy includes aspirations and from July 2004 the council budget included finances for the sweeping of popular tracks (does not specify the amount). Copenhagen has increased funds for cycle track maintenance and uneven track sections were allocated funds for replacement.	Yes. Both cities include policies on cycle track maintenance but Copenhagen specifies the dollar amount whereas Christchurch does not. Of note - Chch cyclists have not strongly complained about cycle track maintenance as was the case in Copenhagen prior to increased investment with half of 2002 cyclists dissatisfied with cycle track maintenance.	Yes. Increase budget, and the time of cleaning and maintenance.	Yes. Copenhagen’s policy was implemented and its effectiveness measured in the bicycle account. Set a measurable goal. Christchurch’s policy does not include a measurable goal for maintenance.	Local. Short Term.
Cycle Track Widening	Yes. Only in Copenhagen. Plan to widen aspects of the cycle route to 3 lanes in each direction by 2025.	Yes. Copenhagen has significantly wider tracks but they also carry more cyclists.	Yes.	Yes.	Local. Mid Term. Would require planning and construction time lags
Enabling Cycling Two-Ways in One-Way Streets	Yes. Only in Copenhagen	Maybe. Gothersgade in Copenhagen is now open for bicycles travelling in both directions but the outcomes of such action is yet to be measured for effectiveness.	Yes. Traffic Engineering or new signage can be introduced so that cyclists know they are allowed to ride both ways in a one way street.	No.	Local. Mid Term. A change that could happen reasonably quickly but cycle lanes and tracks would likely need to be located on either side.
Green Cycle Routes	Yes. Only in Copenhagen	Yes. They have been seen as effective - being well utilised once built.	Yes. Policy can outline a quantity of kilometres to be	Yes If a date is given by which routes will be constructed by.	Local. Appeared in municipal bicycle policy in Copenhagen.

			constructed, the timeline and the funding set aside to do so.		Mid Term.
Lighting for biking and walking	No. No policy found for either cities.	n/a Christchurch did include a 2001 strategy to review lighting provision in pedestrian areas - but this was to be followed up with a detailed implementation plan.	n/a	n/a	n/a Local. Short Term.
Linking cycle and walking tracks -one coordinated network	Yes. Both cities aim to have a connected network that maximises direct routes for cycling and walking.	Yes. Copenhagen has already worked to eliminate gaps in the cycle tracks and are currently focusing on eliminating missing links on main arterial routes. Christchurch is hoping to create a connected cycle network with radial routes from the centre, connected by ring links. The network is to include a range of different cycle ways. Christchurch also plans to undertake network planning to identify where key improvements could be made for walking connections.	Yes. Funding allocation, implementation dates etc. can all help change the difference. Christchurch appears to now be improving but the implementation may take some time.	Yes.	Local. But may also require more national or integration amongst local authorities for a large network. Mid Term. Requires planning to ensure routes are interconnected.
Reconfiguring Traffic Intersections	Yes. Chch inclusion of policy on reconfiguration of traffic intersections all recent (i.e. post 2010) whereas in Copenhagen it has been a more consistent feature. Chch Transport Strategic Plan does not outline what measures will be used to improve intersection safety. Chch plans to develop prioritised intersections. Copenhagen has been reconfiguring intersections since at least 2002 using car set back lines and marked crossings. They are also trialling cyclist detection systems.	Yes. Copenhagen has identified ways to improve safety at intersections (set back lines for cars and marked crossings to indicate where cyclists should ride). Reconfiguration of intersections found to be successful with 70 fewer accidents at intersections in 2009, than in 2008 in Copenhagen. In contrast Chch intersection crashes increased by 88% between 2000 and 2010. Green waves for cyclists have improved bicycle traffic times by as	Yes. Traffic markings can be made (infrastructure), intelligent traffic system signals can be installed, and cyclists can be given a green signal before turning vehicles at intersections.	Yes. Copenhagen strategy outlines timelines by which intelligent traffic systems will be in place etc., when technological solutions are to be tested etc. Christchurch's policy not as implementable.	Local. Depending on who has responsibility it may also be the National Transport Authorities job to carry out reconfiguration implementation. Mid Term.

		much as 12% (Danish Ministry of Transport, 2014, p. 37).			
Separated Bike Paths	Yes. Copenhagen identified approx. 70km of cycle lanes and cycle tracks to be developed between 2006 -2026. Christchurch has identified that new cycle ways will be separated paths where possible.	Yes. Christchurch currently has approximately 61 km of cycle tracks (off-road/separated) (T. Williams, 2014). In contrast Copenhagen had 346km of cycle tracks in 2010 (Technical and Environmental Administration, 2011, p. 7). Copenhagen much more ambitious - i.e. first cycle track plan 1981 and substantial increases over time.	Yes.	Yes. Copenhagen list a goal of wishing to lay 51km of cycle tracks between 2006 and 2016. Christchurch more aspiration based - "separated paths where possible" harder to implement.	Local. Mid Term requires extensive infrastructure investment.
Shared Cycling and Pedestrian Footpaths	Yes. Only found in Christchurch policy. Shared paths are seen as an option when establishing local cycle ways which connect with the major cycle routes.	No. Copenhagen is the city with the higher active transport modal share and yet it does not have any shared paths (Keldorff, 2014).	N/A.	N/A	N/A
Slow Vehicle Speed Zones	Yes. Christchurch only slow speed zones at present around schools but plans for inner CBD areas and for some streets to be slowed to 30km/hr. Copenhagen slow speed zones in place in some areas.	Yes. Christchurch speed zones not yet implemented. Has been seen as an effective measure in both cities with increased sense of safety in Copenhagen and lower motorist speeds around school zones.	Yes.	Yes.	Local. Short Term. An easy change – requiring signage and enforcement.
Turn Restrictions for Cars	No.	No. No policy found for either city on this policy measure.	n/a	n/a	n/a
Economic Factors					
Average Income	Yes. In 2010 Copenhagen average income approx. NZD \$55,600. Canterbury average income \$35,724	No. Active transport is not expensive compared to other modes and hence one can assume income is not significant given that Copenhagen have a higher income and still a higher active modal share.	No.	n/a	n/a

Cost of Central City Car Parking	Yes. Copenhagen is more expensive than Christchurch.	Yes. Copenhagen general city car parking is rated as three different zones and they charge between Monday at 08:00 till Saturday at 17:00. The closer one gets to the city, the dearer the parking becomes. The cheapest of the three zones is 11 kroner an hour (approx. \$2.30 NZD) and the dearest is 30 Kroner (\$6.37 NZD) (Wonderful Copenhagen, 2014c). New Chch car parking building opened Victoria St charging \$2 NZD an hour, and \$5 all day (Transport and Greenspace, 2014)	Yes.	Yes.	Local. Especially if they are local authority owned car parking buildings. Short Term.
Purchasing Power	Yes. Copenhagensers earn more but it also costs more to live.	No. Although Local Purchasing Power in Copenhagen is approximately 40% higher than in Christchurch (Numbeo, 2014), this is not expected to be correlated to high active transport levels. In fact, the city with higher car ownership had the lower level of purchasing power.	No.	n/a	n/a
Employment Rate	Yes. Denmark 63% employed over 15 years. New Zealand 65%.	No. Minor difference.	n/a	n/a	n/a National. Long Term.
Income Tax	Yes. Copenhagen significantly higher income tax (from 42% to 60%). NZ scale from (10.5% to 33%).	No. Active transport is not expensive compared to other modes and hence income tax is not considered significant.	n/a	n/a	n/a National. Long Term.
GST or VAT Tax	Yes. Denmark 25%, New Zealand 15%.	Maybe. Active transport is not expensive compared to other modes and hence income tax is not considered significant. On the other hand, GST can make	Yes.	n/a	National. Long Term.

		purchasing cars more expensive and cycling thus appears more affordable.			
Consumer Petrol Price	Yes. May 2014 - Christchurch 92 Unleaded/L \$2.17 NZD. Copenhagen - \$2.55 NZD.	Yes. Whilst given cross elasticity of petrol price this may not a big impact. However there is a 38 cents price difference equating to prices approx. 17% higher in Denmark than in NZ.	Yes. The difference in in consumer price is almost solely attributed to tax.	Yes.	National. Short Term.
Petrol Tax	Yes. Denmark higher taxation of petrol. Approximately \$1.13 NZD per litre (2012) (EY, 2013, p. 169), whilst NZ taxes is \$0.6713 per litre (plus GST).	Yes. The difference of approx. 46 cents per litre in taxation is similar to the 38 cents per litre price difference recorded for the petrol price showing that the taxation has significance over the price of petrol. Denmark has the highest gasoline tax in the EU (Randell, 2014).	Yes.	Yes.	National. Short Term.
Smart Road Pricing	Yes. Denmark Only.	No. The idea is different but does not appear to have been implemented yet. Concept would price driving in the cities of Denmark more expensive in rush hour and less expensive in rural areas.	Yes.	No. It is assumed that although this policy may be implementable, but no outcomes were found.	National. Long Term Change – would take extensive planning to work out how to implement different pricing charges for driving in different areas.
Vehicle Registration Tax/ High taxes on car ownership	Yes.	Yes. Denmark's 180% tax on vehicle tax registration significant - contributes to low car ownership and 41% of households do not have a car available for use.	Yes. Transport policy - the vehicle registration tax and also the plan to introduce green taxes on vehicles to make it cheaper to buy an energy efficient car.	Yes.	National. Mid Term Change. Once decided on in government this would be relatively easy to implement.
Vehicle Road Worthiness Tests	Yes. Denmark - Compulsory biannually for cars over 4 years old (<i>Angloinfo, n.d.; Michael, 2012</i>). Costs approximately DKK 500	Yes. Denmark has a higher cost for vehicle testing which acts as a car ownership deterrent.	Yes.	Yes.	National. Mid Term Change.

	[NZD \$1080]. Warrant of Fitness – required annually or 6 monthly in NZ the price varying from station to station but approximately \$40-\$60 (NZ Transport Agency, 2014). (Michael, 2012). (Converted 31/10/14)				Once decided on in government this would be relatively easy to implement
Active Transport Funding	<p>Yes.</p> <p>In New Zealand the engagement draft of the 'Government Policy Statement on Land Transport 2015/16-2024/25' outlines that between 2015/16 and 2017/18 NZ will spend between 0.44% and 1% of the total transport budget on walking and cycling (this equates to between \$13m and \$36m)(New Zealand Government, 2014, p. 25).</p> <p>In contrast, the average spend per resident annually is approximately DKK \$155 and in 2012, the City spent approximately \$75 million DKK (approx. \$15 million NZD) on bicycle infrastructure alone (excluding pedestrian investment) (City of Copenhagen, 2013, p. 11).</p>	<p>Yes</p> <p>Copenhagen has greater funding for active transport measures. On cycling infrastructure alone, in 2012 the city spent more than New Zealand's entire national active transport budget.</p>	Yes.	Yes.	<p>Can look at subsequent spending.</p> <p>National (and Local). National Budget Allocation may not direct local spending but it does influence it.</p> <p>Short Term. Simply requires a budget allocation change.</p>
Geographical Factors					
Density	<p>Yes.</p> <p>Copenhagen urban density 6,600/km² in 2014. Christchurch density - urban density 620/km² or general Chch area density 240.5/km²</p>	<p>Yes.</p> <p>Can influence trip distance.</p>	<p>Yes.</p> <p>Controlling urban sprawl or by only permitting development to occur in already built up areas density can be influenced.</p>	n/a	<p>No specific density policies found for either city.</p> <p>Local and National. Numerous policies influence density – urban planning boundaries are one significant impact as well as infrastructure.</p> <p>Long Term. Changing density is only something that can be achieved over time.</p>
Mixed Use Development	<p>Yes.</p> <p>Christchurch Only. Aspiration and encouraging policy to create communities that people can live, work</p>	<p>No.</p> <p>Copenhagen has a significantly higher density than Christchurch but a policy was not</p>	Yes.	No.	<p>In Christchurch the policy only takes a voluntary form.</p> <p>Local.</p> <p>Mid-Term.</p>

	shop and play which will influence modal choice as things can be located closer together.	locates specifying 'mixed use development'			
Population	Yes. Copenhagen approx. 1.2 million in 2014 (Ministry of Foreign Affairs of Denmark, 2014c), Christchurch approx. 341,500 in 2013	Yes. Population can invoke economy of scale on investment options.	Maybe. Yes through birth control or immigration policies population can be changed but generally gradually.	n/a	National. Changing immigration/migration laws. Long Term.
Topography	No – both are relatively flat.	n/a	n/a	n/a	n/a
Urban Consolidation	Yes. Encouraging strategy in place in Christchurch to focus on intensification around already built up centres.	No. Only an aspiration/voluntary policy and recent - 2012(has not yet had time to be implemented etc.)	Yes.	No Christchurch policy only aspiration based - not easy to implement.	Local. Mid Term. Will be considerable time before urban consolidation efforts merit a benefit
Weather	Yes. Similar but Copenhagen colder and has more 'rainy days'.	No. Copenhagen has a higher active modal share despite a colder climate. Average monthly precipitation between the two cities is similar.	No.	n/a	n/a
Trip Length	Yes. Average trip distance to work differs by 5.5 km. Average distance for journey to work in Christchurch with a rolling average of 2009-2012 was 7km (<i>Ministry of Transport, 2014b</i>). Average distance for commute in Copenhagen in 2013 was 12.5km (Nielson, 2014).	No. Despite the longer trip distance Copenhagen still had a higher active transport modal share.	N/a	n/a	n/a
Historical/Cultural Factors					
Attractive Streetscapes	Yes. Only found in Christchurch policy. Aspiration and voluntary based policy to improve streetscapes and make attractive footpaths and 'human scale'	No. Although I did not locate a policy about Copenhagen trying to create attractive streetscapes the literature suggests that they do work to create attractive facades that encourage pedestrians.	N/a	n/a	n/a Local. Short Term.

	developments to encourage walking.				
Car Ownership	Yes. Denmark wide 383 passenger cars for every 1000 inhabitants in 2010 and New Zealand in 2005 was 607 cars.	Yes. Less passenger cars means less modal choices and more incentive to use public and active transport.	Yes. A wide range of policies can influence car ownership levels - taxes, ease of driving etc.	N/a No specific policy can be accredited for low or high car ownership - multiple variables influence this.	National (Price indications etc.). Long Term.
Historical Context	Yes.	Yes. Whether driving is seen as a 'rite of passage', whether bicycles are seen as culturally accepted means of transport etc. all plays a huge role in active transport participation.	No.	n/a	n/a.
Minimum Driving Age	Yes. Denmark age is 18, New Zealand 16.	Yes. The longer one has to wait to learn to drive, the longer period of time in which they become proficient in using other modes of transport.	Yes.	Yes.	National. Mid Term Would need to go through a bill in government.
Implementation					
Actively Enforcing Rules	Yes. Christchurch policy including a goal to 'actively enforce road code rules'	No The inclusion of this policy measure in Christchurch and not in Copenhagen may indicate a weakness on the implementation side of policy that another policy had to acknowledge that legislation should be actively enforced.	n/a	n/a	n/a
Policy Integration	Yes. Both cities contained policies surrounding integration and cooperation between policies and different agencies, municipalities/councils. Copenhagen has entered and is contributing funding towards a traffic safety council which is like a working group which discusses ideas for traffic safety campaign.	No.	n/a	n/a Hard to implement - often aspiration based statements. i.e. "walking and cycling are to be effectively integrated into transport planning, strategies and policies" (Ministry of Transport, 2005, p. 16) with no outline of how this will take place.	n/a

Design Guidelines	Yes. Christchurch Only.	No. Recent policy's (2012 & 2013) surrounding developing design guidelines for cycling and walking. Require further research or are voluntary measures.	n/a	Yes. Cycle guidelines developed in 2013 - evidence of implementation.	n/a
Maps and Signage	Yes. Christchurch lists maps and signs as a policy measure, whilst Copenhagen does not.	No. Copenhagen appears to include maps as a assumed accompanying tool to an effective cycle infrastructure. For example anyone in the world can access and download the "free Cycling Map of Copenhagen" which depicts the green cycle routes, cycle highways, separated tracks etc. The new bike share system also includes maps on the tablets joined to the bikes.	N/a	n/a	n/a

Key

Variables that can be changed by Active Transport Policy	
Variables that can be changed by Other Transport Policy	
Variables that can be changed by Other Policy	
Variables that cannot be changed	

Appendix D Policy Matrix Data Sources

Aargaard, T. (2014, 21st July). [Launch Date].

Canterbury Earthquake Recovery Authority. (2013). An Accessible City - Christchurch Central Recovery Plan: Replacement transport chapter - October 2013. Christchurch: Canterbury Earthquake Recovery Authority.

Canterbury Regional Transport Committee. (2012). Canterbury Regional Land Transport Strategy 2012-2042. Christchurch: Canterbury Regional Transport Committee.

Christchurch City Council. (1995). Draft Cycle Strategy for Christchurch City. Christchurch: Christchurch City Council.

Christchurch City Council. (2001). Pedestrian Strategy for Christchurch City "A Step in the Right Direction". Christchurch: Christchurch City Council.

Christchurch City Council. (2004). Christchurch Cycling Strategy. Christchurch: Christchurch City Council.

Christchurch City Council. (2005). Christchurch City Plan. Christchurch: Christchurch City Council.

Christchurch City Council. (2006). Christchurch Road Safety Strategy 2006. Christchurch, New Zealand: Christchurch City Council.

Christchurch City Council. (2011a, 21 August). A to B by Bike. Cycling. Retrieved 15th May, 2014, from <http://www.ccc.govt.nz/cityleisure/gettingaround/cycling/atobbybike/index.aspx>

Christchurch City Council. (2011b). Walking School Bus Guidelines for Schools and Parents. Christchurch: Christchurch City Council.

Christchurch City Council. (2012). Christchurch Transport Strategic Plan 2012-2042: Keep Christchurch Moving Forward by providing transport choices to connect people and places. Christchurch: Christchurch City Council.

Christchurch City Council. (2013). Christchurch Cycle Design Guidelines 2013. (ISBN 978-0-9922462-7-3). Christchurch: Christchurch City council.

Christchurch City Council. (2014). Frequently asked Questions and Answers: Car Parking Information for the General Public. Christchurch: Christchurch City Council Retrieved from <http://www.ccc.govt.nz/cityleisure/gettingaround/parking/faq.aspx#jumplink31>.

City of Copenhagen. (2002). Cycle Policy 2002-2012: City of Copenhagen. In N. Jensen (Ed.). Copenhagen: City of Copenhagen.

City of Copenhagen. (2004). Traffic and Environment Plan 2004. Copenhagen, Denmark: City of Copenhagen.

City of Copenhagen. (2005). Bicycle Account - 2004: Copenhagen - City of Cyclists Bicycle Account. Copenhagen: Building and Construction Administration, Roads and Parks Department, City of Copenhagen,.

City of Copenhagen. (2011). Good, Better, Best: The City of Copenhagen's Bicycle Strategy 2011-2025. Copenhagen: City of Copenhagen,.

City of Copenhagen. (2013). Copenhagen City of Cyclists: Bicycle Account 2012. Copenhagen: City of Copenhagen.

City of Copenhagen. (2014). Cycle Super Highway. Retrieved July 28, 2014, from <http://denmark.dk/en/green-living/bicycle-culture/cycle-super-highway/>

Colville-Andersen, M. (2013, February 21). Norrebrogade - a Car-Free(ish) Success. Retrieved July 25, 2014, from <http://www.copenhagene.com/2013/02/norrebrogade-car-freeish-success.html>

Colville-Andersen, M. (2014). The Bike Share Bicycle Copenhagen ALMOST Had. Copenhagene.com. Retrieved July 21, 2014, from <http://www.copenhagene.com/2013/05/the-bike-share-bicycle-copenhagen.html>

Danish Ministry of Transport. (2014). Danmark – op på cyklen! Den nationale cykelstrategi. Copenhagen: Danish Ministry of Transport Retrieved from http://www.trm.dk/77768389-183B-4069-8BB8-42C7EA5F3E2E/FinalDownload/DownloadId-89A840CC2563A954661583B782D48CA5/77768389-183B-4069-8BB8-42C7EA5F3E2E/~/_media/Files/Publication/2014/Cykelstrategi%20040714/Cykelstrategi%20%20til%20web%20pdfA%20rev.pdf.

Douglass, M. (2000). Christchurch City Centre: 40 Years of Change, Traffic, Planning 1959-1999. Christchurch: Christchurch City Council.

Environment Canterbury Regional Council. (2014). Bikes on Buses. Travel Information. Retrieved 15th August, 2014, from <http://www.metroinfo.co.nz/info/pages/bikeracks.aspx>

Fyhri, A., Hjorthol, R., Mackett, R., Nordgaard Fotel, T., & Kytta, M. (2011). Children's active travel and independent mobility in four countries: Development, social contributing trends and measures. Transport Policy, 18, 703-710.

Gates, C. (2013, 20th July). Car parks taking over central Christchurch. The Press. Retrieved from <http://i.stuff.co.nz/national/8943931/Car-parks-taking-over-central-Christchurch>

Gehl Architects. (2010). Christchurch 2009: Public Space Public Life (C. C. Council Ed.). Christchurch: Christchurch City Council.

Gehl, J. (1987). *Life Between Buildings: Using Public Space*. New York: Van Nostrand Reinhold.

Gothersgade and the Two-way Cycle Track. (2013). Copenhagenize.com: Bicycle Urbanism for Modern Cities. Since 2007. Retrieved July 21st, 2014, from <http://www.copenhagenize.com/2013/03/gothersgade-and-two-way-cycle-track.html>

Grimar, K. (2006). Large scale test of traffic calming of the city centre of Copenhagen. Paper presented at the Walk21-VII, "The Next Steps", The 7th International Conference on Walking and Liveable Communities, October 23-25 2006, Melbourne, Australia.

Grimar, K., & Jensen, N. (2010). Bicycle-Friendly Street Norrebrogade: Temporary measures to improve attractivity for cyclists. Good Practice Examples. Retrieved July 25, 2014

Jensen, N. (Producer). (2009, March 14 2014). How Copenhagen became a cycling city. [PowerPoint Presentation] Retrieved from http://www.google.co.nz/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCoQFjAA&url=http%3A%2F%2Fwww.gmfus.org%2Fgalleries%2Fcdp-tcn%2FJensen__How_Copenhagen_Became_a_Cycling_City.pdf&ei=bfQnU6PxKY3ikAXmpoCIAQ&usg=AFQjCNFKUCe_bwfN1koScJhfgpqr8dN6gA&sig2=JFEFEFa_OYHVDrqnZaYltA&bvm=bv.62922401,d.dGI

Kingham, S., & Koorey, G. (2011). Assessment of the type of cycling infrastructure required to attract new cyclists: New Zealand Transport Agency.

Ministry of Foreign Affairs of Denmark. (2014). *Cycling in Copenhagen - The Easy Way*. Denmark: The Official Website of Denmark. Retrieved 11 August, 2014, from <http://denmark.dk/en/green-living/bicycle-culture/cycling-in-copenhagen---the-easy-way/>

Ministry of Transport. (2005). *Getting there - on foot, by cycle: A strategy to advance walking and cycling in New Zealand transport*. (ISBN:0-478-10004-3). Ministry of Transport.

Ministry of Transport. (2010). *2020 Safer Journeys: New Zealand's Road Safety Strategy 2010-2020*. Ministry of Transport.

Ministry of Transport Denmark. (2012). *The Danish Transport System: Facts and Figures*. Copenhagen: Ministry of Transport.

Nelson, A. (n.d.). *Livable Copenhagen: The Design of a Bicycle City*: Center for Public Space Research: Copenhagen

University of Washington, Seattle.

Niels, J. (2010, 20 June). *Green Cycling Routes*. Federal Ministry of Transport and Digital Infrastructure. Retrieved 28 April, 2014, from <http://www.nationaler-radverkehrsplan.de/en/praxisbeispiele/anzeige.phtml?id=2149>

Pucher, J., & Buehler, R. (2008). *Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany*. *Transport Reviews*, 28(4), 495-528.

Pucher, J., Garrard, J., & Greaves, S. (2011). *Cycling down under: a comparative analysis of bicycling trends and policies in Sydney and Melbourne*. *Journal of Transport Geography*, 19, 332-345.

Saelens, B., Sallis, J., & Frank, L. (2003). *Environmental Correlates of Walking and Cycling: Findings From the Transportation, Urban Design, and Planning Literature*. *Annals of Behavioural Medicine*, 25(2), 80-91.

Santos Canals, M., Pinaud, A., & Janneau, T. (2006). *Copenhagen: How bicycles can become an efficient means of public transportation*. Roskilde University, Copenhagen.

Technical and Environmental Administration. (2007). *Copenhagen: Traffic Safety Plan 2007-2012*. Copenhagen: City of Copenhagen.

Technical and Environmental Administration. (2011). *Copenhagen City of Cyclists: Bicycle Account 2010*. Christchurch: City of Copenhagen.

The Danish Government. (2008). *Sustainable Transport - better transport*.

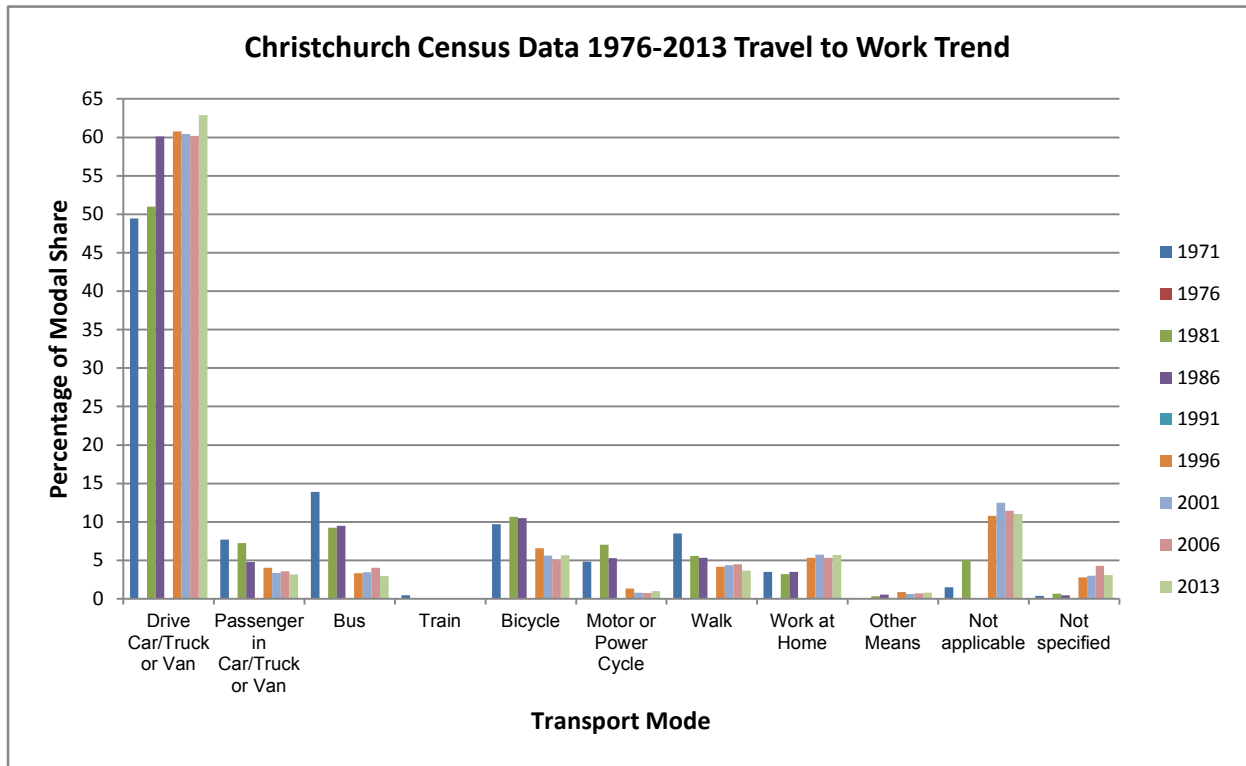
Torslov, N. (2010). *Traffic in Copenhagen 2009*. In Technical and Environmental Administration (Ed.). City of Copenhagen.

Wenande, C. (2014, 7 January). *City bicycle bridges facing further delays*. The Copenhagen Post.

Wonderful Copenhagen. (2014). *GoBike*. Visit Copenhagen: The Official Website. Retrieved July 21, 2014, from www.visitcopenhagen.com/copenhagen/gobike-gdk776628

Yardley, M. (2013, 10th September). *Abolish the two-abreast cycling rule*. The Press. Retrieved from <http://i.stuff.co.nz/the-press/opinion/columnists/mike-yardley/9144961/Abolish-the-two-abreast-cycling-rule>

Appendix E Christchurch City Travel to Work Trends 1976-2013



Data source: Statistics New Zealand via Christchurch Census 1976-2013 (Statistics New Zealand, 1971-2013).

References

- 2004-2014 OSCE Office for Democratic Institutions and Human Rights. (2014). Denmark: Access to Information and Data Protection. *Legislationline*. Retrieved August 19, 2014, from <http://www.legislationline.org/topics/country/34/topic/3>
- AA Motoring. (2014a). Driving Lessons. Retrieved 11 November, 2014, from <http://www.aa.co.nz/drivers/driving-school/driving-lessons/>
- AA Motoring. (2014b). Petrol Tax. Retrieved 9th October, 2014, from <http://www.aa.co.nz/cars/maintenance/fuel-prices-and-types/petrol/>
- AAC Transport Projects. (2014). *Consultation No. 2 - An Accessible City Transport Projects: Proposed Changes; Colombo Street, Tuam Street & Litchfield Street*. Christchurch Central Development Unit, Canterbury Earthquake Recovery Authority & Christchurch City Council.
- Aargaard, T. (2014, 21st July). [Launch Date].
- Alter, L. (2013, September 4). Is Copenhagen's new GoBike bike share system too complicated and expensive? Retrieved 28th September, 2014, from <http://www.treehugger.com/bikes/copenhagens-new-gobike-bike-share-system-too-complicated-and-expensive.html>
- Angloinfo. (2014). Car Taxes in Denmark. *Transport in Denmark*. Retrieved May 19th, 2014, from <http://denmark.angloinfo.com/transport/driving/car-taxes/>
- Angloinfo. (n.d.). Vehicle Roadworthiness Tests in Denmark. *Vehicle Ownership*. Retrieved 31st October, 2014, from <http://copenhagen.angloinfo.com/information/transport/vehicle-ownership/vehicle-roadworthiness/>
- Arditti, D. (2013, 22nd May). Lessons from Copenhagen. Retrieved 30th September, 2013, from <http://www.voleospeed.co.uk/2013/05/lessons-from-copenhagen.html>
- Bayer, K. (2013, October 15). Census 2013: Christchurch's population slumps. *The New Zealand Herald*. Retrieved from http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11140576
- British Medical Association. (1992). *Cycling: Towards Health and Safety*: Wiley-Blackwell.
- Buehler, R., & Pucher, J. (2012). International Overview: Cycling Trends in Western Europe, North America, and Australia. In J. Pucher & R. Buehler (Eds.), *City Cycling* (pp. 9-30). London: The MIT Press.
- Cabinet Office. (2004). *New Zealand's constitution – past, present and future*. beehive.govt.nz - The official website of the New Zealand Government: Retrieved from

- <http://www.beehive.govt.nz/Documents/Files/NZ%20Constitution%20Cabinet%20Office%200backgrounder.pdf>.
- Canterbury Earthquake Recovery Authority. (2013). *An Accessible City - Christchurch Central Recovery Plan: Replacement transport chapter - October 2013*. Christchurch: Canterbury Earthquake Recovery Authority.
- Canterbury Power Solutions. (n.d.). Wind Power Turbines - FAQs. Retrieved 31st October, 2011, from <http://canterburypower.co.nz/wind-turbine-faqs/>
- Canterbury Regional Transport Committee. (2012). *Canterbury Regional Land Transport Strategy 2012-2042*. Christchurch: Canterbury Regional Transport Committee.
- . Central City Plan: Draft Central City Recovery Plan For Ministerial Approval December 2011: Technical Appendices 1 of 3. (2011). Christchurch: Christchurch City Council.
- Christchurch. (2014, 23rd May 2014). *Wikipedia, the free encyclopedia; sourced originally from: "Subnational Population Estimates: At 30 June 2013 (provisional)". Statistics New Zealand. 22 October 2013. Retrieved 4 November 2013. Also "Infoshare; Group: Population Estimates - DPE; Table: Estimated Resident Population for Urban Areas, at 30 June (1996+) (Annual-Jun)". Statistics New Zealand. 19 November 2013. Retrieved 28 November 2013. Retrieved 23rd May, 2014, from <http://en.wikipedia.org/wiki/Christchurch>*
- Christchurch City Council. (1995). *Draft Cycle Strategy for Christchurch City*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2001). *Pedestrian Strategy for Christchurch City "A Step in the Right Direction"*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2003). *Christchurch City Environmental Trends 2003 - Draft: Weather and Climate*. Christchurch City Council Website: Christchurch City Council, Retrieved from <http://resources.ccc.govt.nz/files/02WeatherAndClimate-docs.pdf>.
- Christchurch City Council. (2004). *Christchurch Cycling Strategy*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2005a). *The Christchurch City Plan*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2005b). *Christchurch City Plan*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2006). *Christchurch Road Safety Strategy 2006*. Christchurch, New Zealand: Christchurch City Council.
- Christchurch City Council. (2010). Motor Vehicles: City Plan Monitoring - Transport - Reduced Congestion. In Christchurch City Council (Ed.): Christchurch City Council.

- Christchurch City Council. (2011a). Central City Plan: Draft Central City Recovery Plan For Ministerial Approval December 2011: Technical Appendices 1 of 3. Christchurch: Christchurch City Council.
- Christchurch City Council. (2011b, 21 August). A to B by Bike. *Cycling*. Retrieved 15th May, 2014, from <http://www.ccc.govt.nz/cityleisure/gettingaround/cycling/atobbybike/index.aspx>
- Christchurch City Council. (2011c). *Walking School Bus Guidelines for Schools and Parents*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2012). *Christchurch Transport Strategic Plan 2012-2042: Keep Christchurch Moving Forward by providing transport choices to connect people and places*. Christchurch: Christchurch City Council.
- Christchurch City Council. (2013). *Christchurch Cycle Design Guidelines 2013*. (ISBN 978-0-9922462-7-3). Christchurch: Christchurch City council.
- Christchurch City Council. (2014a, 23 October 2014). Car Parking. Retrieved November 3, 2014, from <http://www.ccc.govt.nz/cityleisure/gettingaround/parking/index.aspx>
- Christchurch City Council. (2014b, 4th April 2014). Cycleways in Christchurch. *Projects to Improve Christchurch - Transport*. Retrieved 5th June, 2014, from <http://www.ccc.govt.nz/cityleisure/projectstoimprovechristchurch/transport/cycleways/index.aspx>
- Christchurch City Council. (2014c). *Frequently asked Questions and Answers: Car Parking Information for the General Public*. Christchurch: Christchurch City Council Retrieved from <http://www.ccc.govt.nz/cityleisure/gettingaround/parking/faq.aspx#jumplink31>.
- Christchurch City Council. (2014d). Major Cycleways Network. In M. C. Network (Ed.).
- Christchurch City Council Traffic and Transportation Division. (1979). *A report on cycling in metropolitan Christchurch, past, present and future*. Christchurch City Council, Heathcote County Council, Paparua County Council, Riccarton Borough Council and Waimairi County Council,.
- Christchurch Regional Planning Authority. (1965). *Traffic in a New Zealand City* (W. B. Johnston Ed.). Christchurch, New Zealand: Whitcombe and Tombs Limited, published for the Canterbury Regional Planning Authority, .
- City Engineer's Department. (1980). *Cycle Planning 1980*. Christchurch City Council.
- City of Copenhagen. (2002). Cycle Policy 2002-2012: City of Copenhagen. In N. Jensen (Ed.). Copenhagen: City of Copenhagen.
- City of Copenhagen. (2004). Traffic and Environment Plan 2004. Copenhagen, Denmark: City of Copenhagen.

- City of Copenhagen. (2005). *Bicycle Account - 2004: Copenhagen - City of Cyclists Bicycle Account*. Copenhagen: Building and Construction Administration, Roads and Parks Department, City of Copenhagen,.
- City of Copenhagen. (2011). *Good, Better, Best: The City of Copenhagen's Bicycle Strategy 2011-2025*. Copenhagen: City of Copenhagen,.
- City of Copenhagen. (2013). *Copenhagen City of Cyclists: Bicycle Account 2012*. Copenhagen: City of Copenhagen.
- City of Copenhagen. (2014). *Cycle Super Highway*. Retrieved July 28, 2014, from <http://denmark.dk/en/green-living/bicycle-culture/cycle-super-highway/>
- Clarke, C. (2012). Evaluation of New Zealand's bicycle helmet law. *New Zealand Medical Journal*, 125(1349), 60-69.
- ClimateData. (2014). *Climate Copenhagen - Denmark. ClimateData.Eu: Temperature - Precipitation - Sunshine*. Retrieved 23rd May, 2014, from <http://www.climatedata.eu/climate.php?loc=daxx0009&lang=en#>
- Colville-Andersen, M. (2013, February 21). *Norrebrogade - a Car-Free(ish) Success*. Retrieved July 25, 2014, from <http://www.copenhagenize.com/2013/02/nrrebrogade-car-freeish-success.html>
- Colville-Andersen, M. (2014a). *The Bike Share Bicycle Copenhagen ALMOST Had. Copenhagenize.com*. Retrieved July 21, 2014, from <http://www.copenhagenize.com/2013/05/the-bike-share-bicycle-copenhagen.html>
- Colville-Andersen, M. (2014b, 5th January). *Copenhagen's Design Manual for Bicycle Infrastructure and Parking. Copenhagenize.com: Bicycle Urbanism for Modern Cities. Since 2007*. Retrieved 1st August, 2014, from <http://www.copenhagenize.com/2014/01/copenhagens-design-manual-for-bicycle.html>
- Colville-Andersen, M. (2014c, 5th August). *The Green Waves of Copenhagen*. Retrieved September 30th, 2014, from <http://www.copenhagenize.com/2014/08/the-green-waves-of-copenhagen.html>
- Copenhagen Portal - Tourist Site and Cultural Guide (2014). *Price level - In and Around Copenhagen - 2014: Average prices in and around Copenhagen week 19-2014. Price level - In and Around Copenhagen - 2014*. Retrieved 23rd May, 2014, from <http://www.copenhagenet.dk/CPH-Price.htm>
- Copenhagenize Design Co. (2013a, April 29). *The 20 Most Bike-Friendly Cities In The World*. Retrieved October 6, 2014, from <http://www.businessinsider.com.au/the-worlds-20-most-bike-friendly-cities-2013-4?op=1#2-copenhagen-denmark-19>

- Copenhagenize Design Co. (2013b). The Copenhagenize Index 2013: Bicycle Friendly Cities. Retrieved 28th September, 2014, from <http://copenhagenize.eu/index/>
- Cycle Safety Panel NZTA. (2014). Safer Journeys for People who Cycle: Cycling Safety Panel Draft Report and Recommendations 25 September 2014 Consultation Document. www.nzta.govt.nz.
- Cyr, A., & Deleon, P. (1975). Comparative Policy Analysis. *Policy Sciences*, 6, 375-384.
- Danish Architecture Centre. (2014). Copenhagen X Gallery: Green Cycle Routes. Copenhagen: Dac & Life.
- Danish Department of Transport. (2014). *Danish National Travel Survey Data - Municipality of Copenhagen, Average 2011-2013: Modal Split*.
- Danish Ministry of Transport. (1996). *The Danish Government's Action Plan for Reduction for the CO₂ Emissions of the Transport Sector*. Copenhagen: Danish Ministry of Transport.
- Danish Ministry of Transport. (2014). *Danmark – op på cyklen! Den nationale cykelstrategi*. Copenhagen: Danish Ministry of Transport Retrieved from [http://www.trm.dk/77768389-183B-4069-8BB8-42C7EA5F3E2E/FinalDownload/DownloadId-89A840CC2563A954661583B782D48CA5/77768389-183B-4069-8BB8-42C7EA5F3E2E/~media/Files/Publication/2014/Cykelstrategi%20040714/Cykelstrategi%20%20til%20web%20pdfA%20rev.pdf](http://www.trm.dk/77768389-183B-4069-8BB8-42C7EA5F3E2E/FinalDownload/DownloadId-89A840CC2563A954661583B782D48CA5/77768389-183B-4069-8BB8-42C7EA5F3E2E/~/media/Files/Publication/2014/Cykelstrategi%20040714/Cykelstrategi%20%20til%20web%20pdfA%20rev.pdf).
- Deleon, P., & Resnick-Terry, P. (1998). Comparative Policy Analysis: Deja vu All Over Again? *Journal of Comparative Policy Analysis*, 1(1), 9-22.
- Department of Internal Affairs. (n.d.). About Local Government. Retrieved August 14, 2014, from http://www.localcouncils.govt.nz/lqip.nsf/wpg_URL/About-Local-Government-Index?OpenDocument
- Directorate-General for the Environment. (2004). Reclaiming city streets for people: Chaos or quality of life? In European Commission (Ed.), (pp. 52): Office for Official Publications of the European Communities.
- Douglass, M. (2000). Christchurch City Centre: 40 Years of Change, Traffic, Planning 1959-1999. Christchurch: Christchurch City Council.
- Editors of Encyclopaedia Britannica. (2014, 6th Jan 2014). Copenhagen. *Encyclopaedia Britannica*. Retrieved 26 March, 2014, from <http://www.britannica.com.ezproxy.lincoln.ac.nz/EBchecked/topic/136520/Copenhagen>
- Electoral Commission. (2013a, 13 February). Age of Reason. *The Right to Vote*. Retrieved 13th August, 2014, from <http://www.elections.org.nz/right-vote/age-reason>

- Electoral Commission. (2013b, 7 February). General Elections. Retrieved 13th August, 2014, from <http://www.elections.org.nz/voting-system/general-elections>
- Electoral Commission New Zealand. (2014, 18 July). MMP Voting System. Retrieved 20 August, 2014, from <http://www.elections.org.nz/voting-system/mmp-voting-system>
- Environment Canterbury Regional Council. (2014). Bikes on Buses. *Travel Information*. Retrieved 15th August, 2014, from <http://www.metroinfo.co.nz/info/pages/bikeracks.aspx>
- Ewing, R., Bartholomew, K., Walters, J., Winkelman, S., & Anderson, G. (2010). Urban Development, VMT and CO2 emissions. In P. Howden-Chapman, K. Stuart & R. Chapman (Eds.), *Sizing up the City: urban form and transport in New Zealand*. Wellington: Steele Roberts Publishers.
- EY. (2013). Global oil and gas tax guide (pp. 632): EY-building a better working world.
- Ferigo, M. (2014, 11 September). [Council Expenditure in Christchurch].
- Fertner, C. (2012). Urbanisation, urban growth and planning in the Copenhagen Metropolitan Region with reference studies from Europe and the USA *Forest & Landscape Research* (Vol. 54, pp. 151). Frederiksberg: Forest & Landscape Denmark.
- Folketinget. (2012). *The Parliamentary System of Denmark: Introduction to Danish Democracy*. Copenhagen: Folketinget, Retrieved from <http://www.thedanishparliament.dk/Publications/The%20Parliamentary%20System%20of%20Denmark.aspx>.
- Furth, P. G. (2012). Bicycling Infrastructure for Mass Cycling: A Transatlantic Comparison. In J. Pucher & R. Buehler (Eds.), *City Cycling*. London: The MIT Press.
- Fyhri, A., Hjorthol, R., Mackett, R., Nordgaard Fotel, T., & Kytta, M. (2011). Children's active travel and independent mobility in four countries: Development, social contributing trends and measures. *Transport Policy*, 18, 703-710.
- Garrard, J. (2009). Active transport: Children and young people - An overview of recent evidence (pp. 21): Vic Health.
- Gates, C. (2013, 20th July). Car parks taking over central Christchurch. *The Press*. Retrieved from <http://i.stuff.co.nz/national/8943931/Car-parks-taking-over-central-Christchurch>
- Gehl Architects. (2010). *Christchurch 2009: Public Space Public Life* (Christchurch City Council Ed.). Christchurch: Christchurch City Council.
- Gehl, J. (1987). *Life Between Buildings: Using Public Space*. New York: Van Nostrand Reinhold.
- Genter, J. A. (2014, 27 February). [Canterbury Active Transport Forum Presentation].
- Getting a Driving Licence in Denmark. (2014). *Copenhagen - MyAngloINFO*. Retrieved 19th May, 2014, from <http://copenhagen.angloinfo.com/information/transport/driving-licences/danish-driving-licences/>

- Gossling, S. (2013). Urban Transport Transitions: Copenhagen, City of Cyclists. *Journal of Transport Geography*, 33, 196-206.
- Gothersgade and the Two-way Cycle Track. (2013). *Copenhagenize.com: Bicycle Urbanism for Modern Cities. Since 2007*. Retrieved July 21st, 2014, from <http://www.copenhagenize.com/2013/03/gothersgade-and-two-way-cycle-track.html>
- Grimar, K. (2006). *Large scale test of traffic calming of the city centre of Copenhagen*. Paper presented at the Walk21-VII, "The Next Steps", The 7th International Conference on Walking and Liveable Communities, October 23-25 2006, Melbourne, Australia.
- Grimar, K., & Jensen, N. (2010). Bicycle-Friendly Street Norrebrogade: Temporary measures to improve attractiveness for cyclists. *Good Practice Examples*. Retrieved July 25, 2014
- Gupta, K. (2012). Comparative Public Policy: Using the Comparative Method to Advance Our Understanding of the Policy Process. *Policy Studies Journal*, 40, 11-26.
- Heb. (2010). Copenhagen - the City of Cyclists. In C. a. r. 2 (Ed.), *Licensed under Creative Commons Attribution-Share Alike 3.0 via Wikimedia Commons* Wikimedia Commons.
- ICIS. (2013, 11 March). Denmark has reduced its greenhouse gas emissions by 14%. Retrieved 3 October, 2014, from <http://iciscenter.org/denmark-has-reduced-its-greenhouse-gas-emissions-by-14/>
- Institute of Physics. (2013, 15 March). Scientific Consensus on Anthropogenic Climate Change. *ScienceDaily*. Retrieved 12 September, 2014, from www.sciencedaily.com/releases/2013/05/130515203048.htm
- International Energy Agency. (2009). Transport Energy and CO₂: Moving Towards Sustainability: IEA, OECD.
- Jacobsen, P. (2003). Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention*, 9, 205-209.
- Jakob, A., Craig, J., & Fisher, G. (2006). Transport cost analysis: a case study of the total costs of private and public transport in Auckland. *Environmental Science and Policy*, 9, 55-66.
- Jensen, N. (Producer). (2009, March 14 2014). How Copenhagen became a cycling city. [PowerPoint Presentation] Retrieved from http://www.google.co.nz/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCoQFjAA&url=http%3A%2F%2Fwww.gmfus.org%2Fgalleries%2Fcdp-tcn%2FJensen__How_Copenhagen_Became_a_Cycling_City.pdf&ei=bfQnU6PxKY3ikAXmpoCIAQ&usg=AFQjCNFKUCe_bwfN1koScJhfgpqr8dN6gA&sig2=JFEFEFa_OYHVDrqnZaYltA&bvm=bv.62922401,d.dGI

- Jones, J. (2009). If you build it, will they come? Urban revitalisation in Christchurch, New Zealand: challenges and implementation.
<http://www.geog.canterbury.ac.nz/postgrad/420papers/2010/Jason%20Jones%20If%20you%20build%20it,%20will%20they%20come%20Urban%20revitalisation%20in%20Christchurch,%20New%20Zealand%20challenges%20and%20implementation.pdf>
- Kamieniecki, S., & Kraft, M. (2012). Series Forward. In P. Steinberg & S. VanDeveer (Eds.), *Comparative Environmental Politics: Theory, Practice, and Prospects* (pp. ix-x). London: The MIT Press.
- Keldorff, A. (2014, 13 August). [Dissertation Research - km of bicycling infrastructure].
- Kenworthy, J., & Laube, F. (1999). Patterns of automobile dependence in cities: an international overview of key physical and economic dimensions with some implications for urban policy. *Transportation Research Part A: Policy and Practice*, 33(7-8), 691-723.
- Key Transport Consultants Ltd. (2013, May 8). Copenhagen Study Tour 2013 - Key Transport Consultants Ltd. Retrieved 8th June, 2014, from <http://www.key-transport.com/copenhagen-study-tour-2013/>
- Kingham, S., & Koorey, G. (2011). Assessment of the type of cycling infrastructure required to attract new cyclists: New Zealand Transport Agency.
- Kiwi Income Property Trust. (2014). Getting here is easy. Retrieved 17 August, 2014, from <http://www.northlands.co.nz/centre-information>
- Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260.
- Lambert, B. (1998). Pedal Power: a clean form of transport rides into town. *UNESCO Courier*(Jan 1998), 30.
- Land Transport New Zealand. (2014). Walking school buses are a safe and sustainable way to travel to and from school. Ministry for the Environment Website: Ministry for the Environment.
- Lauder, W. (2014, 29th October). [Biking to School].
- LifeinDenmark. (2014). Car. *Life in Denmark*. Retrieved May 19th, 2014, from <https://lifeindenmark.borger.dk/Pages/Car.aspx?NavigationTaxonomyId=77c7d0b9-2133-4085-9ee5-d6d134fd8b28>
- Litman, T. (2014). *Evaluating Active Transport Benefits and Costs: Guide to Valuing Walking and Cycling Improvements and Encouragement Programs*. Victoria, Australia: Victoria Transport Policy Institute Retrieved from <http://www.vtpi.org/nmt-tdm.pdf>.

- Local Government Denmark (LGDK). (2009). *The Danish Local Government System*. Local Government Denmark (LGDK), Retrieved from http://www.kl.dk/ImageVaultFiles/id_38221/cf_202/Background_Paper_-_Local_Government_in_Denmark.PDF.
- Macbeth, A. G., Boulter, R., & Ryan, P. S. (2005). *New Zealand Walking and Cycling Strategies - Best Practice: Land Transport New Zealand*.
- Massey, R. (2014). Petrol costs: The tax on a litre of fuel in the UK is the highest in the world. In article-0-1D9B33A000000578-148_634x339 (Ed.). Thisismoney.co.uk.
- Maus, J. (2013, June 12). Nørrebrogade in Copenhagen: Proof of concept that low-car streets work. Retrieved September 29th, 2014, from <http://bikeportland.org/2013/06/12/n%C3%B8rrebrogade-in-copenhagen-proof-of-concept-that-low-car-streets-work-88297>
- McNulty, K. (2014, 11 August). [Car Parking].
- Mees, P. (2000). The Car-Dominated City and Its Discontents. In P. Mees (Ed.), *A Very Public Solution: Transport in the Disperse City* (pp. 11-45): Melbourne University Press.
- Mees, P., & Groenhart, L. (2014). Travel to Work in Australian Cities: 1976-2011. *Australian Planner*, 51(1), 66-75.
- Michael. (2012, November 6). Buying a Used Car in Denmark. *Hej Sonderborg: Culture, events and life on Als, Denmark*. Retrieved 31st October, 2014, from <http://hejsonderborg.dk/buying-a-used-car-in-denmark/>
- Mindali, O., Raveh, A., & Salomon, I. (2004). Urban density and energy consumption: a new look at old statistics. *Transportation Research Part A: Policy and Practice*, 38(2), 143-162.
- Ministry of Foreign Affairs of Denmark. (2014a). Bicycle Culture. *Denmark: The Official Website of Denmark*. Retrieved 13 March, 2014, from <http://denmark.dk/en/green-living/bicycle-culture/>
- Ministry of Foreign Affairs of Denmark. (2014b). Cycling in Copenhagen - The Easy Way. *Denmark: The Official Website of Denmark*. Retrieved 11 August, 2014, from <http://denmark.dk/en/green-living/bicycle-culture/cycling-in-copenhagen---the-easy-way/>
- Ministry of Foreign Affairs of Denmark. (2014c). Facts and Statistics. Retrieved September 15th, 2014, from <http://denmark.dk/en/quick-facts/facts/>
- Ministry of Foreign Affairs of Denmark. (n.d.). Cycling to Kindergarten. *Denmark: The Official Website of Denmark*. Retrieved 31st July, 2014, from <http://denmark.dk/en/green-living/bicycle-culture/cycling-to-kindergarten/>

- Ministry of Justice. (2014). Official Information: Your right to know. Retrieved 19 August, 2014, from <http://www.justice.govt.nz/publications/global-publications/o/official-information-your-right-to-know>
- Ministry of Transport. (2005). *Getting there - on foot, by cycle: A strategy to advance walking and cycling in New Zealand transport*. (ISBN:0-478-10004-3). Ministry of Transport.
- Ministry of Transport. (2010). *2020 Safer Journeys: New Zealand's Road Safety Strategy 2010-2020*. Ministry of Transport.
- Ministry of Transport. (2013). *New Zealand Household Travel Survey 2009–2013: Cycling*. Retrieved from http://www.transport.govt.nz/assets/Import/Documents/_versions/3876/Cycling-2013.1.pdf.
- Ministry of Transport. (2014a). *Christchurch Main Urban Area: July 2007-June 2010*.
- Ministry of Transport. (2014b). *Christchurch Main Urban Area: July 2009-June 2012*.
- Ministry of Transport. (2014c). Climate Change and Energy. Retrieved 3 October, 2014, from <http://www.transport.govt.nz/ourwork/climatechange/>
- Ministry of Transport Denmark. (2012a). *The Danish Transport System: Facts and Figures*. Copenhagen: Ministry of Transport.
- Ministry of Transport Denmark. (2012b). *A Greener Transport System in Denmark: Environmentally Friendly and Energy Efficient Transport*. Copenhagen: Ministry of Transport Denmark.
- Montgomery, C. (2013). *Happy City: Transforming Our Lives through Urban Design*. London: Penguin Books.
- Mud Sweat n Gears. (n.d.). The Bicycle - History & Facts: A pictorial history of the evolution of the bicycle - the wonder years. Retrieved September 15, 2014, from http://www.mudsweatngears.co.uk/page_2473200.html
- Nelson, A. (n.d.). *Livable Copenhagen: The Design of a Bicycle City*: Center for Public Space Research: Copenhagen University of Washington, Seattle.
- New Zealand Government. (2014). *Engagement Draft: Government Policy Statement on Land Transport 2015/16-2024/25*. (ISBN: 978-0-478-07231-0). Wellington: Ministry of Transport.
- New Zealand Transport Agency. (2010). *Resource 1 - Facts and Figures*. Retrieved from <http://www.nzta.govt.nz/resources/travel-planning-toolkit/docs/resource-1-facts-and-figures.pdf>.
- New Zealand Transport Agency. (2012, 1 August 2012). How to get your driver licence. Retrieved October 16, 2012, from <http://www.nzta.govt.nz/resources/roadcode/about-licences/how-to-get-driver-licence.html>

- New Zealand Transport Agency. (2013a, May 2013). Cycles: Road rules and equipment (Factsheet 1). Retrieved January 21, 2014, from <http://www.nzta.govt.nz/resources/factsheets/01/cycles-rules-equipment.html>
- New Zealand Transport Agency. (2013b). Used Car Safety Ratings. *RightCar.govt.nz*. Retrieved July 31, 2014
- New Zealand Transport Agency. (2013c). Walking and Cycling Expenditure - sourced from NZTA + funded organisations. In W. a. C. Expenditure (Ed.): New Zealand Transport Agency.
- Newman, P., & Kenworthy, J. (1989). *Cities and Automobile Dependence: An International Sourcebook*. Aldershot, England: Gower Publishing Company Limited, .
- Niels, J. (2010, 20 June). Green Cycling Routes. *Federal Ministry of Transport and Digital Infrastructure*. Retrieved 28 April, 2014, from <http://www.nationaler-radverkehrsplan.de/en/praxisbeispiele/anzeige.phtml?id=2149>
- Nielson, L. (2014). *AFSTB2: Average commuting distance by area of residence and sex: Copenhagen (male and female)*. Retrieved from: <http://iisboy4.dst.dk/statbank5a/SelectVarVal/saveselections.asp>
- Norman, R., & McOmish, F. (2014). How To: Use Public Transport in Copenhagen. *Scandinavia Standard*. Retrieved 11 August, 2014, from <http://www.scandinaviastandard.com/public-transport-in-copenhagen/>
- Numbeo. (2014, June 2014). Cost of Living Comparison Between Christchurch, New Zealand And Copenhagen, Denmark. *Numbeo Comparison*. Retrieved 8th June, 2014, from http://www.numbeo.com/cost-of-living/compare_cities.jsp?country1=New+Zealand&country2=Denmark&city1=Christchurch&city2=Copenhagen
- NZ Transport Agency. (2013, 23 December). Vehicle Registration and Licensing Fees. Retrieved 5th June, 2014, from <http://www.nzta.govt.nz/vehicle/registration-licensing/fees.html>
- NZ Transport Agency. (2014, 11 September). Warrant of Fitness (WoF). *Registration and Licensing*. Retrieved 31 October, 2014, from <http://nzta.govt.nz/vehicle/registration-licensing/warrant-of-fitness.html>
- O'Fallon, C., & Sullivan, C. (2011). Slow zones: their impact on mode choices and travel behaviour. New Zealand Transport Agency.
- Office of the Ombudsman. (2014). Ombudsman - Fairness for all - it's why we exist. Retrieved 13th August, 2014, from <http://www.ombudsman.parliament.nz/>
- Pardo, C., Jieman, Y., Hongyuan, Y., & Mohanty, C. (2012). Sustainable Urban Transport. In United Nations Department of Economic and Social Affairs (UNDESA) (Ed.), *Shanghai Manual – A*

- Guide for Sustainable Urban Development in the 21st Century: United Nations Department of Economic and Social Affairs (UNDESA),. Retrieved from http://www.un.org/esa/dsd/susdevtopics/sdt_pdfs/shanghaimanual/Chapter%204%20-%20Sustainable%20urban%20transport.pdf.
- Povey, L., Frith, W., & Graham, P. (1999). Cycle helmet effectiveness in New Zealand. *Accident Analysis and Prevention*, 3(1), 763-770.
- Preval, N., Chapman, R., & Howden-Chapman, P. (2010). For whom the city? Housing and locational preferences in New Zealand. In P. Howden-Chapman, K. Stuart & R. Chapman (Eds.), *Sizing up the City*. Wellington: Steele Roberts Publishers.
- Pucher, J., & Buehler, R. (2008). Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany. *Transport Reviews*, 28(4), 495-528.
- Pucher, J., Buehler, R., Bassett, D., & Dannenberg, A. (2010). Walking and Cycling to Health: A Comparative Analysis of City, State, and International Data. *American Journal of Public Health*, 100(10), 1986-1992.
- Pucher, J., & Dijkstra, L. (2003). Promoting Safe Walking and Cycling to Improve Public Health: Lessons From The Netherlands and Germany. *American Journal of Public Health*, 93(9), 1509-1516.
- Pucher, J., Garrard, J., & Greaves, S. (2011). Cycling down under: a comparative analysis of bicycling trends and policies in Sydney and Melbourne. *Journal of Transport Geography*, 19, 332-345.
- Randell, T. (2014, 2 June). Pain at the Pump: Gasline Prices by Country. Retrieved 9 October, 2014, from <http://www.bloomberg.com/visual-data/gas-prices/20142:Denmark:NZD:l>
- Reddy, B. S., & Balachandra, P. (2012). Urban Mobility: A Comparative Analysis of Megacities of India. *Transport Policy*, 21, 152-164.
- Report shows major shift to sustainable transportation. (2013). Retrieved October 17, 2014, from <http://www.mayorofvancouver.ca/activetranspo>
- Russell, H. (2013, 7 February). Buying a car in Denmark: even a banger costs a fortune. *The Telegraph*. Retrieved from <http://www.telegraph.co.uk/expat/9853662/Buying-a-car-in-Denmark-even-a-banger-costs-a-fortune.html>
- Saelens, B., Sallis, J., & Frank, L. (2003). Environmental Correlates of Walking and Cycling: Findings From the Transportation, Urban Design, and Planning Literature. *Annals of Behavioural Medicine*, 25(2), 80-91.
- Santos Canals, M., Pinaud, A., & Janneau, T. (2006). *Copenhagen: How bicycles can become an efficient means of public transportation*. Roskilde University, Copenhagen.

- Schiøtt, J., & Madsen, S. (2011, February 2). Cycle Super Highways in Greater Copenhagen area. Retrieved 30th September, 2014, from <http://www.cycling-embassy.dk/2011/02/02/super-cycle-highways-in-greater-copenhagen-area-2/>
- Spielburg, F. (1989). The Traditional Neighbourhood Development: How Will Traffic Engineers Respond? In *The Traditional Neighbourhood Development: How Will Traffic Engineers Respond?* (Ed.). ITE Journal, 59, 18, (and later published in Sealans, et al., 2003).
- Statistics Copenhagen - Copenhagen City. (2013a). Fact sheet fra Stastics Copenhagen www.kk.dk/statistik.
- Statistics Copenhagen - Copenhagen City. (2013b). Fact sheet from Statistics Copenhagen: Cars for private use by owner's sex, age, family relationships and employment, Copenhagen 1. January 2011: City of Copenhagen, .
- Statistics Copenhagen - Copenhagen City. (2010, 12 October). Taxable persons in Copenhagen by gross income and city district, 2007-2010. Retrieved 23rd May, 2014, from <http://subsite.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage/Press/FactsOnCopenhagen/Statistics/Income/TaxableGrossIncome.aspx>
- Statistics New Zealand. (1971-2013). *Christchurch Census Data: Travel to Work Question 1971-2013*.
- Statistics New Zealand. (1996-2013). *2013 Census of Population and Dwellings: Travel to Work on Census Day*.
- Data collected for the employed census usually resident population, aged 15 years or over (Employed includes Full-time & Part-time Employed and is related to work in the 7 days prior to Sunday 3 March 2013. Full-time is equal to people working 30 or more hours per week. Part-time is equal to people working 1-29 hours per week)).*
- Statistics New Zealand. (2013). *Average weekly income for all people, by regional council area, June quarter 2009-13*.
- Steinberg, P., & VanDeveer, S. (2012). Bridging Archipelagos: Connecting Comparative Politics and Environmental Politics. In P. Steinberg & S. VanDeveer (Eds.), *Comparative environmental politics : theory, practice, and prospects* (pp. 29-47). Cambridge: MIT Press.
- Steinberg, P. F., & VanDeveer, S. D. (2012). Bridging Archipelagos: Connecting Comparative Politics and Environmental Politics *Comparative environmental politics : theory, practice, and prospects* (pp. 29-47). Cambridge: MIT Press.
- Stockdale, M. (2014, 16th May). May 2014 Petrol and Diesel Prices. *Petrolwatch*. Retrieved 23rd May, 2014, from <http://www.aa.co.nz/cars/maintenance/fuel-prices-and-types/petrolwatch-weekly-and-monthly-updates/petrolwatch/may-2014-petrol-and-diesel-prices/>

- Stockley, A. (2010). An Independent Judiciary. In R. Miller (Ed.), *New Zealand Government & Politics* (5 ed., pp. 114-129). Melbourne: Oxford University Press.
- Strahan, D. (2008, 3 May). Oil is expensive because oil is scarce. *The Telegraph*. Retrieved from <http://www.telegraph.co.uk/comment/3557898/Oil-is-expensive-because-oil-is-scarce.html>
- Technical and Environmental Administration. (2007). Copenhagen: Traffic Safety Plan 2007-2012. Copenhagen: City of Copenhagen.
- Technical and Environmental Administration. (2011). *Copenhagen City of Cyclists: Bicycle Account 2010*. Christchurch: City of Copenhagen.
- Technical and Environmental Administration (Cartographer). (2013). Cykelkort København: Cycling map Copenhagen [Map]. Retrieved from http://kk.sites.itera.dk/apps/kk_pub2/pdf/987_VukGL2ROf1.pdf
- The Communications Section. (2014). *My Constitutional Act with explanations, 12th edition*. Danish Parliament: The Communications Section - Danish Parliament.
- The Danish Government. (2008). *Sustainable Transport - better transport*.
- The Department of Internal Affairs. (2014). Local Elections. Retrieved 6 October, 2014, from <http://www.dia.govt.nz/Services-Local-Elections-Index>
- Tin Tin, S., Woodward, A., Thornley, S., & Ameratunga, S. (2009). Cycling and Walking to Work in New Zealand, 1991-2006: regional and individual differences, and pointers to effective interventions. *International Journal of Behavioural Nutrition and Physical Activity*, 6(1).
- Toderain, B. (2014, 15th October). [A Conversation with Brent Toderain].
- Torslov, N. (2010). Traffic in Copenhagen 2009. In Technical and Environmental Administration (Ed.). City of Copenhagen.
- Transit New Zealand. (1991). *Cycle Use and Collisions in Christchurch: Transit New Zealand Research Report No. 7*. Transit New Zealand.
- Transport and Greenspace. (2014, 15 August). Car Parking. Retrieved 17 August, 2014, from <http://www.ccc.govt.nz/cityleisure/gettingaround/parking/index.aspx>
- Transportministeriet. (2014). *Danmark – op på cyklen!: Den nationale cykelstrategi*. www.trm.dk: Ministry of Transport Retrieved from <http://www.trm.dk/~media/Files/Publication/2014/Cykelstrategi%20040714/Cykelstrategi%20%20til%20web%20pdfA.pdf>.
- United Nations Framework Convention on Climate Change. (2014). Status of the Ratification of the Kyoto Protocol. Retrieved 3 October, 2014, from http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

- Vallyon, C., & Turner, S. (2011). Reducing pedestrian delay at traffic signals *New Zealand Transport Agency Research Report 440*: New Zealand Transport Agency.
- VisitDenmark. Copenhagen on two wheels. Retrieved 11th August, 2014, from <http://www.visitdenmark.com/copenhagen/activities/copenhagen-two-wheels>
- VisitDenmark. (2012). A History of Copenhagen. *VisitDenmark - The official tourism site of Denmark* © 2012. Retrieved March 26, 2014, from <http://www.visitdenmark.com/en-us/copenhagen/culture/history-copenhagen>
- Watson, B. (2014). *Infrastructure Committee: Open Agenda*. Auckland Council Retrieved from http://infocouncil.aucklandcouncil.govt.nz/Open/2014/03/INF_20140312_AGN_4787_AT.htm.
- WeatherSpark. (n.d.). Average Weather For Kastrup near Copenhagen, Denmark. Retrieved 31 October, 2014, from <https://weatherspark.com/averages/28823/Kastrup-near-Copenhagen-Capital-Region-of-Denmark>
- Weidekampsgade. (n.d). Local Government Reform. *Local Government Denmark*. Retrieved 14 August, 2014, from <http://www.kl.dk/English/Local-Government-Reform/>
- Weiss, E. (2010). *Bike Snob: Systematically and Mercilessly Realigning the World of Cycling*. San Francisco: Chronicle Books.
- Weiss, H., & Ward, A. (2013). Is it time to advocate for a vulnerable road user protection law in New Zealand? *The New Zealand Medical Journal*, 126(1374), 67-77.
- Wenande, C. (2014, 7 January). City bicycle bridges facing further delays. *The Copenhagen Post*.
- Williams, C. (2013, 19th April 2013). Safety paramount for city cycling, Opinion Piece. *The Press*. Retrieved from <http://www.stuff.co.nz/the-press/opinion/8569936/Safety-paramount-for-city-cycling>
- Williams, T. (2014). Cycle lanes and cycle paths in Christchurch. In *Cycle lanes and cycle paths in Christchurch* (Ed.). unpublished.
- Wilson, M. (2010). Reforming Parliament. In R. Miller (Ed.), *New Zealand Government & Politics* (5 ed., pp. 145-155). Melbourne: Oxford University Press.
- Wonderful Copenhagen. Visit Copenhagen: The Official Website - Bryggebroen Copenhagen: Viist Copenhagen.
- Wonderful Copenhagen. (2014a). Fisketorvet – Copenhagen Mall Retrieved 11 August, 2014, from <http://www.visitcopenhagen.com/copenhagen/fisketorvet---copenhagen-mall-gdk412276>
- Wonderful Copenhagen. (2014b). GoBike. *Visit Copenhagen: The Official Website*. Retrieved July 21, 2014, from www.visitcopenhagen.com/copenhagen/gobike-gdk776628

- Wonderful Copenhagen. (2014c). Parking in Copenhagen. Retrieved 17 August, 2014, from <http://www.visitcopenhagen.com/copenhagen/parking-copenhagen>
- Woodward, A., & Lindsay, G. (2010). Changing modes of travel in New Zealand Cities. In P. Howden-Chapman, K. Stuart & R. Chapman (Eds.), *Sizing Up the City: Urban form and transport in New Zealand*. Wellington: Steele Roberts Publishers.
- Working Group, I. P. C. C. (2013). Climate Change 2013: The Physical Science Basis - Summary for policymakers.
- World Weather and Climate Information. (2013a). Average weather in Christchurch, New Zealand. *World Weather and Climate Information*. Retrieved 23 May, 2014, from <http://www.weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,Christchurch,New-Zealand>
- World Weather and Climate Information. (2013b). Average weather in Copenhagen, Denmark. *World Weather and Climate Information*. Retrieved 23rd May, 2014, from <http://www.weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,copenhagen,Denmark>
- World Weather and Climate Information. (2013c). Average wind speed in Christchurch, New Zealand. Retrieved 31 October, 2014, from <http://www.weather-and-climate.com/average-monthly-Wind-speed,Christchurch,New-Zealand>
- World Weather and Climate Information. (2013d). Average wind speed in Copenhagen, Denmark. Retrieved 31 October, 2014, from <http://www.weather-and-climate.com/average-monthly-Wind-speed,copenhagen,Denmark>
- Yardley, M. (2013, 10th September). Abolish the two-abreast cycling rule. *The Press*. Retrieved from <http://i.stuff.co.nz/the-press/opinion/columnists/mike-yardley/9144961/Abolish-the-two-abreast-cycling-rule>