Maribyrnong Bike Action Plan

Creating a healthy, wealthy and liveable city

A BikeWest Report to the Maribyrnong Council Active Transport Advisory Committee

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BIKEWEST

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Contents

Introduction

Cycling and cycling infrastructure in the City of Maribyrnong requires an action plan. The current bicycle strategy is not only out of date (2014) in terms of its publication date, it is also decades out of date in term so its thinking. Cities all around the world from Addis Ababa to Auckland, from Bogota to Berlin now realise the importance of promoting cycling as a way to make their cities healthier, wealthier, cleaner and more equitable.

The purpose of this report is to document the overwhelming evidence to support the promotion of cycling through infrastructure provision and incentives and to provide ideas of how this can be done in the City of Maribyrnong. This runs counter to the approach taken in the City of Maribyrnong and Australia in general for the past few decades. However, this approach has left our city incredibly car dependent with the inevitable negative consequences this brings: fewer and fewer children cycling to school, adults not getting enough physical activity, increased pollution, a poorer city due to the expensive upkeep of roads rapidly worn out by increasing volumes of traffic and the tragic deaths of people on bikes as the infrastructure is simply not safe enough.

This report describes the current cycling environment in the City of Maribyrnong and draws upon evidence from around the world to establish the health, financial and pollution benefits of promoting cycling as a means of everyday transport as well giving guidance as to how cycle promotion might be achieved.

International, National and City Context

There are large differences in cycling levels among countries in Western Europe, North America and Australasia. Currently the bike share of trips is approximately 1% in Australia, Canada and the USA, about 2% in the UK, 10% in Germany, Finland, Sweden and Belgium, 18% in Denmark and 26% in the Netherlands.

This bike share refers to daily trips for all trip purposes as derived from national travel surveys. However, Australia, Canada and Ireland do not have national travel surveys, as their census reports only trips to work. As such, census data almost certainly underestimate the overall levels of cycling. For example, the occasional travel survey in Victoria (latest published 2013), the *Victorian Integrated Survey of Travel and Activity* (VISTA) does examine trips other than work trips with educational, pick up/drop off, and social trips are also counted. However, it does not report shopping trips that account for a significant percentage of cycling trips in high cycling countries. However, the previous VISTA survey (2007) did report this as shown in Figure 1. This shows that when work trips are not included, the median distance of nearly all trip purpose falls between 2-4km and this distance remains remarkably consistent for the inner, middle and outer suburbs. This is borne out by the 2013 VISTA survey that reported half of all trips were under 4.2km. This distance is a very easy cycling distance.

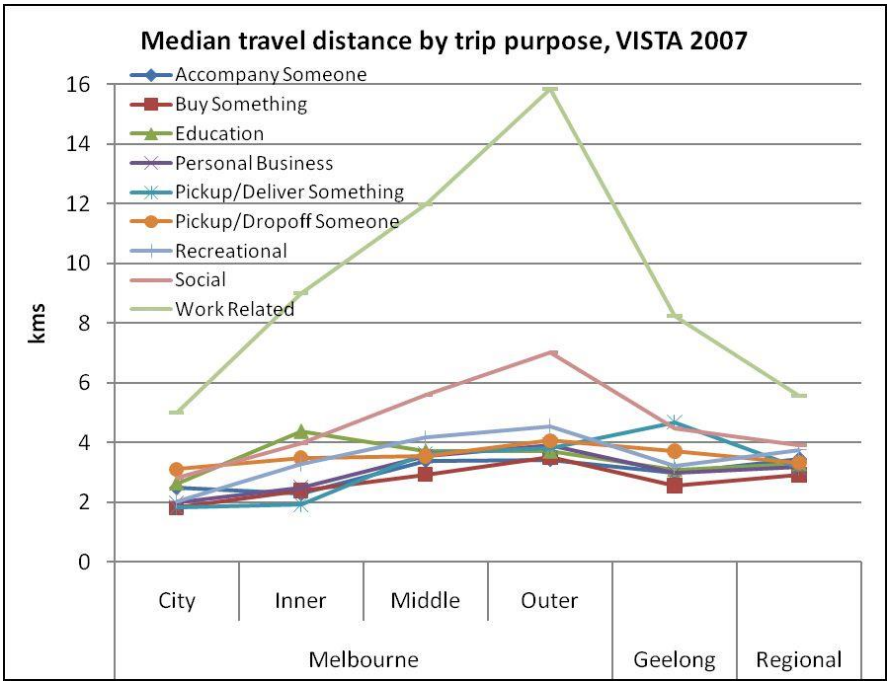

Figure 1: Median Travel distance by trip purpose 2007

In particular, it is not surprising that students have a higher level of active transport than the general population (as shown in Figure 2). Cycling represents 7.49% of journeys to education in inner Melbourne (this includes Maribyrnong).

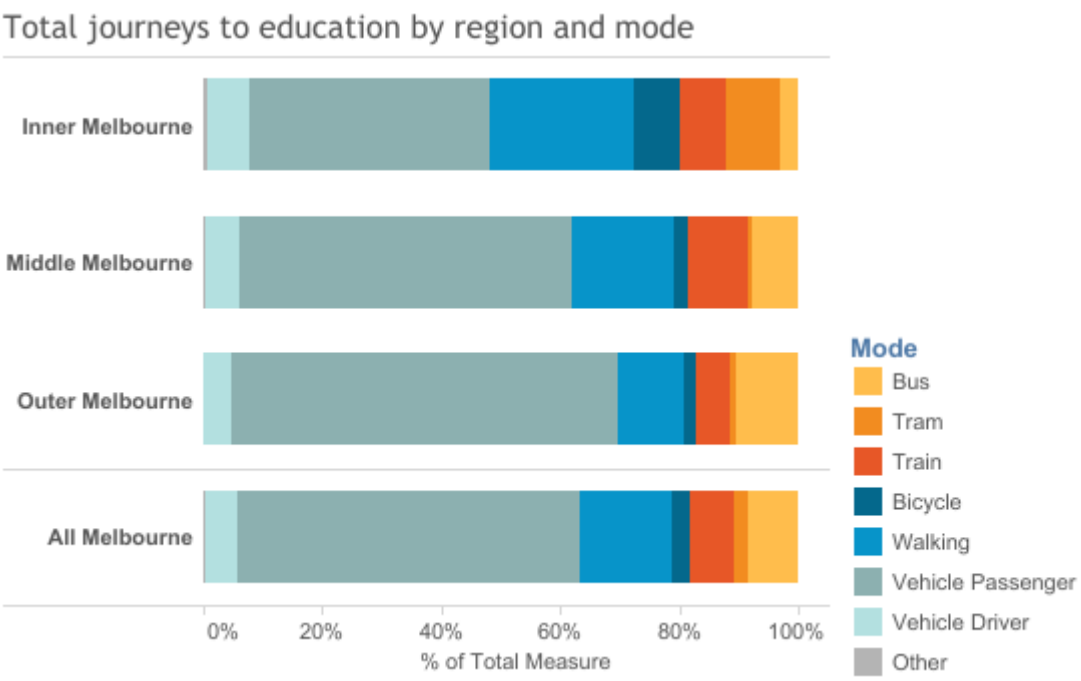

Figure 2: Journey to Education Melbourne by mode and region VISTA 2013[1]

[1] VISTA 2013 https://public.tableau.com/profile/vista#!/vizhome/VISTA-JourneytoeducationAccess/JTE-methodoftravel

Consequently, the lack of data makes it difficult to ascertain exactly the amount of cycling trips in Australia, Melbourne or Maribyrnong (the lack of data is a persistent feature of the cycling landscape in Australia). If the American experience is any guide, where their National Household travel survey reports 50% higher figures than the journey to work census figures. If this is true for Australian then the figure would be approximately 1.5% but in some areas over 30% as shown in Figure 3, Figure 4 and Figure 5. These graphs also show journeys to work in Melbourne are significantly higher in some areas but these also vary considerably throughout Melbourne but has increased since 2006.

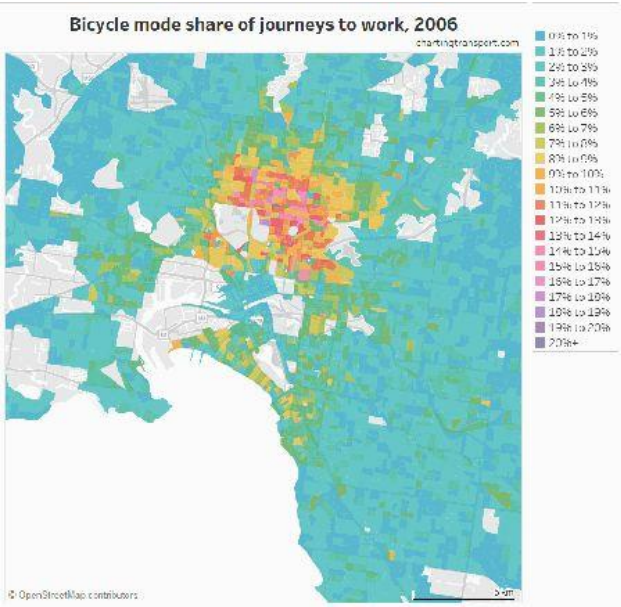

Figure 3: Bicycle mode share journeys to work 2006[2]

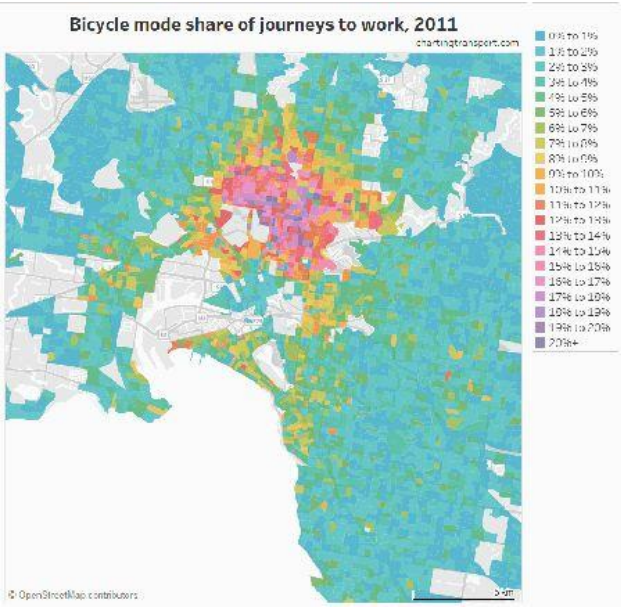

Figure 4: Bicycle mode share journeys to work 2011[3]

[2] Loader, C. 2017 Charting Transport https://chartingtransport.com/category/cycling/
[3] ibid

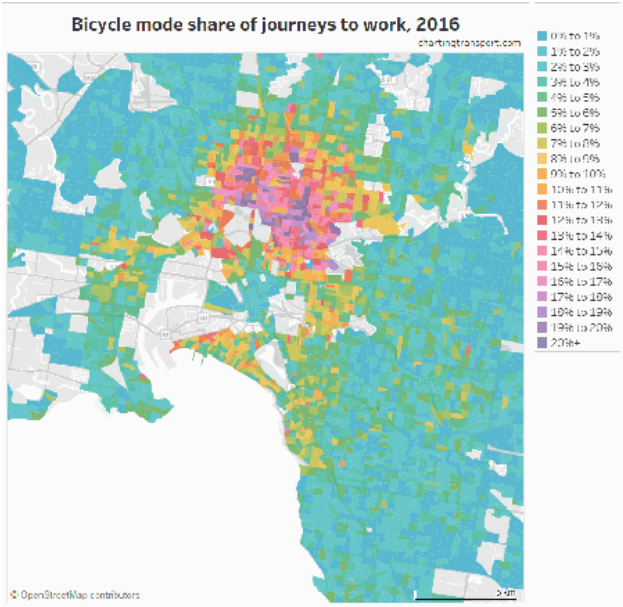

Figure 5: Bicycle mode share journeys to work 2016[4]

As can be seen in Figure 6 this is primarily a phenomenon restricted to the inner 10km radius, or inner Melbourne, which is a pattern that is repeated across most low cycling cities.

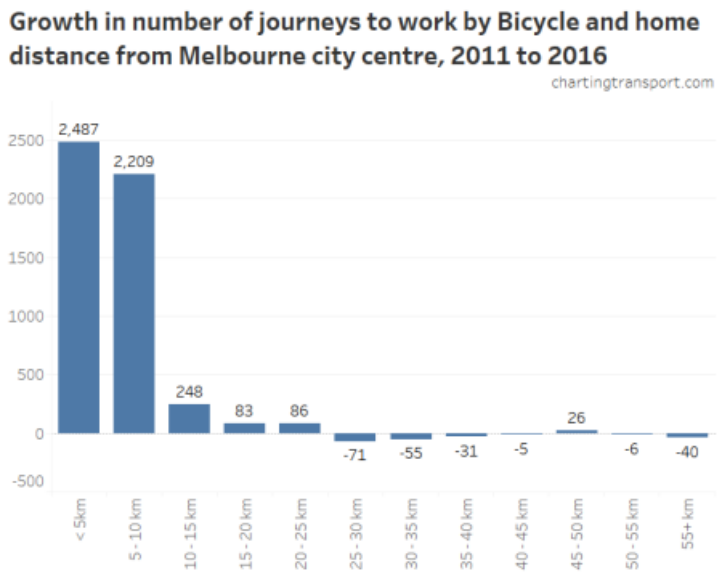

Figure 6: Bicycle journeys to work and distance from CBD[5]

Nevertheless, these graphs show cycling is much more common than the census would suggest. It also highlights that cycling is most prevalent in areas where there has been more and better quality infrastructure installed in the CBD and inner north and east.

[4] ibid
[5] Ibid

4 Types of Cyclists

According to a landmark study in Portland Oregon[6] there are 4 types of cyclists as shown in Figure 7.

Figure 7: 4 types of cyclist

The characteristics of these types of cyclists are as follows:

- Strong and fearless: These are the people who will cycle regardless of roadway conditions. They are 'cyclists;' riding is a strong part of their identity and they are generally undeterred by roadway conditions
- Enthused and Confident: This group is relatively comfortable sharing the roadway with vehicular traffic, but they prefer to do so operating on their own bicycle facilities. They are attracted to cycling in streets that have been redesigned to make them work well for bicycling. They appreciate bicycle lanes and bicycle boulevards.
- Interested but Concerned: These residents are curious about bicycling. They are hearing messages from a wide variety of sources about how cycling is booming in different cities, about the need for people to lead more active lives. They like riding a bicycle, remembering back to their youth, and they would like to ride more, however, they are afraid to ride on busy roads. They don't like the cars speeding down their streets. They get nervous thinking about what would happen to them on a bicycle when a driver runs a red light, or cars passing too closely and too fast. Very few of these people regularly ride bicycles, they would ride if they felt safer on the roadways—if cars were slower and less frequent, and if there were more quiet streets with few cars and paths without any cars at all.
- No way no how: This group is currently not interested in bicycling at all, for reasons of topography, inability, or simply a complete and utter lack of interest.

Currently in Australia, it is nearly entirely the Strong and Fearless who cycle. Neither the Enthused and Confident nor the Interested but Concerned feel sufficiently safe to cycle in large numbers. The Geller study has been replicated in many cities and the results have been approximately the same in all, even in Dutch cities. One of the main reasons the Netherlands has such a high rate of cycling is that the infrastructure caters for the Interested but Concerned and therefore they cycle in much higher numbers than would otherwise be the case.

Who Actually Cycles?

Cycling is common in all demographic groups in the Netherlands, Germany, Sweden and Denmark. Women are as likely to cycle as men in Germany (49% women), Denmark (55% women) and the Netherlands (56% women). This compares with the USA (24% women), UK (29%), Canada (29%) and

[6] Geller 2009 Four Types of Cyclists Portland Office of Transportation

Australia (21%)[7]. Cycling is also common in all age groups in the Netherlands, Germany and Denmark, even for women of childbearing age who still cycle due to safe infrastructure and appropriate types of bicycles (Figure 8). This is not the case in Australia where female participation rates in cycling and other physical activities drop off significantly above the age of 14[8]. Why there is such a discrepancy between countries is the subject of some debate but the correlation between quality of infrastructure and level of cycling for women is irrefutable. This has been borne out by a 2015 study undertaken by Bicycle Network[9].

Figure 8: Women cycling with child

Why take Cycling Seriously?

There are many benefits of cycling with the ones highlighted the most relating to the enormous health and time and cost savings associated with increased levels of cycling. The others are just as important but not discussed as often and include pollution reduction, social justice and climate change benefits.

Health

In Australia in 2014-15, only just over half (56%) of Australians aged 18-64 participated in sufficient physical activity in the previous week[10] and only 19% of children (5 to 17 years) do sufficient physical activity of 60 mins per day, i.e. nearly 4 out of 5 children do not do enough physical activity.

Approximately 21% of children in Australian walked (18%) or rode (3%) to school (2013), with Victoria having slightly higher figures (20% walk and 4% cycle). These figures have fallen markedly since the early 1970s when the rates of active transport to school were 58% of 5 to 9 year olds, and 44% for 10 to 14 year olds[11].

People who are inactive are associated with:

- greater risk of obesity and cardiovascular disease risk factors
- greater risk of depressive symptoms

[7] Buehler, R. and Pucher, J. (2012) *International Overview: Cycling Trends in Western Europe, North America and Australia*, in Pucher, J. R., & Buehler, R. (Eds.). (2012). City cycling (Vol. 11). Cambridge, MA: MIT Press.
[8] VicHealth 2014 Physical activity and sedentary behaviour Evidence summary
[9] Bicycle Network 2015 Pilot Global Bike Count https://www.linkedin.com/pulse/female-ratio-bike-riders-key-benchmark-cycling-health-bart-sbeghen/
[10] VicHealth 2014 Physical activity and sedentary behaviour Evidence summary
[11] van der Ploeg HP, et al. 2008, 'Trends in Australian children traveling to school 1971–2003: Burning petrol or carbohydrates?', *Preventive Medicine*, 46: 60-62.

- lower academic performance, delayed cognitive development and poor school performance
- reduced psychosocial wellbeing and self-worth
- poor prosocial behaviour (eg. aggression and behavioural problems)
- poor sleep patterns (eg. short or delayed sleep and sleep disturbance).[12]

Cycling has multiple health benefits, especially as a form of moderate to vigorous physical activity. Transportation cycling provides an excellent opportunity for individuals to incorporate physical activity into daily life. Furthermore, cycling for transportation is accessible and appealing to population groups that often have low levels of participation in sport and other forms of leisure time physical activity. In pro-cycling countries and cities transportation cycling is undertaken by considerable numbers of children, adolescents, women, older adults, people on low incomes and non-athletic people in general. Consequently, transportation cycling can make a substantial contribution to improved health through increase physical activity levels across diverse population groups[13].

The health benefits of cycling for transport include improved fitness, decreased cardiovascular risk factors, decreased rates of Type 2 diabetes, reduced obesity, decreased blood pressure, improved immune system and decreased lipid levels among others[14]. A landmark British Medical Journal article estimates that those people who undertake a daily commute to work by bicycle had a 52% lower risk of dying from heart disease and a 40% lower risk of dying from cancer[15]. Cycling also leads to improved mental health and well-being, cognitive functioning and educational attainment[16][17], emotional well-being[18], and social health benefits with improved community connections[19].

These health benefits also flow from reduced car use[20], improved air quality[21], reduced noise pollution[22], and improved social capital and community liveability[23].

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[12] VicHealth 2014 Physical activity and sedentary behaviour Evidence summary

[13] Buehler, R., Pucher, J., Merom, D. and Bauman, A., 2011. Active travel in Germany and the US: contributions of daily walking and cycling to physical activity. *American Journal of Preventive Medicine*, *41*(3), pp.241-250.

[14] Oja, P., Titze, S., Bauman, A., de Geus, B., Krenn, P., Reger-Nash, B. and Kohlberger, T., 2011. Health benefits of cycling: a systematic review. *Scandinavian journal of medicine & science in sports*, *21*(4), pp.496-509.

[15] Celis-Morales, C.A., Lyall, D.M., Welsh, P., Anderson, J., Steell, L., Guo, Y., Maldonado, R., Mackay, D.F., Pell, J.P., Sattar, N. and Gill, J.M., 2017. Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *bmj*, *357*, p.j1456.

[16] Åberg, M.A., Pedersen, N.L., Torén, K., Svartengren, M., Bäckstrand, B., Johnsson, T., Cooper-Kuhn, C.M., Åberg, N.D., Nilsson, M. and Kuhn, H.G., 2009. Cardiovascular fitness is associated with cognition in young adulthood. *Proceedings of the National Academy of Sciences*, *106*(49), pp.20906-20911.

[17] Voss, C. and Sandercock, G., 2010. Aerobic fitness and mode of travel to school in English schoolchildren. *Medicine and science in sports and exercise*, *42*(2), pp.281-287.

[18] Gatersleben, B. and Uzzell, D., 2007. Affective appraisals of the daily commute: comparing perceptions of drivers, cyclists, walkers, and users of public transport. *Environment and behavior*, *39*(3), pp.416-431.

[19] Litman, T., 2017. *Community cohesion as a transport planning objective*. Victoria Transport Policy Institute.

[20] Warren, T.Y., Barry, V., Hooker, S.P., Sui, X., Church, T.S. and Blair, S.N., 2010. Sedentary behaviors increase risk of cardiovascular disease mortality in men. *Medicine and science in sports and exercise*, *42*(5), p.879.

[21] Amoako, J., Lodh, M. and Risbey, T., 2005. Health Impacts of Transport Emissions in Australia: Economic Costs.

[22] Australian Bureau of Statistics, 2018. Crime Victimisation, Australia 2016-17, Cat. No. 4530.0 Canberra, Australia Commonwealth of Australia

[23] De Geus, B., De Bourdeaudhuij, I., Jannes, C. and Meeusen, R., 2007. Psychosocial and environmental factors associated with cycling for transport among a working population. *Health Education Research*, *23*(4), pp.697-708.

Clearly, the health benefits of cycling have an economic impact but to date these are not included in any transport cost benefit analysis in Australia and hence these benefits are not considered when planning new transport infrastructure. This is not the case in the United Kingdom where it is standard practice to use the World Health Organisation's Health Economic Assessment Tool for Cycling (HEAT for Cycling). This tool provides a method to incorporate physical activity benefits into transportation appraisals. The HEAT model produces a mean annual benefit (per cyclist, per trip and total annual benefit) due to reduced mortality as a result of cycling. The tool uses a value of statistical life approach and demonstrates health and cost savings for even small increases in population levels of cycling. A Cycling England report valued the health benefits of a regular commuter cyclist (3 times a week for a year) at £679.67 (2010 values, approximately £800 in 2018 or Aus$1450)[24].

Numerous studies have examined the economic benefits of cycling infrastructure and the benefit cost ratios (BCRs) had a median value of 5:1, which is far higher than BCRs usually used in transport infrastructure which normally have values based in the 2:1 range[25] . As an example the Westgate Tunnel project initially having its BCR assessed to be 1.9[26].

Time and Cost Saving

In 2014, a 30km race was held from Werribee to the Melbourne CBD between a driver, a public transport user and a cyclist. The bicycle was the clear winner against the driver only or public transport only option. This race was a repeat of a race held in New York in 2008 before the massive cycling transformation took place there. That the bicycle was fastest in New York should come as no surprise to anyone who has visited New York but the Werribee race result came something as a shock for nearly all. As the Werribee race winner said, "I didn't think it would happen. It's probably a bit embarrassing that we can have someone on a bike beating public transport or even a car into town over 30kms". This is even more embarrassing considering the amount of money spent on road and public transport infrastructure. Even cyclists may be surprised to find out just how much time bicycles can save in any city when all time costs are considered.

Many cyclists already know that they are faster than cars, particularly in peak hour traffic, however, if a holistic view of speed is taken, what emerges is that cycling is a faster mode of transport than the car in just about every major city in the world. This more holistic concept is known as "effective speed"

Effective Speed

Effective speed is calculate using the standard formula for speed: distance/time. However, in the calculation of time, all time costs are included. For car drivers, a significant (and usually ignored) time cost is the time spent at work to earn the money to pay for all the expenses associated with the mode of transportation.

Transport economists usually consider the monetary and nonmonetary costs of travel. For motorists this includes car purchase and repayments, registration costs, fuel, parking, tolls, fines, insurance costs, maintenance and repair costs, other taxes. Nonmonetary costs include the time spent taking a journey. Normally the time is converted to a value in terms of money on the basis of the earning

[24] SQW Consulting 2008 Planning for Cycling. Report to Cycling England. Cambridge UK: SQW Consulting
[25] Future Generations Commissioner for Wales 2018 Transport fit for future generations, Centre for Transport and Society, University of the West of England, Sustrans and New Economics Foundation
[26] Victoria Government 2015 Western Distributor Business Case November 2015

power of the traveller. With effective speed all costs are converted to time which can then be used to calculate speed.

To calculate effective speed the key variables are average trip speed (time spent travelling), the costs of the mode of transport including both direct and indirect (external) costs, the average (or median) income (this determines how much time is devoted to earning the money to pay the costs). External costs are very rarely included in the choices made by individuals though with climate change this may appear to be changing.

In terms of travel times and costs, the car is usually assessed as being better than it really is, and the alternatives worse than they really are[27]. Motorists typically underestimate the costs and overestimate the speeds of their travel. Public transport users do the reverse. A survey in Germany found drivers estimated their costs to be 42% of the real costs and the travel times to be only 82% of the actual times. The car will only save time if the time saved in travelling is greater than the time required to earn the money to pay for the machine. Many motorists and governments appear to ignore this time spent earning money to pay for the transportation costs.

When all the costs are converted to time the following effective speeds have been calculated for driving car driving in several cities.

City	Average speed (usual calculation)	Cycling Average Speed needed for the effective speed to be faster than car drivers	
		Direct Costs Only	Direct and Indirect Costs
Canberra (small car)	33.3	21.5	18.3
Toronto	31.3	17.8	14.6
Auckland	32.3	17.8	14.7
Copenhagen	34.2	16.5	13.4
Canberra (large car)	33.3	15.7	12.7
Melbourne	26.3	14.9	12.5
Los Angeles	26.2	14.9	12.4
Tokyo	19.2	14.4	12.8
Sydney	23.9	14.2	12.0
Hamburg	30.9	12.1	9.6
New York	16.6	10.6	9.2
London	27.7	8.9	7.2

Table 1: Effective Speeds in Various Cities

As can be seen in Table 1 once all the time taken to pay for the costs of travel is included, the effective speed for driving a car drops dramatically, and for a cyclist to have a faster effective speed they only need travel at 9km/h in London, 11km/h in New York and 15km/h in Melbourne.

Increasing the trip speeds for cars has little impact on effective speed as the main time component is not the time spent in the car but the time spent earning the money to pay for all the costs of the car. Government attempts to save time by building faster roads are futile as doing so makes virtually no difference to effective speed even without the phenomenon of induced traffic. The costs of road building is enormous and if these costs are converted to a time measure then building new roads will

[27] Brög, W., 2000, October. Switching to public transport. In *UITP Asia Pacific Congress, Melbourne*.

result in more time spent on transportation rather than less. There are other costs not included in effective speed, such as the costs of increased pollution and increased levels of obesity and heart disease from the increased level of sedentary behaviour.

It is not only individuals who save time by cycling instead of using the car, but also local and state governments save money when investment is directed towards cycling. Cities with high rates of active modes of transportation are those that spend a lower proportion of their total income on transportation. This is indicated by the percentage of gross regional product (GRP) devoted to transportation costs in European cities compared with Australian cities. European cities spend on average 8.1% of their income on transportation whereas Australian cities spend 13.2%. When looking at roads specifically, the city of Copenhagen spent US$97 per person on roads compared with Sydney which spent US$188[28].

Business Case for Cycling Infrastructure

A common phenomenon is for storeowners to complain that replacing on street parking with bike lanes will have a negative impact on their business. Consequently, there are often calls for studies on possible economic impacts requested of bike lanes. Fortunately, an extensive literature has emerged examining that issue and they all reach a similar conclusion: replacing on-street parking with a bike lane has little to no impact on local business, and in some cases might even *increase* business. While cyclists tend to spend less per shopping trip than drivers, they also tend to make more trips, pumping more total money into the local economy over time.

One study in Portland, Oregon found in an analysis of 78 businesses in metropolitan Portland found that non-drivers, including cyclists, are "competitive consumers, spending similar amounts or more, on average, than their counterparts using automobiles." So over the course of a given month, cyclists spent less than drivers on grocery trips, but more at restaurants, bars, and convenience stores. The common theme emerged: cyclists spend less per trip, but they make more trips[29]

A survey of 1,744 shoppers and 144 retailers in nine shopping areas in three New Zealand cities found that drivers spent more money per trip than non-drivers, $47 to $34, however, in central city locations, the gap between drivers and cyclists was only $4 per trip ($47 to $43, respectively). However, non-drivers also spent more time in the shopping areas, suggesting that "the longer-term spending by sustainable users is likely to be higher than that of private vehicle users." This suggests that, in many cases, the benefit of encouraging more sustainable transport journeys to shopping centres outweighs the cost of reallocating space and improving the urban design in shopping centres[30]

Surveys were conducted with 61 merchants and 538 patrons on Bloor Street in Toronto. It was found that only 10 percent of patrons drove to the shopping area, and that those arriving by foot and bicycle spent the most money per month. Report authors concluded that converting street parking

[28] Newman, P., Beatley, T. and Boyer, H., 2009. *Resilient cities: responding to peak oil and climate change*. Island Press.
[29] Clifton, K., Muhs, C., Morrissey, S., Morrissey, T., Currans, K. and Ritter, C. 2012 *Consumer Behavior and Travel Mode Choices*, Oregon Transportation Research and Education Consortium (OTREC)
[30] Fleming (Allatt), T., Turner, T. and Tarjomi. L. 2013 *Reallocation of road space* Beca Infrastructure Ltd, Christchurch NZ Transport Agency research report 530 August

into a bike lane in the area was "unlikely" to have a negative impact on business and that, on the contrary, "this change will likely increase commercial activity."[31]

A study on retail sales data collected retail sales data before and after a bike lane absorbed 12 street-parking spaces on 65th Street in Seattle. The sales index on 65th Street dramatically increased after the lane was put in place, when compared with the index in the rest of the neighbourhood. While business didn't jump in the proximity of another new bike lane in the Greenwood district, it did it fall either concluding that cycling infrastructure had no "negative impact" and probably a positive impact. [32]

After New York City installed a protected bike lane on 9th Ave, retailers along it saw as much as a 49% increase in sales, compared to 3% increase borough-wide[33]: When San Francisco made Valencia Street better for cyclists and pedestrians, nearly 40% of merchants reported increased sales and 60% reported more area residents shopping locally due to reduced travel time and convenience. Two-thirds of merchants said the increased levels of bicycling and walking improved business[34]

All the research suggests

- **Cyclists are repeat, loyal customers.** Customers who arrive by walking and cycling are more frequent and more loyal – they come back again and again. Although they spend less per average visit, they visit more frequently, and ultimately spend more than car-driving patrons. They don't use parking spaces, and they spend more time without a ticking parking meter.
- **Cycling improves retail visibility.** It's easier to attract shoppers off the street for an impulse visit if they're traveling by bike or foot, as opposed to whizzing by and not willing to turn around or manage the parking spot search.
- **Cyclists shop closer to home.** Instead of heading to big-box stores, shopping malls, or chain restaurants at a further distance, cyclists and pedestrians shop where it's most convenient and most familiar – their local shops.

Congestion Reduction

Congestion - mostly understood as the congestion of motorised traffic - is regarded as one of the major problems in urban transport, affecting travel times.[35]

Most existing urban road transport performance analyses do not properly analyse the impact of walking and cycling measures on congestion. Instead, they focus solely on motor vehicle transport performance and either exclude pedestrians and cyclists or include them as disruption factors to motor vehicle traffic.

The positive impacts of walking and cycling for travellers and cities are widely known and documented (e.g. Ogilvie et al. 2007, Pucher et al. 2010, Goodman et al. 2013). An extensive body of

[31] Clean Air Partnership 2009 *Bike Lanes, On-Street Parking and Business A Study of Bloor Street in Toronto's Annex Neighbourhood* Transport Canada, Toronto Community Foundation,

[32] Rowe, K. 2013 Measuring the Economic Impact of Bicycle Facilities on Neighborhood Business Districts, University of Washington College of Built Environments.

[33] Department of Transport 2014 Measuring the Street: New Metrics for 21st Century Streets. New York City

[34] Complete Streets 2018 Complete Streets Spark Economic Revitalization https://www.smartgrowthamerica.org/app/legacy/documents/cs/factsheets/cs-revitalize.pdf

[35] FLOW Project (2016). The Role of Walking and Cycling in Reducing Congestion: A Portfolio of Measures. Brussels. Available at http://www.h2020-flow.eu.

knowledge exists on how to effectively introduce walking and cycling measures in cities. Despite these benefits and knowledge, motorised traffic congestion is still the main focus of mainstream urban mobility policy – usually to the detriment of walking and cycling. Although decision makers may well regard walking and cycling measures as a potential means to achieve a number of economic, social and environmental targets, they may be reluctant to implement them because of the fear of more congestion. However, research for the European Commission suggests that promoting cycling as an alternative to short car trips not only contributes to health and reduces pollution emissions, it also reduces congestion. This research suggests that a cycling promotion scheme including a comprehensive and safe network can reduce the number of car trips by 33%[36].

Attempts to reduce congestion by offering more road capacity can operate as "pull factors" triggering more motorised transport (i.e. induced demand) and thereby generating further congestion (Litman 2014). By contrast, "push measures" can include a reduction of road capacity in order to provide space for bike lanes or wider sidewalks, eventually leading to less congestion in the long run – through a modal shift towards walking and cycling. Consequently, one possible approach to reduce congestion is to change the modal split: reducing motorised transport and strengthening walking and cycling.

Compared with strategies such as expanding road capacity, the bolstering of walking and cycling is considered more effective in the long-term. By building more and or wider roads, congestion can be reduced on the short term – only to rise again due to induced traffic that is attracted by the free flow conditions. By contrast, the effects of promoting walking and cycling through infrastructure measures or mobility management may be small at the beginning, but tend to grow stronger over time (ibid.). Poor conditions for walking and cycling result in low shares for these modes and people tend to use cars even for short trips. Lack of proper walking and cycling conditions can also lead to frictions and safety issues, e.g. when pedestrians cross the road without crosswalks or cyclists have to mix with motorised traffic. To improve the conditions for walking and cycling in urban areas and to promote a shift to those modes, a literature review by the Flow Project recommends several measures:

- the construction and improvement of sidewalks,
- bike lanes and paths,
- more convenient road crossings,
- rephasing of traffic lights,
- better signing,
- more and better bike parking facilities,
- bike sharing schemes,
- the introduction of lower speed limits or mobility management measures such as outreach and education campaigns and programmes at schools and enterprises (Litman 2014, OECD/ECMT 2007).

Another recommendation is to bundle measures to reduce congestion – if various walking and cycling measures are implemented together, the combined effect tends to be larger than the effect of each single measure would be, if implemented alone.

[36] https://ec.europa.eu/transport/road_safety/specialist/knowledge/pedestrians/promote_cycling_and_bicycle_helmets_or_not/promoting_cycling_changes_to_expect_en

When transport planners were surveyed for the reasons why walking and cycling measures are almost never considered as congestion reducing measures in urban transport strategies, they mention several aspects. A central argument was the fear of negative impacts on motor vehicle congestion. Some experts mentioned that policy makers are not even aware of the possible benefits from walking and cycling on congestion reduction. Several stated that it would be politically very difficult to introduce any measures that restrict car traffic, while others pointed out that traditional traffic planning, perhaps relies too heavily on transport modelling tools and calculations like Level of Service (LOS). LOS simply does not allow for the implementation of measures that could potentially reduce capacity and/or impose delays to motor vehicles.

The FLOW project has produced a methodology for multimodal transport network performance and congestion[37]. Walking and cycling measures may have local and/or network-wide impacts, therefore the first step in the FLOW methodology is to determine the scope of the proposed measure and decide which assessment level is best suited to evaluate the measure. The FLOW methodology calculates multimodal (rather than the traditional mono-modal) key performance indicators for an urban road transport network.

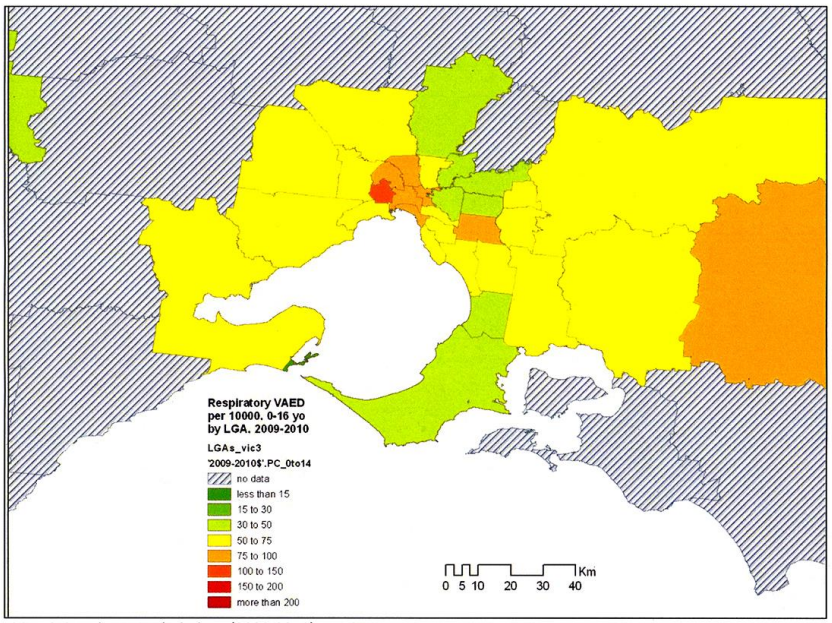
Pollution

The World Health Organisation (WHO) estimates about 3.7 million people die prematurely from outdoor air pollution. This estimate includes all sources of pollution including industry, power stations, as well as transport[38]. However, one study from the UK, however, estimated that emissions from road transport contributes to about 40 per cent of air pollution deaths[39], which would mean nearly 1.5 million people. Many of these deaths are due to particulate matter less than 2.5micrometres in diameter (PM2.5). These particles are emitted from the exhaust of cars as well as another pollutant, nitrogen dioxide that is the chemical primarily responsible for smog.

This is a particularly big issue for the inner west of Melbourne as it already suffers from some of the worst air pollution from the large number of trucks that use its roads and resulting health problems (Figure 9 and Figure 10)

[37] FLOW Project (2016) Multimodal Analysis Methodology of Urban Road Transport Network Performance A Base for Analysing Congestion Effects of Walking and Cycling Measures
[38] WHO Global Health Observation Data, World Health Organisation
[39] Yim, S. and Barrett, S. 2012 'Public Health Impacts of Combustion Emissions in the United Kingdom', Environmental Science and Technology 26 (2012): 4291– 6.
Walker, Peter. Bike Nation: How Cycling Can Save the World (p. 228). Random House. Kindle Edition.

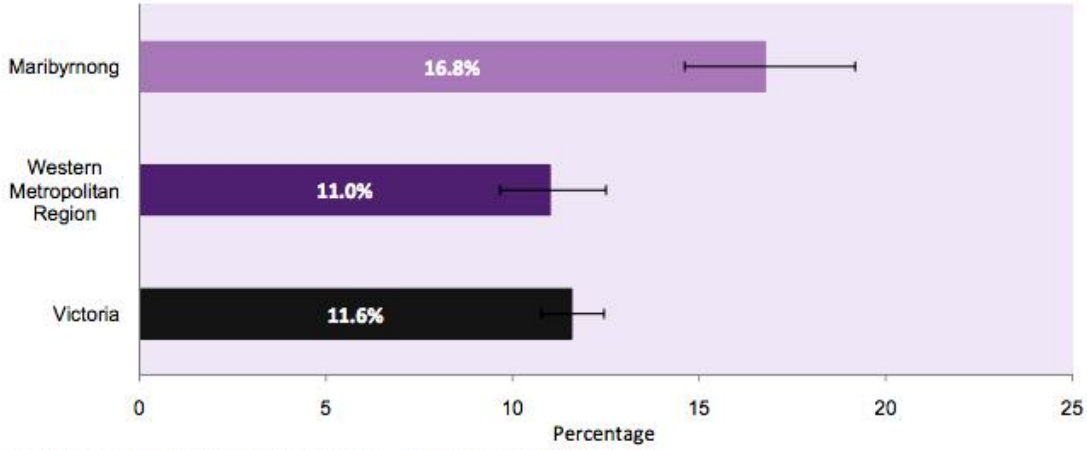
Hospital admissions for respiratory conditions, for LGA in the 2009-2010 year (VAED = Victorian Admitted Episodes Data Set)



Map 1: Respiratory admissions (2009-2010) Age 0-16

Figure 9: Hospital admissions for respiratory conditions

Figure 12: Proportion of adolescents with asthma in Maribyrnong, Western Metropolitan Region and Victoria, 2009.



Source: Adolescent Health and Wellbeing Survey, DEECD, 2009, unpublished.

Figure 10: Adolescents with Asthma

The clear point is if you replace many car trips with bicycle trips then pollution levels will fall.

Social justice

Cycling has the potential to make society fairer as cycling as a form of transport is the cheapest and most equitable option. While walking is cheaper, the difference is small and the distances and access a person riding a bicycle are much greater and therefore expand physical and social boundaries. There are numerous parts of the western suburbs of Melbourne, including the Maribyrnong LGA that are very poorly served with public transport. If there are safe, coherent networks of bicycle lanes, children are far less reliant on a parent being a chauffeur. Older people who struggle to walk

long distances or are wary of driving are able to use a bicycle, especially the recent high quality electronically assisted bicycles that now make up roughly 50% of new bike sales in the Netherlands and women are also far more likely to cycle. Analysis of transport costs in a household budgets show that in the UK they amount to approximately 15% of the total, whereas in the US in areas that are the most car dependent, these costs rise to 25%. This transport cost burden falls particularly hard on low income households in areas poorly served by public transport as has been a recent focus by LeadWest[40]. If cycling is possible for shorter journeys then the financial transport burden is reduced significantly, however, of the small examples of good cycling infrastructure in Melbourne, these are located in areas with higher average incomes[41].

Climate change

2011 European cyclists federation, if every EU nation reached Danish cycling levels it would make a 5 to 11% of the emissions reductions needed to reach EU 2020 targets and reach between 57% and 125% of the reduction needed in transport emissions[42]. A US report in 2015 found e-bikes can often be more efficient than many rail systems. If the global share of urban journeys made by bike rose slightly from the current 6% to 11% in 2030 and 14% in 2050 this would cut overall emissions by 7% by 2030 and 11% by 2050[43]

Successful Bicycle Promotion for Daily Travel

As shown in this report, cycling for daily travel can provide a range of benefits that far outweigh the costs of cycling infrastructure, equipment and programs. The key lessons from all the international experience is that cities with low levels of cycling can dramatically increase cycling with the right policies. Examples include Portland Oregon, increase from 1.1% to 6%, Minneapolis 1.6% to 4.3% Boulder, Colorado 3.8% to 12.3%, and Seville, Spain 0.5% to 7%. In each of these cities cyclist fatalities and serious injuries rates fell dramatically as cycling levels rose.

The lessons from these cities can be grouped into two main categories1/ Infrastructure, Policies and Programs and 2/ Implementation Strategies.

Infrastructure, Policies and Programs

From international experience, these are the most important components of a successful policy package.

Provide a comprehensive package of integrated measures

Firstly, it is important to realise no single measure suffices. A coordinated package of infrastructure provisions, promotional and behaviour change programs, and transportation policies are the trademark of **every** city that has succeeded in significantly raising cycling levels and improving safety.

A comprehensive approach has a much greater impact on cycling than individual measures that are not coordinated. The impact of any particular measure is enhanced by the synergies with complementary measures in the same package. However, the more successfully a city implements a

[40] LeadWest 2017 Time for the West http://www.timeforthewest.org.au/
[41] Domain 2018 Where you'll find Melbourne's most active commuters https://www.domain.com.au/healthy-melbourne/melbournes-healthy-suburbs-2018/suburbs-with-melbournes-most-active-commuters-759055/
[42] European Cyclists' Federation 2011 *Cycle more often 2 cool down the planet*, November, https://ecf.com/sites/ecf.com/files/co2%20study.pdf
[43] Mason, J., Fulton, L. and McDonald, Z. 20155 A Global High Shift Cycling Scenario. November, https://www.itdp.org/wp-content/uploads/2015/11/A-Global-High-Shift-Cycling-Scenario_Nov-2015.pdf

wide range of policies and programs, the more difficult it is to disentangle the separate impacts of each measure. For example, the impacts of improved bike parking, cycle training and individualised marketing are influenced by the extent and quality of the bike network. Similarly, bike to school and bike to work programs are more likely to be successful if motor vehicle speeds and volumes are reduced in residential neighbourhoods through traffic calming measures.

Build a Network of integrated bikeway with intersections that facilitate cycling

No city in Europe, North or South America has achieved a high level of cycling without an extensive network of well-integrated bike lanes and paths that provide separation from motor vehicle traffic. This cannot be emphasised enough, it is not possible to achieve a high level of cycling without protected bike lanes and paths.

Bikeways and paths are the trademark of bicycle-orientated cities in the Netherlands, Denmark, Sweden, Germany, the USA, and the UK. Bike paths and lanes must be combined with intersection modifications such as advance stop lines, special lane markings, refuges islands, extra turning lanes, and advance green lights for cyclists.

Physical separation from motor vehicle traffic is crucial for enabling risk averse and/or vulnerable groups to cycle who make up the vast majority of the population. Virtually all surveys report that separate cycling facilities are needed to encourage non-cyclists to cycle, especially women, children and seniors. These sensitive groups have high rates of participation in countries such as the Netherlands, Denmark, Sweden, Spain and Germany with their extensive separate cycling facilities but low participation rates in countries where most cycling is on roads with heavy traffic and no separation for cyclists. This is why some researchers use the percentage of female usage as an indicator of the success of cycling policies. Where cycling rates for women are high, cycling conditions are generally considered safe, comfortable and convenient[44].

Safe System Approach

For the purposes of achieving a bicycle network that is suitable for All Ages and Abilities (AAA) or 7 to 70 year olds (7270) network, it should also follow the Safe System Approach.

For many years, investment in road safety infrastructure in Australia and New Zealand has taken a bottom-up approach of targeting safety improvements at locations with an established safety problem. While this approach served Australia and New Zealand well in the past, it does not fully embrace the safe system philosophy on which the Australian and New Zealand road safety strategies are based

The Safe System approach to road safety (also known as Vision Zero or Towards Zero) was pioneered in Sweden and acknowledges the physiological and psychological limitations of humans and puts ultimate responsibility on the designers and operators of the system to accommodate these human limitations. This approach is derived from an acceptance that all people make mistakes, and from an ethical point of view, no one should be killed or seriously injured on roads for making a mistake. The focus is on adapting the road system to humans, rather than human behaviour to the roads. The Dutch Sustainable Safety approach is similar to Vision Zero in the understanding that roads should be designed to minimise the chance of crashes, and in the event of a crash prevent serious injury. This approach is supported by the systematic and consistent application of these safety principles.

[44] Buehler, R. and Pucher, J. (2012) *International Overview: Cycling Trends in Western Europe, North America and Australia*, in Pucher, J. R., & Buehler, R. (Eds.). (2012). City cycling (Vol. 11). Cambridge, MA: MIT Press

Safe System road design approaches differ from traditional road design approaches. In traditional road design, crashes are the starting point and road users are generally seen as the cause of crashes. The focus is on reducing crashes and creating roads that have more space for cars, wider lanes and roads, straighter roads. Traditional road design accepts a trade-off between safety, cost and mobility, with expectations that some people will inevitably die in crashes.

Compared to the traditional approach, it is expected that a safe system approach provides greater long-term reductions in fatalities and serious injuries, whereas relying solely on traditional methods results in a levelling off in performance. However, the safe system approach can be combined with traditional interventions in the interim to achieve immediate safety benefits.

With respect to cycling infrastructure, under a Safe System approach, general principles that guide infrastructure work are derived from human tolerance to injury in the event of a crash This means

- Pedestrians and cyclists should not be exposed to vehicle travel speeds of over 30km/h - managed by physical separation or speed limit changes.

This is emphasised by the chance of a pedestrian or cyclist being killed dramatically increases above 30km/h as shown in Figure 11

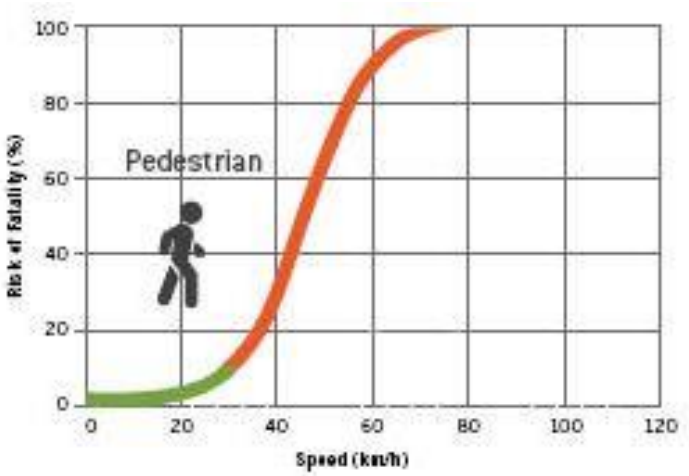


Figure 11: Collision Speed and risk of death

In a Safe System, road infrastructure is designed and constructed such that in the event of a crash, human tolerances to injury are not exceeded. For example if an 80kg person on a 15kg bicycle travelling at 20km/h were to collide with a pedestrian they would face kinetic energy of approximately 1470 joules which is significant but this pales into insignificance when compared to the kinetic energy of a 1.5 tonne car travelling at 50km/h (146,000 joules, i.e. x100).

Infrastructure that support this approach includes treatments that reduce vehicle speeds, removes hazards and obstacles, and physically separation different types of road users. For example, this might include grade separation or roundabouts at intersections to reduce potential conflict points and traffic speeds and installing median barrier and creating clear zones or barriers along roadsides. In a Safe System, these types of treatments are regarded as *primary treatments,* in that they provide a direct Safe System outcome.

Where primary treatments are unsuitable or infeasible, *supporting treatments* can be applied in the interim to deliver a safety benefit in terms of reducing the likelihood and/or severity of crashes in an indirect manner. These types of treatments include audio-tactile edgeline, improving delineation,

wide medians and vehicle activated speed limits. More effort should be focused on primary treatments to deliver longer-term road safety benefits. Focusing solely on secondary treatments is unlikely to achieve the longer-term "Safe System" outcomes.

The Safe System approach is VicRoads policy however, has adopted the Safe System approach, however, this new standard is not being consistently being applied by local government.

Maribyrnong Wide Streets

The City of Maribyrnong is fortunate in that the vast majority of its streets are very wide and could easily accommodate protected bicycle lanes by reversing parking and bike lanes as has been so successfully employed in New York[45]. This could be achieved without narrowing the lane width. BikeWest has already undertaken preliminary studies to identify which streets are wide enough for protected bicycle lanes with no loss of parking (Figure 12)

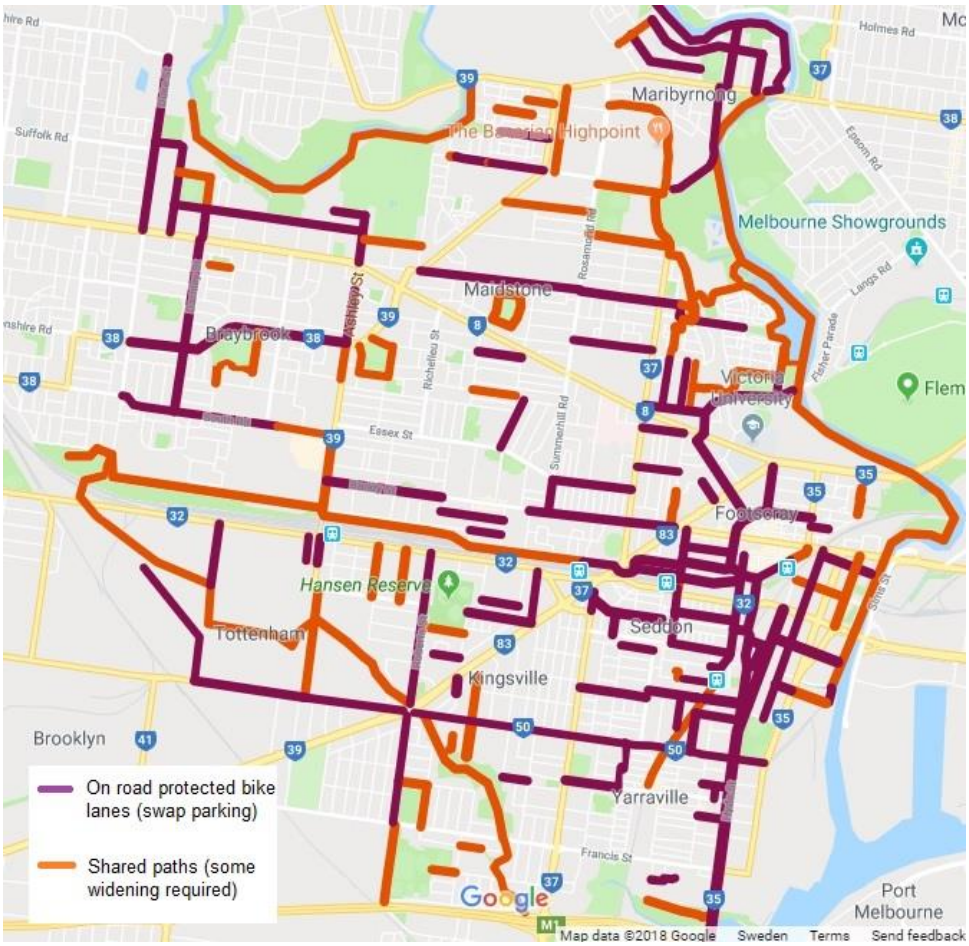


Figure 12: Wide Streets in Maribyrnong LGA suitable for Protected Bike Lanes

What this map clearly shows is the basis for a dense network of protected bike lanes with a small number of streets needing more intervention to complete the network. This would follow the advice given by the Dutch Cycling Embassy who suggest a network should initially take advantage of quieter back streets and reconfigured protected roundabouts where the bicycle lane is set back from the car lanes (Figure 13).

[45] Sadik-Khan, J. 2016 Streetfight: Handbook for an Urban Revolution, Penguin Random House, New York

Figure 13: Protected Roundabout, Lund Sweden

Separate cycling facilities are a crucial first step towards increasing cycling and making it socially inclusive.

Bicycle Network Characteristics

There are five characteristics that should be considered when formulating the overall bicycle network design

1. Directness: This can be measured by directness in time of travel (average speed) and directness in distance (trip length). Stops or loss of priority at crossings, delays at traffic signals, hills, detours, sharp corners, poor sight lines, shared paths (delayed by giving way to pedestrians) and rough surfaces, all impact on directness. Because bicycles are human powered, a direct route from A to B with optimal speed maintenance is essential in high quality design.
2. Safety and Perceived Safety: Safety of bicycle riders primarily depends on the amount of exposure to different masses and speeds of motorised vehicles. Perceived safety is equally important for less confident, traffic-intolerant bicycle riders who feel especially threatened when mixing in the same space as fast moving motorised vehicles. Where bicycle riders are provided exclusive space, cycling is perceived safer and more people choose to ride[21]. To safely provide for all types of bicycle riders, conflicts with motorised vehicles should be avoided with separation or clear priority highlighted with give way lines and green surface treatment to remove confusion.
3. Comfort: To design a bicycle facility that is comfortable for all ages and abilities to ride on, every effort must be made to reduce the nuisance caused to bicycle riders by motorised vehicles. Where the road is shared with motorised vehicles, posted speed should be reduced to achieve a comfortable mixing speed. A good design ensures bicycle riders can comfortably maintain the required design speed. Design speed depends on road function. The design speed sets the requirements for curve radii and width. Steep grades should also be minimised.
4. Attractiveness: Attractiveness of a bicycle facility relates to both perceived safety and quality of infrastructure. The surroundings encountered when cycling range from attractive to intimidating and can encourage or discourage cycling along a route. Landscaping and surroundings can make a cycling route very attractive through an area that might have otherwise been avoided, while high fences, lack

of casual surveillance and no lighting at night can result in actual and perceived loss of personal security.

5. Cohesion: Cohesion is most relevant at the broader cycle network level. The cycle network should include an appropriate density of well-connected cycle routes linking all origins to all destinations, including public transport stations, without interruption. Cycle routes that suddenly stop are a major disincentive for cycling and may force bicycle riders into a dangerous situation. Bicycle riders should always be confident that there will be a quality cycling route to all destinations. Low density development and poorly connected streets reduce the coherence on the cycle network.

A bicycle network that takes these characteristics into consideration will be a AAA (suitable for All Ages and Abilities) or 7270 (suitable for 7 to 70 year olds) network.

Sharrows

One of the principal American road sharing treatments is sharrows and these are common in various parts of Melbourne, including the City of Maribyrnong, where people on bicycles are expected to share the road with cars and trucks travelling at 50-60km/h. This is completely inconsistent with the Safe System approach. Such markings are used in both two lane and multi-lane roads. Numerous studies have shown limited effectiveness in terms of the willingness of cyclists to take control of the lane as espoused in the discredited "vehicular cycling" philosophy promoted in the 1970s[46]. Surveys have also shown that the few cyclists or motorist understand their meaning. Although some cyclists may feel that sharrows give them legitimacy when controlling their lane, however, this appears to be counterproductive as numerous studies suggests sharrows make conditions more dangerous for cycling[47][48][49][50]. It is instructive that sharrows are not mentioned in the latest Austroads "Best Practice in Road Safety Infrastructure Programs"[51]. Therefore, there is a danger that sharrows will become a cop-out, a way for local authorities to claim that it has created bike routes without really doing anything to improve cycling conditions. Sharrows are **never** used in the Netherlands, Denmark, Sweden or Germany.

Consequently, sharrows must **NEVER** be part of any bicycle strategy in the City of Maribyrnong. They are an indicator of cycling not being taken seriously by council and evidence of the individual and social benefits of cycling are being ignored and an effective admission of failure.

Provide Good Bike Parking at Key Destinations and Public Transport Stations

Safe and convenient bike parking is crucial to urban cycling and especially with the integration of cycling with public transport. Countries and cities with the highest rates of cycling provide ample bike parking, including sheltered and secure parking at key locations. Good bike parking at train

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[46] Furness, Zack (2010). *One Less Car: Bicycling and the Politics of Automobility*. Temple University Press

[47] Harris, M.A., Reynolds, C.C., Winters, M., Cripton, P.A., Shen, H., Chipman, M.L., Cusimano, M.D., Babul, S., Brubacher, J.R., Friedman, S.M. and Hunte, G., 2013. Comparing the effects of infrastructure on bicycling injury at intersections and non-intersections using a case–crossover design. *Injury prevention*, *19*(5), pp.303-310.

[48] Winters, M., Babul, S., Becker, H.J.E.H., Brubacher, J.R., Chipman, M., Cripton, P., Cusimano, M.D., Friedman, S.M., Harris, M.A., Hunte, G. and Monro, M., 2012. Safe cycling: how do risk perceptions compare with observed risk. *Can J Public Health*, *103*(9), pp.S42-7.

[49] Teschke, K., Harris, M.A., Reynolds, C.C., Winters, M., Babul, S., Chipman, M., Cusimano, M.D., Brubacher, J.R., Hunte, G., Friedman, S.M. and Monro, M., 2012. Route infrastructure and the risk of injuries to bicyclists: a case-crossover study. *American journal of public health*, *102*(12), pp.2336-2343.

[50] Ferenchak, N.N. and Marshall, W.E., 2016. *The relative (in) effectiveness of bicycle sharrows on ridership and safety outcomes* (No. 16-5232).

[51] Austroads 2018 Best Practice in Road Safety Infrastructure Programs Research Report AP-R562-18

stations is the main approach to integrating cycling with public transport in northern European countries.

Provide convenient information and Promotional Events

It is important to provide the public with a wide range of easily accessible information about cycling facilities and programs, especially for beginner cyclists. Programs such as bike to work or bike to school should be more heavily integrated with safe routes to school programs.

Individual Marketing for Specific Groups

Individualised marketing schemes are likely to be very useful for focusing on particular groups and can have a large impact on cycling levels[52] (Yang et al 2010)

Unlike general promotional material, individualised marketing offers advice on how to reduce car use based on specific situations and preferences of each particular household.

Improve cyclist education and Expand Bike to School Programs

It is especially important to promote cycling among children as habits learned while young tend to persist throughout life. Most Dutch, German and Danish children receive extensive education in traffic safety by the age of 9 or 10. This usually includes classroom instruction about cycling safety and traffic regulations, police run training sessions on special off street bike training facilities and in traffic cycle training with police officers.

Restrict car use through traffic calming car free zones and less automobile parking

Car free zones, home zones and traffic calmed streets are the most obvious restrictions on car use. They make streets bikeable even without separate facilities. As motor vehicles are the main source of danger to cyclists, limiting motor vehicle access and speeds, especially in residential areas, is key to improving cycling safety. Car restrictive measures reduce the noise, air pollution and traffic danger faced by cyclists, thereby facilitating cycling while discouraging car use by making is more circuitous, slower and less convenient.

Implementation Strategies

Any city seeking to promote cycling faces three main tasks:

- It must gather the necessary public and political support
- It must determine the appropriate mix of measures
- It must develop a method for long-term implementation and ongoing, genuine feedback from cyclists, other key stakeholders and the public in general.

These are several strategies that have proven successful in promoting cycling which are discussed below.

Publicise both individual and societal benefits of cycling

A public information campaign is very important to explain the wide range of benefits of cycling to individuals and society at large. Voters and their elected representatives will support the measures necessary to increase cycling only if they are convinced that cycling generates significant benefits. There are both economic and health benefits to individual cyclists and those benefits should be highlighted in campaigns to convince more people to cycle on a daily basis. The message is that

[52] Yang, L., Sahlqvist, S., McMinn, A., Griffin, S. and Ogilvie, S. 2010 Interventions to promote cycling: Systematic Review. *British Medical Journal* 341 DOI: 10.1136/bmj.c5293

cycling pays off for the individual even on the basis of selfish considerations of one's own finances, time, health and recreation. To generate widespread public support, information campaigns should also convey cycling's broader societal benefits including reduced noise, air pollution, energy use and traffic congestion as well as improved public health amore travel options for everyone. The message is that even non-cyclists should support cycling because of these social and environmental benefits of cycling that go beyond the direct benefits to cyclist themselves.

The information campaigns should be as diverse as possible to emphasise the many possible reasons people might have to support cycling.

Make sure citizens are included at all stages of planning and implementation

Ongoing citizen involvement is vitally important for gathering public support and for developing a package of policies that is most appropriate to the needs and preferences of the local population. In New York, the Department of Transport had literally hundreds of meetings before installing bike lanes and creating more pedestrian places. This was vital to their success when a noisy minority complained that the community was not consulted and the new street arrangements were not what the community wanted[53]. The planning process should be transparent, sending a clear message that policies are not being imposed from above but that they are generated in close consultation with key stakeholders, neighbourhood groups and all interested citizens.

Develop long range bike plans and regularly update them

The cities with successful cycling policies have long term bike plans that establish goals for the future and lay out the various measures they intend to implement. Such plans should include a status report on the current situation, evaluation of past and current initiatives, examination of possible funding resources and explanation of future plans.

Bike plans should be developed with close consultation with cycling advocacy group, key stakeholders such as business groups, and interested citizens. Bike plans should be flexible and adaptable. Bike plans also provide an important opportunity to coordinate efforts across different agencies and departments through the design and implementation phases.

Implement controversial policies in stages

It is usually prudent to start with relatively uncontroversial projects that almost everyone can agree on and that have a high probability of success. For example provision of good bike parking at rail stations and other key locations is inexpensive and does not seriously conflict it other users.

In contrast, installation of bike lanes can sometimes mean taking road space away from motor vehicles that may prove controversial. Though this is not always the case as simply swapping the position of bicycle lanes and motor vehicle parking results in no loss. Carefully choosing heavily trafficked routes for bike lanes may reduce opposition from motorists as well as offer a safer, less stressful cycling environment. Reduced speed limits and traffic calming should be introduced first in neighbourhoods where there is widespread support from residents. Consistent with this approach, BikeWest have mapped out streets in the Maribyrnong LGA that could accommodate protected bike lanes with no loss of parking (Figure 12).

Combine incentives for cycling with disincentives for car use

Whenever car use is restricted, it is important to improve alternatives to the car. Providing better cycling, walking, and public transportation services increases the political feasibility of car restrictive

[53] Sadik-Khan, J. 2016 Streetfight: Handbook for an Urban Revolution, Penguin Random House, New York

measures by making it more feasible for communities and individuals to reduce car use. Improving alternatives

International Examples

New York

Since 2012 New York has expanded the on-street bike network by nearly 530kms, including more than 110kms of protected lanes. In 2017, New York installed over 100kms of dedicated cycling space that was the most of any year.

Due to the expansion of the bicycle network on city streets, new greenway paths in public parks, and the introduction of bike share, there are more people cycling in New York City than more than a century. As a result of this new infrastructure, the city has experienced a transformation in the way that people cycle: new bike lanes and greenways encourage New York residents to use bikes to get around their own neighbourhoods and for recreation; protected lanes as the infrastructure has made cycling a more comfortable and convenient transportation option.

In order to capture the widening use of bicycles the annual Community Health Survey now includes a Citywide Mobility Survey as an important data source to better understand the transportation choices of residents. This survey focuses on the cyclist, not the trip and therefore provide a more holistic approach to quantifying cycling activity, especially when used in combination with long-term census data on bike commuting, regular bike counts and data from the bike hire scheme, Citi Bike. Consequently, the New York Department of Transport has as comprehensive understanding of cycling and cycling issues in New York. As of 2018, over eight-hundred thousand people ride a bicycle regularly, 24% of adults (nearly 1.6 million people) have ridden in the past year. On a typical day, there are over 460,000 cycling trips made in New York City. This represents a 156% growth in daily cycling from 2006-2016 (Figure 14) with a commensurate decrease in the decrease in risk while cycling (Figure 15).

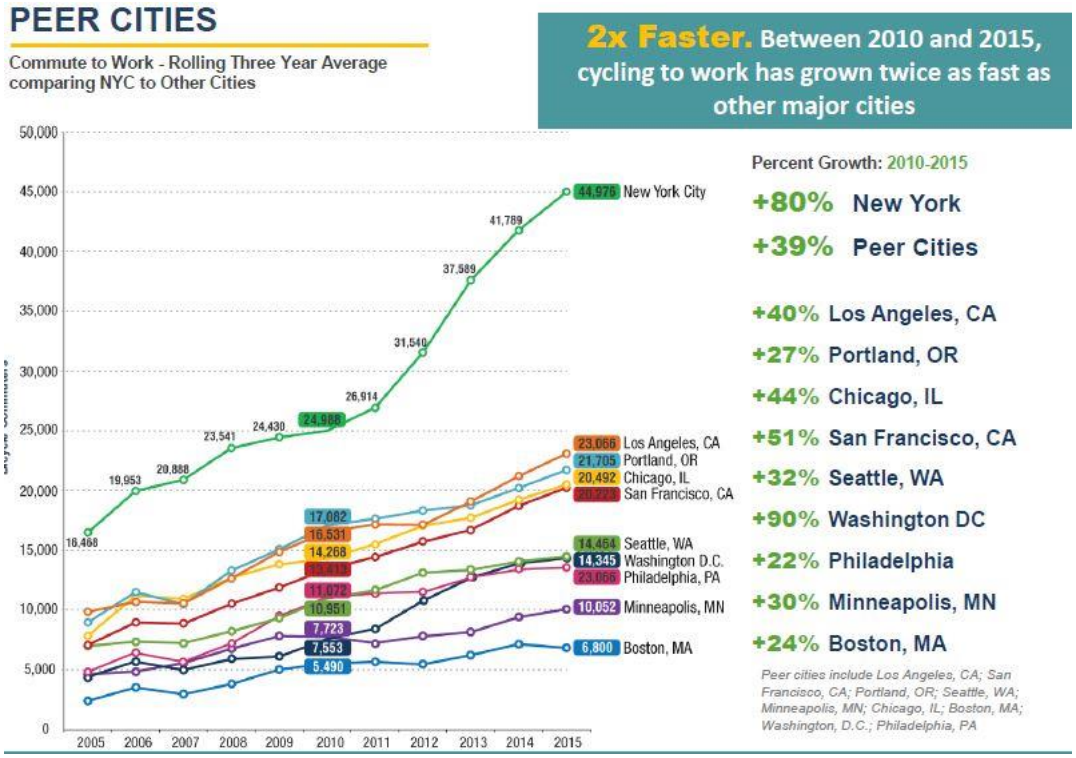

Figure 14: Cycling rates in New York

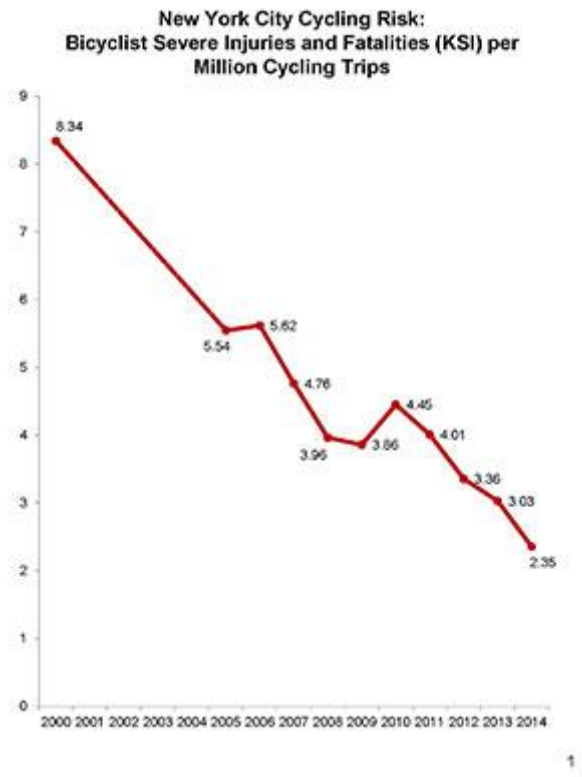

Figure 15: Cycling Risk in New York

Seville

Seville has become a leading city for sustainable transport in the past 10 years. Its proponents say it is living proof that more or less any urban area can get many people on the bikes by the relatively straightforward means of building enough connected, safe lanes on which they can cycle (Figure 16). The number of bicycle trips multiplied 7-fold in three year, rising from just under 1% to 7% of all trips. The bicycle network is comprised of 80kms of completely segregated (kerb, fence or bollards or a combination of the 3) lanes that were installed in 18 months. Segregated, or protected bicycle lanes have made cycling accessible to people of all ages, allowing them to cycle along at slow speeds in everyday clothes. This is in contrast to the scene in most Australian cities, where mainly young, generally male riders speed alongside motor traffic dressed in helmets and luminous high-vis jackets.

Figure 16: Bike Lane in Seville

Consistent with Australian and International Standards

Nearly all of the suggestions in this paper can be implemented in a fashion consistent with Australian and Victoria standards. This is especially the case with recently released publications such as Austroads Best Practice in Road Safety Infrastructure Programs 2018. However, the older publications still occasionally recommended treatments that are inconsistent with the Vision Zero approach where they recommend bicycle users to be exposed to traffic at higher speeds and provide insufficient protection at intersections. While Austroads publications are slowly beginning to catch up with the latest international standards such as those produced by the. Frustration with the lack of progress by similar organisations, led to the publication of the NACTO *Urban Street Design Guide*. This document provides many ideas and examples that can be adapted to Australian condition.

Evidence base

At present, there are no examples of Evidence Based Policy regarding cycling in the City of Maribyrnong. Decisions are made on an ad hoc basis on the pre-conceived preferences of certain staff members and their profession's traditions with little thought about the need for change. Consequently, it is imperative an evidence based policy approach is adopted at Maribyrnong Council.

Evidence-based policy is applied in multiple fields of public policy and refers policy decisions being informed by rigorously established objective evidence. Underlying 'evidence based policy' is a

concern with good practice, and reflects the belief that social goals are best served when scientific evidence used rigorously and comprehensively to inform decisions, rather than in a piecemeal, manipulated, or cherry-picked manner. Clearly a key factor in evidence-based policy is evidence which means collecting data.

Data collection

Currently there is almost no data collected on cycling in Maribyrnong apart from the yearly Supercount. This provides very little information about how people cycle for local trips or where they cycle as the count is only on certain corners. Strava Metro gives some additional data on where people cycle from and to but does not include local trips for shopping, education or visiting friends[54]. Strava Metro is also very costly, however, the global heat map summary is free as shown in Figure 17.

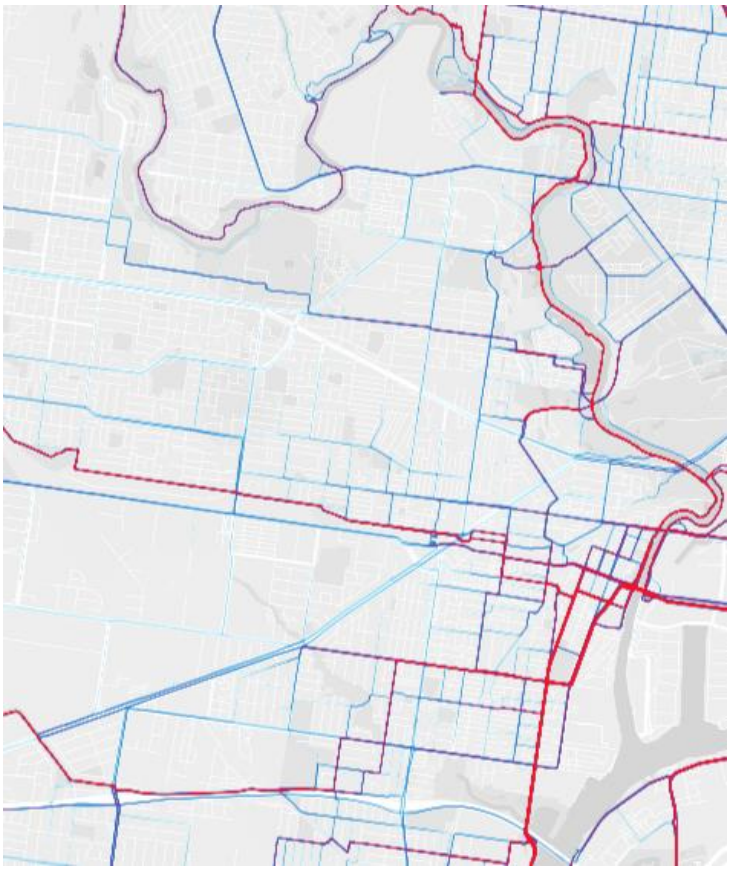

Figure 17: Strava Global Heat Map for Maribyrnong

It is gives no indication as to their preferences for safe cycling infrastructure. Residents in Maribyrnong are never asked if they prefer protected bike lanes. As a comparison, for a bike lane installed in Brooklyn, New York, dozens of public meetings were held in order to gauge community wishes and support[55]. Given this is the case, it is imperative that more data is collected both in terms of observing current cycle trips and comprehensive surveys do determine what the local populace thinks of the current cycling infrastructure, what their preference is and what needs to be done to encourage them to cycle

[54] Strava 2018 *Strava Metro: Better Data for Better Cities* https://sadirava.com/
[55] Sadik-Khan, J. 2016 Streetfight: Handbook for an Urban Revolution, Penguin Random House, New York

This policy must change. Measureable progress is best achieved when good data is collected as the popular business management expression states, "if you can't measure it, you can't manage it". Consequently, it is imperative that Maribyrnong Council set up a comprehensive data collection process regarding cycling. One approach is the Bike Life approach undertaken by Sustrans in the UK.

Sustrans Bike Life

This lack of data compares with the approach taken for the Copenhagen Bicycle Account or BikeLife undertaken by Sustrans in the UK. Sustrans do yearly BikeLife surveys for the following cities[56]:

- Belfast
- Birmingham
- Bristol
- Cardiff
- Edinburgh
- Manchester
- Newcastle and also a special report on
- Women

The BikeLife reports are an assessment of city cycling development including infrastructure, travel behaviour, satisfaction, the impact of cycling, and new initiatives. The BikeLife reports collect data on:

- Awareness of facilities and initiatives
- Overall satisfaction as a place to cycle
- Levels of satisfaction with different infrastructure
- % of citizens who think cycling is safe as other transport options
- % of citizens who think cycling should be improved to make it safer
- Proportion of people who would be encouraged to cycle more, or start cycling, by each of the initiatives listed
- How often they ride a bike
- Proportion of people who agree that more cycling is good for everyone
- Measure of the image of cycling and cyclists
- Support for creation of protected bike lanes
- Support for investment in cycling
- Support for road space reallocation
- Total length of cycle routes
- % of population living within 125m of cycle routes
- % of streets covered by 30km/h limit
- Number of bike parking spaces
- Average number of train passengers per bike parking space
- Investment made in the last 2 years
- % of trips to work by bike
- % of trips to school by bike
- Cycle trips made and distance covered
- Cycle trips made and distance covered by trip type

[56] Sustrans 2018 *Bike Life* https://www.sustrans.org.uk/bikelife

- Estimate change in cycle trips
- % of people in city who are regular cyclists
- % of regular cyclists in each age group
- % of regular cyclists by gender
- % of regular cyclists by ethnic background
- Frequency of cycle trips
- Levels of car and bike ownership
- Relative costs of cycling and driving to individuals (Copenhagen metric)
- Health benefit of cycling (HEAT Model)
- Cost savings to Health System
- Number of kms travelled per killed and seriously injured cyclists
- Number of kms travelled per injury

Clearly this is a substantial amount of data and in addition they have an exhaustive set of counters that help establish where people cycle. This data has helped inform their policy and enabled them to install the infrastructure the community desires and avoid expensive pitfalls of installing infrastructure not required.

Innovation

Innovation In order to make the most of the extensive road infrastructure within the City of Maribyrnong, the council should take advantage of numerous innovations that have led to improved utilisation of public road space. One example of this is the Move Meter. The Move Meter is a web based traffic-modelling tool developed by a Dutch Firm, MOVE Mobility[57], that maps the frequency and distance of car trips in a given setting. Combining modelling from Move Meter that examines short, cycling distance trips, with the Maribyrnong Wide Streets maps and producing a bicycle network took into consideration the short trips with the opportunities provided by Maribyrnong Wide Streets would enable an easily implementable network that catered for local travel demands. Move Mobility has found significant improvement travel times for car traffic as well as helping establish cycle network priorities in various cities.

Another potential innovation is in the area of wayfaring. This is an important consideration as cycle routes are often misleading and confusing. The City of Bristol has adapted the London Underground map to their cycle network to produce an easy to understand and navigate cycle network Figure 18

[57] Move Mobility 2018 https://movemobility.nl/

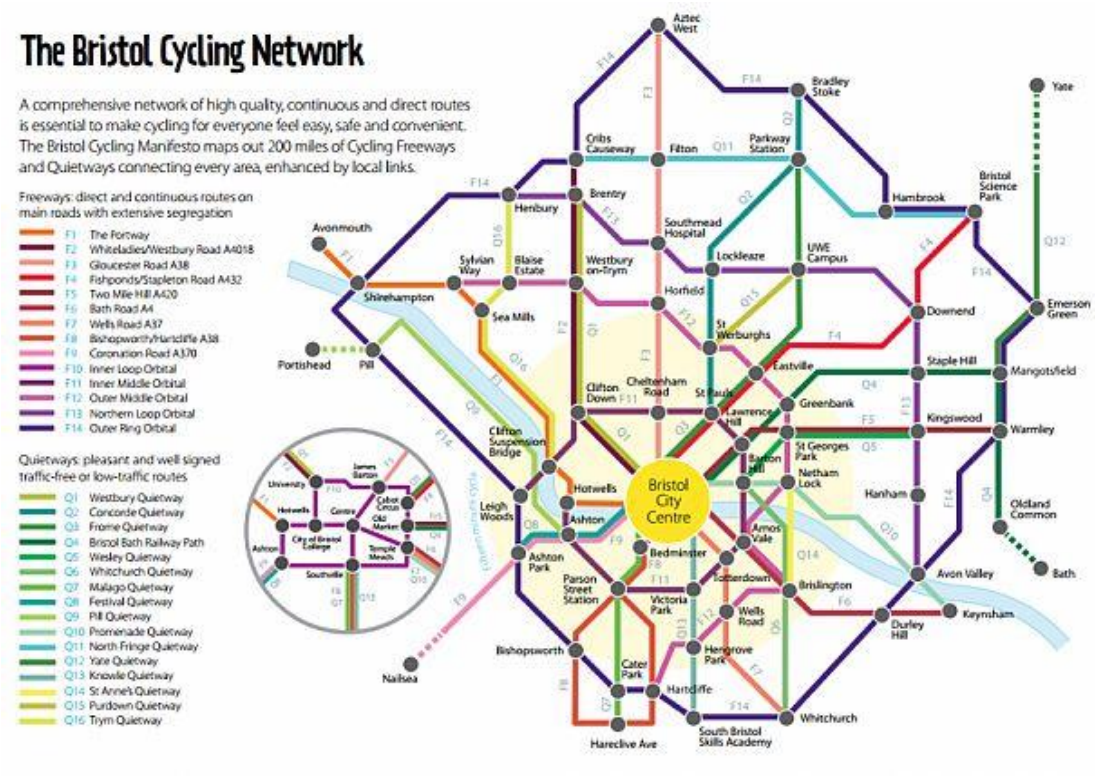

Figure 18: City of Bristol Cycle Network Map[58]

Conclusion

This report has described the current state of cycling conditions in Maribyrnong and then described in detail the overwhelming evidence from around the world to support a focus on promoting cycling in order to build a healthy, wealthy and liveable city. Ideas to achieve this goal are also detailed, with clear goals for infrastructure and implementation strategies.

The health and wealth of the City of Maribyrnong and its residents can be dramatically improved by promoting cycling. It is time for the City of Maribyrnong to join the hundreds of cities from around the world who now realise the importance of making cycling a priority. People of all ages and backgrounds will feel the resulting benefits when their city draw upon the experience and innovation from around the world

[58] https://www.bristolcyclingcampaign.org.uk/