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**On Ya Bike? A Review of the Christchurch
Cycleway Network Business Case**

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WORKING PAPER

No. 27/2016

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Abstract: Transport consulting firm QTP Ltd has estimated that the proposed Christchurch cycleway network provides \$8 of economic benefits for every dollar invested; i.e., a benefit-cost ratio (BCR) of 8.0. As a result, the Christchurch City Council has labelled the network's business case as "proven". However, this "proven" business case has been the subject of precisely zero public scrutiny. We provide that scrutiny and find, in contrast to QTP, that the cycleway network is a doubtful proposition from an economic efficiency perspective, having an estimated BCR in the 0.7-1.6 range, at best.

Keywords: Christchurch, cycleway, benefit-cost, transportation

JEL Classifications: D61, L92, O18, R40, R42

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1 Background

In April 2013, the Christchurch City Council (CCC) agreed to spend \$70 million on funding a network of 13 cycleway routes throughout Christchurch, this being intended to “encourage the large group of people who think they would cycle, or cycle more, if it was safer.”¹ Around these routes the transport network would also be re-jigged in favour of cycling, with reduced on-street parking and cyclists having priority over cars at some intersections. Subsequently, in June 2014, the CCC agreed to accelerate construction of the cycleway network, with a new target completion date of five years. Then in January 2015, the CCC announced that the estimated cost of the network had increased to \$156 million, more than double the original projection.

The CCC’s decision to proceed with the cycleway network was not accompanied or informed by any formal business case. Instead, it seemed to rely on a belief that more cycling was self-evidently a good thing—less traffic congestion, decreased use of fossil fuels, more environment-friendly—and that this desirable objective would be promoted by a cycleway network that would make cycling safer. The vast majority of online comments and public submissions by Christchurch ratepayers seemed to agree, citing greater cyclist safety, promotion of a cycling culture, and less congestion as reasons for support.²

Subsequent to making the decision to proceed with construction of the network, the CCC commissioned Christchurch transport consulting firm QTP Ltd to undertake a formal cost-benefit analysis. Although the objective of this exercise was apparently to support a bid for financial assistance from NZTA, it also provided an *ex post* check on the original decision to proceed. QTP’s draft report, produced in June 2014 and based on the original capital cost estimate, proved to be reassuring: over a 40-year period, the estimated benefits and costs (in present value terms) of the cycleway network were as shown in Table 1. The benefit-cost ratio (BCR) of 15.1 was described by QTP as “substantial”.³

¹See <http://www.ccc.govt.nz/cityleisure/projectstoimprovechristchurch/transport/cycleways/index.aspx> (retrieved 15 February 2015).

²See, for example, <http://www.stuff.co.nz/the-press/news/8594010/Citys-cycleway-plan-goes-European-way> (retrieved 15 February 2015). Of course, and crucially for the viability of the cycleway network, the extent to which this support emanates from current non-cyclists is unknown.

³The difference between \$81.3 million and the commonly-quoted \$70 million cost figure is partly attributable to discounting (the cost is incurred gradually over several years) and partly attributable to QTP (correctly) including the costs of two additional cycleways—the ‘An Accessible City’ routes and the ‘Christchurch Coastal Pathway’—which were excluded from the headline figure.

Table 1: QTP Draft Base Case—June 2014

Benefit/Cost Category	Present Value (\$ mill)
Decongestion	341.9
Safety	26.8
Health & Environment	806.5
Users	53.8
Total Benefits	1229.0
Capital Costs	81.3
Maintenance Costs	0.0
Total Costs	81.3
BCR	15.1

Subsequent to the January 2015 announcement of much higher capital costs, and following a peer review process undertaken by Flow Transportation Specialists Ltd, QTP produced a final report in February 2015 (henceforth referred to as ‘QTP’), which was considered by the CCC’s Infrastructure, Transport and Environment Committee on 5 March. The new report’s summary assessment was:

Table 2: QTP Final Base Case—February 2015

Benefit/Cost Category	Present Value (\$ mill)
Decongestion	340.0
Safety	26.6
Health & Environment	799.3
Users	53.3
Total Benefits	1219.2
Capital Costs	149.4
Maintenance Costs	2.9
Total Costs	152.3
BCR	8.0

Although noting that the revised BCR of 8.0 was “much reduced” from the original estimate of 15.1, QTP nevertheless described the new figure as “very high”. The Committee obviously agreed, with Chairman Phil Clearwater describing the cycleway network business case as “proven”.⁴

However, this “proven” business case has been subject to precisely zero public scrutiny, so some scepticism must remain. For a city facing a deficit of \$1.2 billion,

⁴<http://www.stuff.co.nz/the-press/news/66979991/Cycleways-to-deliver-1-2-billion-in-benefits>

a transport infrastructure project costing in excess of \$150 million is a significant and expensive undertaking, which should therefore be subject to careful, and independent, examination. That is the purpose of this report.

As economists, our focus is solely on the economics of the QTP analysis. That is, we take as given QTP’s underlying framework of cycleway demand—the Christchurch Strategic Cycle Model (CSCM)—as this is an exercise in transport engineering, an area in which we have no particular expertise.⁵ Instead, our objective is to evaluate the economic consequences of this framework from the perspective of Christchurch ratepayers, i.e., has the business case really been “proven”? We conclude that it has not.

2 Estimates of BCR: Fundamental Principles

The BCR is a simple summary measure of the economic viability of a project: if it exceeds 1, then the project’s benefits exceed its costs and the project is efficient, in the sense that the resources it creates are more valuable than those it uses up.⁶ On the other hand, if the BCR is less than 1 then the reverse is true. In practice, however, the costs and benefits are not known with certainty at the time of making the decision to proceed (or not) and so must be estimated. The reported BCR figure is itself, therefore, an estimate of the true BCR (which is unknown). And like all estimates, the BCR estimate contains error. The more uncertainty there is regarding the projected costs and benefits, the greater is this potential error (known, most commonly, as the “margin of error” associated with the estimate).

For evaluation purposes, what this means is that a BCR exceeding 1 is not necessarily sufficient justification for a project to proceed. For example, suppose the BCR for a project was estimated to be 2, and the associated margin of error was estimated to be 1.5. Then the true BCR could reasonably range between 0.5 and 3.5, meaning we cannot be confident that the true BCR does in fact exceed 1. In an uncertain world, the estimated BCR needs to exceed 1 by at least the margin of error in order to confidently justify an investment.

The more uncertainty there is about a project’s costs and benefits, the greater

⁵We do, however, raise some questions about certain aspects of QTP’s implementation of this model—see section 8.

⁶Of course, in a world where financial resources are finite, $BCR > 1$ is not sufficient justification for a project—other projects may provide a still greater return (higher BCR) on public funds.

is the BCR margin of error.⁷ Unfortunately, QTP do not attempt to estimate the margin of error associated with their BCR estimate (and doing so would certainly be a challenging exercise), but it seems likely to be large. As QTP note (p. viii), “cycle modelling is inherently subject to (considerably) more difficulty than traditional vehicle-based transport modelling”, partly because of a lack of data, and partly because of difficulties in capturing, and hence forecasting, the behaviour of potential cyclists. As they also point out (para 7.6), such uncertainties will affect “the level of confidence in ... (cycleway) benefits.”

Presumably at least partly in recognition of the need to apply a margin error when using BCR, the NZTA Economic Evaluation Manual (EEM) specifies that a transport project can be classified as having a “medium” or “high” efficiency rating if and only if it has an estimated BCR of 3 or above, i.e., an implied margin of error of 2. While this is likely to be conservative for cycleway projects, in the absence of any more robust analysis it seems reasonable to adopt 3 as the minimum-acceptable BCR.

3 Cycleway Demand and the Future Price of Fuel

Fundamental to the estimate of benefits generated by the cycleway network is its projected usage; the higher the usage, the greater the potential benefits. QTP (Table 4.1) estimate that the cycleway network will result in 30.6% more cycling trips in 2021 than would otherwise have been the case (17763 trips/day). The corresponding increases in 2031 and 2041 are 33.2% and 35.0% respectively.

This uptake is predicated, in part, on an assumption that real fuel prices will increase by 40% between 2006 and 2041. Such an assumption is at odds with the NZ experience over the last 35 years, as illustrated by Figure 1. Overall, there has been little change in the real NZ petrol price since the first oil shock of 1973–74.

QTP use the theory of “peak oil” to justify their assumption of a 40% real increase. Yet this theory has existed since at least 1956 and has, thus far, stubbornly refused to conform with the facts: with the brief exception of the 1970s OPEC-inspired supply shock, world oil production has continued to rise. More recently, the fracking technology revolution would seem to have pushed “peak oil” even further

⁷This may not be true if cost risks and benefit risks are highly positively correlated, but this is unlikely to be the case for cycleways.

Figure 1: NZ Real Petrol Prices

into the future.⁸

Nevertheless, continued security of supply need not rule out significant increases in price if the new supplies are more costly to extract. But events of recent months (where the NZ petrol price fell by 22% in 4 months) obviously cast some doubt on such a scenario. Moreover, financial markets and forecasts anticipate further declines. For example, the US Crude futures contract is currently pricing in a 6% fall between now and 2020; and the World Bank is predicting a 12% decline by 2024.

Of course, 2041 is currently a long way off and a 40% real increase in petrol prices cannot be completely ruled out. Nevertheless, history and market data suggest it has little credibility as a *forecast* at the current time.⁹ Instead, when there is such uncertain and conflicting information, resulting in both positive and negative estimates of future changes, a far more reasonable estimate of growth in real petrol prices over the next 40 years would seem to be 0%.¹⁰ Incorporating this lower estimate decreases the predicted uptake of the cycleway network and reduces the BCR to 6.0.

⁸Moreover, as Alan Stent pointed out to us, a significant real increase in fuel prices will also encourage migration towards close substitutes such as electric cars, not just cycles.

⁹Some commentators confuse this point: that a 40% real increase is a *possible* outcome does not make it the most likely, or “optimal forecast”, outcome.

¹⁰QTP consider this scenario (Scenario 1-2, para 6.2.2) and describe it as “quite simply untenable”, but for the reasons noted above it is in fact far more reasonable than their assumption of a 40% increase.

Table 3: Adjustment for 0% real petrol price increase

Benefit/Cost Category	Present Value (\$ mill)
Decongestion	223.6
Safety	23.0
Health & Environment	617.3
Users	46.1
Total Benefits	910.0
Capital Costs	149.4
Maintenance Costs	2.9
Total Costs	152.3
BCR	6.0

4 Decongestion

A major source of cycleway benefits in the QTP analysis is due to a forecast reduction in traffic congestion: with more cycling trips and fewer car trips, congestion and its associated costs are lower for remaining motorists.

These benefits take two forms: savings on vehicle operating costs (quicker, and more economical, driving trips) and time savings (shorter driving trips). QTP estimate these to be approximately \$24 million and \$316 million respectively.¹¹

Given the relatively small estimated benefits from lower vehicle operating costs, we bypass further consideration of these and focus on the time savings estimates.¹² QTP's Table 5-3 reveals that the cycleway network is predicted to eliminate 12361 vehicle trips per day in 2021 (approximately 0.8% of total predicted vehicle trips) and that this has a time savings value of approximately \$18.8 million to the remaining drivers¹³

To understand the implications of the latter figure, note that at the \$22.74/hour value of time used by QTP, \$18.8 million corresponds to a time saving of 827,000 hours. Over the 464.6 million vehicle trips predicted for the year (QTP Table D1), this represents a saving of 0.00178 hours per trip—or *6.4 seconds*. Although this is projected to rise with time, the expected time savings remain trivial—approximately

¹¹These become \$14 million and \$210 million under the assumption of a zero real fuel price increase.

¹²The decision by QTP to include vehicle operating expense savings, but to exclude bike purchase and maintenance costs, seems a strange one. Since both figures seem likely to be small, we do not pursue this issue.

¹³95% of the total congestion benefit of \$19.8 million (Table F-2).

12 seconds per trip by 2041.¹⁴

Why does the cycleway network create such meagre time savings? Because according to QTP’s own demand projections, the number of cyclist trips (with or without cycleways) relative to car trips is tiny, and thus their presence or absence has very little impact on commuting times for motorists. For example, by 2021 QTP predict that the cycleway network will increase the daily number of cycle trips from 57994 (i.e., the number of trips if the cycleway didn’t exist) to 75757, a 31% rise. But this increase is less than 1% of the projected number of vehicle trips (and not all of these will result in foregone car trips). The cycleway network’s effect on total cycling demand and commuting activity is just too small to have any noticeable effect on traffic congestion.

The economic consequences of this are profound. QTP assume that every 6.2 seconds of trip time saved has an economic value of $\frac{\$22.74}{6.2/3600} = \0.039 . Adding this over billions of trips then produces the estimated savings of \$317 million. But as NZTA research points out (O’Fallon and Wallis, 2012, p9):

“(V)ery small units of travel time savings (e.g. several seconds, or a minute or two) may be relatively meaningless to (commuters) and hence should not be valued.”

In other words, because nothing productive can be accomplished in 6 seconds (or 12 seconds), and because this time cannot be “stored” and used in conjunction with other blocks of 6 seconds, the economic value of such tiny savings is zero. And adding zero billions of times is still zero.

Moreover, even 6.4 seconds is likely to over-state the case, as QTP’s analysis makes no allowance for the adverse effects of the cycleway network on vehicle trip time, e.g., giving priority to cyclists at intersections. This point is raised by Flow Transportation (the peer reviewer) and acknowledged by QTP:

“(The cycleway network) could lead to some additional delays for motor vehicles, as could more vehicular (cycle) traffic at priority intersections.”

However, QTP make no adjustment for this to their decongestion estimate.

In short, the vehicle time savings attributable to the cycleway network are too small to have any economic value and may even be negative. As a result, zero is

¹⁴QTP (5.2.11) note that almost all of their estimated time savings occur during peak travel periods, but this does little to make these estimates more economically meaningful. For example, the 2041 estimated time savings during peak periods is approximately 24 seconds.

a more realistic estimate of the time savings attributable to the cycleway network (leaving only the vehicle operating costs of \$13.7 million). This reduces estimated cycleway benefits to \$700.1 million and the BCR to 4.6.

Table 4: Adjustment for true economic value of congestion savings

Benefit/Cost Category	Present Value (\$ mill)
Decongestion	13.7
Safety	23.0
Health & Environment	617.3
Users	46.1
Total Benefits	700.1
Capital Costs	149.4
Maintenance Costs	2.9
Total Costs	152.3
BCR	4.6

5 Safety

A key perceived reason for the cycleway network is cyclist safety. Yet, as QTP acknowledge (para 5.3.1), there is little evidence that off-road cycle paths actually result in fewer accidents and deaths, for two reasons. First, most NZ urban cycle accidents occur at intersections (Bassam et al., 2014). Consequently, when segregated facilities are mixed with a lot of intersections (or driveways) they become dangerous compared to on-road cycling. Second, cycling is inherently more risky than driving (both by time and distance), so any increase in the number of cycling trips will necessarily result in more accidents, an effect likely to be exacerbated by the presence of “new” cyclists on the cycleway network. There is also a potential moral hazard problem: cycleways may induce a false sense of security among cyclists, encouraging them, for example, to dispense with high-visibility clothing.¹⁵ On the other hand, greater cyclist numbers may induce a “safety-in-numbers” effect.

QTP attempt to quantify these competing safety benefits in two ways. The first is straightforward (but opaque): they take the NZTA’s EEM Simplified Procedures safety benefit of \$0.056/km and multiply it by total cycling km on the new network. For example, in 2021, 34.84 million cycling km on the new cycleways yields estimated

¹⁵Thanks to Andrea Menclova for pointing this out to us.

benefits of \$1.95 million; for the entire 40-year period, projected benefits are \$26.6 million.

QTP also outline a more complex multi-step procedure (based on their CAST Safety Model) that works as follows:

- (i) Estimate the 2006 cost of cycling crashes as the product of (i) the crash-cost per km of cycling (\$1.042 in 2008 dollars) and (ii) total 2006 cycling km (47.3 million): \$49.3 million.
- (ii) Estimate the total increase in cycling km between 2006 and 2021: 51% increase in trip numbers and 37% increase in average trip length, yielding a total increase of 106%.
- (iii) Adjust this by a safety-in-numbers factor of 0.4 (i.e., a 100% increase in cycle trips results in only 32% more cyclist crashes) to estimate the increase in cycle accidents attributable to the cycleway network: $2.06^4 = 33\%$.
- (iv) Apply this 33% increase to 2006 crash costs: \$65.8 million.
- (v) Subtract off 2021 crash costs estimated to be incurred in the absence of the cycleway network (\$54 million): \$11.8 million.
- (vi) Add \$2.0 million reflecting the benefits of fewer cars on the road (QTP model estimate): \$9.8 million.

That is, the cycleway network is expected to generate a *negative* safety benefit of \$9.8 million in 2021. Over the full 40-year period, such costs have a present value of \$121.7 million.¹⁶ Safety-in-numbers reduces, but does not eliminate, the risks emanating from having more (and probably less skilled) cyclists on the road.

QTP acknowledge (para 6.2.18) that the EEM procedure is “highly likely to underplay the potential for additional crashes (and costs)”, but nevertheless employ it in arriving at their BCR estimate. Yet the CAST procedure seems far more realistic. Implementing it results in a safety benefit estimate of -\$97.2 million and a further reduction in the BCR estimate to 3.8.

¹⁶This differs from the QTP figure of \$64.8 million (QTP Table F-2) because it corrects two QTP calculation errors: they treat the safety-in-numbers factor of 0.4 as a ratio rather than exponent, which over-estimates the potential increase in cyclist accidents; and they consider only increases in cyclist trips (rather than cycling km), which under-estimates the potential increase in cyclist accidents. Overall, the latter error dominates.

Table 5: Adjustment for true economic value of safety benefits

Benefit/Cost Category	PV Benefits (\$ mill)
Decongestion	13.7
Safety	−97.2
Health & Environment	617.3
Users	46.1
Total Benefits	579.9
Capital Costs	149.4
Maintenance Costs	2.9
Total Costs	153.2
BCR	3.8

6 Health & Environment

The projected Health and Environmental benefit of \$799 million (approximately \$742 and \$57 million respectively) is the single biggest contributor to QTP’s BCR estimate. QTP arrive at this figure using the EEM Simplified Procedure, which applies a combined health and environment benefit of \$1.57 to every km of cycling attributable to the cycleway network.¹⁷ For example, an additional 38 million km of cycling is predicted to occur in 2021 (QTP Table E1/E2) as a result of the cycleway network; multiplying this by \$1.57 gives a predicted 2021 benefit of \$59.7 million. Summing (and discounting) over the entire 40-year period yields the total estimated benefit of \$799 million.

However, the EEM explicitly cautions that the Simplified Procedures should only be used for a cycling project costing less than \$5 million. That is clearly not the case here. An alternative method for estimating the health benefits (to avoid overload, we take QTP’s environmental benefits as given) not subject to this caution is provided by the World Health Organisation’s Health Economic Assessment Tool (HEAT).¹⁸ In very simple terms, the HEAT starts by assuming that cyclists are 10% less likely to die from any cause than non-cyclists, applies this “protective benefit” to the target population, and converts this to a dollar value using the NZ value of a statistical life (approximately \$4 million).

The World Health Organisation recommends against including health benefits

¹⁷QTP (para 5.5.1) claim that they use \$1.45/km, but their Table C1 makes it clear that \$1.57/km is actually the figure used.

¹⁸The HEAT is commonly used by researchers when evaluating alternatives to motorised transport, e.g., Deenihan and Caulfield (2014), Gotschi (2011), Olabarria et al. (2013).

to children in cycling proposals. However, given that school children are specifically mentioned by QTP as a target group, this recommendation seems inappropriate here, as well as being overly cautious (health benefits to children may be different to adults, but they’re also not zero). We therefore assume that children capture 50% of the benefits accruing to adults.¹⁹

Applying this version of the HEAT to the cycleway network estimates cycleway health benefits at \$354 million. Combined with the existing environmental benefits estimate of \$39.1 million, the total health and environment benefit estimate falls to \$393.1 million and the BCR estimate to 2.3.

Consultancy Services firm BECA advocate even lower health benefits. In a 2007 report, they recommend that cycling attract a \$0.40/km benefit along with a cap of \$1000 per cyclist.²⁰ As Table 6 shows, this lowers the BCR to 1.0.

Table 6: Adjustment for true economic value of health benefits

Benefit/Cost Category	PV Benefits (\$ mill)	
	(HEAT)	(BECA)
Decongestion	13.7	13.7
Safety	−97.2	−97.2
Health & Environment	393.1	186.0
Users	46.1	46.1
Total Benefits	355.7	148.6
Capital Costs	149.4	149.4
Maintenance Costs	2.9	2.9
Total Costs	152.3	152.3
BCR	2.3	1.0

While much reduced on QTP’s figure, both these estimates are likely to overstate the true health benefits of the cycleway network. Neither takes account of self-selection (people who start cycling to and from work are likely to already be fitter than average), or exercise substitution (people who start cycling to and from work stop going to the gym or for a lunchtime run), or virtue substitution (people who start cycling to and from work may feel justified in consuming more junk food or alcohol—see Karmaker and Bollinger, 2014).

¹⁹Our adjustment is based on the proportion of cycle trips to primary, intermediate, and secondary schools (22.4%), as reported in QTP (2012).

²⁰This is based on an estimate of the disability-adjusted life years lost due to inactivity divided by 3 to reflect the proportion of the population that will use the facilities (similar to a trader factor of 3).

7 Discount Rate

QTP use the NZTA EEM-mandated discount rate of 6% to evaluate future estimates of costs and benefits. Between 2008 and 2013, NZTA twice lowered their discount rate—from 10% to 8%, and again from 8% to 6%. Such a significant reduction is puzzling, given that this period has coincided with the Global Financial Crisis, which seems likely to have resulted in a rise in market risk premia.

Financial economics is quite clear about the appropriate discount rate for the cycleway network—it is the opportunity cost of capital used in the project, i.e., the expected return available on a project of equal risk to the cycleway. What would constitute a similar-risk investment is by no means obvious—given the considerable uncertainty about cycleway uptake, and hence the network’s success, the risk premium seems likely to be significant.

The NZTA choice of 6%, as explained by Heerdegen (2013), is based on the Capital Asset Pricing Model (CAPM). However, the comparator firms Heerdegen uses for estimating the cycleway β are global toll road operators. While such a benchmark is not unreasonable for roading projects, it hardly seems relevant to cycleways.²¹ The discount rate is highly sensitive to the choice of benchmark. For example, if the NZX transport index is used, the β estimate is approximately 0.8 and the estimated discount rate is 9%. In any event, the CAPM applies to a world where investments are perfectly liquid and perfect investor diversification is possible. Neither situation is remotely satisfied by the cycleway network, which is non-marketable and requires ‘investors’ (ratepayers) to hold 100%. Much evidence suggests that illiquidity and imperfect diversification results in discount rates many times greater than implied by the CAPM.

A robust estimation of the appropriate cycleway discount rate is a major project in itself and beyond the scope of this review, but it seems likely to exceed 6%, probably by a significant amount. At a minimum then, 8% would appear to be a more realistic (but likely still too low) discount rate. Applying this rate to the cycleway project lowers total estimated benefits to \$248.8 million and the

²¹One view expressed to us is that QTP are right to use 6% because that is the discount rate specified by NZTA as being appropriate for roading projects, thereby putting cycleways and roads on an equal footing. But this displays a fundamental misunderstanding of financial economics: the discount rate applicable to any project reflects the risk relevant to that project, not the risk of some other project. In this case, the risks of roading projects are (relatively) well understood, in contrast to cycleways. For the latter, the risks also seem likely to be highly systematic—the returns to cycleways will be high during booms and low during busts.

BCR to 1.6 if health benefits are estimated using the HEAT (\$122.2 million and 0.8 respectively using the BECA health benefits).

Table 7: Adjustment for 8% discount rate

Benefit/Cost Category	PV Benefits (\$ mill)	
	(HEAT)	(BECA)
Decongestion	9.5	9.5
Safety	−73.2	−73.2
Health & Environment	280.4	138.7
Users	31.3	31.3
Total Benefits	248.0	106.3
Capital Costs	149.4	149.4
Maintenance Costs	2.9	2.9
Total Costs	152.3	152.3
BCR	1.6	0.7

8 Other Matters

The above analysis suggests that the best possible estimate of the cycleway network BCR is not 8.0, but somewhere below 2.0, and quite possibly below 1.0. This is not the end of the matter—there are also a number of other factors that are likely to reduce these estimates further.

(i) Trader Factor

A vital component of QTP’s cycleway uptake estimates is the so-called trader-factor: this represents, approximately, an upper bound on new cyclist demand created by the construction of the cycleway network. As QTP acknowledge (para 4.1.2), international estimates of the trader-factor vary widely. Reflecting this point, Aecom (2010, p33) note that trader-factors are “highly dependent on localised factors including weather, land-use patterns, cultural factors and car dependence”, suggesting the need for a Christchurch-specific estimate of the trader factor. Despite this, QTP adopt an estimate (Brög, 1982) that is both dated and foreign.²²

More fundamentally, stated preference surveys are notorious for over-estimating the actual uptakes of respondents, i.e., x% of current non-cyclists may indeed

²²If, for example, the trader factor estimate used by QTP is 10% too high, then the BCR estimate (at a 6% discount rate) falls to 2.0 (HEAT) or 0.9 (BECA) and to (at an 8% discount rate) 1.4 (HEAT) or 0.6 (BECA).

be “keen” to cycle in principle, but in practice become a lot less keen when the practicalities of doing so become apparent.

(ii) Relative Attractiveness

Another important determinant of QTP’s cycleway uptake estimates is the “relative attractiveness” factor of cycleways: the weight cyclists put on the provision of off-street cycleways relative to road cycling. QTP do not discuss this issue in their cycleway business case, but make reference to it in QTP (2012). Although the NZTA EEM recommends a weight of 2.0, on this occasion QTP choose to ignore this source and instead settle on the weight of 3.52 advocated by Aecom (2010), as adapted from Wardman et al. (2007). We do not have the information necessary to estimate the effect of this higher weight, but it seems likely to be substantial.

(iii) Capital Costs

The current capital cost estimate is almost certainly too low, as such projects inevitably experience cost escalation, e.g., Flyvbjerg, Bruzelius and Rothengatter (2003) and Flyvbjerg, Holm and Buhl (2003). A recent local example is, of course, the Dunedin Stadium.

(iv) Effects on Pedestrians

QTP make no allowance for disutility costs of pedestrians. Competition for space between cyclists and pedestrians already creates problems, and these seem likely to increase significantly with greater numbers of cyclists on shared pathways.

9 Concluding Remarks

Our analysis suggests that, far from having a BCR of 8, the Christchurch cycleway network is a doubtful proposition from an economic efficiency perspective. Of course, this is not necessarily the only relevant perspective. Recreational cycling, which is not considered in either QTP’s or our analysis, also potentially adds to the value of the network. But in the absence of any evidence on the long-term recreational uptake, it is difficult to know how much weight, if any, could reasonably be placed on this. In any event, recreational benefits are not considered by NZTA in assessing applications for taxpayer funding.

Another possible case that could be made for the cycleway network is that it primarily benefits the less well off. Cycling is a relatively low cost activity, so making it more attractive could potentially have the greatest impact on low-income households (who could, as a result, seek employment in more distant areas, and/or dispense with the high-cost car). However, we are doubtful that the majority of cycleway users will come from this group—the primary beneficiaries seem most likely to be the well-heeled middle class (or their children).

Absent such considerations, the prognosis looks grim. The average Christchurch household is faced with a bill of at least \$1100 for facilities that will result in more cyclist deaths, have at best zero impact on congestion, yield highly uncertain health benefits, and attract only a small number of additional cyclists. Each such projected new cyclist could be gifted a Suzuki Alto for the same cost as the cycleway network.

Postscript (August 2015)

The above report was completed in mid-April 2015.

Copies were immediately sent to several Christchurch councillors, including the mayor (Lianne Dalziel), the chair of the Infrastructure, Transport and Environment Committee (Phil Clearwater), and the finance spokesman (Raf Manji). No response has ever been received.

A summary of our report's findings appeared on the front page of The Press on 23 April 2015. Online comment was overwhelmingly negative (and virulently so!) Letters to the Editor were more evenly split.

On 27 April 2015, The Press published an op-ed taking issue with our findings. A particular criticism was that we hadn't properly taken account of health benefits, citing two studies that actually estimated *lower* health benefits than the lowest of our estimates.

On 27 June 2015, NZTA announced (as part of a nationwide package) a \$40 million contribution to Christchurch's cycleway network.

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