DID THE INNER CITY BYPASS DELIVER?

Nadine Dodge, PhD

Senior Advisor, Wellington City Council
Nadine.dodge@wcc.govt.nz

ABSTRACT

Despite the reliance on cost-benefit analysis for the assessment of transport projects in New Zealand, relatively little attention has been paid to forecast accuracy compared to actual outcomes. In the transport sector, the accuracy of cost-benefit analysis is primarily reliant on the accurate forecasting of two variables, construction costs and travel demand. Construction costs are the main determinant of project expense, while travel demand is used to estimate total travel time savings, the largest benefit stream in conventional assessments of transport investments.

International reviews have indicated that there is a systematic under-estimation of costs and over-estimation of benefits in assessments of major road projects, resulting in an exaggeration of the economic viability of projects. Cognitive bias is the primary cause cited for the under-estimation of costs. Omission of induced travel demand is often cited as an explanation for the underestimation of travel demand, and can result in lower travel time savings, worse than expected environmental impacts, and reduced cost-benefit ratios.

This paper presents an ex-post economic analysis of the Wellington Inner City Bypass, 10 years after completion. Nearly twenty years of data are used to assess the travel time savings, environmental and safety impact, and economic performance of the project. Consistent with other studies, final outturn costs were substantially higher than initially estimated. Contrary to international narratives, travel demand was lower than forecast. Lower than expected travel demand allowed for sustained travel time savings, but also resulted in fewer than expected beneficiaries and lower than expected benefits. Analysis indicates that the BCR was severely over-stated, and may have been below one, indicating the project costs may have outweighed its benefits. This analysis calls into question the ability of forecasts to reliably predict economic performance. Because both underestimation and overestimation of travel demand can reduce project benefits, taking a wide view of uncertainty can ensure investments will deliver value for money under a range of alternative futures.

INTRODUCTION

Cost-benefit analysis (CBA) is a critical decision support tool across government sectors and is used as a key metric in New Zealand investment assessments. In the transport sector, the accuracy of CBA is primarily reliant on the accurate forecasting of two variables, construction costs and travel demand. Construction costs are the main determinant of project expense, while travel demand is used to estimate total travel time savings. Travel time savings are typically the principal benefit stream for road projects, and can constitute over 80% of calculated benefits (Banister, 2008). Therefore, it is the most decisive benefit in determining the economic viability of projects and is the most critical benefit stream to overall assessment accuracy.

CBA can be undertaken before a project (ex-ante), after project completion (ex-post), or during construction (in medias res) (Boardman, et al 1994). Despite widespread use of ex-ante CBA in the transport sector, its accuracy relative to actual outcomes is rarely tested using ex-post analysis internationally or in New Zealand. There is increasing international interest in conducting ex-post CBA, but such studies are rare in a New Zealand context, and are usually confined to internal New Zealand Transport Agency (NZTA) reviews.

The aim of this article is to investigate the performance of Wellington's Inner City Bypass, a decade after construction, relative to ex-ante estimates. The Inner City Bypass project aimed to reduce travel times and increase safety by redirecting and shortening travel distances on State Highway 1 through Wellington's central city. This paper briefly reviews the causes and evidence for inaccuracy in transport appraisal, conducts an ex-post review of the Inner City Bypass, and concludes with a discussion of avenues for improving the accuracy of transport appraisal in the New Zealand context.

The present study compares calculated costs and benefits in an ex-ante appraisal conducted in 1994 with measured outcomes for the Inner City Bypass. While other cost-benefit analyses have been conducted for the project at other points in time, the 1994 study was chosen as a basis for comparison because it was used to decide upon the option that was ultimately implemented. For the purposes of benefit calculations, a five year time period before and a 10 year time period after project opening is used. The present study has conducted an ex-post appraisal of Wellington's Inner City Bypass using two appraisal methodologies, one outlined in the 2004 Project Evaluation Manual, which was in place when funding was approved, and the other outlined in the 2018 Economic Evaluation Manual, which is currently used for assessments. The Project Evaluation Manual (2002) uses a 10 percent discount rate and a 25 year assessment period, while the Economic Evaluation Manual (2018) uses a 6 percent discount rate and a 40 year assessment period. For ease of comparison, all benefits and costs have been converted to 2017 dollars.

EXAMINING THE ACCURACY OF TRANSPORT APPRAISAL

Over two decades ago, Boardman et al (1994) called for ex-ante vs. ex-post studies of CBA in the transport sector to ensure that ex-ante CBA is an accurate decision-making tool. Academic research conducted over the past two decades suggests that transport appraisal techniques are far from accurate, and tend to over-estimate project benefits while under-estimating project costs. Kelly et al (2015) conducted an ex post appraisal of 10 large European transport projects, and found a systematic over-estimation of cost-benefit ratios. This was primarily due to an under-estimation of project costs and incorrect forecasting of travel demand. Flyvberg, Holm, and Buhl (2006) examined forecast inaccuracies for 183 road projects across 14 countries. For major road projects, half of all projects had demand forecast inaccuracies of more than +-20% and the average project had a more than 20% cost overrun.

Several explanations have been presented to explain the regular over-estimation of cost-benefit ratios, and include cognitive bias, strategic misrepresentation, and technical deficiencies, such as unreliable data or inaccurate forecasting models (Lovello and Kahhneman, 2004, Flyvberg, 2008, Naes, Nicolaisen, and Strand 2012). While technical deficiencies are most often blamed as the source of forecast inaccuracies, cognitive bias and strategic misrepresentation of datasets better account for inaccurate forecasting (Flyvberg, 2008).

For major road investments, accurate forecasting of travel demand is the most important factor in determining the overall accuracy of benefit estimation (Naess, Nicolaisen, and Strand 2012). Within the research community, considerable attention has been paid to the failure to account for induced demand as a source of travel demand forecast inaccuracy. Induced demand refers to the additional travel that occurs when improvements reduce travel costs, including when costs are reduced due to shortened travel times. Road capacity increases can induce demand in both the short and long term through a number of pathways. These pathways include new vehicle trips, longer vehicle trips because of travel to more distant destinations, shifts from other modes to driving, and change in land use development patterns (Handy and Boarnet, 2014).

Several studies have provided strong evidence that transport investments induce travel in the short and long term. Increased demand has been found to be proportionate to the percentage increase in transport capacity, so is especially important for larger projects that result in a larger increase in road capacity (Handy and Boarnet, 2014). Travel forecasts that ignore induced demand and are identical with and without the proposed investment will tend to result in an overestimation of the negative impacts of congestion in the absence of the proposed investments and an over-estimation of travel time benefits associated with proposed investments (Naess, Nicolaisen, and Strand 2012). Despite evidence of induced demand across several countries, transport planning practice does not regularly fully account for induced demand, resulting in the over-estimation of travel time benefits and an under-estimation of the environmental impacts of additional road capacity (Milam et al 2017, Nicolaisen and Driscoll 2014).

Because accuracy of travel demand forecasting is critical to overall accuracy of benefit calculations, sensitivity testing benefits for varying levels of travel demand is highly desirable, if not critical, to overall forecast accuracy. Despite its importance, a review of assessments of large European transport projects, only two of the 10 projects identified incorrect forecasting of travel demand as a risk and included it as a factor in sensitivity testing (Kelly, et al 2015).

New Zealand transport appraisal methods contain practices that may ignore induced demand and could result in an over-estimation of travel time benefits. The country's transport modelling practices have been criticised for relying on fixed trip matrices that do not account for changes in travel demand caused by changes in travel times and costs (Mees and Dodson, 2006). By relying on fixed land use assumptions, they also fail to identify transport and land use interaction effects that may induce demand and erode travel time benefits (Wallis, Wignall and Parker 2012).

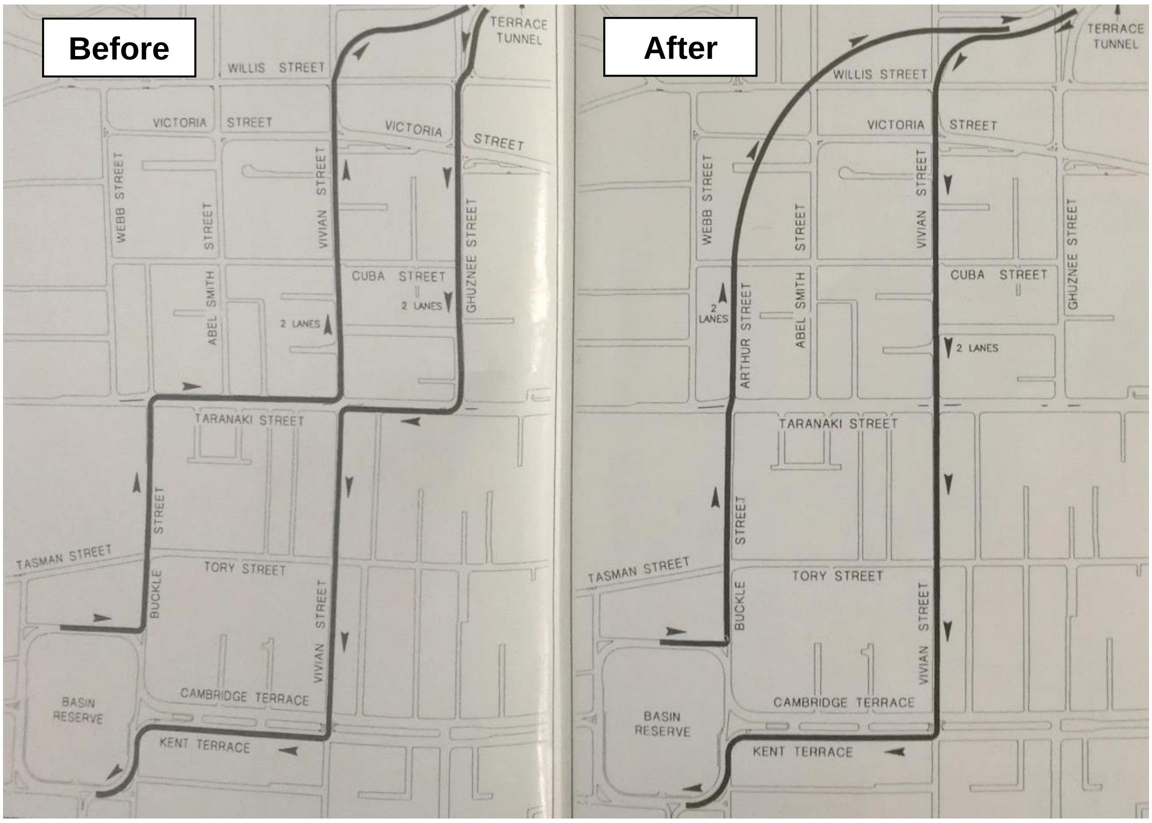
While many studies have indicated that ex-ante CBA is often inaccurate, ex-post CBA in transport is rarely conducted in transport planning practice and ex-ante CBA is frequently relied upon as a factual and conclusive decision support tool (Kelly et al 2015). Within a New Zealand context, ex-post analyses of transport investments are undertaken by NZTA in the form of post implementation reviews. Post implementation reviews are performed on about 10 percent of small and medium sized NZTA funded projects, and are typically conducted at either one year or five years after project opening. They assess actual performance of projects after their completion, as compared to forecast cost and benefits at time of funding approval, but do not usually entail a complete CBA calculation (Wallis, Wignall and Parker 2012). Several recent post implementation reviews conducted by NZTA have demonstrated that roading investments have failed to deliver predicted travel time benefits, with post implementation travel times the same as or worse that they were pre-implementation (NZTA, 2018; NZTA, 2017; NZTA, 2016).

THE INNER CITY BYPASS PROJECT

Proposals to extend the Wellington region's motorway system to and through the central city have been put forward since the 1960's. In 1990, Transit New Zealand conducted detailed investigations of 10 options for an extension of State Highway 1 into Wellington's central city, and ultimately recommended a 1.6 km trench be built between the Terrace and Mt Victoria tunnels (Aasen, Jones, Probine, and Tobin 1991). In 1994, Transit NZ decided that it could not fund the tunnel link in the short term due to funding constraints and initiated a review to explore options in the area in the short to medium term (Wellington City Council, 2013).

In 1994, a team representing Wellington City Council and Transit New Zealand investigated short and long term options for State Highway 1 between the Terrace and Mt Victoria tunnels in Wellington's central city. A total of 34 options were considered, and a cost-benefit analysis was conducted for seven shortlisted options (Works Consultancy Services, 1994). An at grade solution that redirected traffic and shortened travel times with a new road was chosen as the preferred option, with BCR and affordability being key deciding factors (Figure 1). After several years of consultation and legal challenges, a detailed business case was completed in 2000 and detailed design began in 2001. Construction began in August 2005 and the new route was completed in February 2007 (Wellington City Council, 2013).

Figure 1: SH1 Before and After Implementation of the Inner City Bypass



Source: Works Consultancy Services, 1995

PROJECT COSTS

Costs are a main determinant of overall benefit-cost ratios (BCR) for projects. At the short list options assessment stage for the Inner City Bypass, costs were project to be $22 million ($35.6 million in 2017 dollars), with a margin of error of +-20 percent (Works Consultancy Services, 1994). Final outturn costs were $55 million ($63.8 million in 2017 dollars), nearly double what was projected. Cited explanations for the escalation of costs include storm water drainage, planting of trees and shrubs, environmental compliance costs, and the relocation and restoration of 19 heritage buildings (Transit New Zealand, 2007).

IMPACTS ON SAFETY

The Inner City Bypass was projected to reduce vehicle crashes along the route and deliver $32.4 million in crash cost savings. To assess the project's impact on crashes, crash data was obtained using the NZTA Crash Analysis System.

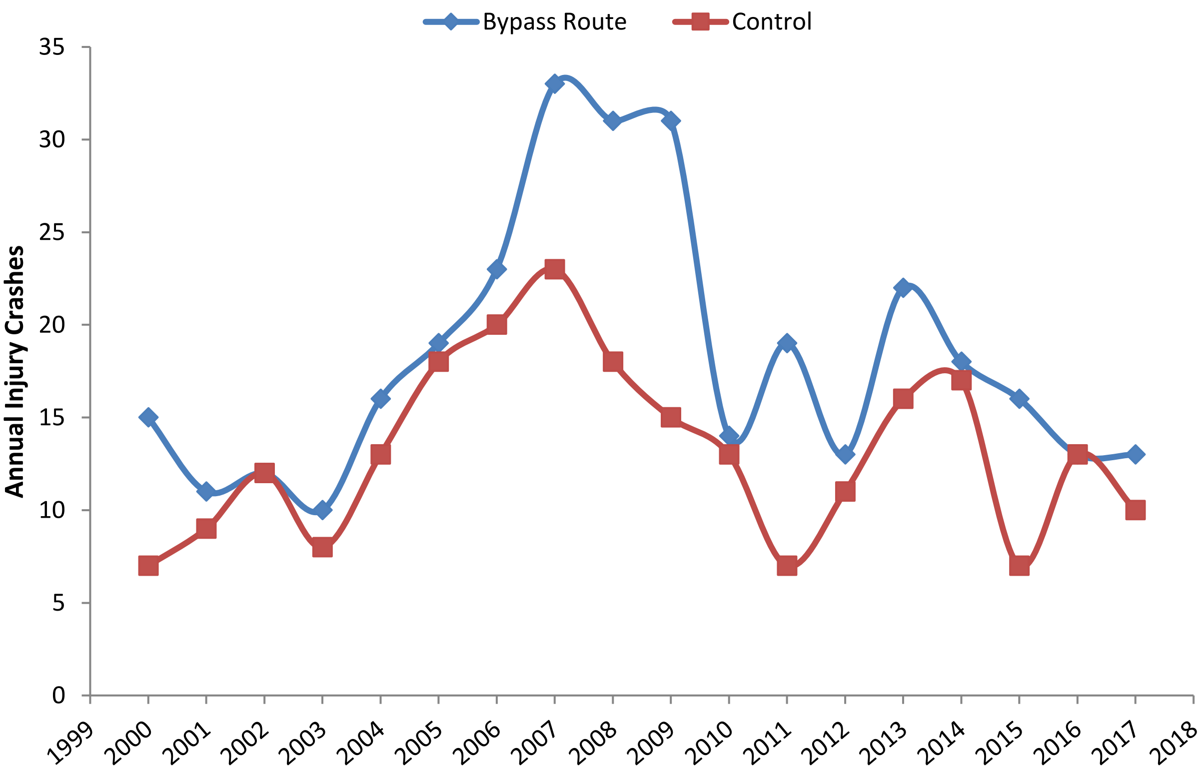
Crash outcomes were compared to a control group of nearby roads where changes were not implemented. The control group of roads had similar total length and daily traffic volumes as the bypass route. The attributes of the bypass route and the control group are shown in Table 1.

Table 1: Route Attributes

Group	Number of road segments	Length (km)	Daily Vehicle Kilometres Travelled
Control	4	3.1	54,233
Inner City Bypass	3	3.0	51,758

From 2000 to 2005, the bypass route had three more injury crashes per year than the control group on average and followed a similar year to year variation in crashes (Figure 3). For the first three years after bypass completion, the bypass route had 13 more injury crashes per year on average, and from 2010 to 2017, the bypass route had 4.3 more injury crashes per year on average, as compared to the control group.

Figure 3: Annual Injury Crashes



A difference in difference regression model was conducted to estimate the impact of the Inner City Bypass on crashes, as compared to the control group (Schiff, Wright, and Denne 2017). The dependent variable is annual injury crashes per road segment, with three road segments for the bypass route and four road segments in the control group. Explanatory variables are annual average daily traffic count (AADT), road segment length in kilometres, whether the observed year was before or after inner city bypass completion (dummy variable), whether the road was on the bypass route (dummy variable), and whether the road segment in the observed year received the intervention (the Inner City Bypass project).

Table 2: Regression estimates of crashes

	Model 1		**Model 2**	
R^2	0.26		0.40	
Explanatory Variables	**Coefficients**	**Standard Error**	**Coefficients**	**Standard Error**
Intercept	2.43**	1.18	2.45**	1.07
AADT ('000)	-0.08*	0.05	-0.08*	0.05
Road segment length	4.15**	1.84	4.18**	1.66
Before/after treatment	0.30	0.67	0.30	0.61
Treatment group (SH1)	-0.03	1.17	-0.05	1.06
Received treatment (Year 1-11)	1.36	1.03	-	-
Received treatment (Year 1-3)	-	-	5.17***	1.17
Received treatment (Year 4-11)	-	-	-0.07	0.97

* p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01

In Table 2, Model 1 estimates the impact of the Inner City Bypass on injury crashes in the decade after project opening relative to the control group and finds that there were 1.36 more crashes per road segment on the bypass route as compared to the control group, but the finding is not statistically significant (95% confidence interval: -0.68 - 3.40). Model 2 estimates the impact of the inner city bypass on injury crashes for two time periods, the three years after project opening and in the longer term, 4-11 years after project opening. Model 2 estimates that there were 5.17 more crashes per road segment on the bypass route as compared to the control group in the first three years after project completion, and this finding is statistically significant at the 99% confidence level (95% confidence interval: 2.84 – 7.49). In the longer term, 4-11 years after project opening, annual injury crashes were not significantly different than the control group.

Difference in difference regression analysis indicates that the inner city bypass resulted in 47 additional injury crashes in the three years after project completion. Along the Inner City Bypass route, 2% of injury crashes result in a fatal injury, 10% result in a serious injury, and 88% result in a minor injury. If we presume that the induced injury crashes follow the same severity pattern, the social cost of these crashes is $7.9 million, undiscounted, using Economic Evaluation Manual (2018) crash costs.

Using a Project Evaluation Manual (2002) methodology, discounted crash costs were $6.9 million and using an Economic Evaluation Manual Methodology (2018), discounted crash costs were $6.2 million.

IMPACTS ON TRAVEL TIMES

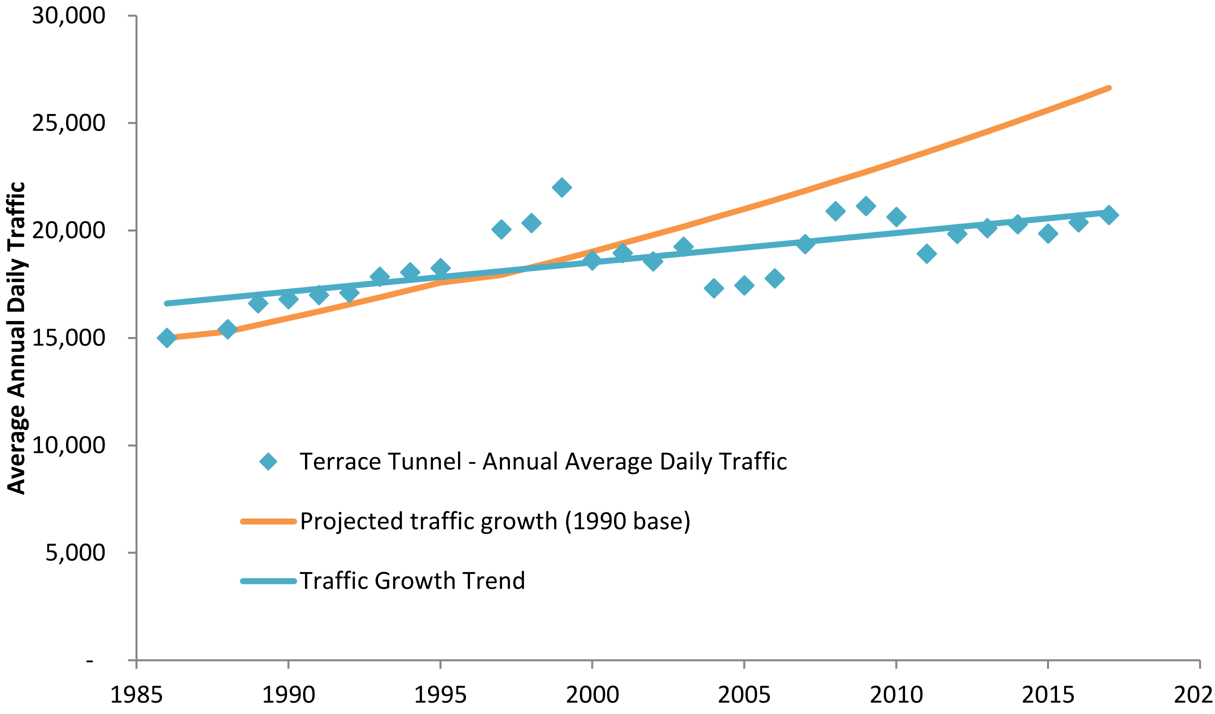
The project was projected to reduce travel times by providing a more direct route and by allowing for higher average vehicle speeds, with benefits of $189.5 million. Travel time savings represented 78% of calculated benefits in ex-ante cost-benefit analysis. Projected travel time savings were heavily reliant on projections of a traffic growth rate of 2% per year for the foreseeable future, resulting in increasingly congested conditions along the route.

The accuracy of travel demand forecasts was assessed using average daily traffic count figures, published annually over a 32 year time period (New Zealand Transport Agency, 1975-2017).

Figure 3 shows actual annual traffic growth at the Terrace Tunnel exit and beginning of the Inner City Bypass, as compared to projected traffic levels. Over a 30 year time period (1986-2016), annual average daily traffic grew by an average of 1.2% per year, 40% lower than was projected.

In 1991, an independent review of the assessment suggested sensitivity testing of travel time benefits with 1.5%, 2%, and 2.5% annual traffic growth (Aasen, Jones, Probine, and Tobin 1991). However, sensitivity testing was not completed as part of the options assessment cost-benefit analysis.

Figure 3: Projected and Actual Traffic Growth (Terrace Tunnel Exit)



Source: NZTA, 1975-2018; Aasen et. al., 1991

Projected travel time benefits were assessed against observed travel times for the first decade after project completion. Travel times on the route have been measured quarterly by Wellington City Council since 2002 using floating car surveys. Figures 4 and 5 show average and standard deviation of travel times on the inner city bypass route, for 5 years before construction and for 10 years after the project's completion. Data available from travel time surveys suggest that the Inner City Bypass has delivered sustained travel time savings along SH1 at all times of day. Northbound and southbound journeys along the route are 58 seconds faster on average, compared to the five years before the project was undertaken. While the project also aimed to increase journey time reliability, travel times have become more variable than before the project, especially at peak times.

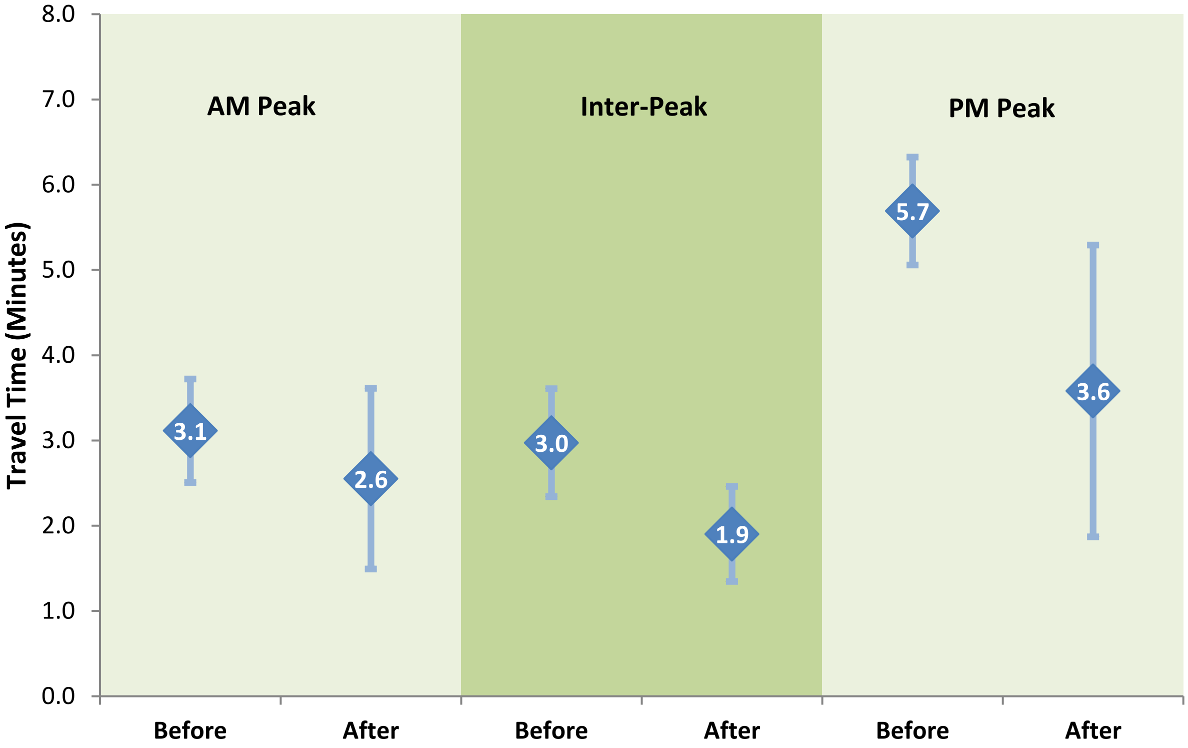
Average annual daily traffic counts and average travel times savings were used to estimate overall travel time savings. Floating car surveys indicate that travel time savings were consistent with respect to time of day and from weekdays to weekends. Therefore, to calculate travel time savings, a 56 second savings was assumed northbound and a 62 second savings was assumed southbound, for 365 days per year. Annual average daily traffic counts were obtained from NZTA (1975-2017).

It is worth noting that ex-ante and ex-post estimates of travel time savings are not directly comparable because ex-ante estimates are derived from a traffic model and ex-post estimates were directly observed. While ex-post observations are a more accurate reflection of achieved travel time benefits, they do not quantify the impact of the project on the wider traffic network.

For the first decade of project assessment (2007-2017), actual savings were calculated. For 2018 onwards, it was assumed that travel time savings and traffic volumes remain at 2017 levels. Using a Project Evaluation Manual (2002) methodology, actual travel time savings were $50.7 million and using an Economic Evaluation Manual Methodology (2018) actual travel time savings were $96.8

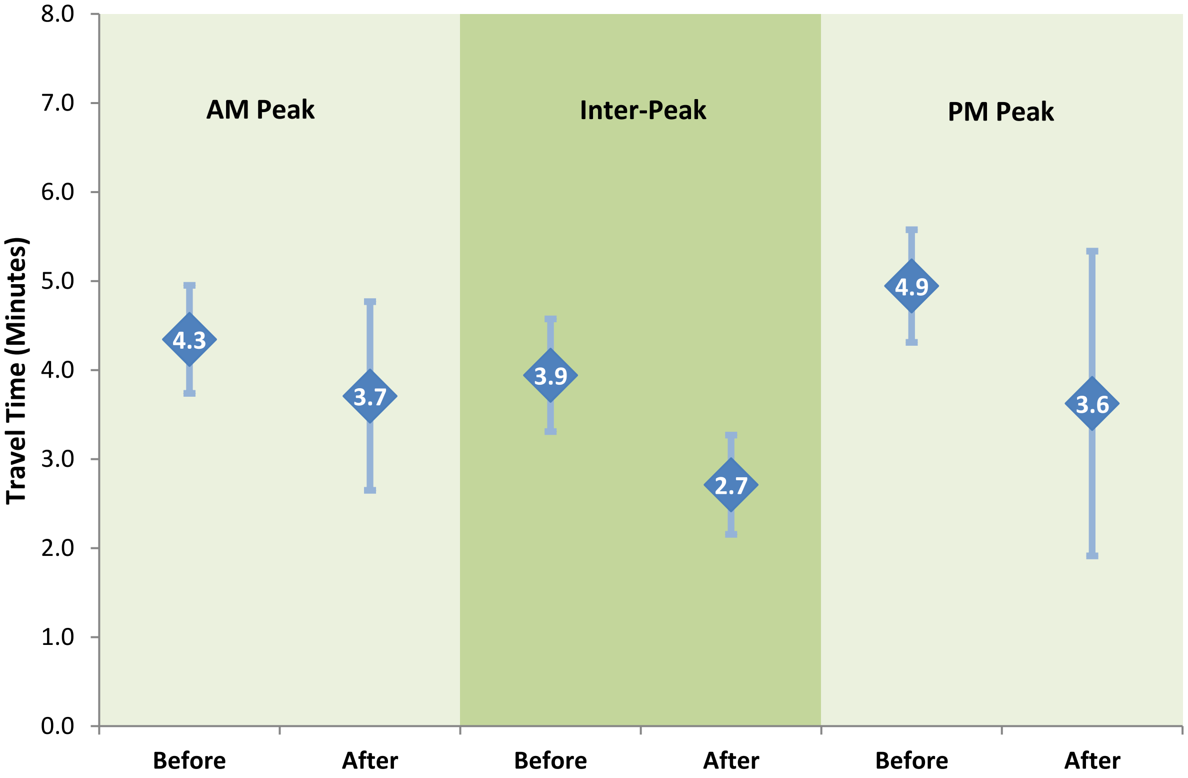
million.

Figure 4 Northbound Travel Times Before and After Construction



Source: Traffic Design Group, 2002-2018

Figure 5 Southbound Travel Times Before and After Construction



Source: Traffic Design Group, 2002-2018

IMPACTS ON VEHICLE OPERATING COSTS

The project was projected to reduce vehicle operating costs by providing a more direct route and by allowing for higher average vehicle speeds, with benefits of $11.3 million. Table 3 shows the change in vehicle speeds and route length achieved by the project. An average increase in speeds of 6.6 km/h and a 750m shorter route allowed for an average $0.05 vehicle operating cost savings per vehicle driving along the route, using current evaluation procedures.

Table 3: Vehicle operating cost savings

Speed (km/h)	**Before**	**After**	**Change**
Southbound (Vivian)	21.4	27.0	5.6
Northbound (Karo)	25.5	33.1	7.6
Length (km)			
Southbound (Vivian)	1.57	1.53	-0.04
Northbound (Karo)	1.49	1.38	-0.11
VOC per trip ($) (NZ EEM 2018)			
Southbound (Vivian)	$ 0.51	$ 0.46	-$ 0.05
Northbound (Karo)	$ 0.46	$ 0.40	-$ 0.06

Using a Project Evaluation Manual (2002) methodology, discounted vehicle operating cost savings were $1.6 million and using an Economic Evaluation Manual Methodology (2018) discounted vehicle operating cost savings were $8.6 million.

IMPACTS ON EMISSIONS

The project was projected to reduce air emissions by providing a more direct route and by allowing for higher average vehicle speeds, with benefits of $7.8 million.

Using the Economic Evaluation Manual (2018), changes in air emissions costs were calculated for four local air pollutants (PM_{10}, NO_x, CO, and HC) and for carbon dioxide emissions. Emissions costs were calculated using emission factors given the mean operating speeds and gradients along the route. The Project Evaluation Manual (2002) had a less developed methodology for quantifying emissions. It only included procedures for quantifying the cost of two pollutants, PM10 and carbon dioxide, and had much lower values for the costs of air pollution.

An average increase in speeds and a shorter route allowed for a reduction in local air emissions and a very modest reduction in carbon dioxide emissions. Using the Economic Evaluation Manual (2018), reductions in local air pollutants were equivalent to $0.013 per vehicle driving along the route and using the Project Evaluation Manual (2002), reductions in local air pollutants were equivalent to $0.0006 per vehicle driving along the route, 22.9 times lower than using the current evaluation methodology.

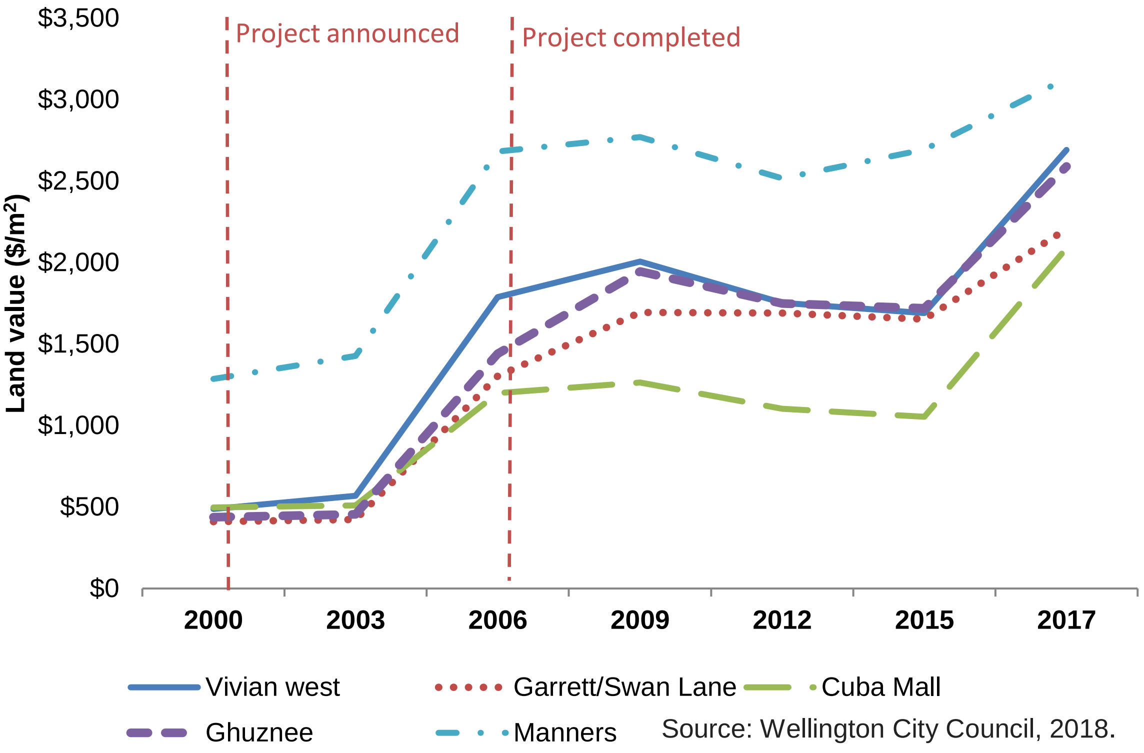
Using a Project Evaluation Manual (2002) methodology, discounted emissions reduction benefits were $0.8 million and using an Economic Evaluation Manual Methodology (2018) discounted emissions reduction benefits were $2.5 million.

IMPACTS ON AMENITY AND PROPERTY VALUES

A desired outcome of the Inner City Bypass was to increase amenity on Ghuznee Street by reverting it to a two way local road and planting street trees. After the project's completion, traffic on Ghuznee Street was reduced from around 20,000 to 8,000 vehicles per day. Land values in the local area were used as a proxy for the impact of the project on local amenity values. To assess the impact of traffic volumes on land values in the area, land values were tracked from project announcement to a decade after project completion. Land values were compared between streets in the local area that were affected by the project and those that were not affected by the project.

From 2000 to 2017, land values along Ghuznee Street, where traffic volume was drastically reduced, increased by 293 percent, land values along Vivian Street, where traffic volumes remained high, increased by 246 percent, and land values on Cuba Mall, where there is almost no traffic, increased by 112 percent. This suggests there is a very weak, if any, relationship between traffic density and land values in Te Aro.

Figure 6: Land Values along Streets in Te Aro



Source: Wellington City Council, 2018.

EX POST VS EX ANTE COST-BENEFIT RATIOS

Figure 7 shows the estimated BCR and project cost estimates for the Inner City Bypass throughout the project's life cycle. The BCR has dropped from over 6 to between 0.73 and 1.59, while costs more than doubled, from $35.6 to $63.8 million.

Figure 7: BCR and cost estimates through project life cycle

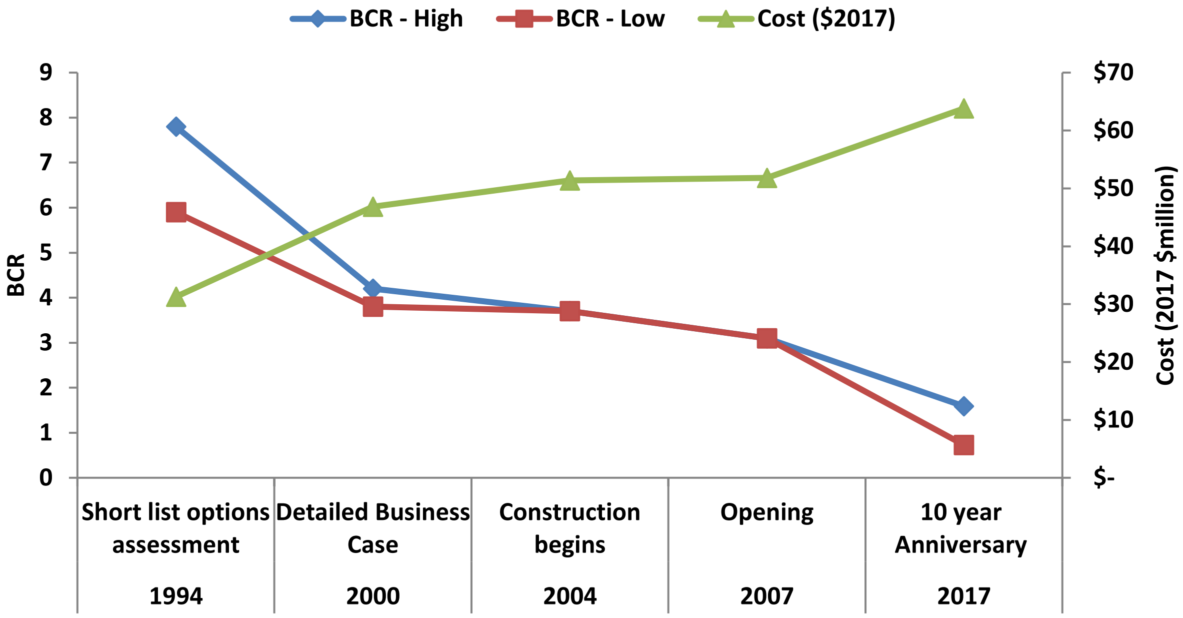


Table 4 compares estimates of project benefits and costs between the 1994 ex-ante appraisal and two ex-post appraisals, one using the procedures that were in place when funding was approved, and one using current evaluation methodologies. This analysis does not take into account construction disbenefits, such as noise, traffic disruption, or decreases in retail activity, or increases in traffic volumes beyond 2017, suggesting that the actual achieved BCR may be lower than currently calculated.

The present study suggests that benefit estimates were much lower than was projected. The over-estimation affected all benefit categories. The choice of evaluation procedure has a noticeable impact on the BCR, with a cost-benefit ratio that is 120 percent higher when using the most up to date economic evaluation manual, as compared to the 2004 version. The main determinant of the difference in benefits is the choice of discount rate. The use of a 6 percent discount rate, currently used for assessments, results in higher overall benefits as travel time benefits have persisted over time. The use of a 10 percent discount rate, which was in place when funding was approved, reduces travel time benefits by 48 percent.

Table 4: Cost and Benefit Estimates (2017 millions)

Appraisal	Ex-Ante (1994)	Ex-Post (PEM 2004)	Ex-Post (EEM 2018)
Travel time savings	$189.54	$50.69	$96.81
Vehicle operating costs	$11.34	$1.63	$8.58
Safety	$32.40	-$6.88	-$6.15
Local air emissions	$2.92	$0.83	$2.51
CO2 emissions	$4.86	$0.00	$0.01
Noise	$2.03	not quantified	not quantified
Urban Amenity	$1.46	$0.00	$0.00
Total Benefits	$244.54	$46.27	$101.75
Cost	$35.64	$63.80	$63.80
BCR	6.86	0.73	1.59

CONCLUSION

A number of national and international studies have indicated that ex-ante cost-benefit analysis tends to under-estimate project cost and over-estimate project benefits, resulting in inflated cost-benefit ratio estimates that negatively influence decision-making in the transport sector. Failure to account for induced demand has been identified as a key source of underestimation of travel demand and overestimation of project benefits.

The present study has conducted an ex-post appraisal of Wellington’s Inner City Bypass. Consistent with other studies, final outturn costs for the Inner City Bypass were substantially higher than initially estimated. While international studies have shown that induced demand caused by roading investments frequently results in an under-estimation of travel demand, in the present case study travel demand was lower than forecast. Because increased demand is proportionate to the percentage increase in transport capacity, the Inner City Bypass may not have resulted in measurable levels of induced demand due to its relatively limited scope. Lower than expected travel demand allowed for sustained travel time savings, but also resulted in fewer than expected beneficiaries and lower than expected benefits. Analysis indicates that in the highlighted case study, the ex-ante BCR was between 3.3 and 8.5 times higher than the actual result, calling into question the reliability of ex-ante forecasts as a decision support tool. This demonstrates that both underestimation and overestimation of travel demand can reduce transport benefits, highlighting the need for accurate forecasting of travel demand if CBA is to be an accurate decision support tool in the transport sector.

The most inaccurately forecast benefit category was safety, where ex-ante appraisal indicated substantial benefits but there were actually disbenefits. This may have been due to changes in road layouts and traffic directions, resulting in crashes between pedestrians and vehicles. This outcome indicates that future roading improvements should take care to avoid safety disbenefits and impacts to vulnerable road users, especially in urban environments.

In the absence of certainty surrounding travel demand forecasts, sensitivity testing of proposed investments under a wide range of future travel demand scenarios can provide greater certainty investments will deliver value for money under a range of possible futures. The present study also suggests that the routine usage of a +-20% margin of error is inappropriate, as the actual margin of error appears to be much larger.

While the NZTA post implementation review process assesses investments relative to their forecast performance at the time of funding approval, the current review has indicated that using time of funding approval at the baseline year may be problematic. CBA is frequently used to decide between alternative investment options well before final approval is given, and the accuracy of CBA at this stage of a business case is important to ensure that CBA assists with identifying the best performing option. The case of the Inner City Bypass has demonstrated that costs escalated considerably between the identification of the preferred option and ultimate funding approval, resulting in a substantially reduced BCR. While a post implementation review methodology may have indicated that the project performed well relative to forecast performance at the time of funding approval, an ex-post analysis compared to initial CBA forecasts tells another story. Conducting post implementation reviews relative to CBA estimates at the short list or programme business case stage may provide better insight into the overall reliability of CBA and its usefulness as a tool to decide between alternative investment options.

Ex-post analysis is relatively infrequent in New Zealand, and NZTA reviews are confined to a small percentage of small and medium sized projects. There is therefore substantial scope to expand the usage of ex- post analysis to ensure that ex-ante appraisal techniques accurately predict investment performance. The case of the Inner City Bypass suggests that more frequent use of ex-post CBA can inform the accuracy of transport investment decision making in New Zealand.

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