

Northern Busway Review

Summary

Northern Busway Map

Fully operational February 2008



Northern Busway Review

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Summary

Purpose

- To review NZ and international public transport (PT) economic evaluation procedures.
- Undertake a post-implementation review (PIR) of the Northern Busway (NB) in terms of costs, benefits and wider outcomes. Quantify the range of benefits delivered by the NB using available data and appropriate methodologies.
- Determine if any of the identified benefits from the NB are unaccounted for in current current NZ PT evaluation procedures and make recommendations accordingly.

Project Scope

The original 2004 evaluation was based on a comparison of modelled 'do-minimum' and 'do-something' demand scenarios. This evaluation considered the effects of the busway in terms of the improved operations arising from new busway infrastructure (only) and considered the following benefits:

- New bus user benefits
- Congestion relief
- Existing bus user benefits

The NB project (the 'do-something' scenario considered in the review) assumed that the following components would be in place in addition to the future 'do-minimum' scenario:

- The exclusive busway lane.
- The planned 2011 bus rapid transit services on North Shore Busway.
- 'Basic stations' at Akoranga, Westlake, Sunnynook, Constellation and Albany.
- Park and ride facilities.

The costs associated with setting up and operating the new bus rapid transit services, the revenues arising from these and a comprehensive range of potential benefits were all excluded from the original evaluation, in order to be consistent with the project evaluation manual (PEM) and funding rules applying at the time.

Current economic evaluation manual (EEM, 2010) procedures encourage a wider range of potential benefits to be considered and current funding rules permit a more comprehensive project scope to be tested, for example to include the busway, 'full' station costs, associated facilities and services. Such an integrated 'package approach' to economic evaluation has been tested experimentally in this review, using a model developed for the purpose of the preliminary economic evaluation of PT service and infrastructure packages.

This review has also sensitivity tested the effects of increasing the evaluation period and of reducing the discount rate for the economic evaluation of the NB project.

It is important to note that this review has been based largely on monitoring information from the early post-implementation period (2008-11) and that no comprehensive revision of future year modelled forecasts has been undertaken.

Post-implementation Monitoring

The main findings of post-implementation monitoring indicated that actual out-turn benefits were higher than anticipated due to:

- Busway patronage increasing more rapidly than forecast.
- Bus services operating faster and more reliably than prior to the busway.
- Reductions in post-implementation peak traffic volumes on the parallel SH1.

Out-turn projects costs were slightly higher than anticipated due to variations identified during project implementation.

Cost Benefit Analysis

Original Evaluation and PIR – Project Infrastructure Only

The originally calculated BCR of 1.2 (Scenario A) in 2004 used the Project Evaluation Manual (PEM) and Alternatives to Roothing (ATR) Manual. This evaluation primarily considered the costs and benefits of busway infrastructure. This effectively excluded services and stations by treating the project ‘as a road’. Furthermore the evaluation only included a narrow range of potential benefits.

Within these limitations, the demand forecasts and cost estimates used for the original BCR were found to be robust when compared to actual post-implementation data. This data was used, together with the original calculation method for PIR purposes, to produce a corrected out-turn BCR of 1.3.

Procedure (PEM/ATR 2004)	Original Forecasts	Actual Effects Revised Forecasts
Benefit Cost Ratio	BCR 1.2	BCR 1.3

The changes between the original evaluation¹ and an evaluation based on monitoring data can be summarised as follows:

Cost Change	Benefit Change	BCR Change
+6%	+18%	+12%

This is good in terms of predictive accuracy, when comparing immediate pre- and post-implementation conditions.

Additional Sensitivity Testing – Project Infrastructure Only – Current Practice

Additional sensitivity testing using the current version of the EEM (2010) and actual post-implementation monitoring data were also undertaken with the following results:

- Applying current EEM techniques (especially the extension of evaluation period from 25 to 30 years and a reduction in discount rate from 10% to 8%) to the original forecasts produced a BCR of 1.5.
- The use of actual patronage growth, the application of current (2010) EEM techniques and the equalisation of modal travel time values, further increased the BCR to 1.8.

¹ Costs and benefits discounted back to a common year for evaluation purposes. This means that the costs are not the same as pre-implementation cost estimates or post-implementation recorded out-turn costs. See also Annex A2.3.

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Procedure - EEM 2011	Original Forecasts	Actual Effects Revised Forecasts
Benefit Cost Ratio	BCR 1.5	BCR 1.8

These results indicate that evaluating the NB project using current evaluation methods and using more accurate forecasting methods have the effect of increasing the BCRs.

Additional Sensitivity Testing – Project Infrastructure Only - Extended Benefits/Evaluation Period and Reduced Discount Rate

Further tests to extend the range of allowable benefits, to extend the evaluation period and to reduce the discount rate were undertaken as follows:

Procedure – Extended EEM	Actual Effects Revised Forecasts Extended Benefit Range	Actual Effects Revised Forecasts Lower Discount Rate Longer Period
Benefit Cost Ratio	BCR 2.6	BCR 5.2

- An extended benefit range (including reliability, health, option, peak spreading and agglomeration benefit²) has the effect of increasing the BCR to 2.6.
- Applying an extended evaluation period (60 years) and a reduced discount rate (4%) further increased the BCR to 5.2.

Project Infrastructure Only - Summary

The total variation of the BCR range between 1.2 (the original BCR) and 5.2 (extending the range of benefits, evaluation period and reduced discount rate) may seem surprising, but this illustrates the importance of background assumptions and methodology selection.

The evaluation of project infrastructure only, applying current EEM methodology and an extended benefit range produces a BCR of 2.6. This appears to be fully justified in terms of post-implementation monitoring information and the application of good evaluation practice.

Package Approach to Cost Benefit Analysis

An experimental model was developed to undertake cost benefit analysis testing of the NB project by treating it as an integrated PT 'package' (including busway infrastructure, stations, facilities and services).

This acknowledges that the original evaluation of the scheme was limited, in terms of both costs and benefits, and therefore the results from the 'infrastructure only' economic evaluation can only be regarded as limited indicators of economic performance.

Package (Capital and Operational) Evaluation	30 Years and 8% Discount Rate	60 Years and 4% Discount Rate
Benefit Cost Ratio	BCR 1.4	BCR 2.6

² Some of these benefits are explicitly described in the current EEM, and none are specifically excluded. All of these benefits are rarely included in current PT evaluation practice.

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Treating the project as an integrated package, in terms of the inclusion of additional costs, revenues and adjustments to the treatment of benefits, resulted in a BCR of 1.4 over a 30 year evaluation period, at an 8% discount rate.

Increasing the evaluation period to 60 years and lowering the discount rate to 4% resulted in a substantial increase in the forecast BCR of the integrated package to 2.6.

Wider Outcomes

Economic evaluation is a very useful technique, but economic efficiency as represented by the BCR is not as the only decision making tool, especially for major investments³. Consideration also needs to be given to strategic objectives and non-monetised benefits, collectively termed 'wider outcomes' and these can be summarised for the NB project as follows:

- PT patronage and mode split has increased substantially, and in line with performance targets for 2016.
- Transport system resilience has improved through the establishment of an increased mode choice.
- Peak direction person movement has increased by 15% and the potential for further growth, particularly through additional PT travel, has been created.
- Traffic levels on the parallel SH1 have reduced substantially as a result of mode transfer to PT.
- CBD and corridor growth has been supported and North Shore residents assisted in accessing employment and other activities.

Overall, the PIR undertaken in this review has established that the NB project:

- Achieved the forecast BCR.
- Delivered the wider outcomes for the project set at the time of funding approval.

Implications For Current NZ Procedures

NZ economic evaluation procedures for public transport (PT) have developed since 1997 but cost benefit analysis procedures that can be said to be 'broadly consistent' with international procedures have only been in place since 2006. While travel time values of those transferring from car to bus are now retained at the car level in the EEM travel time calculations, there has been limited other development of economic evaluation procedures since 2008. .

Current PT evaluations do not always make full use of the potential offered by existing NZ procedures, and the comprehensive evaluation of major PT packages (infrastructure, facilities and services) remains a rarity.

PT economic evaluation procedures would benefit from further development in the following ways:

- The EEM manual could be better integrated and restructured to improve the consistency and clarity of advice.
- The range of explicitly allowable benefits (including option and non-use values) could be extended.
- Changes to the valuation of benefits (for example, the equalisation of modal travel time) are needed.
- A lower discount rate (to 4%) would be more consistent with market conditions.

³ Current NZTA assessment requirements include factors for strategic fit and effectiveness, in addition to efficiency.

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- For major infrastructure, a longer evaluation period (to 60 years) would better reflect the long term nature of major investments.

Recommendations

- Advice is issued by NZTA to encourage PT evaluation to be undertaken on a more comprehensive basis, including the findings of this review with respect to the treatment of benefits and packages.
- The EEM is revised to incorporate more comprehensive advice on public transport, including recognition of the need for improved methods for application to major urban public transport projects.
- Consideration is given to a comprehensive restructuring of the EEM to improve the consistency of approaches to the evaluation of different modes.
- Consideration is given to extending the evaluation period and reducing the discount rate for major infrastructure investments.