

Chapter 11 Evaluation of private sector financing and road tolling

11.1 Overview

Introduction

This chapter describes methods for evaluation of projects involving private sector financing, and road tolling projects. Chapter 2 describes road tolling.

Private sector financing and tolling provide alternatives to government funded transport infrastructure. Reference 3 provides guidance on private sector participation in provision of public infrastructure.

In New Zealand, road tolling can currently only be used in conjunction with a new road and this will generally be within a network of otherwise 'free' roads. This has implications for:

- traffic distribution/assignment
- environmental impacts
- economic efficiency
- financial – toll level and fundability of the new road
- design of the new road and toll facility.

In this chapter

This chapter contains the following topics:

	Topic	Page
11.1	Overview	11-1
11.2	Method of evaluation	11-2
11.3	Stages of analysis	11-4
11.4	Do minimum	11-5
11.5	Travel impacts	11-6
11.6	Costs	11-7
11.7	Benefits	11-8
11.8	Period of analysis	11-10
11.9	Financial evaluation	11-11
11.10	Cost benefit evaluation	11-14
11.11	Alternatives and options	11-16
11.12	Sensitivity and risk analysis	11-17
11.13	References	11-18

11.2 Method of evaluation

Introduction

As well as economic efficiency, social and environmental objectives, financial considerations must be taken into account when evaluating projects involving private sector financing and projects with road tolling. An effective community consultation process is essential for road tolling projects.

In principle, the economic efficiency evaluation of toll options is no different from that for other (non-pricing) options for any scheme. However, the following issues warrant particular attention:

- the range of options considered
- the treatment of value of time savings
- the composition and application of benefit cost ratios.

Consumer surplus

Consumer surplus methodology must be used for evaluation of road tolling proposals because motorists' behaviour in response to various levels of tolls (including no toll) must be determined and therefore a measure of the willingness to pay. Stated preference (SP) surveys or, possibly, revealed preference (RP) data, need to be used to give a general cost equation (combining travel time, vehicle operating cost and toll charge).

Range of options

Economic efficiency evaluation of road tolling projects must be undertaken with and without the tolls in place, as alternatives and options are required to be considered under the LTMA. As well, financial analysis is required of the toll options.

Financial analysis is used to determine the optimum tolls, choices of debt financing, optimum borrowing, and timeframe for implementing tolls. The imposition of tolls has consequences in terms of changing the demand for the facility, diverting traffic onto other facilities, increasing the costs due to toll collection, and other issues.

11.2 Method of evaluation, continued

Methods of setting tolls

There are a number of approaches to setting charges for a toll road where other routes are 'free'. Three of the most common approaches are:

- a pricing policy where economic welfare as defined by the BCR is maximised
- a revenue maximising pricing policy where service provider revenue is maximised
- a 'network optimisation' pricing level which seeks to optimise the performance of the network in terms of total travel times or average network speeds.

In practice, all these three considerations and possibly others may need be taken into account in reaching a toll regime which seeks to meet the overall objectives of the project.

Value of travel time

For most transport proposals, an average value of time is used in economic efficiency evaluations, ie the same unit values are used for motorists from more affluent households and for those from less affluent households. This is essentially an 'equity' approach (to avoid favouring road schemes used by higher income groups). It also makes the economic evaluation easier. This averaging approach is not of major consequence for most situations.

However, it has important implications for toll roads, particularly when comparing the economic merits of tolled vs. un-tolled options. An 'equity' value of time will substantially over-estimate the perceived disbenefits of tolling. The extent of distortion is directly related to the spread of the behavioural ('willingness-to-pay') value of travel time.

Evaluation of toll roads (including tolling policies) must use a distribution of values of travel time consistent with users' willingness-to-pay values established through stated preference surveys or other means. A consistent distribution of values of travel time must be used in both the traffic modelling and economic efficiency evaluation.

When investigating options and alternatives, behavioural values can be used to calculate initial user benefits, with the overall results adjusted to the average value of travel time between the behavioural and equity values for consistency with other projects.

11.3 Stages of analysis

Stages

The following are essential steps for consideration of a road tolling project:

- ensure that the need for the project and the benefits to the community have been identified and maximised
- explore alternative solutions, including non-capital options
- identify risks and returns and determine appropriate allocation among relevant parties
- establish the nature and extent of community support likely to be required.

Concession agreements

The purpose of private sector projects is to involve private sector funds in community projects. When considering private sector financing of a project, a concession agreement, the following steps should be taken:

- ensure that any private sector involvement is commercially feasible and offers a more cost-effective solution than the traditional public sector approach
- only private sector options that reduce public sector costs should remain in the final set of options under consideration
- ensure that any commercial arrangement with the private sector is appropriate and that any probity and accountability requirements have been met
- identify the degree to which risks can be shared with, or assumed by, private sector participants.

Options with private sector financing can lead to an earlier start date, depending on the ability of the private sector to raise funds. Also, there is usually an incentive for early completion of privately financed projects since revenue starts to accrue upon completion of work.

Concessionaries may propose arrangements where the government provides substantial initial funding for which repayments are made over time, generally from the project income. This type of arrangement is, in effect, a loan and should be identified.

11.4 Do minimum

Introduction

The do minimum for evaluating projects with public sector financing and/or road tolling is typically the existing road network with minor improvements and the provision of the new road at a much later date.

11.5 Travel impacts

Introduction

The draft Transit NZ implementation guide for finance and toll projects (reference 1) provides guidance on the traffic/toll modelling requirements and methods for assessing toll route feasibility.

Traffic modelling

Traffic modelling for a tolled road (and the surrounding road network) is an essential input to evaluation. The main purpose of the assignment part of the traffic modelling is to forecast traffic volumes (and corresponding traffic speeds) on each part of the road network and particularly on the toll road. The toll road traffic volumes in turn determine toll revenues.

For accurate forecasting of route choice between the toll road and alternative routes, it is important to take into account the full range of behavioural preferences of potential users of the toll road. This generally requires more sophisticated choice models and a better understanding of motorists preferences than is the cases in standard traffic models.

Traffic modelling used for road tolling projects should take into account behavioural responses such as:

- peak spreading/contraction
- trip end redistribution
- modal shift
- trip generation/suppression.

The split of traffic between the toll road and alternative routes is likely to be sensitive to the level of congestion on the road network and the mix of trip purposes by time of day/day of week. Therefore, detailed traffic modelling must separately consider periods with differing levels of congestion. Expansion or annualisation factors need to be applied separately to the results for each of these periods based on the characteristics of the toll route traffic rather than the traffic volumes in general.

11.6 Costs

Introduction

Costs need to be viewed from both an economic and financing point of view.

Affect of public sector financing and tolling

The public sector financing and/or toll charges reduce the effective project costs to the government.

Even if a project is totally funded by the private sector, there will still be some costs to government agencies, such as contract preparation and ongoing contract management and monitoring. The cost of these activities should be included in the cost of the option involving private sector financing.

Similarly the additional cost of toll infrastructure and toll collection must be included in the tolling option.

11.7 Benefits

Introduction

Once traffic impacts have been determined, the calculation of national economic benefits follows in the normal manner but using the disaggregated willingness to pay values for travel time for benefits or disbenefits – see section 11.2.

Tolled versus un-tolled roads

When users are required to pay tolls on a route, some will choose to avoid the toll by using alternative routes if they are available. The toll charges change the benefits that would otherwise be received by road users in the following ways:

- for those motorists that continue to use the toll road, benefits are reduced by the extent of the toll charge
- the benefits to users on the toll road may be increased due to less congestion on the tolled facility
- for those that would have used the new road if it was not tolled but decide to divert to a 'free' road because of the toll, travel time and perhaps vehicle operating costs are likely to increase
- for those that would have continued to use alternative routes even if the new road was not tolled, benefits are likely to be reduced because of more congestion.

Environmental and community benefits may also change with a tolled road compared to leaving the road un-tolled. Possibilities include:

- overall vehicle use
- use of car pools
- level of public transport use
- options to develop public transport
- overall pollution
- degree of decentralisation
- local area traffic management
- timing of infrastructure provision.

It may not be possible to put values on all these items, but they need to be considered for a tolled facility.

11.7 Benefits, continued

Tolls

Tolls are payment by road users for the right to travel on a particular road. In economic efficiency terms the tolls can be viewed in three ways:

- If the facility is government funded, the tolls are simply a transfer payment between those motorists who pay them and the government.
- If the facility is privately financed and the concessionaire (with its toll level proposal) is selected by competitive tendering, then the toll charges also represent a true market price, ie the resource cost, for that part of the project. Any government contribution or expenditure is also part of the project cost.
- Alternatively, tolls can be related to negative benefits (disbenefits). The effect of the toll is to reduce overall public benefits. If a particular road user would achieve a benefit of say \$3 by using a new toll road, but must pay a toll of \$2, then the net benefit is only \$1 if the tolled road is used. The loss of benefits by those who continue to use the 'free' route will be somewhere between zero (because there would be no benefit in using the tolled route even if there was no toll) and the cost of the toll (\$2).

The present value (PV) of gross toll collections is the same, regardless of which way they are viewed. Provided that tolls are not double counted, the net present value of the project (PV of benefits minus PV of costs) is also independent of the way tolls are viewed.

Traffic congestion reduction

Some trips that would use the new route if it was 'free' will be deterred from its use by the charges and will continue to use the existing network. Hence the extent of congestion relief on the existing network provided by the new route is less than would be achieved if the new route were 'free'.

Disbenefits during construction

The costs of dislocation and traffic disruption during construction should be included as negative benefits for all options. These may be different for an un-tolled road compared to a tolled road (particularly if the construction period is different).

11.8 Period of analysis

Introduction

Timing of project start is an important consideration for projects involving private sector financing and/or road tolling. These strategies are often used to allow an earlier start for the project than that which would apply without these funding sources. The analysis period (see section 3 of volume 1) for all project options should be extended to capture the project benefits over the useful life of all the options.

With projects involving private sector financing, and particularly tolling, there is usually also an incentive for early completion of the project as revenue starts to accrue upon completion of the project.

11.9 Financial evaluation

Introduction

Financial analysis is a method to evaluate the viability of a project by assessing its cash flows. This differs from economic evaluation in the:

- scope of investigation
- range of input
- methodology used.

Financial analysis views the costs and revenues of the project from a 'commercial' investment point of view, ie the cashflow impact on government and any private sector party. By contrast economic efficiency analysis also considers external benefits and costs of the project whether or not they involve monetary payments.

Other differences include:

- Market prices and valuations are used in assessing benefits and costs in financial analysis, instead of measures such as willingness to pay and opportunity cost used in economic analysis. Market prices include all applicable taxes, tariffs, trade mark-ups and commissions.
- The discount rate used in financial analysis represents the weighted average costs of debt and equity capital rather than the estimated social opportunity cost of capital.
- The discount rate used in financial analysis and the cashflows to which it is applied are usually specified in nominal terms (allowing for future inflation), as the cost of debt and equity are observed only in nominal terms.

Undertaking an economic evaluation does not remove the need for a financial evaluation.

Feasibility of private sector financing

Where consideration is being given to private sector involvement in financing land transport infrastructure, it is important to ensure that the involvement is commercially feasible and that it offers a more cost-effective solution than the traditional public sector funding approach.

11.9 Financial evaluation, *continued*

Cash flows to be measured

All incremental costs, revenues and risks associated with a project and its best alternative should be identified and measured as nominal cashflows in the period in which they occur. Cashflows should be on an after tax basis. An estimate of the asset's residual value must be included at the end of the analysis period to represent the asset's remaining service potential. The residual value should not be such as to bias the viability of the project.

Typical inward cashflows to be considered include:

- operating revenues
- subsidies from external parties
- operational savings occurring in other areas as a result of the project
- sale of surplus assets
- residual values of assets.

Typical cash outflows to be considered include:

- capital costs (including land, equipment, buildings)
- maintenance and operating costs
- taxes, where appropriate
- operating lease payments
- contract termination payments
- revenue losses to existing operations affected by the project
- the opportunity cost of resources (including land) that would otherwise be available for sale or lease.

Treatment of specific items

Financing costs (interest) should be excluded in the cashflows because the opportunity cost of debt is accounted for in the weighted average cost of capital (WACC).

Accounting, depreciation, economic multiplier effect and sunk costs should be excluded in financial analysis.

The effect of dividend imputation needs to be taken into account in financial analysis.

Operating leases should be evaluated in the form of a series of regular payments and compared to an outright purchase alternative, with consideration for the value of options such as renewal or purchase rights if these features are present. Financing leases do not form part of a financial analysis as these are merely an alternative means of financing the project.

11.9 Financial evaluation, continued

Weighted average cost of capital

A weighted average cost of capital (WACC) is used in financial analysis. The WACC is the weighted average of the required return on equity and the (interest) cost of any debt financing.

The WACC should reflect the appropriate risk and norms associated with the industry.

Summary measures of commercial merit

The more common measures for evaluating the financial viability of a project are, for example:

- Net present value (NPV) of cash flows.
- NPV per \$ of capital invested (NPVI).
- Internal rate of return (IRR) of cash flows.
- Payback period.
- Profitability indices.

Measures used in commercial evaluations will vary between projects and private sector proponents. Specialist advice should be sought on financial evaluations and detailed descriptions of these evaluations are not included here.

11.10 Cost benefit evaluation

Introduction

As noted in section 11.2, while the basic principles of economic evaluation apply to the evaluation of toll road projects and projects involving private sector financing, some adjustment is required to the composition and application of benefit cost ratios.

Present value of tolls

In present value calculations, all government costs and user costs and benefits are presumed to increase with inflation. When this is the case, the discount rate is used to determine the present value of un-escalated costs and benefits in economic analysis, and no adjustment is made for inflation.

With private sector financed projects, a rise and fall clause relating to tolls is likely to be included in the conditions. The gross toll collections for each vehicle category for each year of the project will need to be estimated. If tolls are regularly changed in line with general inflation in the economy, then the normal inflation free discount rate can be used to determine present values only if the escalating effects of the clauses are first removed from the cash flow estimates.

If tolls are not linked to the general economy inflation rate, some other analysis of the present value of toll revenues may be required.

National BCR for a toll road

From the national economic point of view tolls are transfer payments and therefore not taken into account in the national benefit cost ratio (BCR_N), which is the same irrespective of whether the toll road is private sector funded or not.

$$BCR_N = \frac{\text{present value of national economic benefits}}{\text{present value of costs}}$$

where:

national economic benefits = net direct and indirect benefits and disbenefits to all affected transport users plus all other monetised impacts.

present value of costs = project capital costs + project operating costs + changes in road maintenance costs - deferred capital cost on other roads.

11.10 Cost benefit evaluation, continued

Government BCR for a toll road

The form of the government benefit cost ratio (BCR_G) is the same irrespective of whether the toll road is private sector funded or not. However, the value of BCR_G for the private sector financing case will depend on the size of the required government contribution.

$$BCR_G = \frac{(\text{present value of national economic benefits} - \text{present value of tolls})}{\text{present value of net government costs}}$$

where:

national economic benefits = net direct and indirect benefits and disbenefits to all affected transport users plus all other monetised impacts.

tolls = gross toll collections

net government costs = net costs to Land Transport NZ and approved organisations.

First year rate of return for a toll road

The first year rate of return (FYRR) for a road tolled project is:

$$FYRR = \frac{(\text{present value of national economic benefits} - \text{present value of tolls})^1}{(\text{present value of net government costs})^2}$$

¹ In the first year of operation.

² To the end of the first year.

Evaluation criteria for projects with private sector involvement

The option with the highest national economic NPV/capital outlay is the best option, other things being equal. However, technical capacity, financial backing, business acumen, project life, level of government contribution, non-monetised impacts and other aspects of the different offers and options will all influence the final decision.

11.11 Alternatives and options

Introduction

Tolling must be evaluated as an option compared with the case of no tolls.

A number of other options aimed at optimisation of the transport system should also be assessed, including:

- revenue maximisation tolls
- level of tolls and other measures maximising social welfare
- level of tolls and other measures maximising traffic diversion from sensitive areas
- level of tolls and other measures to optimise level of service.

When considering private sector financing options, only options that reduce public sector costs should remain in the final set of options.

11.12 Sensitivity and risk analysis

Introduction	Sensitivity analysis applies to both financial analysis and economic efficiency analysis.
Identification of risks	<p>Risks are different between options with and without private sector financing and/or operation. Technical capacity, financial backing, business acumen, project life and government exposure are very important considerations where there is private sector involvement.</p> <p>Identification, quantification and assignment of risks among relevant parties are essential for projects involving private sector financing and for road tolling projects. This should include preparation of a risk management plan.</p> <p>For private sector financing, it is essential to ensure that the commercial arrangement with the private sector is appropriate and that any probity and accountability requirements are met. The degree to which risks can be shared with, or assumed by, private sector participants must be identified. Details of likely contractual obligations as they affect pricing, ongoing risk to government, terms of the contract, termination arrangements and debt and equity contributions of each party should be clearly specified.</p>
Test assumptions	The impact of risks (their probability or likelihood of occurrence and the consequence) on the project results must be tested by sensitivity analysis. Critical assumptions that could be varied should be altered one at a time.
Test affect on cashflows	<p>For financial analysis, analyse the sensitivity to variations associated with cashflows for each option, eg changes to key variables by ± 20 percent and different combinations of key variables which taken together represent an alternative, plausible and consistent view of the future.</p> <p>Calculate and present summary financial measures for the best and worst cases and for specific changes to key variables that are deemed highly probable. Break even points (at which the project begins to lose money) should be identified.</p>

11.13 References

-
1. Transit New Zealand, *Finance and toll projects – implementation guide*. (Draft) October 2003.
 2. I Wallis, Booz Allen Hamilton, *Implications of selected urban road tolling policies for New Zealand*. Land Transport New Zealand Research Report No 270, 2005.
 3. New South Wales Department of State and Regional Development, *Guidelines for private sector participation in the provision of public infrastructure*, October 1997.
-