

# Chapter 12 Risk analysis

## 12.1 Overview

### Introduction

Volume 1 of Land Transport NZ's economic evaluation manual sets out detailed risk analysis guidelines for roading projects. This chapter identifies how the risk analysis guidelines may be applied to other transport infrastructure and transport services projects, in particular passenger transport. The guidance modifies the description of the risk categories in worksheet A13(a) in volume 1, summary of risks, to reflect the particular features of passenger transport projects. Because of the diversity of transport projects, modelling techniques, benefit sources and cost items, this guidance should be adapted to suit the particular project context.

This guidance note should be read together with the risk analysis guidelines contained in volume 1. These specify underlying risk management principles, and provide further guidance on how identified project risks should be evaluated, managed and reported to Land Transport NZ.

### Proposals requiring a risk analysis

All evaluations for passenger and freight transport proposals with a present value of the funding gap of greater than \$1 million are required to include a detailed risk analysis. Other types of transport proposal with a net cost to government (central plus local) greater than \$1 million must also include a risk analysis as part of the evaluation.

**Note:** Where a project up to \$1 million warrants it, Land Transport NZ may also request a risk analysis.

### In this chapter

This chapter contains the following topics:

	Topic	Page
12.1	Overview	12-1
12.2	Benefit risks	12-2
12.3	Cost risks	12-6

## 12.2 Benefit risks

### Procedure

As a general principle, if there is at least a five percent risk that any of the following categories or sub-categories could account for a variation in total project benefits of more than  $\pm 10$  percent then it should be classified as 'high risk'.

### Base travel demand

Age of data source	As for roading. Refer to worksheet A13(a) in volume 1.	
Data scope	As for roading. Refer to worksheet A13(a) in volume 1.	
Data quality and statistical reliability	Low risk	Boarding/alighting counts. Intercept data. Census data of recent origin may provide a reliable source of commuting patronage matrices.
	High risk	Screenline counts. Typically based on relatively unreliable observation methods and limited in geographic scope.  Strategic model. Because such models may be based on small public transport trip samples, they would usually provide an unreliable, high-risk basis for a project trip matrix. Convincing evidence that this was not the case would be required in order to reduce the risk classification.
Travel demand validation to counts	As for roading. Refer to worksheet A13(a) in volume 1.	
Travel composition	For models based only on count data, reliable passenger composition estimates may be required for choosing elasticities or other modelling factors. In general, the variations in the passenger mix are not believed to be so large as to make assumptions of this nature a particular risk issue. Classify as low risk unless effects of uncertainties on benefits exceed 5 percent.	

## 12.2 Benefit risks, continued

<b>Forecasts</b>	The growth scenario	<p>Passenger transport patronage growth trends are affected by:</p> <ul style="list-style-type: none"> <li>• population</li> <li>• age structure</li> <li>• employment</li> <li>• car ownership</li> <li>• economic factors</li> <li>• policy measures</li> <li>• other factors.</li> </ul>
	High city population growth	As for roading. Refer to worksheet A13(a) in volume 1.
	Development-related traffic as proportion of scheme traffic	As for roading. Refer to worksheet A13(a) in volume 1.
	Other scenario factors	<p>If project benefits are affected by more than 10 percent classify as high risk, if less than five percent classify as low risk.</p> <p>Passenger transport patronage trends are more sensitive to economic, strategic and policy factors (eg the past impacts of reduced costs of car ownership in NZ), which may not be explicitly represented in forecasting methodologies. In general, this would imply that this aspect of the forecast should be classified as medium or high risk, depending on:</p> <ol style="list-style-type: none"> <li>a. the evidence of stability in past growth trends</li> <li>b. the extent to which the modelling methods encompass the major scenario factors</li> <li>c. views on the sensitivity of future growth trends.</li> </ol>

## 12.2 Benefit risks, continued

### Forecasts, continued

Effects of passenger transport projects on overall passenger transport patronage	Passenger transport improvements will cause diversion of trips from other transport modes (car, walk and cycle), redistribution of travel demand and induced patronage. If such diversions are a significant part of project patronage, the patronage risks are likely to be higher. These risks will be further increased if there is uncertainty regarding the extent of passenger transport capacity to be provided as part of the scheme (such as might be the case if the required service frequencies were subject to uncertainty).
Diversion from car	<p>Decongestion benefits are a significant element of a transport service evaluation. They are also difficult to estimate with precision, being sensitive to the assumed elasticities and/or model coefficients. Stable iterative modelling processes are also required, linked to assignment procedures able to measure accurately the impacts of small traffic changes.</p> <p>Consequently, the risk associated with diversion from car and the associated benefits should be classified as high, unless it can be convincingly demonstrated that these risks are reduced by the particular modelling processes adopted.</p>
Diversion to passenger transport from walk and cycle; re-distributed and induced passenger transport patronage	In general, these are likely to have a small effect on the overall level of public transport benefits. Providing it is demonstrated through sensitivity tests that their effects on benefits are less than five percent of the total, these factors can be considered low risk.
Other sources of patronage and benefits	Some projects may have attributes, which, it may be argued, attract additional patronage or bring additional benefits. These may particularly relate to quality improvements to public transport. The risks associated with these sources should be assessed where they account for more than five percent of the benefits.

## 12.2 Benefit risks, continued

### Assignment and the choice between alternative passenger transport modes (eg bus, light rail, heavy rail and ferry)

For many projects there will be a choice of route and a choice of passenger transport mode. This latter choice may be modelled either as an assignment process or using a logit mode share model.

Other future projects	As for roading. Refer to worksheet A13(a) in volume 1.
Path derivation method	As for roading. Refer to worksheet A13(a) in volume 1.
Generalised cost (routeing parameters)	In some circumstances, forecasts will be sensitive to the definition of generalised cost in the models (for example, to the size of the assignment boarding and interchange penalties) and sensitivity tests will be needed to demonstrate the extent of the risk.
Supply relationships	Not generally relevant.
Convergence	Not generally relevant.
Proportion of benefits accounted for by accidents	<p>The proportion of benefits accounted for by road accident savings will normally be less than 10 percent and should therefore be classified as low risk.</p> <p>In exceptional circumstances (for example, the provision of grade separation to replace a level crossing) this may not be the case, and a specific risk assessment should be made. If the proportion of benefits exceeds 20 percent classify as high risk.</p>
Proportion of benefits accounted for by environmental factors	<p>The proportion of benefits accounted for by environmental factors will normally be less than 10 percent and should therefore be classified as low risk.</p> <p>If the proportion of benefits exceeds 20 percent classify as high risk.</p>

## 12.3 Cost risks

### Procedure

As a general principle, if there is at least a five percent risk that any of the following categories or sub-categories could account for a variation in total project cost of more than  $\pm 10$  percent then it should be classified as 'high risk'.

Most of the cost risks are comparable with roading risk although there may be differences in their precise description and nature, which should be allowed for in completing worksheet A13(a) in volume 1.

<b>Base travel demands</b>	Tangata Whenua issues	As for roading. Refer to worksheet A13(a) in volume 1.
	Emissions	
	Landscape and visual	
	Ecological effects	
	Archaeological and historic sites	
	Social networks and severance	
	Economic/amenity impacts on land users	
<b>Land and property</b>	Property acquisition	
	Property economic value	
<b>Earthworks</b>	Knowledge of ground conditions	
	Complex/unpredictable conditions	
	Design form	
	Extent of topographical data	
	Source and disposal of material	
<b>Other engineering costs</b>	Engineering complexity	
	Signalling and communications	Signalling and communications infrastructure should generally be considered a high risk element of engineering costs.
	Operating surplus/deficit	Unless the service operating surplus/deficit (the balance of revenue and operating costs) forms a large part of total costs, it would normally be classified as low risk.
<b>Services</b>	Existence, location and condition	As for roading. Refer to worksheet A13(a) in volume 1.
	Site flexibility	
	Co-operation of utilities	