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1 Introduction to the technical guide

The *Technical Guide* provides detailed information and explanations on calculations underlying CBA6. This document is a useful resource for anyone involved in testing and comparing project evaluation models, for example, researchers, consultants, economists, engineers and software developers.

1.1   Introduction

The purpose of the *Technical Guide* is to provide a complete breakdown of all algorithms, formulae and parameters in CBA6. This includes important outputs such as operating speed, VOC, TTC, accident costs and the decision criteria.

CBA6 pricing, common structures and unit values are created, maintained and updated periodically and internally by TMR and as such cannot be modified by the system user. To maintain the integrity of the tool, CBA6 pricing, common structures and unit values are derived from external sources such as Austroads and ATC guidelines.

The *Technical Guide* also provides the relevant algorithms and methodology for advanced modules available in CBA6, including:

- road closures with a diverting route

- road closures with no diverting route

- generated traffic

- bypass

- overtaking lanes

- livestock damage

- intersections.

The process structure of CBA6 is illustrated by Figure 1. This figure highlights the relationships between inputs entered by system users and CBA6 calculations and outputs. The *Technical Guide* discusses these relationships in further detail and shows how inputs influence outputs, which can then be used to demonstrate the overall economic justification for a project.

Figure 1: CBA6 structural processes
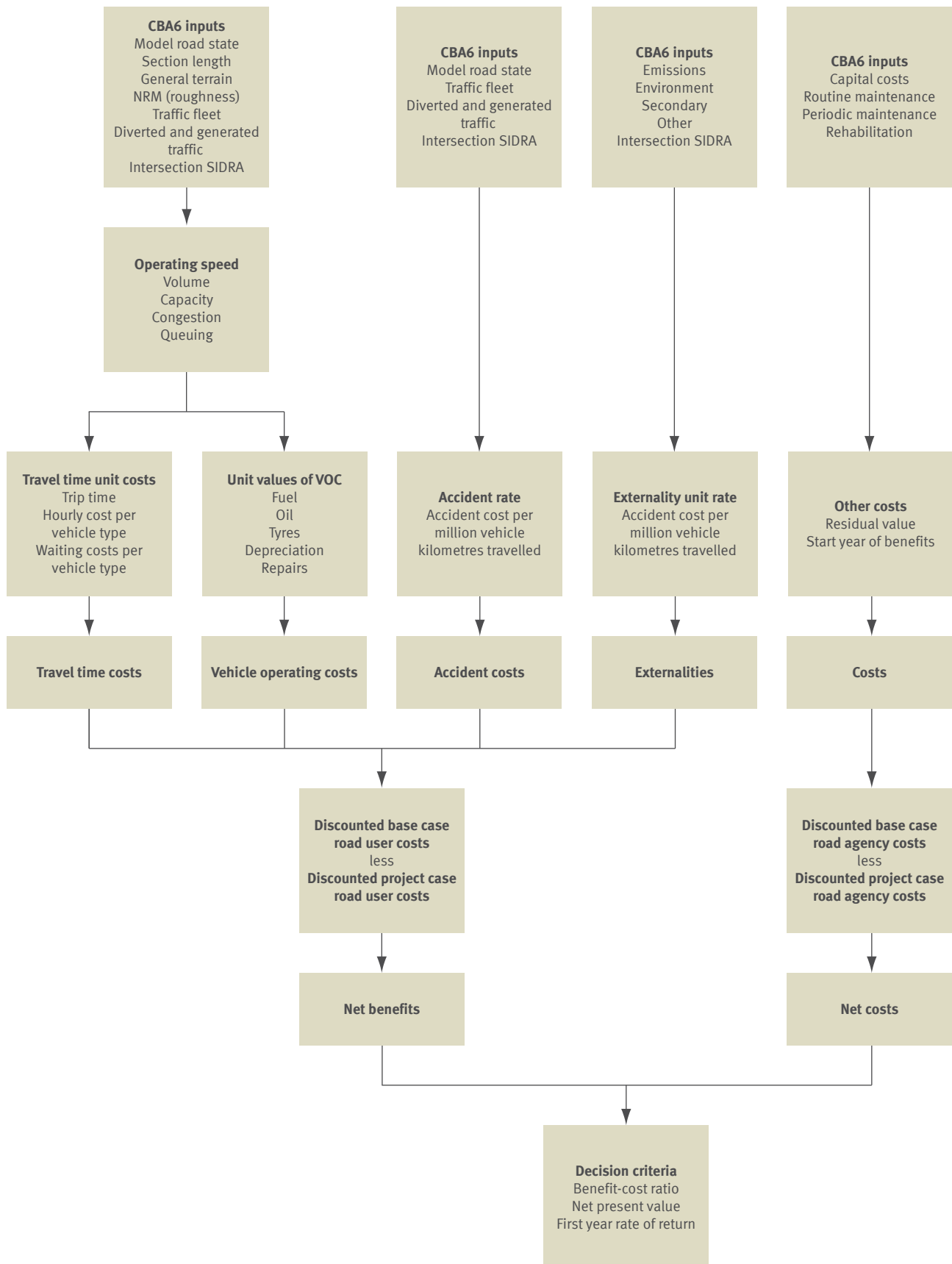
1.2　Harmonisation summary

CBA6 has been developed consistent with, and based on, NAASRA Improved Model for Project Assessment and Costing (NIMPAC) standards as documented in the Austroads harmonisation paper AP-R264/05, to derive road user costs. AP-R264/05 was created in conjunction with research undertaken by the Austroads Road User Effects Reference Group (RUERG). RUERG was comprised of technical representatives and evaluation system users from all state jurisdictions and the private sector, and had the intention of testing and harmonising the calculations in NIMPAC evaluation models with the international highway demand management (HDM) model. AP-R264/05 consequently compared state models to the international HDM model.

RUERG established and revised NIMPAC algorithms for adoption in each state which derived comparable results to the HDM model. Each jurisdiction, subsequently, incorporated the changes into their respective project evaluation models to ensure the consistency and transparency of the results. The harmonisation process continued in 2006 with the federal government and ARRB investigating a process to consider using the updated HDM-4 as a tool to conduct all road project evaluation work across the national highway network.

1.3   Outline of the *Technical Guide*

The layout of the *Technical Guide* is set out in the same order as the calculations within CBA6, which is shown by Figure 1.

2 Volume capacity ratio sets out the formulae used by CBA6 to calculate the level of congestion based on traffic inputs and road characteristics. The VCR incorporates traffic volume and growth rates and the road capacity based on peak hour usage. CBA6 calculates the operating speed of the fleet based on the VCR.

3 Operating speed shows the formulae and assumptions made in this calculation. Operating speed is one of the most important calculations made in CBA6, as it has a direct effect on the value of VOC and TTC.

4 Vehicle operating costs sets out the formulae and unit values used to calculate VOC. These costs are made up of fuel, oil, tyre, repairs and maintenance, depreciation and interest costs. These costs vary according to operating speed, road roughness and road alignment.

5 Travel time costs shows the TTC incurred by motorists according to journey time and the economic value of time.

6 Accident costs contains the average accident cost for Queensland and the accident rate for each road stereotype, and discusses accident and crash costs.

7 Externalities presents information on the calculation of externalities. This includes calculations for air pollution, greenhouse gas, noise, water, nature and landscape, urban separation and upstream and downstream costs.

8 Advanced projects applies these calculations to the advanced project modules used in CBA6 including road closures, intersections, overtaking lanes, generated traffic, livestock and bypasses.

9 Decision criteria used by CBA6 are mathematically defined. These criteria include BCR, NPV, FYRR, IBCR and NPVI.

10 Sensitivity testing explains the formulae applied to the sensitivity testing of the parameters in CBA6.

11 Effects of intermediate outputs contains a final summary of the effect inputs have on CBA6 outputs.