



1 Introduction

The *Cost-benefit Analysis manual* (the manual) is a practical reference tool for Transport and Main Roads (TMR) staff and consultants evaluating the economic merits of transport and road projects. The manual replaces the *Cost-Benefit Analysis Manual for Road Projects*, which was produced in 1999.

The manual presents a number of case studies to help give system users an understanding of the principles involved in evaluating transport and road projects. It details TMR's cost-benefit analysis (CBA) tool, known as CBA6, which is used to evaluate rural and urban projects.

The manual is aimed at a broad range of stakeholders including policy makers, managers, regional staff, project managers, engineers and system users. It is divided into three different parts to help meet the needs of all stakeholders:

- *Theoretical Guide*
- *User Guide*
- *Technical Guide*

1.1 Purpose

Project evaluation is an essential element in the development and delivery of successful transport systems. CBA remains a complex and highly technical process and usually should be undertaken only by qualified and experienced specialists in economics. The purpose of the manual is to provide system users and decision makers within TMR with an appreciation of how welfare economics in general, and CBA in particular, may be applied to support the project evaluation process. Regions using CBA6 will find the *User Guide* helpful.

CBA provides a framework for organising information, listing the advantages and disadvantages of each alternative course of action in terms of economic values and ranking alternatives on the criteria of net economic value. CBA can be used to compare alternatives for transport and road projects by the net benefits that they create over time, when the broad social view is important and when projects may be characterised by a flow of benefits and costs over time.

CBA helps the decision-making process by:

- determining what constitutes a tangible benefit or a cost to the wider community over and above a ‘no project’ alternative
- preventing ‘double counting’ of either benefits or costs
- incorporating a time dimension via discounting of benefit and cost streams
- identifying net benefits of project alternatives
- presenting how variance, particularly assumptions, influences the net benefits of alternatives
- presenting the preferred course of action which offers the highest net benefit to the community.

More broadly, CBA can help by:

- bringing economic theory into decision making
- improving the logic of thinking and problem solving
- reducing the complexity of decisions.

The objective of the manual is to provide techniques and methodologies for undertaking CBA and promoting the use of project evaluation in the decision-making process.

CBA can be a complex process, and CBA6 cannot be applied in all situations. The manual provides the scope of evaluation that can be undertaken by system users without the need for specialised assistance.

1.2 Scope

The manual provides a comprehensive guide to CBA in the context of roads and transport. Concepts, theories, methodologies and processes relevant to CBA are explained in sufficient detail for any system user with a basic background in economics to comprehend. The manual focuses on the application of the TMR CBA tool (CBA6) but provides sufficient instruction and reference to alternative approaches to project evaluation. The manual is divided into three sections: the *Theoretical Guide*, the *User Guide* and the *Technical Guide*.

The *Theoretical Guide* introduces the reader to the theoretical basis of CBA. This section also discusses complementary issues associated with CBA such as the treatment of externalities and tolling. The section also contains a discussion of other important issues including development benefits and issues of Wide Economic Benefits. The manual does not provide general coverage of CBA or welfare economics outside of transport and roads.

The *User Guide* is an instructional aid for system users when operating CBA6. All characteristics of the tool are described in detail. Using 18 different case studies, the *User Guide* enables the navigation and exemplification of the functionality of all CBA6 modules.

The *Technical Guide* contains relevant information on, and a practical explanation of, the formulae and equations found in CBA6. It also explains the background and context of the tool within TMR. The technical guide also provides information relating to Austroads endorsed harmonisation publications, therefore establishing the technical basis for project evaluation in Australia.

1.3 Alignment with national strategies and guidelines

National frameworks, guidelines, processes and methodologies have been established which underlie Australian Government funding for transport and road projects. CBA is used to support funding submissions by outlining the viability of a project. The Queensland Government has also established a framework and process incorporating the economic evaluation of projects for state funding.

1.3.1 National Guidelines for Transport System Management in Australia

The Australia Transport Council (ATC) *National Guidelines for Transport System Management in Australia* is endorsed by the Council of Australian Governments as the high-level framework for transport system management. Volume 3 provides principles and methodologies for appraising transport and road projects. CBA is endorsed in the guidelines as an important decision-making tool. However, additional tools including strategic merit test, rapid CBA, non-monetised evaluation, detailed CBA, adjusted CBA and evaluation summary tables are also recommended.

1.3.2 Guide to Project Evaluation

The Austroads *Guide to Project Evaluation* provides guidelines and techniques for appraising transport and road projects, and is a complementary source of information to the manual. It also provides economic data sets for calculating travel time, vehicle operating costs, accident avoidance and externality benefits. These data sets are used by all transport and road agencies and jurisdictions in Australia and are regularly updated.

1.4 Alignment with state strategies and guidelines

The Queensland Government has established a framework outlining the overall direction and governance procedures for the planning and evaluation of projects. This framework is supported by a number of strategic processes and outcomes.

1.4.1 Project Assurance Framework

The *Project Assurance Framework* (PAF) is the Queensland Government's project evaluation process for project initiation, evaluation, procurement and assurance across government. The PAF is broken into the various stages of a project's lifecycle.

CBA is required at the preliminary evaluation and business case development stages of the PAF. At the preliminary evaluation stage, CBA is used to assess project options using incremental analysis. This includes determining all potential project impacts including any unpriced outcomes such as social and environmental. Each project option is evaluated under the same assumptions to ensure a suitable comparison can be made. The measurement of these impacts is refined at the business case stage along with more detailed sensitivity testing. The manual provides a more transport-specific focus on CBA.

1.4.2 Outcomes

The Queensland Government *Value for Money Framework* is used to progress potential projects under a Public Private Partnership (PPP) delivery model. If a project is considered to have PPP potential, the *Value for Money Framework* is used for business case development. The framework is also designed to help optimise the delivery of a project. Under the *Value for Money Framework*, economic CBA is required at the business case stage. A separate financial evaluation is used to determine the success of a project at the 'expression of interest' stage.

1.5 Alignment with TMR strategies and guidelines

TMR's strategic processes govern the way TMR identifies and develops transport and road projects from concept through to business case development and implementation. CBA aligns with each strategic process to deliver outcomes that are consistent with whole-of-government strategic objectives, and ensures TMR achieves value-for-money outcomes. The manual links to, and is aligned with, TMR's overall strategic priorities.

1.5.1 Roads Connecting Queenslanders

Roads Connecting Queenslanders (RCQ) outlines the strategic long-term direction for the road system in Queensland. The four road-based outcomes identified in RCQ are:

- safer communities
- industry competitiveness and growth
- liveable communities
- environmental conservation.

1.5.2 Queensland Transport and Roads Investment Program

The *Queensland Transport and Roads Investment Program* (QTRIP) details TMR's program of transport and road projects for the upcoming five years. Each project that is included in the QTRIP must include a CBA. 95% of projects that are justified on economic grounds alone, have a cost-benefit ratio greater than 1.

1.5.3 Program Management Framework

The *Program Management Framework* is applied when delivering a series of projects that make up a program. The framework identifies interdependencies between projects and ensures planning, scheduling and operations result in optimal delivery. It also measures the net economic impact of the program.

CBA helps identify projects that will be included in a program, and can be used to prioritise projects within a program.

1.5.4 OnQ Project Management Framework

The *OnQ Project Management Framework* is used to ensure the outputs and outcomes of a project are delivered in line with strategic objectives and policy.

Within the OnQ framework, CBA helps in project management throughout a project's lifecycle. CBA is undertaken at various stages including the project proposal, options analysis and business case stages for specific transport and road projects.

1.6 Project evaluation process

TMR's project evaluation process uses a three-stage CBA approach that incorporates:

- strategic merits test
- rapid evaluation
- detailed evaluation.

1.6.1 Strategic merits test

A strategic merits test evaluates a project's alignment with strategic policy and planning objectives. A strategic merits test should be undertaken for all projects to ensure they align with TMR's strategic and state-wide directions. A strategic merits test is normally undertaken at the project proposal stage.

1.6.2 Rapid evaluation

A rapid evaluation measures the 'headline' costs and benefits of a project and determines whether it should progress to the detailed evaluation stage. The rapid CBA is generally conducted in the options analysis stage.

1.6.3 Detailed evaluation

A detailed evaluation is a comprehensive analysis of a project, and extends on and refines the findings of the rapid evaluation. A detailed evaluation, incorporating CBA, should quantify all foreseeable project impacts. A detailed CBA provides sufficient evaluation rigor to support a funding submission and is usually undertaken at the business case stage.

1.7 Evaluation tools and methodology

CBA is the primary decision-making tool used by TMR to determine the net economic benefits of transport and road projects. Other tools may also be required to address non-monetary or non-quantifiable project impacts. These tools often incorporate a qualitative evaluation of project impacts, and include multi-criteria analysis, adjusted CBA, cost-effectiveness analysis and strategic merits tests. These tools can be used to complement the CBA or, in some instances, as an alternative to a quantitative evaluation.

The level of analysis needed will depend on a project's complexity, risk profile and degree of uncertainty. The purpose of the three-stage approach is to screen out projects at each stage that are unlikely to have merit in developing further.