TRANSPORT AND INFRASTRUCTURE COUNCIL

2015 National Guidelines for Transport System Management in Australia

Review and Post Completion Evaluation [F7]

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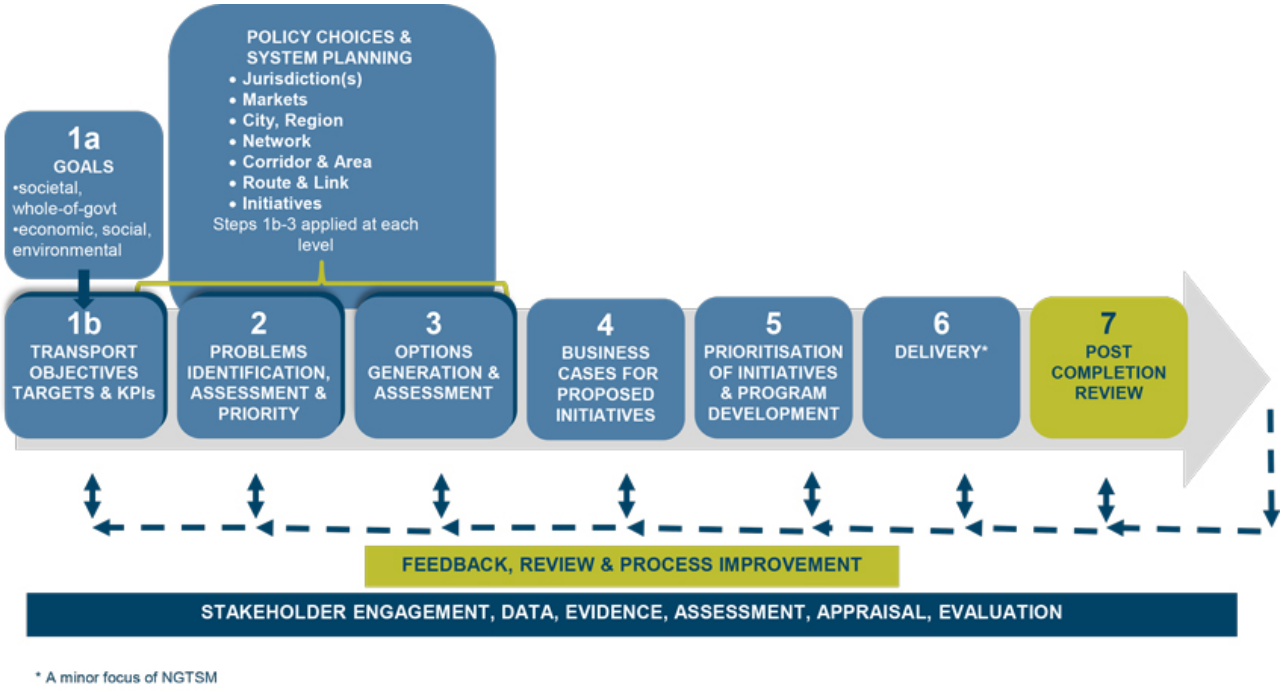


* A minor focus of NGTSM

At a glance

Step 7 of the Framework covers performance review and post-completion evaluation. The process covers consideration of:

- Actual versus desired outcomes
- Effectiveness of strategies, policies, plans and individual initiatives in achieving performance targets
- Effectiveness of the entire Transport System Management Framework.

It is important to assess whether each individual initiative met its specific objectives, and whether it helped or hindered the pursuit of stated transport system objectives and targets. This should be complemented by a progressive review of the achievement of objectives at each planning level, i.e. at link/route, corridor/area, network, city/region.

Evaluation should consider questions such as:

- Was the correct strategy chosen and did the defined network contain the most appropriate corridors or areas?
- Were the best initiatives selected for the program?
- Were the initiatives correctly implemented?

Evaluation can identify significant factors that have contributed to differences between actual and desired outcomes. Where these factors reflect the underlying methodology, the Guidelines should be reviewed.

Regular review of the Guidelines and associated methodologies will provide a basis for continuous improvement and development. Any reviews should be undertaken in close consultation with users of the Guidelines.

1. Introduction

The whole NGTSM Framework and its various components are aimed at the achievement of high level jurisdiction goals, transport (and land use) system objectives, and the expressed targets associated with the objectives.

The question of whether those objectives and targets are being met is the driver of Step 7. It proposes a system of reviews (evaluations) that compare the expressed targets (i.e. preferred outcomes) with actual outcomes so that we can judge how successful we have been.

This process supports one of the key principles of the NGTSM that there should a culture of continuous learning and improvement to ensure that future decisions can take account of lessons from past experience. For this to occur, a process of reviews is required right across the NGTSM.

As the NGTSM Framework chart shows (see Figure 1 in 'About' chapter), reviews should ideally occur after each individual step of the framework, for example, reviews of:

- transport planning processes
- processes used in identifying and assessing problems and options
- various types of analyses that are undertaken
- the entire life-cycle initiatives
- the degree of achievement of transport system objectives and targets, and finally
- the entire NGTSM Framework.

The following points on terminology should be noted:

- 'Review' and 'evaluation' are used here interchangeably - both involve an assessment 'after the event', specifically consideration of how well actual outcomes match expected outcomes predicted 'before the event'.
- 'Evaluation' and 'post-completion evaluation' are also assumed here to have the same meaning - but 'post completion evaluation' is used here in cases where practitioners are most likely to be currently using it.
- 'Evaluation' contrasts with 'appraisal', with the latter being assessment 'before the event'.

Stage 2 of the NGTSM Revision project will introduce the related concept and process of *benefit realisation* into the guidelines.

2. Benefits

The benefits of undertaking review processes, and the feedback arising from them, are:

- in the delivery step, cases can be identified where expected costs and benefits may not be realised, and corrective action developed
- future decisions can take account of lessons from past experience (see Figure 1)
- as a result, the effectiveness of future decisions (from planning to delivery) can be enhanced
- they enable stakeholders to be provided with evidence-based explanations of why actual outcomes may have varied from expected outcomes.

Figure 1: The plan, deliver, learn cycle

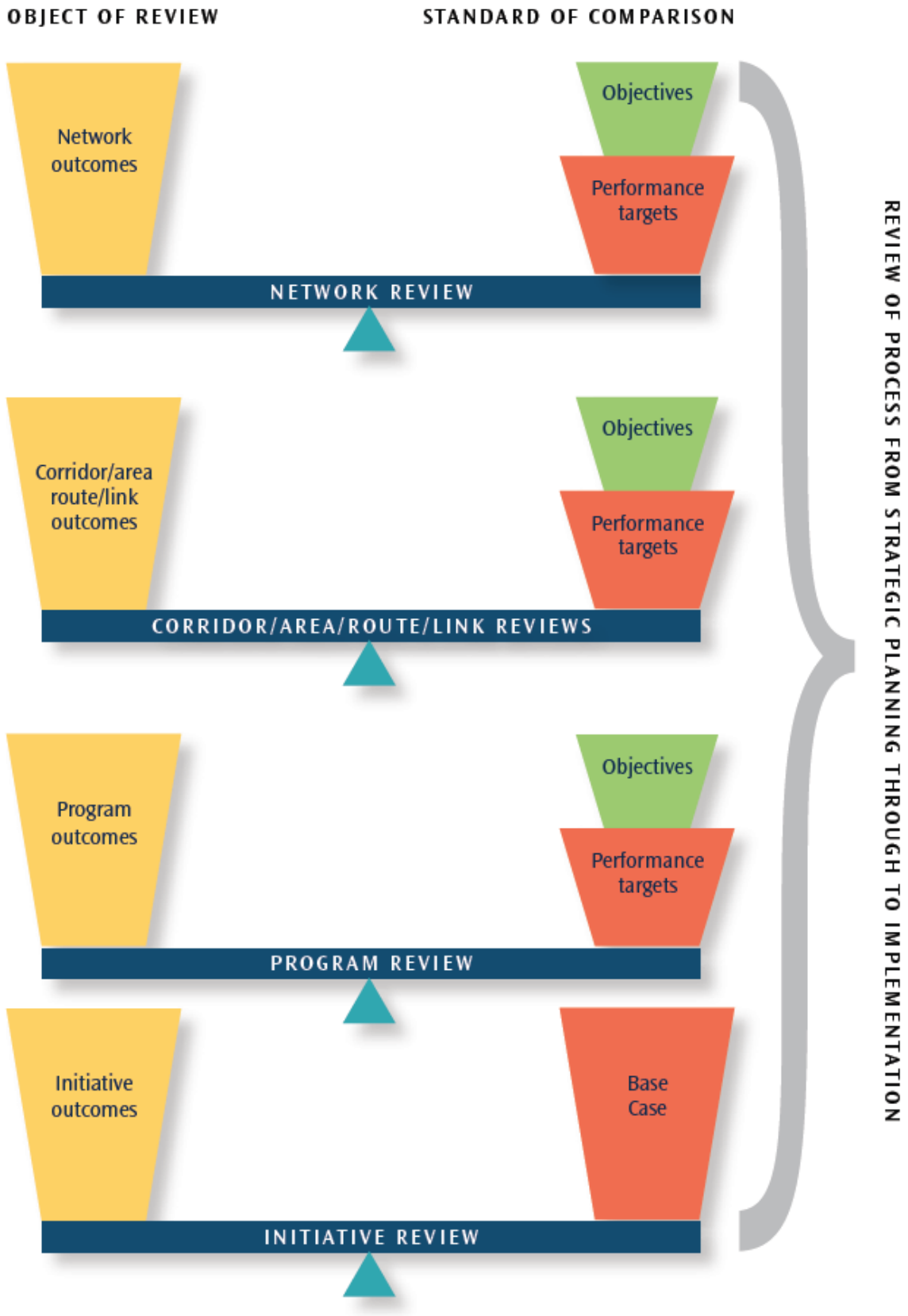
VicRoads (2014)

3. Performance review principles

- Resource limitations prevent all decisions, processes and outcomes from being reviewed, so careful thought must be given to how best to spend limited evaluation resources. This includes ensuring reviews must be fit-for-purpose, scaled to the size and complexity, and designed for the purpose and audience.
- Reviews should be undertaken once a sufficient period of time has passed for a step to have taken effect, for benefits to be realized and for review data to become available. They should also take account of seasonal and other relevant factors.
- If the actual outcomes are markedly different from the desired outcomes, the evaluation should explore factors contributing to the variation.
- Comparisons of actual outcomes with desired outcomes should be conducted within consistent timeframes. It is unreasonable, for example, to compare desired outcomes for an initiative running over 15 years with actual outcomes after five years. Actual outcomes after five years should be compared with stated desired outcomes after five years.

Figure 2 provides an overview of the post-completion evaluation process. It shows that reviews should be undertaken at the various levels of the Framework. At each level, both process and outcome reviews should ideally be undertaken. In addition, reviews should consider both effectiveness and efficiency perspectives.

Figure 2: Post-completion evaluation



4. Evaluation of specific initiatives and programs

Post-completion evaluation of individual initiatives may consist of reviews of:

- whether the initiative was well delivered (timeliness, within budget, within scope)
- how the initiative influenced key performance indicators
- how well were initiative-specific transport related objectives achieved
- whether the initiative helped or hindered the process of pursuing agreed transport system objectives and targets?
- whether the identified problem has been resolved or reduced as a result of an initiative
- whether the best option was selected
- whether there were any unintended outcomes
- the extent to which forecasts in the CBA were realised (e.g. construction costs, operating costs, demand levels, accident rates, other benefits).
- how the decision to proceed with the initiative was made.

The post-completion evaluation may extend to a full ex-post CBA, and may also extend to reviewing detailed impact assessments, e.g. environmental, regional, family and other impacts.

5. Evaluation of Planning

After reviews at the initiative and program levels are completed, reviews at the various planning levels should be undertaken – i.e. link & route, corridor & area.

Corridor & Area

For example, at the corridor or area level, the first step in the review should be to assess whether corridor or area objectives have been achieved. This analysis should be undertaken on a corridor-by-corridor or area-by-area basis, and consider all the initiatives implemented within each corridor or area.

For each corridor or area, actual outcomes should be measured and compared with the desired outcomes reflected in corridor or area objectives or targets. Where there is under- or over-performance, contributing factors should be considered in terms such as:

- Did the assumptions reflect ultimate reality?
- Was the analysis based on suitable and reliable data?
- What were the within-corridor or within-area impacts?
- What were the off-corridor or out-of-area impacts?
- Did off-corridor or out-of-area developments have an unexpected impact on outcomes?
- What were the cross-modal impacts?
- Did the corridor or area strategy help or hinder the attainment of agreed transport system objectives and targets?

Network

A similar review process should also be undertaken at the network level through comparing actual network performance with desired outcomes as stated in network targets, and through exploration for causes of under- or over-performance. This requires consideration of all actual outcomes across all corridors and areas.

If actual network performance does not meet the network targets, and hence does not contribute to meeting transport system objectives, several questions should be asked:

- Were sufficient corridor or area options identified and assessed?
- Was the focus across corridors or areas prioritised?
- Was this the best network?
- Is there a need to review the policy or program (e.g. review the national land transport program)?

- Is the set of transport system objectives appropriate?
- Did the network strategy help or hinder the attainment of agreed transport system objectives and targets?

Integration across transport and land use

In all planning reviews, integrated transport and land use objectives need to be taken into account in an explicit manner. This can be done by considering wider community outcomes such as housing availability and job creation in the areas or corridors under consideration.

6. Review against transport system objectives

The first review step is to assess system performance against each system objective (e.g. efficiency, safety, security, environment, equity) and its performance targets. This requires the measurement of actual outcomes and comparing them with the stated, desired outcomes. For example, consider the reduction of fatalities as an objective. Any reduction in fatalities is clearly desirable. However, if a safety performance target of a 20 per cent reduction in the number of recorded fatalities over a ten-year period has been set, it is necessary to determine whether or not the initiative delivered against this target.

Once performance against each objective has been assessed, the review should assess the causes of any under- or over-performance.

The collection of integrated objectives (see Figure 3 in F1) provides an effective mechanism for reviewing the success of programs and their components. A review should progress through these objectives in reverse order from bottom to top – i.e. from initiatives to the network (see Figure 1).

A final step in the review process may be to assess whether individual transport system objectives were conflicting and, if so, how that affected actual outcomes. Transport system objectives are often interrelated – achieving one objective may influence the degree to which another objective can be achieved.

Over time, as governments change or the emphasis of government objectives and priorities varies, there will need to be a review of transport system objectives, policy directions and strategies. This will be particularly important if there are gaps emerging in long-term strategic policy.

Review of the overall performance of the transport system aims to assess whether ‘we are doing things right’ (a technical or process efficiency question) and whether ‘we are doing the right things’ (an effectiveness question) to achieve the agreed, desired objectives and outcomes.

Together with ongoing stakeholder engagement and the evaluation of changing funding scenarios, the review process should guide the refinement of all steps of transport system development — from objective setting through to program delivery. The entire process relies on the presence of strong feedback loops between the Framework steps as well as two-way dialogue between agencies and their governments, communities and stakeholders.

Key questions would include:

- What were the actual transport system outcomes that eventuated?
- How do they compare with the desired transport system performance targets stated at the start of the process?

7. Review and improvement of the framework and guidelines

As discussed above, the review and evaluation of the overall collection of policies, strategies, plans, programs and individual initiatives should provide valuable insights into explaining why any differences between actual and desired outcomes are observed, and contributing factors. These factors may include cost estimates, projected benefits, land use changes, timing of impacts and unintended impacts (positive or negative).

A further consideration is whether some of the differences between actual and desired outcomes are attributable to the underlying methodology in the Transport System Management Framework. To address this possibility, the Guidelines should be independently reviewed at appropriate intervals. Key questions would include:

- Did the Framework prove effective?
- What revisions to the Framework should be made to improve transport planning and assessment

8. Data for evaluation

To undertake effective performance reviews and post-completion evaluations, the availability of necessary data is critical. This requires advanced planning of data needs, specific mention of evaluation data needs in planning documents, and then scheduling and collecting the required data. This will ensure that the required data is available when the evaluation is actually undertaken. It may also require data collection before initiative delivery to ensure baseline data is available.

9. Evaluation process

Note: This section comes directly from NGTSM06, Vol 3, section 2.20

Steps

9.1 Determine what is to be evaluated, the purpose and audience of the evaluation.

9.2 Determine the standards of comparison.

9.3 Determine the depth and frequency of post-completion evaluation.

9.4 Appoint evaluators.

9.5 Collect and assess data, prepare report.

9.6 Undertake ex-post BCAs of selected initiatives.

9.1 Determine what is to be evaluated

First, determine the subject of the evaluation. It could be a single initiative, a group of initiatives that have something in common, or a whole program of initiatives. Also be clear on the purpose of the evaluation and the audience. Second, decide on the stage, or stages, of the decision and implementation processes that are to be evaluated. Table 1 lists stages that might be evaluated.

9.2 Determine the standards of comparison

Post-completion evaluations can be applied to the process that led to the outcomes and to the outcomes themselves.

Process reviews look at how the outcomes were achieved. The outcome reviews can point to whether or not a process has worked well. But bear in mind that a faulty process can still produce a good outcome, due to luck.

Outcome reviews involve comparing actual with predicted outcomes. For an outcome review, the standards of comparison are external standards of desirable attributes of outcomes (e.g. correct BCA methodology) and benchmarks or forecasts established during a previous process. To streamline post-completion evaluations, set the benchmark levels during the appraisal and design stages (e.g. construction costs, physical quantities and unit costs of inputs, timing of construction, operating costs, demand levels, revenues, benefits, environmental impacts).

Carry out process and outcome reviews simultaneously for a single stage so that any process-related reasons for successes or failures can be explored. The outcome review at one stage can point to process issues in earlier stages.

Table 1 lists the stages at which process and outcome reviews can be undertaken and shows sources for standards of comparison for outcome reviews.

Table 1: Types of post-completion review

PROCESS REVIEW	OUTCOME REVIEW	
	Actual outcomes	**Sources of predicted outcomes**
Identification, consideration of options	Initiatives identified	Government strategy documents, stakeholder views of options
Appraisal	BCA, SMT, other analyses, Business Case	Guidelines, knowledge of correct methodologies, technical publications, government strategy documents
Recommendation	Recommendation for or against	Business Case
Planning and design, budget development	Detailed specification of initiative, scope, cost estimates, risks during implementation stage	Business Case, design guidelines
Delivery	Initiative in place, actual costs	Business Case, plans and designs, budget
Operation	Performance	Business Case

The timing of the evaluation matters. A stage in Table 1 can be evaluated only after the stage has been completed. For the initiative operation stage, allow time to establish levels and trends with adequate certainty, and be selective about the variables assessed so as to avoid premature comparisons.

9.3 Determine the depth and frequency of post-completion evaluation

Subject all initiatives to some basic level of post-completion evaluation using benchmarks set during the appraisal and design phases.

To make best use of limited resources available for post-completion evaluation, for detailed evaluations, select initiatives that are:

- Large
- Appear to have gone badly or exceptionally well
- A recurring type of initiative
- Particularly risky, including pilot initiatives for testing innovations
- Strategically important
- Long-term, undertaking interim evaluations, say, annually

- Staged, undertaking evaluations of each stage
- Programs involving a series of smaller initiatives.[1]

9.4 Appoint evaluators

Independent evaluators should be appointed to avoid bias and create objectivity and credibility. For smaller initiatives, it may be reasonable to use internal resources to undertake the evaluation.

Do not allow those responsible for the initiative to evaluate their own work.

9.5 Collect and assess data, prepare report

Having discovered where process or outcomes are good or poor, look for the reasons for the results. Separate consequences of internal management and planning processes from impacts of external factors. Aim to identify lessons for the future; do not allocate blame for past mistakes or state what should have been done with the benefit of hindsight. Where external factors had an adverse impact, consider whether actions should be taken in the future to mitigate such occurrences.

Be wary of making recommendations for major changes to processes based on a single post-completion evaluation. Keep the recommendations in broad terms, suggesting a direction for change.

9.6 Undertake ex-post BCAs of selected initiatives

An ex-post BCA compares the actual outcome with a hypothetical Base Case in which the initiative does not exist. The central question is: 'With hindsight, how strong was the economic justification for the initiative?'

The original BCA could be used as the basis for the ex-post analysis by replacing the assumptions (costs, demand forecasts) with actual outcomes. Project the current level of demand forward for the remaining life of the initiative. This type of exercise serves a secondary purpose of providing a review of the original BCA.

An ex-post BCA may be accompanied by an assessment of the broader impacts of the initiative – regional, environmental, social, financial.

Appendix A discusses specific evaluation examples drawn from Austroads (2005).

[1] Based on Austroads (2005d, p.4)

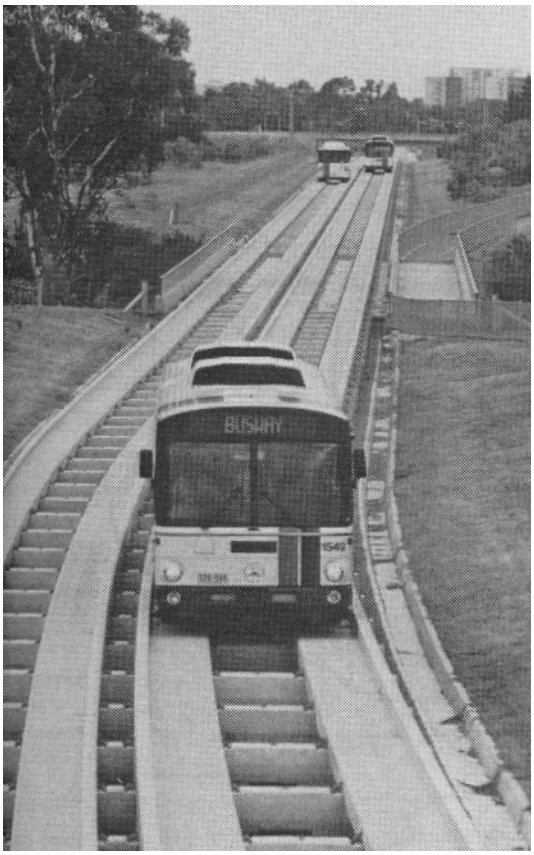
Appendix A Example evaluations

The examples cited below have each been developed for a different purpose, and as such, none of them includes all of the elements that ideally would be incorporated into a comprehensive post-completion evaluation report. Nonetheless, the examples do highlight the types of variables that are investigated during post-completion evaluations and what lessons can be learned from the process.

A.1 Adelaide's O- Bahn Busway

The Adelaide O-Bahn Busway (pictured below) opened in 1986. The O-Bahn system involves the fitting of guide rollers to the front wheels of a conventional bus, which can then be driven either normally or on a guide-rail track that bypasses, for example, points of traffic congestion. A total of 12 km of Busway track were constructed, running between the edge of the Adelaide CBD and the north-eastern suburbs.

Adelaide's O-Bahn Busway



Source: Wayte and Wilson (1989).

The main objectives of the initiative were to:

- increase accessibility between the north-eastern suburbs and the CBD by significantly reducing travel-times and improving the reliability of bus schedules
- reduce congestion on the existing road network.

The O-Bahn post-completion evaluations as described by Wayte (1991) were focussed on the performance of the O-Bahn system and the outcomes of the initiative. In addition to the performance of the O-Bahn system, a series of before and after studies were conducted to assess user response to the system (Pak-Poy & Kneebone Pty Ltd, 1990; Denis Johnston & Associates Pty Ltd, 1988, as cited in Wayte, 1991). Specifically, the following variables were assessed:

Technical performance of the O-Bahn system. The technical performance of the O-Bahn was evaluated against design expectations. Events such as stoppages caused by the guidance technology, ride quality, and vehicle breakdown were considered.

Safety performance of the O-Bahn system. The number of accidents that occurred per kilometre of travel on the O-Bahn was compared with the accident rate of conventional buses. This is similar to the 'comparison of different groups' method described earlier (Austroads, 2005), whereby conventional buses (a group among which no intiative implementation had taken place) were compared with O-Bahn buses (a group among which the initiative was implemented).

Financial performance of the O-Bahn system. The budget set for the initiative was compared with actual expenditure, and the estimated costs of some elements of a conventional Busway were compared with the costs of the O-Bahn to evaluate the financial performance of the initiative.

Patronage. One of the variables measured in the assessment of patronage impacts was passenger volumes on the Busway corridor prior to its conversion to the O-Bahn system compared with passenger volumes after the conversion. In order to account for exogenous impacts on these figures (such as population growth), changes in bus patronage in Adelaide during the same time period were used as a comparison benchmark.

In defining the focus of attention (purpose) for the evaluation, it was noted that it is important for post-completion evaluations to provide clues as to why measured initiative outcomes have occurred. To investigate why new passengers were attracted to the Busway, a survey of Busway passengers was undertaken.

Reductions in motor vehicle volumes. An objective of the O-Bahn initiative was to reduce congestion on the existing road network. Congestion was not investigated directly but factors assumed to be related to traffic congestion were investigated. Based upon observed increases in patronage before and after the implementation of the O-Bahn system on the route, and on passenger reports of prior mode of transport, the decrease in the number of vehicles travelling the route was calculated.

Changes in travel-time. An objective of the O-Bahn initiative was to reduce the time taken to travel between the north-eastern suburbs and the Adelaide CBD. Bus travel-time measurements were taken before and after the implementation of the O-Bahn system so that it could be determined whether this objective had been met.

The post-completion evaluation of the O-Bahn, as described by Wayte (1991) employed comparisons of factors at different points in time (patronage and travel time before and after O-Bahn implementation) and for different groups (accident rates of O-Bahn and conventional buses). An attempt was also made to determine the reasons for some of the changes that took place (opinion survey of O-Bahn passengers) and to address initiative objectives (travel times and traffic congestion).

A.2 Road upgrades at Lauderdale, Margate and Devonport (Tasmania)

The Tasmanian Department of Infrastructure Energy and Resources (DIER) attempts to 'debrief' up to six key initiatives each financial year, a process which involves a range of stakeholders, including initiative managers, contract staff, initiative designers and initiative sponsors. The aim of the DIER initiative debrief process is to seek and communicate the learning opportunities that arise during the implementation of their initiatives.

The table below presents a summary of the implementation issues, identified through the debrief process, that were encountered during three road upgrade initiatives undertaken by DIER. Adherence to the predicted timelines, budget, and technical specifications were considered key initiative success factors (DIER, 2004).

Issues encountered during post-completion reviews conducted by DIER

Aspect of implementation	Issue encountered	Learning opportunity identified
Initiative definition	Initiatives are poorly defined at inception	Initiatives should be well defined at the planning stage
Financial performance	Initiative budgets exceeded	As above
Design and technical specifications	Difficulties working with service authorities	Closer relationships between service authorities, designers and DIER are required, and these relationships should be embodied under a memorandum of agreement executed at the planning stages of each initiative
Management of landowner issues	No clear process for consultation with landowners	Define the roles and responsibilities of various team members in relation to consultation with landowners within each phase of a initiative
Procurement	Late award of contract date	Review processes to bring works forward and take advantage of the full construction season
Maintenance	Poor handover of initiative from construction to maintenance phases	DIER standard design brief to include maintenance requirements/ objectives during the design phase. DIER maintenance personnel to be a part of the initiative team and attend initiative inception meetings.

These post-completion reviews have been utilised to provide learning opportunities that can guide improvements in the conduct of other initiatives, an important application of post-completion evaluations. DIER has, for example, used the learning opportunities provided by these post-completion reviews to improve the programming and delivery processes of all subsequent initiatives.

A.3 Department for Transport Trunk-road Schemes

The United Kingdom Department for Transport (DfT) uses a benefit cost analysis computer program (COBA) to establish the net present value of proposed trunk road schemes compared with a traffic scenario without the road scheme. The COBA program measures the benefits of road schemes as savings in journey time, vehicle operating costs, and the value of reduced accidents. These benefits are assigned a monetary value which is then compared with the capital and operation costs of the scheme (Swift, 2001).

Knight et al. (1996) describe the post-completion evaluation of 11 trunk road schemes during which the actual Net Present Value (NPV) was compared with the NPV predicted using the COBA program, prior to the opening of the schemes. Unlike the two examples presented above, this post-completion evaluation was aimed more at assessing the initiative evaluation technique (that is, the COBA program) than the outcomes of the initiative or the initiative implementation process.

The difference between predicted and actual NPV was calculated by updating original COBA parameters (such as the value of time and of accidents) and substituting predicted traffic data, including traffic volumes, accident numbers and journey times, with measured data. The table below shows the stages involved in comparing actual NPV with the NPV of the initiatives as predicted by COBA prior to their implementation.

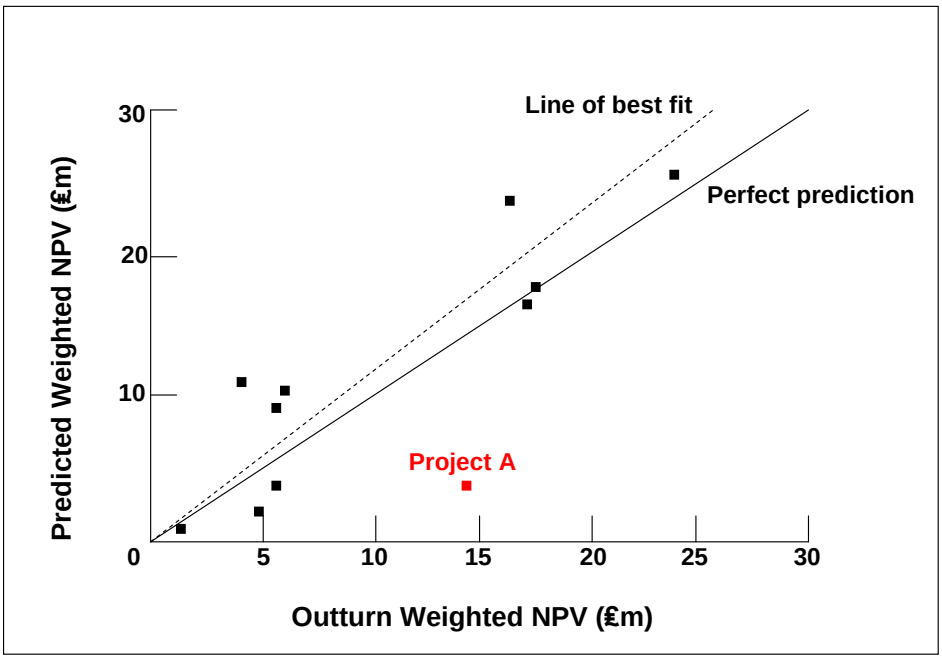
Summary of stages in calculation of actual benefits of trunk road schemes

Stage	Description
COBA replication	Replicate the original COBA results, as obtained prior to trunk road initiative implementation.
COBA rebasing	Change the discount rate and manually rebase predicted benefits to the latest Present Value Year (1988).
COBA updating	Update COBA economic values relating to time and vehicle operating costs, accidents, annual compound growth rates and maintenance costs.
Updating traffic parameters	Update accident rates, occupancy rates and vehicle category proportions.
Application of actual traffic data	Input observed traffic flow, observed vehicle category proportions, observed accident rates and adjust for factors such as road type. Adjust COBA speed-flow curves and junction configurations to reflect observed journey time savings.

Source: Knight et al. (1996)

This post-completion evaluation is an example of a comparison between real and predicted situations. Through the steps outlined above it was possible to determine how some of the actual outcomes of trunk road initiatives, such as reductions in journey times, traffic congestion and accident rates, compared with the outcomes modelled by COBA. The following figure shows the predicted and actual NPV of each of the trunk road initiatives selected for post-completion evaluation as arrived at through the post-completion evaluation process. For example, NPV for Initiative A achieved more than three times the predicted value. The NPV predictions when considered in total were within 6 per cent of the NPV line of best fit. While results were found to be variable across different initiatives, it was found that the main source of inaccuracy came from difficulties in estimating initiative costs.

Actual and predicted weighted Net Present Values



Source: Knight et al. (1996)

A.4 The effectiveness of black spot treatment

In 2001, the BTRE conducted an evaluation of the Federal Road Safety Black Spot Program that commenced on 1 July 1996 (BTRE, 2001). This program provided $36 million per year in 1996-97 dollars from 1996-97 until 1999-2000. The Program was extended in the 1999-2000 Budget, which provided $40.8 million in 2000-01 and $41.7 million in 2001-02.

The Program's objective is to reduce the social and economic costs of road trauma by improving the physical condition and management of black spots. This is done by implementing traffic management techniques and other road safety measures that have proven road safety value.

The purpose of the evaluation was to provide information to the Federal Government about the merits of continuing to fund black spot treatment.

The evaluation adopted a before and after treatment approach, because of the nature of the data available for analysis. The evaluation compared the number and severity of crashes after the black spots were treated with the number and severity of crashes that would have been expected with no treatment. A Poisson distribution (regression model) was used to determine whether black spot treatments had a statistically significant effect. The benefits of black spot treatments were estimated in terms of crash costs avoided.

The evaluation found strong evidence that the Program achieved its aim of improving safety at black spot locations. It was estimated that from 1996-97 to 1998-99, the Black Spot Program generated a net present value of $1.3 billion and a benefit-cost ratio of 14. It was also estimated that the Program prevented around 32 fatal crashes and 1,539 serious crashes between 1996–97 and 1998–99. Further benefits will continue to accrue over the life of the black spot treatments that were applied

The evaluation also found that the Program was not uniformly effective in reducing the number of casualty crashes, in that not all road engineering treatments had a statistically significant effect. For example, in the capital cities it was found that sealing road shoulders had no statistically significant effect on road safety. This was interesting as this was the fifth most popular treatment in expenditure terms, and accounted for nearly seven per cent of expenditure on urban black spot treatment. On the other hand, there were many areas in which the Program had a dramatic effect in reducing the number of casualty crashes, and some engineering treatments were consistently very successful.

The evaluation supported continuing the Program on the basis that it was highly effective in reducing the number of casualty crashes. From the findings on the effectiveness of various treatments, the evaluation also suggested modifications to the Program to increase its effectiveness.

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