# Benefits realisation review and assessment

## September 2022

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**Waka Kotahi NZ Transport Agency research report 699**
Contracted research organisation – New Zealand Institute of Economic Research (NZIER)

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New Zealand Government

ISBN 978-1-99-004483-0 (electronic)
ISSN 2815-8377 (electronic)

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Clough, P., & Bealing, M. (2022). *Benefits realisation review and assessment* (Waka Kotahi NZ Transport Agency research report 699).

NZIER was contracted by Waka Kotahi NZ Transport Agency in December 2021 to carry out this research.



**Keywords:** benefits realisation, investment appraisal, project management, transport

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# Acknowledgements

The authors appreciate the interest and advice of other agencies and individuals in preparation of this report, including:

- Dr John Yeabsley at NZIER for providing internal quality assurance on the draft
- peer reviewers Professor Basil Sharp (University of Auckland) and Dr Thijs Dekker (University of Leeds) for their feedback comments on an earlier draft
- Sarah Spring (NZIER) for helping with information search and retrieval.

# Abbreviations and acronyms

| | |
|---|---|
| ATAP | Australian Transport Assessment and Planning |
| BRM | benefits realisation management |
| CBA | cost–benefit analysis |
| DPSIR | Driver–Pressure–State–Impact–Response |
| EEIST | Economics of Energy Innovation and System Transition |
| GPS | Government Policy Statement on land transport |
| ICT | information and communication technology |
| IPA | Infrastructure and Projects Authority |
| IT | information technology |
| LSF | Living Standards Framework |
| LTMA | Land Transport Management Act |
| MCA | multi-criteria analysis |
| MCDA | multi-criteria decision analysis |
| NPV | net present value |
| NSW | New South Wales |
| NZIER | New Zealand Institute of Economic Research |
| OECD | Organisation for Economic Co-operation and Development |
| $PM_{10}$ | particulate matter with a diameter of 10 microns or less |
| PSR | Pressure–State–Response |
| TAG | Transport Analysis Guidance |
| VKT | vehicle kilometres travelled |
| WBG | World Bank Group |

# Contents

# Executive summary

This report reviews the Waka Kotahi benefit realisation management (BRM) framework, as described in 'Part 2: Benefit Management' and Figure 1 in *Land Transport Benefits Framework and Management Approach: Guidelines* (Waka Kotahi, 2021).

The draft covers the following milestones in the project:

- review and assessment of literature
- definition of key criteria for frameworks
- definition of key criteria for measures
- assessment of the Waka Kotahi BRM framework
- recommendations on improvements that could be made to the Waka Kotahi BRM framework and operations.

## Key points in brief

### Review and assessment of literature

- The literature review found that BRM has gained prominence in the last 30 years in response to the perceived failings of large projects in delivering expected benefits. It first arose in connection with large information technology projects that failed to live up to expectations and has since been rolled out across projects in other industries with large government involvement.
- BRM is a tool for monitoring whether the benefits and objectives of investments and overarching strategy are realised. It emerged as a refinement of project management to shift focus away from the 'iron triangle' of completing work of the right quality, on time and on budget, towards delivering the expected benefits for which the projects received funding. Key characteristics of BRM are a focus on beneficial outcomes rather than on inputs and outputs of projects, and alignment with overall organisational or government strategies.
- BRM is a process through the full life cycle of a project, covering distinct project stages that typically include benefit identification; benefit appraisal (for project approval); benefit planning, monitoring and management through the project; and ex-post evaluation after completion. BRM is closely associated with cost–benefit analysis (CBA) appraisals at the benefits identification stage and again with retrospective CBA at the post-completion evaluation stage. The intermediate stages are more readily applicable to projects in which benefits emerge during a project and are suited to monitoring and 'agile' management rather than 'waterfall' projects that run their course and deliver benefits only after completion.
- Both BRM and CBA are part of investment decision processes, but BRM appears broader and more tied to strategic aims than CBA, which primarily evaluates economic and social effects in one of the five business cases used in investment appraisal. Despite areas of overlap, important measures for BRM may differ from those for CBA. BRM assessments also need to be proportionate and may vary with the scale of projects under consideration. Like CBA, they also need to focus on the additionality of results from an investment and not count effects that would have happened in the absence of investment.
- The literature reveals variation in terminology across these stages and also various subsidiary tools that may assist BRM, such as a benefits register, benefits mapping of the connections between projects and intended outcomes, and a benefits management strategy to oversee the BRM process, including a

governance structure that assigns responsibility for BRM to a separate party distinct from the project manager and project sponsor.

- BRM principles are similar for the realisation of benefits at the project, programme and strategic level. But literature and guidance are lacking on integrating the different levels of BRM. Aggregating benefit measures at the project or programme level to identify movements towards strategic objectives may be subject to double counting and interaction effects in more holistic higher-level goals.
- Project-level CBA is framed as a partial equilibrium analysis that can consistently compare relevant returns from an alternative investment of resources across projects. Comparison is strong where project components are similar and readily quantified and valued but becomes weaker where there is diversity in components between different projects and where components are difficult to quantify.
- National strategic direction is more attuned to a general equilibrium framework in which intersectoral interactions need to be explicitly taken into account. National-level accounting frameworks like the System of National Accounts are currently unable to account for many transport benefits in project-level appraisal, such as changes in environmental conditions and in health and safety. Use of the Treasury's Living Standards Framework may help in drawing out effects of an investment for wellbeing.
- BRM has been applied to investments in transport infrastructure and services in the UK, in Australia at both federal and state levels, and in New Zealand in the Waka Kotahi BRM framework and in Treasury guidance on managing benefits from projects and programmes. Internationally, ex-post CBAs have been used in European countries as part of BRM, notably in the UK and Norway, but only a selection of investments funded are subject to such appraisal. In the UK and Australia, the intermediate stages of BRM are expressed through a series of gateway checks at different points in a large project, and the United States also uses critical decision checks throughout projects.
- Surveys of application of BRM in both transport and other areas have found uneven application and implementation.
  - Large effort is needed in the benefit identification and appraisal for approval stages; less effort is needed in later stages.
  - Ex-post CBA is constrained by funding and used sparingly across countries.
  - There is no universal standard for BRM; each country adapts it to its own priorities.
- Parallel to the emergence of BRM, CBA has evolved from focusing mainly on user benefits of savings in travel cost and time and injury risk to include some monetised externalities. The analysis has been broadened to include wider economic benefits. BRM, to date, has been less expansive in its coverage of benefits, focusing on those that are most readily measured.
- BRM is a distinct part of project management, which can cover all aspects of the investment decision-making and management processes. All countries place CBA in a wider decision framework in which factors other than the net present value results are weighed to prioritise projects (including non-quantifiable elements). The methods used in such weighting are opaque and commonly left to entities that are politically accountable to decide.
- Benefits that cannot be measured are difficult to use in a BRM framework, which is challenging when projects have been selected based on unquantifiable benefits. The size of benefits may be inferred by examining the net benefit of quantified items only and estimating how large unquantifiable benefits would need to be to justify the decision to proceed, but this does not directly value the benefits realised.

## Definition of key criteria for frameworks and measures

- Key principles for BRM frameworks are that they should be:
  - simple to understand and integrate into an organisation's management activities

  - consistently applied across the organisations subject to them
  - able to demonstrate the link between investments and beneficial outcomes
  - focused on identifying only core information to ease data management and the burden of reporting.
- Key principles for BRM indicators are that they should be:
  - measurable and verifiable
  - attributable and relevant to desired outcomes
  - consistent and understandable
  - cost-effective.
- Given the different perspectives between high-level strategy (general equilibrium) and lower-level projects and programmes (partial equilibrium), few indicators or measures can be used unambiguously across both strategic and project-level BRM. Examples of common but ambiguous indicators include:
  - **size of transport sector contribution to GDP** – this is readily collected, but as transport services are a cost input to other productive activities, the sector's growth is not necessarily a benefit but more a sign of potential for economic rents being earned by inefficiency in the transport system
  - **conventional measures of transport activity like vehicle kilometres, passenger kilometres and tonne kilometres travelled** – these are measures of system output rather than outcomes, and growth may signal overly transport-intensive activity caused by transport services priced at less than their full marginal social cost.
- While there will continue to be uses for conventional transport measures, these need to be used to construct indicators of the transport system components and their frugality in meeting demands for transport services at low cost. The extent and cost of transport activities across the economy expressed in per capita terms will be useful in assessing achievements in the face of a likely increase in population.

## Review of the Waka Kotahi BRM approach

- The Waka Kotahi Investment Decision-Making Framework is consistent with international practice in regard to it having a BRM component and CBA as part of a 5-step business case process and in its handling of monetary elements, but it has a more disaggregated list of non-monetised items than most.
- The current Waka Kotahi BRM framework is long on pre-approval appraisal but short on post-approval monitoring and evaluation: this works for large waterfall projects but may miss an opportunity for improvement in sequential programmes that may be suitable for more agile management.
- Many current Waka Kotahi benefits are not quantified and cannot be considered for BRM measures because the quantification and monetisation of benefits are critical for coping with benefit trade-offs and competing objectives.
- The combination of high-level goals from the Transport Outcomes Framework and the Government Policy Statement on land transport (GPS) provides a mix of quantified and unquantifiable direction that is challenging to reconcile with appraisals using the Waka Kotahi BRM framework.

## Recommendations for improvements

- A fundamental question for BRM is to determine what it is primarily for. Is it primarily to provide accountability by ensuring that expected benefits are delivered, or is it primarily a process to channel experience into improving future practice in project management? Most literature surveyed is more focused on accountability, but the learning potential provides a more distinct addition to investment appraisal.

- Simplifying the Waka Kotahi BRM approach to solely focus on quantifiable benefits would improve the alignment with best practice by improving the cost-effectiveness, consistency, measurability and verifiability of benefits realised from projects. It would identify how many projects are being approved on an expectation of benefits that cannot be verified against quantifiable measures, and it would clarify consideration of what proportion of investment should be decided on unverifiable benefits.
- Two strategic-level approaches in the literature shed some light on improving the links between strategic- and project-level benefits realisation:
  - Norway's National Transport Plans cover periods of around 10 years. They specify three broad strategic goals of making transport more efficient, safer and environmentally friendlier, along with five related objectives, and outline projects on key corridors and on system management that contribute to these objectives, some of which include quantified targets. These are implemented through portfolio management with frequent reviews that allow components of projects and the order of their implementation to be adjusted should changing conditions necessitate a change in priorities.
  - The UK Department of Transport's monitoring and evaluation reports provide a retrospective review of programmes and projects under three broad strategic goals: improving connectivity to grow the economy; improving users' experience of transport safety, reliability and inclusive access; and improving impacts on air quality and climate change. It lists projects and programmes that are in progress and contributing to the strategic goals, indicating progress to date and changes to come.
- A fundamental requirement in improving the current list of strategic outcomes and benefits measures is to decide what project success would look like, which outcomes are essential, and which are discretionary. That will help the selection of a core set of indicators with which to measure progress against strategic aims.
- The guidance about the quantification of measures for BRM in the guidelines could be significantly improved by providing links to procedures in other manuals such as the *Monetised Benefits and Costs Manual*.
- Quantifiable measures for inclusive access and environmental sustainability are available and could be adapted for BRM by Waka Kotahi.
- More consideration of accessibility for people with disabilities and mobility impairments is needed, and quantifiable BRM measures exist for Waka Kotahi to adopt.
- It is not always the case that the measures that meet the BRM criteria of good practice are consistently measurable at the project and strategic level. For example, growth in regional tourism in one location due to a transport investment could simply relocate tourists at the national strategic level. More warning about the potential to overstate the national benefits would support the users of the guidelines.
- The following proposed indicators in the GPS provide a basis on which to build a set of indicators applicable to BRM across project, programme and strategic levels.
  - Reductions in injuries and in greenhouse gas emissions are beneficial at both the project and the national strategic level.
  - Other environmental externalities (air quality, noise) are beneficial at the project and the strategic level but vary by locality, so national effects cannot be simply extrapolated from local project appraisals.
  - Reduction in transport costs per kilometre is an indicator of beneficial improvements but can still lead to an increase in transport activity and cost at the aggregate level.
  - Wider economic benefits estimated as a function of savings in transport cost in project appraisals should not be aggregated to the national level without adjusting for potential economy-wide transfers.

  - Reduction of transport service costs as a proportion of GDP is a beneficial outcome at the strategic level.
  - Waka Kotahi invests in transport infrastructure and some aspects of the regulation of its use but does not control all influences over the use of that infrastructure (eg, road pricing). This complicates the attribution of observed effects to investments and requires indicators that can support further analysis to explain the outcomes observed.
- This report concludes with a suggested revised set of measures that draw from the Land Transport Benefits Framework and the GPS, based on a combination of existing measures, some of them amended to improve alignment with the purpose of BRM, and new measures to close gaps in the framework.

# Abstract

This paper reviews literature on the frameworks and measures used for benefits realisation management (BRM). BRM has emerged over the past three decades as a stream within project management intended to counter the traditional focus on completing projects to the specification required, on time and on budget, adding a focus on the achievement of the project's intended beneficial outcomes. In the initial benefits realisation stage, it has strong connections with cost–benefit analysis (CBA). It may also draw on ex-post CBA in evaluating whether a project achieves its intended outcomes. But BRM has a broader scope than CBA, including strategic objectives and possibly also aspects of financial and managerial processes. The literature shows the UK, Australia and New Zealand have formal processes for BRM, and other countries employ similar processes that are not referred to as BRM. BRM is currently most strenuously applied at the early stage of investment appraisal, with less emphasis on later stage monitoring or post-completion evaluation. It is also mostly applied to improve accountability of investment decisions and reduce the risks of optimism bias, rather than its other potential role for learning about project implementation to improve future practices. The paper examines the Waka Kotahi BRM approach in light of international practice, examines how project-level benefits can be informative in achieving strategic objectives, and suggests a set of indicators for BRM drawing on existing measures, amended measures, and new measures to fill identified gaps in the BRM framework.

# 1 Introduction

## 1.1 Research rationale

Waka Kotahi NZ Transport Agency has developed a benefits realisation management (BRM) framework, as described in 'Part 2: Benefit Management' and Figure 1 in *Land Transport Benefits Framework and Management Approach: Guidelines* (Waka Kotahi, 2021). This framework is designed to assess and measure whether the identified benefits of transport investments made through the National Land Transport Programme process actually occur. To this effect, an initial set of benefits and their likely impacts have been identified, and performance measures to monitor and assess their impacts have been implemented.

Waka Kotahi carried out research on best practice management indicators and benchmarking in 2013 (see NZ Transport Agency research report 522 – *Blueprint for a Best Practice Management Indicator Set and Benchmarking*; Denne et al., 2013). However, the current framework and performance measures are more detailed and extensive, and therefore a comprehensive analysis needs to be carried out to ensure the framework and performance measures are fit for purpose.

## 1.2 Research objectives

The objectives of the research were to:

- carry out a comprehensive assessment of the Waka Kotahi BRM framework, including a review of best New Zealand and international practices
- assess whether the framework, considering the set of benefits, set of measures and their structures, is appropriate and fit for purpose
- assess whether the current individual measures are appropriate and can determine, track and monitor the realisation of identified benefits resulting from transport investments
- give guidance to the development of the framework's operational model, ensuring it is fit for purpose to drive the realisation of benefits out of investments by Waka Kotahi
- recommend how the measures should be structured to support reporting as part of the operational model; in particular, identify the sub-set of measures that will enable reporting at a strategic level.

## 1.3 Research scope

The scope of the research was a comprehensive review of all aspects of the BRM framework based on best New Zealand and international practices but adapted and suitable for Waka Kotahi.

## 1.4 Report structure

This report is structured around a succession of steps.

1. **Comprehensive literature review** of BRM practices, performance measures, frameworks and management processes concerning investments in land transport and other infrastructure that have developed BRM processes transferrable to other industries. The literature findings were used to establish the criteria for evaluating BRM frameworks.
2. **Defining key characteristics or criteria for a BRM framework**. Drawing on the literature, this step involved identifying the characteristics that a BRM framework should have for it to be fit for purpose in

providing consistent guidance on the value of different benefits to inform investment and management of transport infrastructure.

3. **Defining key characteristics or criteria for benefits and measures**. Drawing on the literature, this step involved identifying the characteristics of benefit measures that make them fit for purpose for use in a BRM framework.
4. **Assessment of the Waka Kotahi BRM framework**. This step assessed the Waka Kotahi BRM framework against the key characteristics identified from the literature for such frameworks and the individual measures within them. This included the identified benefits and performance measures used to assess the benefits realisation and the operational model that underpins it – in particular, the measures' structure or hierarchy and the ability to report at a strategic/system level through a small sub-set of measures.
5. **Recommendations to improve the framework**. Drawing on the literature and what it says about best practice and the conditions under which it occurs, this step will suggest areas for improving the Waka Kotahi framework, including which small sub-set of measures would best enable reporting at a strategic/system level.

## 1.5 Research approach

Any review of the Waka Kotahi benefit realisation programme is of necessity made with reference to some underlying principles and criteria about its purpose and how it achieves it. The approach taken by this review is that BRM is part of the Waka Kotahi Investment Decision-Making Framework, a primary purpose of which is to achieve value for money from the uses of public funding. Government funding decisions in New Zealand today are guided by considerations of whether investments improve wellbeing within the community and economy, as indicated by enhancement of components of the Treasury's Living Standards Framework, and also by considerations of the efficiency with which they are obtained, as indicated by cost-effectiveness analysis of achieving individual components and cost–benefit analysis (CBA) of the components in combination.

In other words, BRM is one of the tools to assist in obtaining societal return on investment of public funds. As they share a common interest in benefits, there are clear connections between BRM and CBA: the benefit measures used in both would be expected to be compatible with each other, even if not actually identical. But CBA is a long established technique that has been applied to transport over several decades, evolving as new issues arise and new data and measurement possibilities emerge to expand the scope of quantified and monetised analysis. BRM has emerged as a project management tool within the last three decades, with a purpose and focus that may not exactly coincide with that of CBA. The differences and similarities between the two techniques and how they retain connection while dealing with separate evolutionary paths is a fundamental question in reviewing the adequacy of BRM.

The underlying approach of this report, therefore, is based on economics. And as the underlying objective of public funding is a societal return on investment, the underlying economic framework needs to look beyond the national accounting framework of the measured economy to a social CBA that covers the effects of externalities and non-market impacts to the extent that it is feasible to do so. BRM and CBA are intertwined, and the ways in which changes in one method affect the practical execution of the other recur throughout this report.

However, CBA is not the be all and end all of investment appraisal. For Waka Kotahi, it forms part of the organisation's investment management framework, which involves prioritising activities for inclusion in the National Land Transport Programme in accord with government strategies and direction for transport, and then developing business cases for particular components in that programme. The development of business

cases is informed by the New Zealand Treasury's Better Business Cases framework, which contains five distinct cases and questions to be addressed:

- **Strategic case:** What is the compelling case for change? What benefits will change bring?
- **Economic case:** What are the options, and which is the best option for New Zealand?
- **Commercial case:** Is the proposed procurement commercially viable and deliverable by the market?
- **Financial case:** Is the investment proposal affordable? How will it be funded?
- **Management case:** How will the project be organised for successful delivery?

The five-case model aligns with international practice: it has been the required standard for government business cases in the UK since the early 2000s. In 2018, it was adopted by the G20 as an international standard for infrastructure projects. CBA speaks directly to the economic case about social and economic effects with and without options being adopted. It may also be informative for parts of the other business cases, such as the strategic, commercial and financial cases.

But its position in the business case model makes it clear that CBA is not the totality of the business case and investment decision frameworks. It follows that the benefits realisation on which a project is adjudged successful need not coincide with the contents of a CBA, and BRM can also have a different scope. This implies that BRM is a distinct function of project management for monitoring and adjusting projects in delivering expected benefits and meeting their objectives, but one that can be informed by CBA undertaken before the project's inception or after its completion.

Normally CBA is undertaken to assess whether the totality of benefits achieved is sufficient to exceed the costs, and it is not particularly concerned with whether the pricing applied to the services provided by new options is complete or efficient. However, in transport, and particularly in road transport, much of the infrastructure is provided to users at less than full cost or without any direct charging as if it is a public good, despite such services and infrastructure being subject to congestion of limited capacity and being responsible for a range of unpriced externality effects on other transport users or the wider environment.

While, in principle, a CBA with correctly valued components can estimate the net benefits for the nation of unpriced services, in practice, that is too challenging a task where there is insufficient data to quantify all relevant components or to account for changes in the value of components caused by variation in external factors. As inefficiently under-priced infrastructure can be subject to excessive use, which in turn generates demand for further capacity expansion or alternatively non-price demand management actions, this affects the efficiency of the benefits realised and of the investments made. That is relevant to the interpretation of benefits realisation assessments and to the long-term strategic direction of investments.

# 2 Literature review

Transport investment is a significant enabler of economic and social interactions in modern societies, improving accessibility of places and reducing the costs of connectivity for people and businesses, stimulating new productivity, employment and growth. Investment appraisal is used to ensure new investments are likely to be effective to meet changing demands and to prioritise the allocation of investment funds to projects that will be most beneficial for society. Such appraisal has evolved to include CBA to help identify the projects that provide the greatest benefits from available funding.

However, concerns over the failure of projects to achieve their expected outcomes remain, particularly for publicly funded projects. An emerging body of literature suggests that the assessment of a project's capacity to deliver benefits should be viewed within a broader context of 'benefits realisation', 'benefits management' or 'benefits realisation management' (BRM).[1] Conceptual frameworks capturing the various elements and perspectives of BRM applicable to infrastructure projects have been developed, and empirical data from multiple sources have suggested greater attention to BRM could support the delivery of improved project outcomes. However, its adoption would entail a significant cultural shift in organisations (Mehta & Kiridena, 2019).

The recommendation for greater attention to BRM calls into question the suitability of current approaches to investment appraisal, the reliance on CBA and the adequacy of its scope and implementation. It also has implications for other steps in investment appraisal processes and their integration and consistency with each other. In this literature review, we examine what is meant by benefits realisation and BRM, the role of CBA in BRM, how the technique has evolved, and how countries have adapted and applied both BRM and CBA to their processes of investment appraisal.

From this, we distil the principles and criteria that have been found helpful for designing BRM frameworks, the role of CBA within those frameworks, and the principles and criteria for compiling indicators or measures to put BRM into effect. The literature review ranges across both general BRM applied in all industries and that specifically relevant to investment appraisal in transport, and we conclude by assessing the Waka Kotahi BRM framework against these criteria to identify if there are areas where changes would be useful to either the scope of the current evaluation framework or the measures that are used to populate it.

## 2.1 Approach to literature search and literature review

Our international literature review focused on keywords such as 'transport appraisal', 'benefits realisation', 'benefits management', 'cost–benefit analysis', and 'economic evaluation'. This yielded a mix of official guidance from other countries on processes and methods, and indicators to use in investment appraisal. The academic literature predominantly covered the frameworks that could be used and empirical assessments of the effectiveness of current appraisal processes. We also identified some literature from intermediaries such as consultants and industry groups. We then sorted the literature according to its subject matter, its country

[1] While some literature uses the terms 'benefit realisation', 'benefit management' and 'benefit realisation management' (BRM) interchangeably, they are three distinct concepts. Benefit realisation is the benefits that can be attributed to a project, obtained even without management to obtain them; benefits management involves deliberate management to enhance some benefits but not necessarily those originally envisaged; BRM is deliberate management to realise the original intended benefits. Most of this report is about BRM.

of origin, and its theoretical or empirical relevance, and we reviewed it for its insights into framing, choice of measures and the effectiveness of the processes described.

## 2.2 Background to BRM

BRM has emerged in recent decades as a complement to investment appraisal, which has conventionally been built around CBA. Relevant literature includes both that about the content, evolution and practice of CBA, and literature about effective project management that delivers the benefits that projects are intended to provide (Serra & Kunc, 2015). The project management literature places CBA at particular stages in a project's life cycle – particularly at the start at the proof of concept and approval stage, and potentially also at later stages (retrospective ex-post analysis). CBA has a long history of application and incremental improvements and, occasionally, more radical changes in scope and practice. Only some of these are reflected in BRM.

### 2.2.1 The emergence of BRM

Surveys of project management indicate a focus on the preparatory stages as projects seek funding approval, but after that, there may be relatively little attention to whether expected benefits will be provided, given the contingencies that may arise, and changes made in the course of project implementation. Project management may become focused on the 'iron triangle' of delivering the right quality, on time and on budget, and lose sight of the actual beneficial outcomes sought. That was demonstrated by Goldsmith and Boeuf (2019) in their assessment of the implementation of the Channel Tunnel between the UK and France, which in its early years was widely panned by press and political commentators oblivious to its significant benefits for connectivity. Projects need to be managed throughout their life cycle to ensure expected benefits will actually be realised.

Since the 1990s, BRM has emerged as a distinct part of project management, particularly in the UK, Australia and New Zealand (Abba et al., 2018). In the UK, BRM emerged in response to problems with large information technology (IT) projects, but it has been adopted for wider use in government (Breese, 2012). The original intent was to improve outcomes and reduce the potential for optimism bias and benefit falsification, but the approach has sometimes become reductionist, seeking to find a few 'key benefits' that proxy the whole set. The approach to BRM needs to strike a balance between being comprehensive in coverage of significant benefits, but also concise and frugal in the resources used, if it is to be widely undertaken with the consistency required to compare investment proposals between projects/programmes.

Breese (2012) concludes that BRM is neither a panacea nor a false dawn, but rather an important element for bridging the gap between strategy/change management and project/programme management. The literature is very broad and describes BRM applying to matters of national strategy, individual projects and as part of an individual organisation's implementation of its policies or strategies. A part of the literature focuses on BRM as part of change management within organisations, in which benefits realisation is equated with uptake and adaptation of new techniques and ways of working, where active monitoring and management responses are required to keep benefits on track. The literature on these internal applications of BRM is not closely analogous to the role of Waka Kotahi in managing investments in New Zealand's land transport infrastructure and is not examined in this review.

In the UK, the Cabinet Office defines **benefit** as 'a measurable improvement resulting from an outcome perceived as an advantage by one or more stakeholders, which contributes to one or more organisational objectives' (Infrastructure and Projects Authority (IPA), 2017, p. 12). **Benefits management** is defined as 'the identification, definition, tracking, realisation and optimisation of benefits' and is undertaken throughout a project's life cycle, both establishment and operation (p. 12).

According to the IPA, effective benefits management is needed to:

- measure an organisation's performance in delivering its projects
- deliver the widest possible benefits to society (not just financial measures of project implementation)
- provide value for money when public funds have been invested
- create a virtuous circle of lessons learned and shared to improve future project delivery.

BRM is variously described as covering three to five components. The names of these components vary across sources, but a typical nomenclature is outlined below:

- **Benefits identification** – aligned to proposal appraisal and ex-ante CBA
- **Benefits planning** – a logical mapping of causation, timing and volume of expected benefits realisation
- **Benefits monitoring** – tracking the emergence of benefits resulting from investments
- **Benefits management** – may include planning and monitoring plus control and response functions
- **Benefits evaluation** – ex-post assessment of the project once completed and in the operational phase.

Three-stage descriptions are even more compressed, focusing on the:

- **identification stage** (building a sound business case of benefits expected from the investment)
- **execution stage** (effective implementation of changes in the system to bring about expected benefits)
- **sustaining stage** (monitoring of realised benefits and adjustments made to maintain or enhance them).

Such descriptions may fit more readily with small projects where the period of agile management after completion of installation fits within business planning cycles, but the idea of managing well beyond the completion date can apply to new transport infrastructure assets with much longer effective lifespans of 50 years or more.

Accountability is a key aspect of BRM, which emphasises a specific role for project governance, with separate roles/responsibilities for a benefits manager distinct from the project manager and project sponsors.

The emergence of BRM has coincided with increasing interest in public–private partnerships that share risk and return and require a sharper focus on what is actually achieved, and by whom, in project delivery. The larger scale of projects and wider scope of appraisals has also increased the risk of expected benefits being confounded by other factors as a project proceeds.

In their survey of BRM, Williams et al. (2017) drew from other literature analysing projects undertaken in Australia, the UK, the USA and elsewhere. Their survey identified a number of issues impacting poor project performance:

- failure to clearly identify project benefits during the early stage of a project
- a focus on traditional measurement of time, scope, and budget rather than the realisation of target benefits
- limited attention given to intangible benefits, so that project outcomes do not always address the government needs.

They concluded this showed a need to define target benefits in a specific, attainable and comprehensive way, establish a methodology for evaluating target benefits, and focus on BRM throughout the project life.

They also found that current practitioners, despite knowing the life cycle scope of BRM, expressed a clear emphasis on getting projects past the approval stage – interest in benefits realisation fades in the later stages (Williams et al., 2017). There is widespread recognition that expectations of benefits change through a project, but no consistent process is applied to capture those changes. Benefits quantification is important in setting baselines but lacks standardisation, and BRM and risk management are not generally integrated.

### 2.2.2 The evolution and coverage of CBA

The idea of CBA originated in the 19th century (Dupuit, 1995). It became widely applied in developed countries following the Great Depression in the 1930s and during the reconstruction following World War II when a range of infrastructure investments were required to facilitate economic recovery. It has become widely used in transport appraisal over the past 50 years or more in some countries due to the relative ease with which a standardised approach to comparing investment proposals can be developed for components of transport investment, compared to diverse alternative investment areas.

CBA was originally restricted to elements that could be readily observed and quantified, but over the years has been expanding its scope and complexity (Vickerman, 2017). In transport, its initial focus was almost entirely on user benefits – vehicle operating costs, travel times, road user safety – assuming that these would create savings and economic surpluses that could stimulate further economic activity and growth. That initial focus was largely oriented around measuring benefits for prosperity (eg, time savings valued at workers' productivity rates, averted fatalities valued at the forgone lifetime earnings of those prematurely killed) until non-market valuation techniques were adapted to value risk reduction directly, an approach now widely practised across Organisation for Economic Co-operation and Development (OECD) member countries (Clough et al., 2015).

However, CBA is rooted in a welfare economics framework of maximising economic surpluses, and over time new externality elements were added like changes in noise nuisance and greenhouse gas emissions, but others that are more difficult to quantify, like visual intrusion, were left out of the quantified CBA and assessed through a more qualitative process of multi-criteria analysis (MCA). Many of these externalities have a less obvious connection to productivity but do impact on the wellbeing of people, both transport users and bystanders, through effects on their quality of life.

There is no universal standard for CBA, but most countries' approaches have broad similarities in principles that are applied with adaptations to local circumstances (Annema et al., 2015). The benefits of transport investment are critically dependent on the adequacy or inadequacy of the transport network in which it is made: the greater the inadequacy, the larger the potential benefit from improvement, other things held constant. Beneficial impacts of transport infrastructure investment in one location cannot be taken to imply a similar project will have similar impacts elsewhere without accounting for differences in local circumstances (Vickerman, 2017).

A key issue is that the results of ex-ante CBAs, which have been influential in decisions to fund projects, often differ from the results of ex-post CBAs of projects after they are built. The comparison is difficult to draw because ex-post CBAs are done rarely compared to ex-ante CBAs (International Transport Forum, 2017). Nicolaisen and Driscoll (2016) compared the extensive focus on ex-ante project appraisals and the significantly less attention from practitioners and academics alike given to ex-post analyses. Every project proposal goes through at least one CBA or related business case analysis, whereas only a fraction of approved projects are subjected to an ex-post CBA. Most OECD countries do not require ex-post analyses to be done. Even where it is mandated, as in the UK and Norway, funding provision for such analysis is insufficient to cover more than a small selection of successful projects.

There is a widely recognised risk of optimism bias and a focus on getting a project through approval processes that could cause an ex-ante analysis to overstate the benefits likely to be brought by a project (Bureau of Infrastructure, Transport and Regional Economics, 2018). Countering optimism bias commonly appears in the literature as a specific issue that BRM is intended to address. Over-optimistic forecasts that fail to account for a changing mix of transport mode over time or that underestimate costs that fail to account for contingencies of delay caused by weather or supply chain disruptions are common causes of exaggerated net benefits in ex-ante analyses. However, sometimes empirical studies find the opposite result. In comparing ex-post analyses of 27 Norwegian road projects that had been in service for at least five years

or longer, Odeck and Kjerkreit (2019) found the ex-ante CBAs underestimated the ex-post net benefits by 50% on average due to low traffic forecasts. Ex-ante construction costs were also underestimated by 5% on average, a difference too small to offset the benefit understatement.

Another issue with CBA is the wide variation in the influence the CBA has on decisions taken. In retrospective studies of transport projects in Norway and France, with particular emphasis on the forecast and estimation accuracy for traffic and construction costs to compare with the project outturns, Meunier and Welde (2017) found their ex-post evaluations often indicate a project's net benefit exceeds the ex-ante estimates; also that many large projects are approved despite unfavourable ex-ante net present value (NPV), indicating the importance attached to benefits that are non-quantified or otherwise outside of the quantified CBA. Their ex-post analysis focuses on the core components of the quantified CBA. It does not capture all environmental and social impacts that are emphasised by decision-makers when selecting projects for implementation. A majority of projects successfully delivered the anticipated user benefits. Those that delivered large reductions in generalised costs and that connected regions with complementary business communities delivered benefits in addition to the direct user effects.

Many countries do not seem assiduous in enforcing BRM after the initial assessment on which the funding approval is based, even when it is a legislative requirement. Annema et al. (2017) used logit regression and latent class analysis to identify associations between CBA results and transport investment decisions in the Netherlands. They found that, despite politicians deciding in 2000 to make CBA a mandatory tool for investment decisions, there was no significant association between the project's NPV and the political decisions for funding approval. In a review of the literature on ex-post analyses, de Jong et al. (2018) found political-economic explanations for cost overruns and over-stressed benefits (strategic bias favouring particular projects over others) more compelling than technical arguments about deficiencies in available data and models used.

Another significant issue for conventional CBA is the value of transport user benefits from travel time savings, which are assumed to provide significant value from the additional productive use of travel time saved. Mobile communications reduce the value of saving travel time if people can work in transit, on aircraft or inter-city trains. This is problematic for large inter-urban transport projects, which often claim transformative benefits from bringing cities closer together in travel time terms (Vickerman, 2017).

In the UK, the Standing Advisory Committee on Trunk Road Assessment (1999) identified how a number of extensions could be made to the basic CBA model, most dealing with negative externalities. But there has also been interest in accounting for potential positive impacts on jobs and growth and, more recently, on transformational changes. Following the work of Krugman (1991), there is recognition that market imperfections can drive a wedge between the value of a project for transport users and the value for the rest of the economy. This implies that under some circumstances, shifts in property values, which conventional CBA excludes on the basis of double counting the travel cost savings capitalised into location values, could be additional to those savings. It also implies that transport can provide agglomeration benefits from economies of scale and improved labour market operation (business–labour matching) that are also additional to the conventional CBA model, and methods for accounting for these wider economic benefits are now becoming more often accounted for in some countries' approaches to CBA.

Studies of transport improvements show a wide range of economically relevant positive impacts, including on city size, employment and land values (Venables et al., 2014). Focusing narrowly on the economic impacts in the broad categories of user benefits, productivity effects and investment and employment effects, Venables et al. explored the coverage of different impacts in current CBA practice and found some appraisals are insufficiently context and project specific, and need to be informed by a clearer narrative about how economic benefits arise. Transport's role in attracting private investment and creating jobs attracts a lot of attention from politicians and other interests, but often insufficient attention is paid to ensuring

the additionality of new investment and the impacts it brings. Transport is just one of a range of interventions that shape the level and location of private investment, so there is a risk of over-attributing changes to transport initiatives. Effects on land-use change and the spatial distribution of private investment could be estimated and reported in a wider range of projects than is currently the norm.

These changes reflect the political zeitgeist; as Vickerman (2017) suggests, policymakers have shifted away from the abstract notions of consumer and producer surpluses towards a project's contributions to growth in employment and economic growth activity. Concerns over environmental impact and sustainability have also shifted the attention of transport managers away from indicators of transport activity, such as vehicle kilometres, passenger kilometres or tonne kilometres travelled, towards more abstract measures about the accessibility of people to required service locations, or about improved connectivity between the different components of the economy. This is also ultimately about a shift towards better measurement of impacts on wellbeing, albeit one based on a wider measure than the economic surpluses that accrue mainly to transport users in conventional CBA.

However, despite this shift in coverage, some literature confines itself to the narrow financial costs and benefits. Arup and the Institute of Transport Studies (2016) considered a number of questions concerning long-term demand forecasting, accounting for uncertainty, the profile of benefits throughout the appraisal period, and other elements of benefits appraisal in the UK, but they focused on the core transport user benefits considered in standard appraisal and did not consider wider economic benefits. And Davis et al. (2020) examined the historical roots of value management and its implications for more effective project stakeholder management, illustrating the significance of BRM through an in-depth examination of an ongoing large-scale UK rail project: High Speed Two.

Vickerman (2017) notes that the broadening coverage of CBA and a focus on wellbeing implies greater accounting for the distribution of costs and benefits than has conventionally been the case. CBA currently covers distribution between different time periods affected by a project (through discounting) more than it does distribution between affected groups within the community now. As CBAs include greater technical complexity, they become more challenging for effective public consultation on projects to identify local impacts or suggestions for improvement. This excludes parts of the population from participating in realising the projects' benefits and risks their alienation. Benefits not only need to be defined and delivered but also communicated so those potentially affected can make the most of them.

A recurring issue with CBA is the appropriate treatment and valuation of non-marginal changes that are often claimed for projects, particularly large ones. Critiques of CBA characterise it as suited for only marginal changes, based on a static welfare model in which small changes are possible but do not fundamentally change the economic structure; conversely, it is unsuited to transformational changes to the economy (Economics of Energy Innovation and System Transition (EEIST) Consortium, 2021). This is a valid criticism, but it is not a weakness unique to CBA, as it involves the difficulty of predicting outcomes that are potentially so significantly different from the past that there is no prior experience to draw on, and genuine uncertainty to which it is not possible to attach probability or expectation (Kay & King, 2020). Nor does the criticism invalidate the use of CBA for investments where the improvements achieved are marginal, as is the case for many roading investments, which involve relatively minor road straightening or widening or adding new layouts to alleviate frequently congested areas.

A paper by the UK's EEIST Consortium (2021) critiques the adequacy of conventional CBA for assessing transformational innovation, which may initially be more costly than established technologies, but with wider uptake, scale economies and technological improvement can rapidly reduce costs to become competitive. It argues that CBA gives misleading guidance for investment decisions as it struggles with quantifying transformational change and converting it to a monetary metric. As an alternative, the paper proposes a risk–opportunity analysis in which CBA is supplemented by a wider set of risk and opportunity assessments that

are not quantified but ranked according to their individual contribution in moving towards desired outcomes and which may override the primary short-term financial considerations reflected in the CBA.

The EEIST Consortium's report is written from the perspective of encouraging transformative innovation, not from that of transport authorities controlling existing networks and systems. The solution to innovation is setting up processes, institutions, and funding to cover investments in transformation and assessing their risks and opportunities, not expecting it to pop out of routine funding processes subjected to CBA. Directing money at emergent technologies like wind generation or LEDs until they reach the scale and cost reduction necessary for wider uptake is one way to achieve transformational impacts, but it is different from what is required to infer transformational effects that might arise from a new transport route or interchange.

### 2.2.3 Decision-making beyond CBA

In many countries, CBA is embedded in multi-criteria analysis (MCA) frameworks that view the CBA result as just one of many influential factors on the choice of projects to fund and which may provide an assessment mechanism like the EEIST Consortium's recommended risk–opportunity analysis. The BRM literature also promotes the view that CBA is just one supporting step in a larger process of project management that turns promising proposals into reality.

Like MCA, risk–opportunity analysis is a way of formalising assessments of matters that are not readily quantifiable and presenting the choices in a consistent way for accountable political decision-makers to make the call. But unlike the EEIST Consortium's case studies, which are all about choosing technologies that already exist and just need investment backing that will give them scale to lower their costs and allow them to be rolled out widely in pursuit of a stated goal, in transport infrastructure investments the claims for transformational change hinge on the flow-on effects of individual transport improvements, such as high speed inter-city rail links or cross-city underground links of what are individual and distinctive origin–destination routes. They are not about lowering cost and increasing the scale of widely replicated outcomes.

Some countries are stepping back from relying on MCA as a technical tool for use in investment appraisals because it is subjective, prone to analyst bias and not transparent. For instance, the UK's 2020 *Green Book* no longer endorses the use of MCA as a method for valuing benefits in an appraisal. However, it does accept the use of a variant known as multi-criteria decision analysis (MCDA), which uses expertly facilitated workshops and swing-weighting techniques to objectively weigh the balance of informed expert and stakeholder opinion (HM Treasury, 2020, p. 37).

A literature review covering 66 papers in the field of transport identified perceived strengths and weaknesses of CBA and MCDA, the different ways to combine them, and their complementary uses to support sustainable transport decision processes. By facilitating the inclusion of a participative process, MCDA, or a combination of both methods, emerged as a promising appraisal method for sustainable transport (Marleau Donais et al., 2019). A recent analysis of Queensland's Gold Coast Light Rail describes a modern form of multi-criteria decision-making, the i3d3 model, developed at Bond University, which can rank projects from best to worst across an organisational portfolio, geographic region, or industry sector (Langston & Crowley, 2021).

The replacement of MCA by MCDA applies at the analytical level of preparing project appraisals. It does not describe the process of multi-attribute weighting and assessment at a higher level of strategic decision-making, which takes other forms subject to political accountability. As seen in some literature referred to above, this may result in a different selection of projects approved for funding than that suggested by quantified CBA (Annema et al., 2017; Meunier & Welde, 2017). We have found little literature on those higher-level weighting decision processes, and beyond the observation that decisions reflect political preferences, the workings of these processes remain opaque.

### 2.2.4 Summary on evolving CBA and benefit identification

The literature on the evolution of CBA shows how its scope is expanding as the evidence allows. Monetised values for the environmental externalities that reflect missing markets are included as it becomes feasible to do so, with a vertical expansion of the list of benefits to be considered. There is also recognition of the validity of horizontal expansion of the effects of projects flowing on from the direct impacts on users, in the presence of market imperfections that can create value gain above the capitalised benefits of transport users. However, it is evident in some literature that not all monetised benefits are equally weighted: benefit–cost ratios for project ranking are computed on the core costs and benefits, while other benefits, for which quantification and/or monetisation may be more uncertain, are left out of the comparative calculations and presented separately alongside the monetary analysis for politically accountable decision-makers to assess and bear responsibility.

Valuing transformative projects remains controversial in transport because of uncertainty around the non-marginal changes. Claims of transformational change are open to the charge of optimism bias, and there is little that can be done in dealing with genuinely uncertain outcomes other than to present a series of scenarios of a range of potential outcomes and present them, along with all the information and assumptions behind them, clearly and consistently, to decision-makers to make the final call.

With climate change, changes in transport propulsion and the potential for autonomous vehicles, transformation issues are likely to become more apparent in future transport appraisals. But such technological advances are inputs into the processes of transport – not outcomes. The beneficial outcomes of transport changes enabled by technological advances remain broadly the same – savings in time, lowering of risks, reductions in the negative externalities. Transformational issues may change the way risk and uncertainty around future outcomes are analysed, but the role of CBA remains – to consistently compare expected outcomes against the cost of achieving them for a range of prospective funded projects. It is important that the strength of CBA in providing a consistent way of comparing alternative projects be retained, focusing on the relative return in the elements in common across projects, rather than comparing analyses that are varying in scope according to how far unquantifiable impacts can have monetary values attached to them. Weighing the quantifiable items in the analysis and considering unquantifiable analyses in a wider multi-attribute assessment framework is how transport appraisal is undertaken in other countries.

It is also important that CBA should retain the clarity of distinction between economic activity as identified in an economic impact analysis and the economic surplus gain from a CBA, against the tendency observed in some countries for decision-makers to blur the two and seek inclusion of expenditure and employment numbers in their benefit framework (Vickerman, 2017). Any project involves spending and employment, both of which are inputs into projects, and the economic impact of an $*X* million project will be much the same on road A as on road B. The key difference between projects for selection is their net beneficial outcomes and the effectiveness of each project in providing these outcomes. So, the political urge to mix impact measures into CBA muddies the comparison between projects and should be resisted – the analytical frame of CBA focuses on the surpluses generated from the use of funds, which is required for investment appraisal. Politicians may want to stress jobs and spending, which is their prerogative if they are held accountable for their choices. But investment appraisal and BRM need to keep that choice separate from the rigorous CBA so there is a firm quantitative basis for comparing projects and it is clear where responsibility lies for project selection that relies on an unquantified assessment that outweighs the quantitative results.

# 3 Frameworks and indicators of project benefits

## 3.1 Cross-country practice of benefit appraisal and realisation

BRM and CBA inevitably intersect at the benefits identification stage of project design. Benefits may be claimed for a project, but it is the appraisal and business case that test their potential substance and endurability and compare the value they provide against alternative uses of investment resources. Once the case has been shown sufficient to obtain approval for the proposed project to proceed, the CBA helps formulate the expectations for the benefits to be obtained and is one basis for considering if the actuality is living up to expectations. Any weaknesses or limitations in the CBA can also limit the BRM practice.

Mackie et al. (2014) reviewed transport appraisal and the role and position of CBA in a transport planning process, with a brief survey of seven selected countries where CBA plays a formalised role in decision making: England, Germany, Netherlands, Sweden, the USA, New South Wales (NSW, Australia) and New Zealand. They found methodologies, valuations, and application areas are broadly similar across the countries. All countries place the CBA results in a comprehensive assessment framework that also includes various non-monetised benefits. Large-scale projects with claimed transformational benefits are hard to handle, as are impacts on the costs for business of moving freight and value of travel time savings.

Time lags between investment and project completion raise issues for BRM, particularly when external conditions change. There are also challenges to CBA, BRM and to quantitative assessment in general in the institutional and political context. Countries with federal governments devolve much transport responsibility to the state or regional level, where politicians may place more emphasis on benefits for local employment or gross value added than on more broadly defined economic surpluses, and there is also risk when local ‘visionaries’ lock in a solution before all options have been comparatively appraised. If CBA enters into consideration of options too late, it is reduced to endorsing decisions that have been already taken. That risk is increased when planning processes are centred around a perceived problem, which may be arbitrarily defined and provokes a view that any intervention is better than none (Mackie et al., 2014).

### 3.1.1 BRM

In one of a series of studies for the Project Management Institute, Williams et al. (2017) surveyed the state of BRM programmes in six countries (Australia, Canada, Norway, United Arab Emirates, UK and USA), one Australian state (NSW), the European Union, and one trans-national organisation – the World Bank Group. A later study followed up with interviews in the four Anglophone countries in this selection – Australia, Canada, UK and USA – to probe the differences between the ‘espoused’ method of BRM in these countries and actual practice (Williams et al. 2018).

They found practice varied across these entities, with some similarities but many differences determined by local circumstances. The Anglophone countries were more explicit in espousing BRM, although not necessarily assiduous in carrying out all its stages, from benefit identification to project evaluation. The three countries with federal governments (Australia, Canada and the USA) all had guidelines issued by their federal governments concerning the spending of federal tax funds, but individual state and provincial governments often adapted these or issued their own guidelines to fit with their own priorities. While the state-level guidelines are broadly consistent with the federal guidelines, most of the publicly funded projects in these countries are commissioned at the state level, so state guidance predominates over federal.

Williams et al. (2017) identified some dominant aspects of definitions of benefits, including that benefits:

- are measurable

- are a consequence of change
- are perceived by stakeholders as positive
- are an outcome considered advantageous by an organisation
- contribute to organisational/strategic objectives.

They also found benefits can be categorised in a number of ways according to a variety of different criteria, such as:

- qualitative and quantitative benefits
- tangible and intangible benefits
- business/end and intermediate benefits
- opportunity value benefits
- planned and emergent benefits
- economic and financial benefits.

Another way of classifying benefits is to align them with the main elements of an organisation, such as strategic, management, operational, functional and support.

#### 3.1.1.1 Australia

Williams et al. in 2017 concluded that the Commonwealth Government in Australia had not yet worked out a comprehensive BRM framework or assigned tasks within it to specific parties. But it did have a benefits management strategy template as a guide to Commonwealth and State project management. It explicitly grants freedom for states and major Commonwealth departments to provide their own guidance, creating a fragmented BRM landscape.

The Australian Transport Assessment and Planning (ATAP) Steering Committee has issued guidelines, tools and techniques covering six broad headings: Travel Demand Modelling; CBA; WEBs; Productivity metrics; Distributional (Equity) effects; and T6 Benefits Management (ATAP, 2016). T6 Benefits Management covers benefits identification, benefits planning, benefits monitoring, and benefits evaluation.

Infrastructure Australia, an independent statutory body that is the key source of research and advice for governments, industry and the community on nationally significant infrastructure needs, issued an Assessment Framework to assist project proponents in assessing projects and completing submissions (Infrastructure Australia, 2017). This provides templates for project submissions and business case templates for sectors such as transport, energy, telecommunications and water industries. Its templates cover five distinct stages:

- problem identification and priority setting
- initiative identification and options development
- business case development
- business case assessment
- post-completion review.

Whilst these framework stages have similarities to a BRM framework outlined above, it has little to say about the intermediate stages between benefit identification and project appraisal and the post-completion review. That review is taken some time after project completion when its outcomes are clear, and the guidance underlines the importance of understanding the magnitude and longevity of benefits over the long term, including for productivity and economic impacts (eg, vehicle operating costs, travel time and reliability),

impacts on individuals (eg, accessibility, connectivity), service improvement impacts, and health, safety and security impacts.

Another post-completion management stage is the Australian Government's Assurance Reviews, administered by the Finance Department and drawing on the skills of the Australian National Audit Office and the Department of the Prime Minister and Cabinet (Commonwealth of Australia, 2020). Its purpose is to provide some independent perspective and external assurance on how the project is progressing, potentially adding new insights to internal control and highlighting issues that may jeopardise the delivery of benefits. The Assurance Review Process involves conducting 'Gateway Reviews' at different stages through the project, of which 'Gate 5 Benefits Realisation' focuses on measuring the project's success to date in achieving its objectives, expectations for the future and any potential remedial action. The process draws on a range of proven better practice methodologies, including the UK's Office of Government Commerce Gateway Review process.

#### 3.1.1.2 New South Wales

The NSW Government has a Benefits Realisation Management Framework that covers principles, processes, guidelines, tailoring, and glossaries. Its Business Case Guidelines and Guide to Cost-Benefit Analysis also inform BRM. The NSW Government also has Program Evaluation Guidelines and an Infrastructure Investor Assurance Framework (Infrastructure NSW, 2018).

The Benefits Realisation Management Framework (NSW Department of Finance, 2020) covers a framework of 10 best practice principles, a 4-stage process of Understand–Plan–Manage–Evaluate; guidelines covering the steps involved in applying the process; 'tailoring' to get the framework fit the situation; and a glossary. The principles define the characteristics of a benefit, how it must be a measurable improvement in outcomes, aligned to strategic goals, how the number of monitored and reported benefits must be kept to a 'sensible' number, and how BRM should be integrated with other management processes. Principle 6 states that benefits must be owned by appropriate sponsors and managers, not by the project/programme manager, and responsibility for benefits realisation lies with those business units affected. The process guidelines also include a section called 'Benefits Realisation Management Organisation Maturity', outlining ways of defining potential outcomes and strategically aligned objectives and benefits, and developing a benefit plan to monitor and evaluate benefits achieved.

#### 3.1.1.3 VicRoads Benefit Management Framework

The VicRoads (2016) Benefit Management Framework aims to enable a consistent approach to identifying, monitoring and evaluating the success of VicRoads transport investment. The framework provides a link between the outcomes of VicRoads investment activities and broader governmental objectives. The intra-governmental link allows for the comparison of alternative investment options across government, which facilitates consideration of the efficiency of public investment across the wider portfolios of alternatives. The framework also provides a project or programme-level link between the desired benefits identified at the outset of a project, such as during the development of the intervention logic map, and what happens in reality when the project is implemented and subject to evaluation. **The key finding here is that the BRM framework can be designed to provide intra-project and extra-project management for monitoring and evaluation.**

The jargon used in the framework aligns with external sources of jargon regarding BRM, particularly the UK Department for Transport. Four key terms are used:

- **Outcomes** describe the long-term aims sought at the highest level, such as the outcomes sought by the state government.
- **Benefits** reflect the contribution to outcomes.

- **Key performance indicators** describe or reflect the level of change in benefits.
- **Measures** are the quantifiable units used to assess or validate the change in the benefits and the key performance indicator level.

The framework is founded on the following four framework principles:

1. The framework must be simple to understand and integrate into activities – if it's not, it will not be used.
2. The framework must be consistently applied throughout an organisation – inconsistent application undermines the advantages and purposes of BRM.
3. The framework must clearly demonstrate how an investment contributes to benefits and outcomes.
4. The framework must focus on only core information – monitoring can be onerous; therefore, the information requirement should be minimised to encourage commitment to using the framework.

The VicRoads framework applies three principles for selecting individual indicators. The three principles are:

1. The indicator must be relevant to the desired outcomes sought.
2. The indicator must be measurable in a practical and unambiguous way.
3. The indicator must describe effects that are clearly attributable to the investment.

In this framework, **relevance** is defined as a clear relationship between the investment and the benefit. A direct relationship is preferable, but an indirect indicator might be a relevant indicator if no direct indicator can be found or measured reliably.

**Measurable** is defined as the ability to quantify the change in the benefit or outcome due to the investment and the direction of change in the benefit or outcome.

**Attributable** is defined as the ability to be confident that the investment is the most likely reason or cause of the change in the indicator, such that the investment is the primary reason for the change in the indicator.

Table 3.1 shows three examples of the outcome–benefit–indicator relationship.

**Table 3.1 Examples of the outcome–benefit–indicator relationship (adapted from VicRoads, 2016, pp. 10, 15, 20)**

| Outcome | Benefit | Indicator |
|---|---|---|
| Improved wellbeing | Actual transport safety improvement | • Lower crash severity<br>• Lower crash frequency |
| | Perception of safety improvement | • People report feeling safer<br>• Increase in the proportion of local trips are made using walking and cycling |
| Better journeys | Community satisfaction with journeys | • Travel time reliability (low variability in actual travel times)<br>• Travel time (time taken to travel between places)<br>• Frequency of delays (number of delay events and duration) |
| Increased productivity | Reduced exposure to transport costs | • Lower whole-of-life costs for infrastructure<br>• Avoided future costs<br>• Access to shared assets |
| | Improved resource efficiency | • Time savings (specifically for business and freight travel)<br>• Optimising the public transport fleet<br>• Durability of assets<br>• Asset utilisation<br>• Network utilisation |

#### 3.1.1.4 Canada

In Canada, 98% of infrastructure project approvals are by provincial or municipal agencies that are not required to follow federal government processes. Federally funded projects have to provide three documents to the Canada Revenue Agency Finance Committee: a benefit map (high-level overview of project outputs and outcomes), a Benefits Management Plan, and a Benefits Realisation Report (Williams et al., 2017). BRM has also been practised under the name of Outcome Management, a Canadian-devised approach based on internationally recognised project management and risk management techniques. It combines elements of CBA and a 'Gating' progress reporting system.

All projects, as defined by the federal government's policy on the management of projects, are subject to Treasury Board policy instruments and their related standards, tools and guidance. There is not a single standard project benefits identification, quantification or management process, and federal government departments can determine the methodology that best meets these requirements. Federal government has outlined a BRM methodology aligning outcomes to business objectives, which establishes accountability, and includes evaluation, but federal departments exercise autonomy in how they apply it.

The Organisational Project Management Capacity Assessment tool lists questions to encourage managers to develop performance metrics that track project outcomes, define success criteria and review performance at project close out.

Canada has a long history of applying CBA at the provincial level. For instance, in British Columbia there are CBA guidelines that describe how to quantify the benefits of savings in travel time, accident costs and vehicle operating costs and also the (usually negative) benefit of construction delay (Ministry of Transportation and Infrastructure, 2014). The guidelines also account for residual values of land and structures as a negative cost. The CBA sits in a Multiple Account Evaluation framework, which divides benefits into:

- customer services (savings in time, accidents and operating costs)
- social/community effects (noise, air quality, community severance, visual and business impact)
- environmental effects (land requirements and site rehabilitation, greenhouse gas emissions, water pollution, impacts on wildlife and special areas).

There is also a separate financial effects account, which focuses on the NPV of a project from the public provider's perspective, and an economic development account, which is activated through elaborate procedures by projects likely to have significant economic impacts.

Litman (2021) provides guidance on the use of indicators for sustainable and liveable transportation planning, defining sustainability and liveability, and discussing sustainable development and sustainable transport concepts, and how sustainability indicators can be applied in transport evaluation and planning. Another report describes factors to consider when selecting sustainable transportation indicators, identifies indicators and indicator sets, and provides recommendations for sustainable transport indicators for use in a particular situation (Litman, 2021). After a wide-ranging review of incorporating sustainable management perspectives into transport planning, with greater focus on long-term enduring effects of transport actions, and a range of suggested infrastructure frameworks to inform transport investments and decision making, it provides a recommended indicator set, distinguishing the most important items from those that may be useful. Most of the frameworks examined are proposed, rather than implemented, approaches.

**Table 3.2 Recommended indicator sets (adapted from Litman, 2021, p. 85)**

| Economic | Social | Environmental |
|---|---|---|
| **Most important (should usually be used)** | | |
| Personal mobility (annual passenger kilometres travelled and trips), annual vehicle kilometres travelled (VKT), by mode (automobile, public transport, non-motorised) | Trip-to-school mode share (non-motorised, public transport and automobile) | Per capita energy consumption, by fuel and mode |
| Freight mobility (annual tonne kilometre travelled) by mode (truck, rail, ship, air) | Per capita traffic crash and fatal/non-fatal injury rates | Energy consumption per freight tonne kilometre travelled |
| Land-use density (residents and jobs per unit of land area) | Affordability (portion of household budgets devoted to transport and housing) | Climate change emissions from transport |
| Average commute travel time and reliability (variability) | Quality of transport access for disadvantaged people (disabled, low incomes, children etc) | Air pollution emissions (various types) by transport and by mode |
| Average freight transport speed and reliability (variability) | Extent of universal design (transport system quality for people with special needs) | Air and noise pollution exposure of population, and associated health impacts |
| Congestion costs per capita across a given road network | Overall transport system satisfaction rating (based on objective user surveys) | Land paved for transport facilities (roads, parking, railyards, ports, airports) |
| Total transport expenditures (vehicles, fuel, parking, transit services and network upkeep) | | Stormwater management practices |
| **Helpful (should be used if possible)** | | |
| Quality (availability, speed, reliability, safety and prestige) of non-automobile modes (walking, cycling, ride-sharing, public transport) | Portion of residents who walk or bicycle sufficiently to realise health benefits (30 minutes or more daily) | Community liveability ratings |
| Number of public services within 10-minute walk of residences | Portion of children walking or cycling to school | Transport contributions to water pollution discharges |
| Number of job opportunities within 30-minute commute of residences | Extent to which cultural resources are considered in transport planning | Renewable share of transport fuels and propulsion sources |
| Portion of households with internet access | Housing affordability in accessible locations | Transport facility resource efficiency (eg, use of renewable materials and energy efficient lighting) |
| | Affordability of public transit services (bus, train, ferry etc) | Impacts on special habitats and environmental resources |

#### 3.1.1.5 European Union

Williams et al. (2017) found benefit identification and management processes are not very well defined for internal projects within the European Commission. Due to the relatively small size of the European Commission's staff relative to the size of budgets handled, the European Commission cannot handle project management, so it leaves that to member states who select projects according to an agreement around the 'operational programme'. The maturity of benefit identification and management is relatively low.

For infrastructure projects over a certain size in the European Union, CBA is now mandatory, employing sophisticated economic analysis of benefits with many items monetised. But benefits that are less easy to quantify, such as those with transformational intent, are less easy to justify through the CBA process, not least because of fundamental uncertainty about the extent and timing of expected transformations.

For instance, the *Commission Implementing Decision C(2021) 5763 Final on the Financing of the Connecting Europe Facility – Transport Sector and the Adoption of the Work Programme for 2021–2027* (as cited in European Commission, 2021) states that proposals including works shall include a CBA. Proposals must include a 'full CBA' of at least 20 pages and a CBA Cash Flow template filled into a common and simplified format covering:

- transport users' benefits/consumer surplus (including savings in travel times and vehicle costs)
- operator costs and revenues/producer surplus (cost savings for commercial vehicles)
- externalities (such as air and noise pollution, reduction of fatalities and injuries).

Following the Directorate-General for Regional and Urban Policy *Guide to Cost-Benefit Analysis of Investment Projects*, the inclusion of effects on markets other than transport (either indirect or wider economic effects) should be extremely rare (European Commission, 2015). Indirect effects transferred to the industrial sector are excluded because of the risk of double-counting effects already captured in the direct effects. Wider economic effects such as productivity gain in imperfectly competitive markets, agglomeration effects and tax implications of a move to more productive jobs are not counted because of lack of consensus among practitioners, and because excluding them makes the analysis more conservative by excluding arguable benefits (European Commission, 2021).

Legislation only covers up-front CBA; there is no guidance for ongoing BRM.

#### 3.1.1.6 Norway

Norway, which has population size and density similar to New Zealand, appears relatively frequently in the literature on ex-post evaluation of projects. Since the development of North Sea oil and gas extraction in the 1970s, part of the wealth generated has supported large-scale transport infrastructure investments in Norway. Bridges and tunnels have been built to replace ferries and tortuous detours linking remote settlements to regional hubs. This has been aided by the widespread use of tolls, both in rural areas and on ring cordons in urban areas of Oslo, Bergen and Trondheim, aimed at funding alternative transport infrastructure and alleviating inner-city congestion.

Norway's infrastructure investments are governed by two processes – a CBA process and a Quality Assurance process. The CBA guidance covers not only financial matters of transport costs but also time savings, some environmental effects, social discount rate, carbon price and value of health. CBA is not mandated for all major projects, but the Quality Assurance process is, which raises the likelihood of CBA being used to surmount the two-step process before proposals are presented to Parliament for approval. Optimism bias is recognised as a problem, but no formal mechanism addresses it (Williams et al., 2017).

Once a project is approved and started, there is no standard process for ongoing BRM and no link to project risk management. Williams et al. (2017) found there is no general requirement (introduced by the Ministry of Finance) for agencies to perform ex-post evaluations of their projects, but there is an expectation from the

Ministry of Transport for a small sample of road and rail projects each year to be subject to ex-post evaluations, to see if the effects were as estimated. This review has examined various ex-post evaluations of multiple projects from Norway (Nicolaisen & Driscoll, 2016; Meunier & Welde, 2017; Odeck & Kjerkreit, 2019; Volden, 2018).

A comprehensive CBA document from the Ministry of Finance (2012) covers guidance of CBA but with particular focus on dealing with:

- distributional effects in CBA
- price adjustments, time savings and environmental goods
- social discount rate
- lifespan and residual value of investments
- secondary effects resulting from transport projects
- treatment of low probability disasters
- carbon pricing
- value of life and health (using quality adjusted life years and value of a statistical life of about NOK30 million, about NZ$5.1 million).

CBA is used in the standard Quality Assurance Gateway system, which also includes a project needs analysis, coupling stakeholders with anticipated investment outcomes. This provides some of the features of BRM, although Williams et al. (2017) describe it as of variable quality across agencies. They note that in their survey of Norway's officials, respondents suggested the country's small size, the strength of the Ministry of Finance, and the requirement that all these projects go through Parliament for approval enables a centralised Quality Assurance system and uniform CBA rules.

Norway's Ministry of Transport periodically issues National Transport Plans for about a decade at a time, the most recent of which covers 2022–2033 (Norwegian Ministry of Transport, 2021). This sets out an overriding objective for providing an efficient, environment-friendly and safe transport system in 2050, with five strategic objectives to guide its implementation:

- better value for money from public spending
- efficient use of new technologies and research to improve transport's efficiency, safety and emissions
- contribution to the achievement of national climate and environmental goals
- 'Vision Zero' for a transport system where no one is killed or seriously injured across roads and the entire transport sector
- make travelling easier to increase the competitiveness of business and industry.

These objectives provide strategic direction for selecting projects and programmes for funding. Some strategic aims articulated under these objectives are highly specific and quantified, such as a target of achieving all new vehicles entering the market to be low emission models by 2025. However, not all of these aims are within the purview of the national roading agency, Nye Veier. Nye Veier's mission is described as providing:

- strengthened competitiveness – linking housing and labour market regions together, to improve business competitiveness and enhance people's everyday lives
- social benefits – socio-economic benefit net of costs guides which roads are developed and when, with reduced travel times a central factor in calculating net benefit
- traffic safety – fewer accidents and reduction in societal costs and human suffering.

Norway has included some firm numerical targets in its national transport plans, providing a tangible means of aligning policies and projects to national strategic objectives. For instance, in 2012, the country adopted a goal of having 85 g $CO_2$/VKT by 2020, and embarked on a policy with incentives for increasing the proportion of electric vehicles on its roads to meet that target (Simonet, 2019). It now has a target of all new light passenger vehicle sales to be of low emission vehicles by 2025.

The composition of the vehicle fleet is not within the remit of a road controlling authority, but there are other links between project-level measures and strategic objectives. Implementing the National Transport Plan's aim of developing a transport system that is safe, enhances value creation and contributes to a low-carbon society, the National Road Administration, Statens Vegvesen, oversees the selection and sequencing of national road projects. For instance, the E39 coastal route between Kristiansand and Trondheim in the southwest of Norway, home to a third of the country's population, would replace a mostly single-lane road over 1,100 km crossing seven deep fiords by ferry with a multi-lane road with new bridges and tunnels, cutting travelling time end to end from 21 hours currently to 11 hours. As there is an inland 830 km route between Kristiansand and Trondheim, it would primarily improve the accessibility of cities and hinterlands along its route (eg, Stavanger to Bergen), with savings in travel time, vehicle operating costs and associated externalities.

Responsibility for building such roads falls to Ny Veier, which arranges contracting with suppliers and oversees the execution of the contract. Ny Veier defines its strategic aims as improving connectivity and widening labour and investment markets. It also aims to deliver socio-economic benefit value from reduced traffic accidents and injury rates, travel time savings/speed improvements, enlargement of accessible living choices and labour markets, improved availability of roads (network density and resilience) and improved investment cost-effectiveness, optimising the balance of capital and long-term maintenance spending. It does not explicitly record environmental outcomes, but savings in greenhouse gas emissions can be estimated from observed traffic outcomes, along with cost savings from shorter journey times and accident reductions.

Partly in response to the disruptions caused by COVID-19, the latest National Transport Plan has adopted a new approach to managing its spending through portfolio management that allows continuous optimisation that will allow individual projects and the order in which projects are implemented to be adjusted, if new conditions indicate that priorities need to be changed (Government of Norway, 2021, p. 15). Although the plan does not refer to the term 'benefits realisation management', implicitly it follows some of its steps and has adopted an 'agile' approach to selection and portfolio management of projects at a strategic level.

#### 3.1.1.7 UK

There are extensively documented processes for putting business cases together, following Treasury guidelines in the *Green Book*, one of the most widely emulated appraisal guides in the world (Taliercio & Estrada, 2020). Benefits are identified and described at both the programme and project level within the business case. Standard rules for quantifying benefits are in HM Treasury's *Green Book*, including CBA, Whole Life Cycle Costing and Cost Effectiveness (HM Treasury, 2020).

The *Green Book* describes a hierarchy of outcomes, outputs and targets. Outcomes are at the highest level and refer to benefits to society but cannot always be measured effectively. It is nested within the *Magenta Book*, which provides a wider scope of evaluation but contains no references to BRM (HM Treasury, 2021). However, the *Green Book* (HM Treasury, 2020) contains only one reference to benefits realisation (on page 45) relating to uses of a benefits register, and no references to benefits management. The 2020 *Green Book* has also pulled back from its former versions on the uses of MCA for appraisals, although it still supports expertly facilitated MCDA, making use of swing-weighting techniques that objectively weigh the balance of informed expert and stakeholder opinion in a high-level expert workshop (HM Treasury, 2020, p. 37).

BRM in the UK can be traced back to 1999, when the Office of Government Commerce issued its Managing Successful Programmes guide/standard (Abba et al., 2018). This arose following the failure of some major IT projects, and it included a discussion of programme benefits and how they would be identified and managed for all major UK government-funded IT programmes. It was replaced in 2010 by Guidelines for Managing Programmes, which are required for all major UK government-funded programmes and require the same BRM discipline as Managing Successful Programmes (Department for Business Innovation & Skills, 2010).

Williams et al. (2017) consider that, compared to the private sector, UK government agencies are less good at tracking benefits and ensuring their delivery. BRM varies across programmes and projects and government departments.

Guidance is available from bodies such as the IPA (2017) and the Department for Transport (2018a) for projects to follow, which varies according to the resources available and the characteristics of projects. The IPA sets out expectations for BRM. All projects are expected to manage their benefits according to the government's project delivery standard requirements. Major projects that are part of the Government's Major Project Portfolio are expected to be more rigorously managed, especially relating to assurance, reporting, capability development and product development. Some of these activities include a minimum requirement for BRM for assurance and review.

Typically, major projects should have a benefits map (or similar) and a benefits management strategy and/or a benefits realisation plan. The IPA (2017) describes the analysis of drivers – the existing issues or problems that are prompting the calls for change – which are often the needs of business and commerce identified in the strategic assessment of the business case development. Driver analysis is undertaken to improve understanding of the existing problems or opportunities that are stimulating the need for change, and which will shape the intended benefits of the project. Identified benefits are likely to be the opposite of the existing or anticipated problems that the project is intended to solve.

The IPA has set out a Gateway Review process for tracking the progress of major projects from inception to completion, which has many of the features of a BRM process (IPA 2021a, 2021b, 2021c). The Gateway Review process involves external peer reviews of a programme or project at key decision points in its life cycle to assure that it can proceed successfully. The individual gates are:

- Opportunity framing – defining what success would be
- Gate 1: Business justification – identifying benefits
- Gate 2: Delivery strategy – value and appraise
- Gate 3: Investment decision – plan to realise
- Gate 4: Readiness for delivery – work to realise
- Gate 5: Operation review and benefits realisation.

The UK also has guidance for what it calls 'commercial benefits', defined as 'those that materialise during contract implementation (otherwise known as "intermediate benefits") and that specifically result in commercial outcomes … [that] ... result from pursuing a selected commercial approach' (UK Government, 2021, p. 53). Examples include a decision to outsource a service that was previously delivered in house, the decision to update an existing contract model when considering new procurement, or cost savings that materialise compared to taking a do-nothing approach. They do not refer to longer-term strategic benefits a policy might be trying to achieve, such as increased economic output or improved health and wellbeing.

There is a well-developed framework for the appraisal of transport improvements covered in the Transport Analysis Guidance (TAG) suite of tools and documents, as described in *Transport Analysis Guidance – The Transport Appraisal Process* (Department for Transport, 2018b). This employs some of the language of BRM literature in describing separate roles for a technical projects manager, a senior reporting officer (on benefits

realisation) and separate modelling and appraisal practitioners. This process now sits within a *Monitoring and Evaluation Programme 2021,* which identifies groups of projects and programmes under three overarching strategic headings:

- **improving connectivity**, which includes economic objectives such as reductions in travel costs and travel time and business benefits as their primary focus
- **improving users experience of the transport network**, which includes social objectives of improving safety, comfort and security of people using transport
- **tackling climate change**, which is oriented to reducing greenhouse gas emissions and the associated risks of climate change, such as exposure to more severe storm and flood events (Department for Transport, 2021).

The strategic headings are not mutually exclusive, as all projects and programmes contribute to all headings, but they provide a way of categorising and distinguishing projects according to their primary orientation – new rail lines for speed and improved connectivity, new cycle-lanes for safety, and environmental improvement from both, depending on their success in displacing alternative more heavily emitting transport.

The UK does provide for some ex-post evaluations as a way of learning and improving practice in the future. This is often outsourced to a consultancy rather than the ministry or agency involved in a project, such as the review of Highways England's processes for evaluating and assessing the benefits realised from its capital investment, and how these processes are being implemented, including the publication of the post-opening project evaluation reports (Hyperion, 2020). The post-opening project evaluation compares forecasts against realised/observed benefits related to traffic (eg, traffic volumes, travel time), safety (eg, crash reduction), accessibility, and environment.

An independent assessment of BRM in the UK is provided by a report from the University of Umea in Sweden (Omar & Bernløv, 2020). They examined connections in the UK's approach, between various guidelines for BRM and also various other influences and constraints that may bias the application of BRM in practice. The report concludes that the UK's approach is adequate in front-end benefit identification and appraisal but deficient in post-delivery BRM and also, notwithstanding the gateway checks, inadequate during the project lifetime, having insufficient attention to the full life-cycle implications of decisions made at the intermediate stages of the project.

These conclusions are not drawn as an indictment of the UK's BRM, which other sources suggest is more mature than that in some other countries. They are more of a salutary reminder that once a project is approved for funding it may gather a momentum of its own and be difficult to change or terminate if things appear to be heading off course.

#### 3.1.1.8 USA

US federal agencies require robust processes of needs assessment and project approvals that explicitly integrate benefits management. Overarching guidance comes from the Office of Management and Budget Circular A-11, but implementation varies across federal agencies. Guidance on benefits identification comes from the Government Accountability Office *Cost Estimating and Assessment Guide*, which includes recommendations about business case analysis (a form of CBA). The business case analysis identifies quantifiable and unquantifiable benefits and compels consideration of alternatives. It is a live process that can be updated throughout a project's life.

Agencies like the Department of Energy face a project management process that depends on five critical decisions (CDs):

- CD-0, Approve Mission Need. There is a need that cannot be met through other than material means.

- CD-1, Approve Alternative Selection and Cost Range. The selected alternative and approach is the optimum solution.
- CD-2, Approve Performance Baseline. Definitive scope, schedule and cost baselines have been developed.
- CD-3, Approve Start of Construction/Execution. The project is ready for implementation.
- CD-4, Approve Start of Operations or Project Completion. The project is ready for turnover or transition to operations, if applicable.

Williams et al. (2017) found the processes for ongoing BRM are less explicit than benefits identification and ex-post evaluations. Ongoing benefits management falls under traditional project management processes, which monitor project spend and project scheduling and evaluate the project's ability to meet the capability gap identified at CD-0.

At approval of CD-4 (Project Completion/Transition to Operations), the Project Director must brief the Project Management Risk Committee on the likelihood of the project meeting its key performance parameters, which are informally split into a minimum set and a best-case set. The Department of Energy has a process of peer review and impact evaluations after the completion of the project.

Abba et al. (2018) claim there is little evidence of BRM being implemented in the USA, in contrast to its uptake in the UK, Australia, and New Zealand, despite its being highlighted by the US Project Management Institute. But the USA approval process of going through critical decisions bears some resemblance to the gateway processes used in the UK and similar systems elsewhere.

#### 3.1.1.9 World Bank

The World Bank Group (WBG) uses a process involving CBA in some form in all five of its constituent institutions: the International Bank of Reconstruction and Development, the International Development Agency, the International Finance Corporation, the Multilateral Investment Guarantee Agency and the International Centre for Settlement of Investment Disputes. All must support WBG's two strategic goals – reducing poverty and increasing shared prosperity. Project effectiveness and impact are measured by a hierarchy of indicators derived from these goals (Williams et al., 2017).

WBG uses special project benefit-related constructs of its Results Framework or the similar LogFrame. The Results Framework describes a hierarchy of objectives, outcomes, outputs and activities and develops the desired set of strategic outcomes (WBG's Country Assistance Strategy) and a portfolio of project activities to achieve it. The LogFrame structures project design in a matrix with four columns highlighting:

- cause and effect (from the Results Framework)
- performance indicators and targets
- monitoring and evaluation – source of data
- assumptions.

WBG has a long history of using CBA, sometimes controversial due to scepticism about applying the method to non-financial areas of education, health, nutrition and the environment. Although it issued CBA manuals in the past, no official guidance currently exists. The share of projects approved on CBA has declined in recent decades, as decisions have tended to rely more on a qualitative assessment of multiple outcomes, of which the CBA result is just one. The International Finance Corporation's Results Framework has development goals, a development tracker system and an evaluation of its operations, which bears some similarity to BRM processes. There is monitoring of inputs, activities, outputs, outcomes, and other aspects of the project on an ongoing basis during the implementation period as an integral part of the project management function.

Evaluation is a process to establish causality between a project and its outcomes by assessing results, impacts, and implementation performance.

#### 3.1.1.10 Other countries

Project appraisal in France has been directed by guidelines based on classical partial equilibrium CBA, its main ingredients being travel time savings, some safety and vehicle cost savings and established environmental values for changes in air pollution (validated from epidemiological data), greenhouse gas emissions and noise (Dahl et al., 2015). But guidelines issued in 2004 were inconsistently used and began to look outdated in the wake of the global financial crisis and the emergence of two fundamental challenges requiring a long-term strategy, not just extrapolation of past trends. The challenges are:

- compositional shifts in an economy adapting to the loss of productivity relative to other nations
- required changes in energy use within the economy to meet emission limits for ecological and environmental protection goals.

In 2014 a new Commission was set up to review the guidelines and develop assessments that would be used more consistently than those in the 2004 guidelines.

Among the Commission's recommendations were:

- a value of time revised downwards to better reflect individual's time management with more mobile communication technology
- taking public transport comfort into account in proportion to the density of persons standing on public transport
- travel reliability reflecting magnitude and probability of delays
- an increase in value of a statistical life and related non-fatality values
- accounting for reductions in emissions of air quality pollutants and $CO_2$, reflecting improved fuel efficiency.

The Commission also recommended extended coverage to widen its scope to reflect:

- effects on macro-economic growth and employment
- impacts on market power and competition
- impacts on spatial distribution of activities and outcomes
- impacts on distributional equity.

It also recommended more ex-post analyses, and more transparency in the models underpinning the appraisals, to be more informative for decision-makers. Most of the Commission's recommendations were accepted and incorporated into appraisals.

French guidelines require some mandatory ex-post evaluations, but they do not indicate how to prioritise investment selection other than trying to maximise programme NPV. This is in contrast to some other countries such as Germany, which explicitly allows the contribution to long-term objectives to influence selection, and Norway, where such allowance is more implicit in the number of projects selected that do not have the highest NPV of prospective investments because of high value attached to some outcome not included in the quantified CBA (Meunier & Welde, 2017).

In Germany, the Federal Ministry of Transport and Digital Information prepares Federal Transport Infrastructure Programmes using four evaluation modules of the impacts of prospective projects (Dahl et al., 2015). One module is a CBA that attempts to capture all monetisable effects. Other modules include Environmental Assessment, Spatial Planning and Urban Development.

In 2015, new variables were added to the CBAs used in this process. These were principally 'transport reliability', measured as a deviation from the expected mean of travel time, and life cycle emissions of greenhouse gases during construction and operations of infrastructure. The CBA is based on assessing welfare changes for producers and consumers, in which benefits are measured by changes in money, clean air, time and other transport variables – that is, the differences between the with and without project situation. The environment module focuses on the assessment of additional environmental effects. The spatial impact assessment considers aspects of distribution theory and minimal accessibility to regions. The Urban Development module looks at a project's impact on the functioning of urban areas and the use of space in the transport corridors.

The German assessment process is overtly a multi-criteria framework in which CBA is just one element. It also explicitly allows for prioritisation of proposals selected for funding to reflect contributions to long-term strategic goals and targets: this is a characteristic of BRM, although not expressed in the same terms.

#### 3.1.1.11 Conclusions about current practices of BRM

The literature reviewed above indicates that most countries use some form of CBA in appraising large public investment and policy proposals, although there are differences in detail in how it is applied in different countries, both in the scope and coverage of the analysis and in which level of government (central or local) has most responsibility for undertaking appraisals. Countries often limit the requirement for detailed appraisal to large projects, the threshold for which varies widely across countries. Countries also differ in the degree to which the appraisal process is centralised: most countries allow some flexibility for government departments or agencies to adapt the guidance issued by the treasury or central finance ministry to their own particular circumstances, but the extent of that devolution and the scope of departmental appraisals vary widely, even in transport, where the broad characteristics of scope and matters included show a degree of agreement across countries.

The same applies to BRM practice. The UK and Australia have adopted a gateway approach to applying successive checks on progress through project implementation, and the USA has something similar with its critical decision processes. The European Union and Norway do not put as much emphasis on intermediate checks, but Norway appears to put more effort than most in an ex-post analysis of a selection of its major investments in transport.

Williams et al. (2018) followed up their 2017 review with a further examination of the effectiveness of the 'espoused' BRM frameworks in practice. This study was confined to four of the countries covered in their earlier study – Australia, Canada, the UK and the USA. The study was based on interviews in each country with senior government officials, interviewees with experience in managing government projects, interviewees in professional bodies and authorised project reviewers and interviewees from management offices of major public projects. Here are some of its findings:

- There is a wide range of BRM guidelines, frameworks and practices across and within the four countries.
- Frameworks for transport/infrastructure tended to be well developed compared to other areas (such as transformation projects).
- While the purpose of BRM frameworks was understood, their level of uptake was variable.
- Frameworks were often only advisory, although sometimes mandated at the project appraisal and approval stage; at later stages, the emphasis shifted to project delivery rather than outcomes/benefits.
- Implementation of CBA and business cases varied in different government departments/agencies.
- Optimism bias and 'gaming the system' occasionally occurred to 'get things through', and there were few systems in place to minimise this: but the UK was the only country offering an explicit approach to quantifying optimism bias.

- Most participants recognised that expectations of project benefits could change between benefit identification and ex-post evaluation, but there were no practices in place to capture such change.
- BRM and risk management methods are not generally integrated, but there is a slow trend towards greater integration.
- Long-term ex-post evaluations of projects were considered important but rarely done, and there was little evidence of best practices being passed on to later project appraisal.
- There was strong emphasis on quantification of benefits and particularly those that are easy to measure or useful for showing alignment with strategic directions, but most participants could not give clear evidence of the treatment of benefits that were difficult to quantify or monetise.

Overall, Williams et al. (2018) present a mixed picture of the efficacy of BRM frameworks in practice, identifying common barriers to better application in lack of support from senior managers, lack of 'culture' around implementing BRM and the lack of commitment to ex-post analysis to demonstrated benefits achieved. The report distinguishes between 'agile' projects, which are loosely designed to be responsive to changes detected in the markets they serve, and what are termed 'waterfall' projects, which are tightly designed to be rolled out down a cascade of pre-determined stages. The authors suggest that BRM might fit more naturally with agile projects than with waterfall projects. Agile projects are exemplified by information and communication technology (ICT) developments that have had relatively short lives. They can be more easily adjusted and patched to respond to changing circumstances than the heavy earthmoving and construction of transport infrastructure.

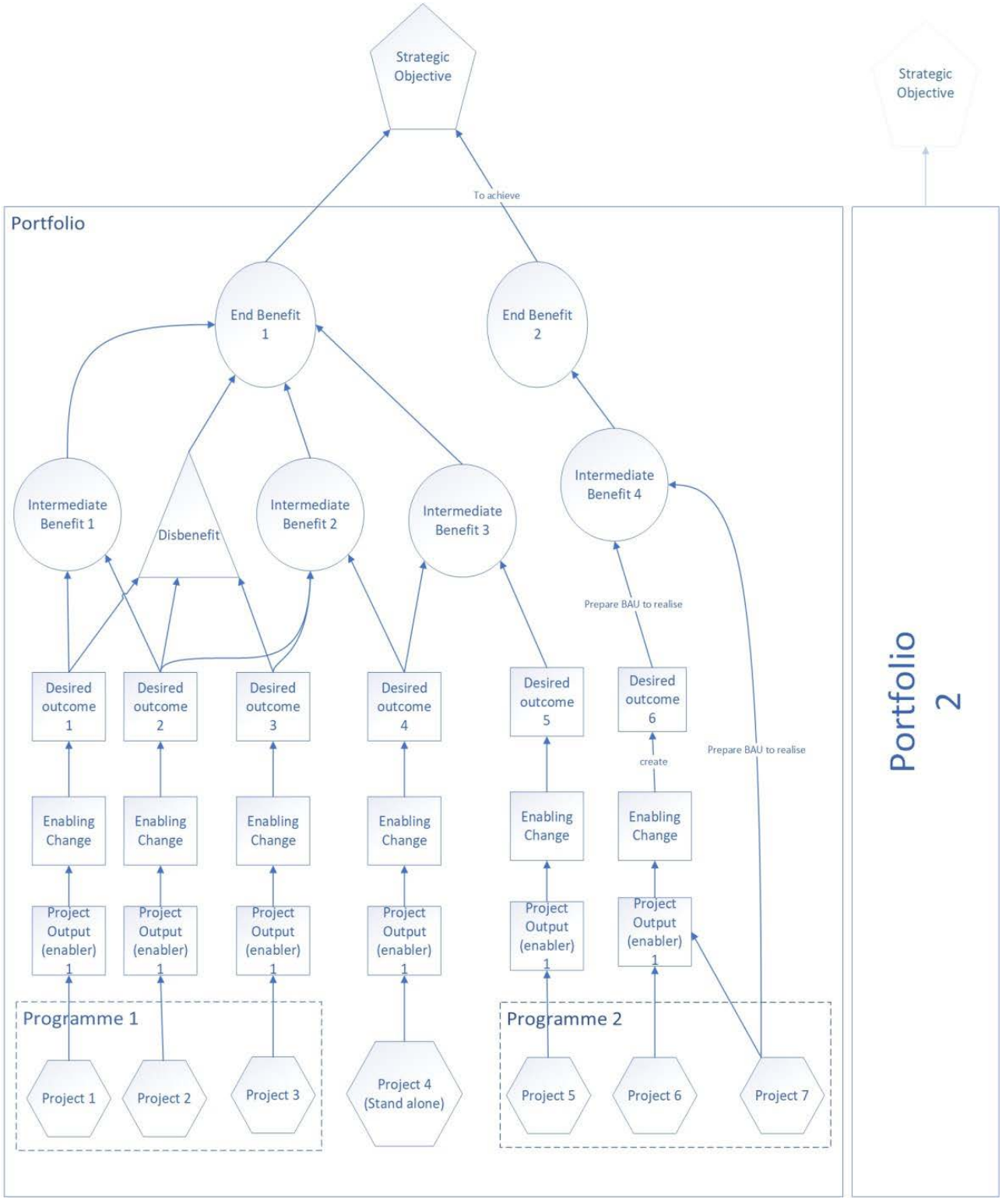
In 2020 the same team followed up with an investigation of three case studies of BRM in the UK: the application of ICT to the National Health Service, the transformational extension of services at the Department of Pensions, and a £1.5 billion transport infrastructure project involving undergrounding highways around the World Heritage Site of Stonehenge. This project delivered a wide range of benefits, encompassing transport, economic gain, and heritage and landscape improvements, and there was considerable emphasis on benefits by the management team and their communication to stakeholders to address early concerns about the impacts of a project of that scale. Benefits perception changed over time with an understanding of the project and the opportunities it created. The project raised questions about how to account for such changes in the planning and implementation of such projections (Williams et al., 2020).

### 3.1.2 Benefits realisation – from strategy to projects

The BRM literature is overwhelmingly focused on managing individual projects or programmes. While most literature pays lip service to benefits arising from outcomes of projects or programmes that are aligned with overarching organisational or national strategic aims, and that there should be a 'clear line of sight' between outputs of a project and the benefits it is intended to provide, it generally does not describe how projects are conceived and implemented to provide a contribution to strategic aims. Nor does it identify a clear set of indicators that can be used to assess projects and simply be aggregated up to demonstrate the achievement of strategic aims.

Most explicit guidance comes from the idea of benefits mapping, in which projects can be grouped into programmes, and programmes into portfolios, which can be traced as providing outputs that enable outcomes that can be assessed as beneficial to strategic aims (Omar & Bernløv, 2020). Figure 3.1 illustrates benefits mapping, in which programmes are clusters of projects that result in 'intermediate benefits' and 'end benefits' and even some disbenefits, which in combination trace how the line of sight is expected to work. But mapping literature does not address whether indicators at a project or programme level are meaningful when aggregated up to assess whether strategic objectives are met.

**Figure 3.1 Benefits mapping from strategy to project (reprinted from Omar & Bernløv, 2020, p. 74)**




In practice, as is evident from reviews done of departmental uses of the New Zealand Treasury's CBAx tool in preparing budget bids, analysts rarely get beyond suggesting their proposed initiatives *should* align with broader objectives – that is, they support the direction of travel sought by government policy but give little indication of the magnitude (New Zealand Institute of Economic Research (NZIER), 2018). They may suggest a clean car subsidy on electric vehicles is aligned with the government's objectives for emission

reduction in pursuit of net zero carbon by 2050, but not how much reduction it would offer to that target, nor the effective cost per tonne of carbon reduction of subsidising electric vehicles, which could be compared with other means of emission reduction.

Confusing matters in the BRM literature is that many writers suggest the necessity of having a benefits management strategy as an overarching control over the BRM framework. The strategy can be implicitly or explicitly linked to making a case for intervention at the benefits identification stage but, by its nature, extends beyond that initial stage in the full benefits realisation process. Intermediate benefits are also lightly covered in the literature and are vaguely described as anything that the end benefits are dependent upon, either in the short term or in the long term (Gonzalez & Ubilla, 2017).

The practical linkage between strategy and project objectives is more usefully addressed in government agency reviews than in the academic literature. One example with useful pointers is the UK's latest Department for Transport (2021) monitoring and evaluation report, which lists programmes and projects under three broad strategic objectives:

- Improving connectivity and growing the economy by enhancing the transport network, on time and on budget.
- Improving users' experience of the transport network, ensuring that the network is safe, reliable and inclusive.
- Tackling climate change and improving air quality by decarbonising transport.

Each programme is then described in terms of its budget commitment and its achievement to date in delivering outputs, but with little quantification of outcomes or contribution to strategic objectives other than some references to external links under the climate change programmes. The sorting under headings improves the clarity of 'lines of sight' but does little to measure the scale of benefits achieved against national strategic objectives.

Similar clarity is provided by the Norwegian National Transport Plan, which outlines a range of contributions to three broad strategic goals of achieving an efficient, environment-friendly and safe transport system in 2050 (Norwegian Ministry of Transport, 2021, p. 17). All three goals are reflected in five equally important policy objectives for resource use during the plan period:

- better value for public money spent
- efficiency improvements through use of new technologies
- easier travel to assist business competitiveness
- contribution to climate and environmental goals
- 'Vision Zero' target for transport injuries.[2]

The National Transport Plan is a forward-looking document outlining a number of projects for the transport system and on key corridors and their expected contributions to these objectives, but it is not a retrospective report on achievements. Norway has introduced a method of portfolio management that allows continuous optimisation of the scope and ordering of projects implemented, which may widen the differences between ex-ante and ex-post evaluations.

These approaches from the UK and Norway have some potential for application to the New Zealand Ministry of Transport's Transport Outcomes Framework, which has five categories of desired outcomes:

[2] The five directional objectives reflect all three strategic goals to varying degrees: the three objectives more aligned to efficiency still adhere to environmental/safety restraints; environmental and safety objectives are still to be met efficiently.

- Healthy and safe people
- Economic prosperity
- Inclusive access
- Resilience and security
- Environmental sustainability.

Aligned to this is the Government Policy Statement for land transport (GPS), which closely matches the strategic objectives of Waka Kotahi in its four priorities: safety, better travel options, climate change and improving freight connections. Mapping funded projects in the National Land Transport Programme under these headings, clustering projects into programmes and programmes into portfolios, would be a step in confirming alignment with strategy, but not a fully quantified one.

Beyond this, there are challenges with respect to quantification of project and programme outcomes with the achievement of strategic objectives, with risks of double counting and interaction effects in assessing the more holistic targets at higher levels. The principles of BRM are broadly similar at the strategic and project level, as indicated in the UK Treasury's *Magenta Book* companion to its *Green Book*, but the literature is missing detailed guidance on integrating the different levels. This is partly because the project appraisals based on CBA are a partial equilibrium approach, having evolved from private investment methods with the accretion of various additions and amendments to cover the external effects that come into consideration in a social CBA. Strategic policy, however, starts with a broad national perspective and more of a general equilibrium perspective that needs to account for how benefits claimed for individual projects may overlap, double count or work against each other to give misleading impressions of the cumulative effects across all projects. This is particularly apparent in the appraisal of proposed projects affecting tourism. The benefits of transport improvements largely involve relocating visitation and spending to different places, redistributing rather than adding to the tourism spending and economic value-added in New Zealand.

## 3.2 Frameworks for BRM

This section summarises what the literature says about good practice when designing frameworks for BRM. It is based on BRM being a start-to-finish process within project management, including such stages as benefits identification, appraisal, planning, monitoring, management and ex-post evaluation. The literature shows that the weight given to these different stages, and the names and functions attached to them, varies across countries and context.

### 3.2.1 Guidance for effective BRM in major projects

One of the driving forces behind the emergence of BRM has been the perception of major projects failing to deliver the benefits expected of them. The UK's IPA (2017) provides informative guidance on general BRM, which forms a useful starting point for considering the design of BRM frameworks and the measures used to put them into practice. Citing 60 documents on benefits realisation, assurance, and plans, it describes effective BRM as needing to:

- measure performance
- deliver the widest possible benefits to society (not just financial ones)
- provide value for money to the public
- create a virtuous circle of lessons learned and shared.

The IPA (2017, p. 12) states that benefits:

- should be measurable

- are an improvement resulting from the outcome change (not the change itself)
- are in the eye of the beholder (different stakeholders will value the same benefits differently)
- create a link between tangible outputs and strategic goals
- ensure alignment of effort, resources and investment towards achieving organisational goals.

The IPA's benefits management principles (IPA, 2017, p. 16) are as follows.

1. BRM activities should be integrated into other project management activities as far as possible.
2. Benefits should be identified, quantified and managed to ensure consistency with strategic goals.
3. BRM should be taken throughout a project's life cycle, with regular reviews to ensure benefits are on track.
4. BRM should have clear documentation and understanding of roles and responsibilities, with evidence that relevant parties have accepted responsibilities.
5. BRM activities should be appropriate, scalable and proportionate to the project's size.
6. BRM should be evidence based, driven by real information as much as possible.
7. Valuation and appraisal of benefits is one element of a much wider BRM process.
8. As far as practicable, benefits should be specific enough and isolated enough for their realisation to be directly attributed to the specific initiative or change.
9. Benefits should have a proportionate amount of time, money and resource spent on them for adequate identification, quantification, planning and measurement.
10. BRM should be seen as a continuous activity whereby benefits realised by one project should be reviewed and inform lessons learned for future initiatives.

From the literature, it is apparent that BRM has been variously applied across countries and across government activities, including transport. The UK and Australia have some guidelines of varying degrees of prescription. Canada has some general government guidelines, but transport still appears more focused on sustainable transport in which BRM is implicit rather than explicit. Norway has a relatively active programme of ex-post analysis, which forms part of a BRM process. Some differences between these countries' approaches are outlined in Table 3.3.

**Table 3.3 Distillation of principles applying to BRM frameworks**

| ATAP (2016) – T6 Benefits Management | IPA (2017) – Principles of BRM | VicRoads (2016) – Benefit Management Framework | Litman (2021) – Sustainable transportation principles | Volden (2018) – Evaluation criteria for project success |
|---|---|---|---|---|
| Benefits need to be understood as outcomes. | BRM should be integrated into other project management activities. | Framework is simple to understand and integrate with other activities. | Do no harm – avoid changes that degrade the surrounding environment. | Efficiency: a measure of success in converting inputs into outputs. |
| Benefits are aligned with transport objectives and performance measures. | Benefits are identified, quantified and managed in line with strategic goals. | Framework is consistently applied across the organisation. | Precautionary principle – beware of irreversible damage. | Effectiveness: a measure of success in obtaining intended outcome. |
| BRM is an end-to-end process during a project's full life cycle. | BRM carries on throughout a project's life cycle, with regular tracking reviews. | Frameworks clearly demonstrate how investments contribute to resulting benefits. | Design with nature and culture: create according to culture and environment. | Other impacts: evaluation of success in all attributable consequences beyond the agreed outcomes. |
| Benefits are not automatic – they require active monitoring and management. | BRM needs clear understanding of different parties' roles and responsibilities | Frameworks should manage only core data, so monitoring is not too onerous. | Support a living process. | Sustainability: assess if project benefits are likely to persist, and long-term acceptability of total impacts (financial, environmental and social). |
| Benefits are dynamic – they change with circumstances and need continuous review and adjustment. | BRM activities should be appropriate, scalable and proportionate to the project's size. | | Use systems thinking that reflects sustaining ecosystem services and essential relationship between natural processes and human activity. | Benefit–cost efficiency: an evaluation of societal willingness to pay value in relation to cost, or physical outcome in relation to cost (cost effectiveness). |
| Benefits can be monetised or non-monetised. | BRM should be evidence based, driven by real information as much as possible. | | Use a collaborative communication approach to link ethical responsibility with long-term sustainability. | |
| Benefits should be measurable and reasonable. | Valuation and benefits appraisal is one element of a wider BRM process. | | Use a decision hierarchy of preservation, conservation and regeneration. | |

| ATAP (2016) – T6 Benefits Management | IPA (2017) – Principles of BRM | VicRoads (2016) – Benefit Management Framework | Litman (2021) – Sustainable transportation principles | Volden (2018) – Evaluation criteria for project success |
|---|---|---|---|---|
| Benefits must be owned by appropriate sponsors and managers. | As far as practicable, benefits should be specific and isolated to be directly attributed to a specific project. | | Provide regenerative systems as intergenerational equity. | |
| Benefits and measures used should be integrated with an organisation's performance management systems. | Benefits need a proportionate amount of time, money and resource for adequate identification, planning and management. | | Maintain integrity in transparent and participatory leadership, with technical rigour in research and clear, consistent, timely communication of findings. | |
| Benefits identified for monitoring should be limited to a manageable number. | BRM should be a continuous activity whereby benefits realised by one project should be reviewed and inform improved future practices. | | | |
| BRM needs to be integrated with all other aspects of project delivery. | | | | |
| Benefits are to be communicated. | | | | |

Clearly, there is much diversity in how BRM framing principles are described in the different countries. ATAP and the UK's IPA describe characteristics of a BRM framework's scope and contents, while VicRoads opts for a more succinct list of what a BRM framework should be – capable of being understood, consistently applied, demonstrating links between projects and outcomes, and focused on core information only. The Canadian sustainability framework emphasises outcomes sought from transport – using a precautionary approach, avoiding degradation of the environment, designing with nature that enables regenerative systems and using collaborative communication. The Norwegian approach lists some success criteria – the need for efficiency, effectiveness, sustainability and coverage of a broad range of consequences, and the assessment of benefit–cost efficiency, which focuses on the monetary metrics of societal willingness to pay and cost.

New Zealand has adopted BRM in guidelines issued by the Treasury (2017) and in the Waka Kotahi BRM framework (Waka Kotahi, 2021), discussed later in this document.

### 3.2.2 Distilling good practice principles for BRM frameworks and indicators

The literature reviewed above shows a diverse set of principles and a variety of approaches for the application of BRM in theory and practice. However, there are common themes in the principles for BRM frameworks and indicators. We have distilled those principles for the purpose of reviewing the Waka Kotahi approach to BRM. These common good practice principles for BRM frameworks are described in Table 3.4.

**Table 3.4 Good practice principles for BRM frameworks**

| Principle | Description |
|---|---|
| Simple to understand and to integrate into the organisation's activities. | The barriers to understanding and applying BRM need to be low and low-friction. |
| Consistently applied across the organisation. | BRM needs to be widespread and comparable to maximise the continuous improvement and growth opportunities for an organisation and its talent. |
| Demonstrate how investments contribute to the resulting benefits, with a clear line of sight to outcomes achieved. | The relationship and causal pathway between the investment and the benefits need to be apparent to drive engagement over the life of the projects and programmes. |
| Identify only core information to avoid data management and reporting becoming too onerous for effective uptake. | The cost-effectiveness of frameworks should be maximised to optimise the return on investment from BRM and encourage consistent engagement in BRM. |
| Ownership and accountability for the journey and completion of BRM must be clearly established. | Without clear ownership of and accountability for BRM, it will not yield continuous improvement for organisations and investors. |

The frameworks should be proportional to the scale and significance of the project, varying with size so as not to unduly burden small projects. They should highlight the additionality of effects brought about by the project, compared to the alternative without it proceeding.

The literature on BRM indicators or measures (used interchangeably) describes a wide range of separate measures. Many of these refer to overlapping concepts across the different sources so that they can be condensed down to four or five principles. It is also useful to distinguish the broad criteria for designing the indicator set and a separate set of principles consistent with those criteria for selecting and designing the indicators themselves.

Following the criteria outlined in NZIER (2012), an indicator set and the information it provides should be:

- chosen for clearly defined purposes and uses (minimal redundancy in data gathered)

- focused on outcomes, not just inputs and outputs
- forming a concise set of measures, cost-effectively prepared
- based on measures that are valid, reliable, consistent, comparable
- rich in information that is relevant, balanced and valued by an organisation's leaders/funders
- stable, widely understood and supported in the organisations affected.

Drawing on this, the VicRoads (2016) Benefit Management Framework, and some others, the measures themselves need to be measurable, attributable, understandable, consistent and cost-effective to compile and use. These common good practice principles for BRM indicators are described in Table 3.5.

**Table 3.5 Good practice principles for BRM indicators**

| Principle | Description |
|---|---|
| Attributable and relevant | Attribution requires a link between the benefit and the outcome. Relevance requires that the benefit makes a meaningful contribution to the outcome sought. |
| Measurable and verifiable | An indicator must be measured to be useful, and the change over time needs to be verifiable to be able to test the realisation of the benefit level associated with the investment or intervention. |
| Understandable | Indicators need to make sense to practitioners, officials and stakeholders to support engagement. |
| Consistent and comparable | The indicator needs to be stable and comparable across projects and contexts. |
| Cost-effective | The indicator must be cost-effective to reduce the burden and support engagement. |

These indicator principles are consistent with the New Zealand Treasury's benefits management guide (Treasury, 2017), which describes how Cabinet Office circular *CO (15)53 (Investment Management and Asset Performance in the State Services)* sets out the expectations for agencies in regard to benefits management. The circular:

- defines **investment** as the commitment of capital or balance sheet resources to the delivery of government services with the expectation of **receiving future benefits**
- has a strong focus on BRM throughout the investment management life cycle of Think, Plan, Do and Review.

At a high level, the Treasury's BRM framework has four phases:

- Identification – identify, define measures and identify owners of benefits
- Analysis – quantify the scale of benefits, compare options, assess attribution, prove identified measurements will work – via analysis such as a CBA or benefit–cost ratios
- Planning – schedule how much of the benefits will be realised, by whom, and by when
- Realisation & Reporting – track, monitor, report on and optimally realise planned benefits, including:
  - reporting on both benefits realisation and risks to benefits not being realised
  - lessons learned (ensuring any lessons are actively incorporated in benefits realisation and as inputs to future benefits) and a feedback loop to inform the organisation's BRM performance system and its strategy when this is refreshed.

To demonstrate value, the Treasury recommends benefits indicators should be:

- **measurable**, both monetary and non-monetary items

- **meaningful**, in that there is a direct relationship between the achievement of the measure/s and the achievement of the benefit
- **attributable**, where it can be reasonably claimed that the benefit measure/s results are due to the investment and not any other
- **aligned** to strategic outcomes and targets.

‘Measurable’ and ‘attributable’ correspond to the similarly named items in our table above. However, we interpret ‘meaningful’ as broadly synonymous with ‘relevant’, which is a characteristic linked to measurability in our table. We also suggest that alignment to strategic outcomes and targets is a fundamental characteristic in defining all benefits sought from a project or programme and is superfluous in the choice of measures. For this reason, we recommend supplementing the Treasury’s list of criteria to include the requirement that measures should be:

- **readily understandable**, to improve engagement and acceptability with project practitioners, politicians and the wider public
- **capable of being applied consistently across projects**, to enable comparison across alternative uses of public funds.

# 4 Reviewing the Waka Kotahi BRM approach

The review of the Waka Kotahi BRM approach had the following process or stages:

- outlining government's guiding objectives for benefits realisation
- distilling the BRM approach of Waka Kotahi into a set of representative features and characteristics that generally represent the whole but make it possible to describe the review in a concise way
- completing the review by comparing the current approach to the evaluation criteria for the review.

## 4.1 Guiding objectives of the benefits realisation activities of Waka Kotahi

The benefits realisation activities of Waka Kotahi exist in the context of the regulatory objectives, transport sector strategic objectives, funding priorities and regulatory functions. The Land Transport Management Act (LTMA) 2003 defines the primary objective of Waka Kotahi as to contribute to an effective, efficient and safe land transport system. The Ministry of Transport's Transport Outcomes Framework focuses on the following five outcomes through which the transport system can contribute to improving wellbeing and liveability:

- inclusive access
- economic prosperity
- resilience and security
- environmental sustainability
- healthy and safe people.

Furthermore, the GPS on land transport includes the following priorities:

- safety
- better travel options
- climate change
- improving freight connections.

Table 4.1 illustrates the variety of strategic objectives and outcomes from the LTMA, the Transport Outcomes Framework and the GPS that Waka Kotahi needs to be aligned with. It also identifies proposed GPS indicators associated with the GPS priorities. Some of these are already collected and readily available (national transport-related greenhouse gas emissions and fatalities). Some are more localised or exposure-related and need to be compiled from geographically disaggregated data (population exposed to elevated air pollution and noise) and some need to build on existing survey data (passenger and freight mode shares). The GPS indicators provide a core of measures that could be used for tracking national-level progress towards strategic objectives of improved accessibility and lowered adverse externalities.

**Table 4.1 The variety of objectives and outcomes Waka Kotahi must demonstrate a contribution to**

| LTMA 2003 | Transport Outcomes Framework | GPS priorities | GPS transport indicators |
|---|---|---|---|
| Effective | Inclusive access | Better travel options | • Accessibility to jobs<br>• Access to essential services<br>• Access to regular public transport<br>• Passenger mode shares |
| Efficiency | Economic prosperity | Improving freight connections | • Priority route travel time reliability<br>• Domestic freight mode shares<br>• State highway availability<br>• Priority routes unavailability<br>• Priority routes with alternatives<br>• Roads at risk of sea level rise |
| Safety | Healthy and safe people | Safety | • Annual road and rail fatalities<br>• Annual hospitalised injuries<br>• Pedestrian and cyclist safety |
| | Resilience and security | – | – |
| | Environmental sustainability | Low-carbon transformation | • Annual greenhouse gas emitted<br>• Annual air pollutant emissions<br>• Exposure to elevated air pollution<br>• Exposure to elevated noise |

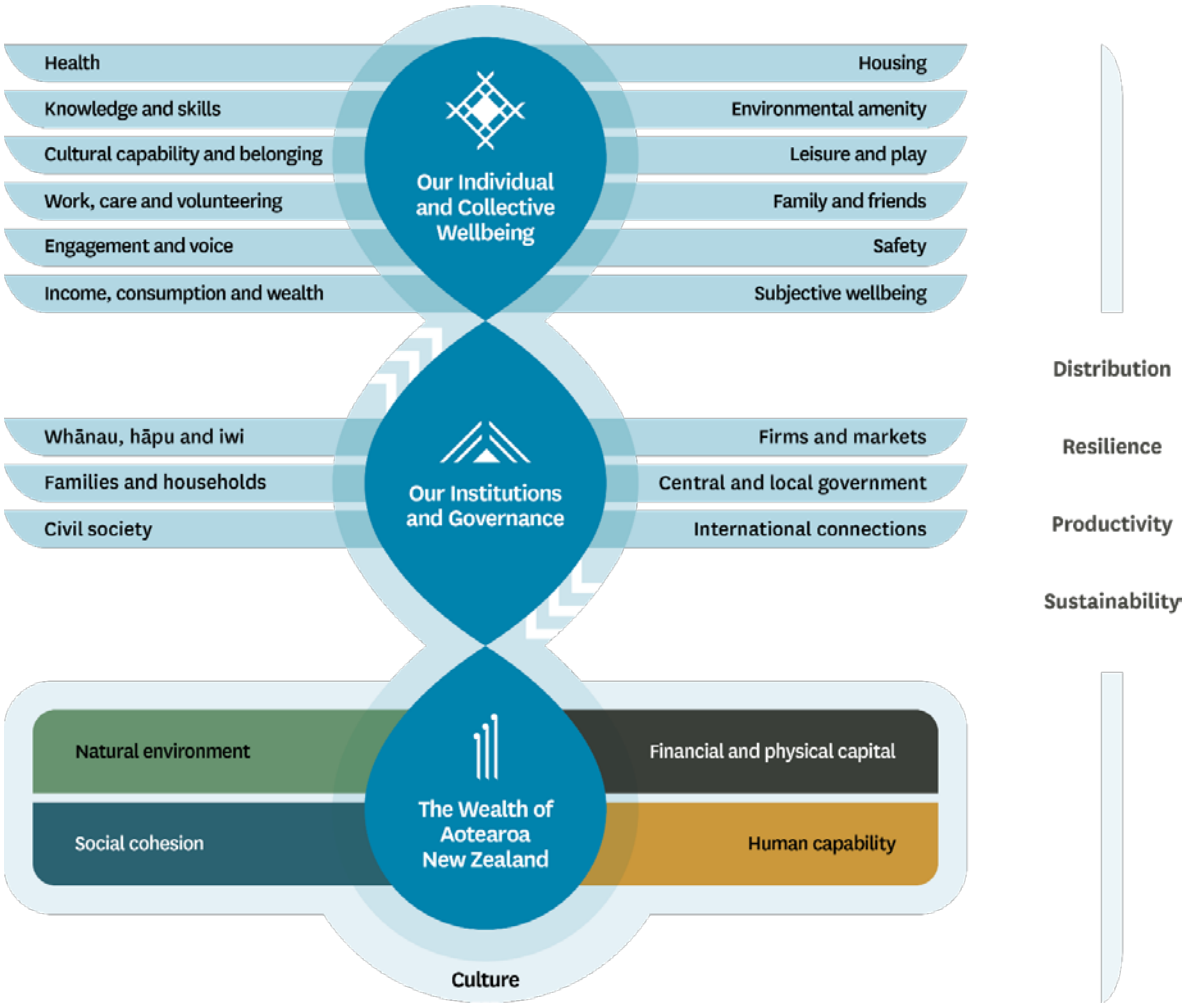
The Transport Outcomes Framework provides a strategic link between the regulatory objectives and the priorities emphasised and funded through the GPS. The Transport Outcomes Framework was designed to align with the Treasury's Living Standards Framework, which is described in the next section.

### 4.1.1 The Treasury's Living Standards Framework

In 2011, the New Zealand Treasury began developing its Living Standards Framework (LSF) to improve the monitoring of multiple dimensions of wellbeing. This was revised in 2017, influenced by previous work done at the OECD (2017), to contain 41 indicators across 12 wellbeing domains that reflect current wellbeing at a point in time, and also 22 indicators of four capital stocks to reflect sustainable capacity for future wellbeing – natural (environmental), human (educational and health), social (cultural and institutional) and economic (financial and built).

The LSF and its dashboard were revised again in late 2021, with a third layer of institutional and governance capability stripping out many of the components of social capital and positioning them between the current and future-oriented measures. The word 'capital' has also been removed from the remaining future-oriented measures to avoid confusion and in some cases objection from sections of the public.

**Figure 4.1 The Treasury's LSF (reprinted from Treasury, 2022)**




The framework can be presented in a dashboard of headline indicators for tracking the country's position over time. The underlying statistics can be sliced to show how wellbeing status varies across different regions or subgroups of the population. The Treasury has also produced guidance on how to use its framework in reporting documents.

The LSF is currently routinely being used alongside the Treasury's CBAx template to assess government budget initiatives. In that process, departmental analysts prepare CBAs of proposed budget initiatives using the CBAx template that allows for quantitative and monetised inputs into the evaluation, which may cover single or multiple years, and produces NPV results of national net benefits, and also government returns and liabilities within that calculation. Benefits are estimated from input data and forecasts, with their sources identified and rating attached as to their reliability (high, medium or low). The CBAx template also allows for alignment with LSF domains to be identified. The completed evaluations are attached to budget bids and passed to Treasury for scrutiny and approval for presenting to Cabinet. In a process that resembles the gateway checks employed by some countries' BRM, the Treasury can moderate any tendency of departments for optimism bias or placing undue weight on weakly evidenced inputs.

From the 12 domains of current wellbeing, the LSF is framed more in terms of providing aggregate pictures of progress as a supplement to GDP statistics than it is for addressing marginal changes from individual investments. Domains such as income and consumption and jobs and earnings mesh well with national economic accounting measures. Those on knowledge and skills and health are informative of the human

capital of the population reflecting their capabilities and capacity for productive and fulfilling lives. Domains such as subjective wellbeing, social connections, cultural identity and civic engagement are more difficult to quantify. The natural environment is relatively lightly covered in the LSF, which has current indicators for air quality (particulate matter with a diameter of 10 microns or less – $PM_{10}$), access to the natural environment, water quality (swim-ability) and perceived environmental quality. It has a rather longer set of indicators for natural capital, including net greenhouse gas emissions, New Zealand's renewable energy, climate regulation, sustainable food production, drinking water, biodiversity and genetic resources, and waste management.

The LSF, in principle, can be used to give expression to government pursuit of improvements in wellbeing across the nation, but at present, it is still a work in progress with few measures defined and finalised. It is most suited to measuring progress at an aggregate level and, in its current form, not much practical use for assessing marginal improvements from individual projects.

### 4.1.2 Other frameworks that may be applied

Although not yet a statutory requirement, other frameworks from different fields could possibly be applied in BRM. One such framework that has been discussed in the past is the Driver–Pressure–State–Impact–Response (DPSIR) framework, a refinement of the Pressure–State–Response (PSR) framework that the OECD developed for compiling environmental indicators. Denne et al. (2013) raised the possibility of applying the PSR framework to transport indicators and, in an appendix, tried fitting several countries' transport-related statistics to the PSR categories. That showed that in most countries' statistics, the State category had the largest share of statistics, followed by the Response category, and there were very few statistics for the Pressure category. It also showed that the categorisation is subjective and open to challenge: for instance, for Australian states, it records 'Number of fauna-sensitive design road installations' in the State category, but it might equally be argued to be a response to the pressure of rising roadkill; for Canada, it records air polluting and greenhouse gas emissions in the State category, although they could be argued to be in the Pressure category.

The DPSIR framework extends the PSR framework to identify the drivers that are causing pressure, and also the impacts that pressure causes on the state of the environment. It is applied to provide policymakers and stakeholders with a structured framework for monitoring the state of the environment and the impacts of changes in factors that influence it. In conjunction with Statistics New Zealand, the Ministry for the Environment applies a reduced framework that considers Pressures, States and Impacts for reporting on the state of the environment (Ministry for the Environment, 2014). The Impacts category is included to cover more of the social and economic effects of changes caused in the natural environment. The Response category has been dropped because response indicators include effects of government interventions, the effectiveness of which is assessed in other government processes. The exclusion of indicators of response has been 'chosen to help maintain environmental reporting at arm's length from the government of the day' (Ministry for the Environment, 2014, p. 12).

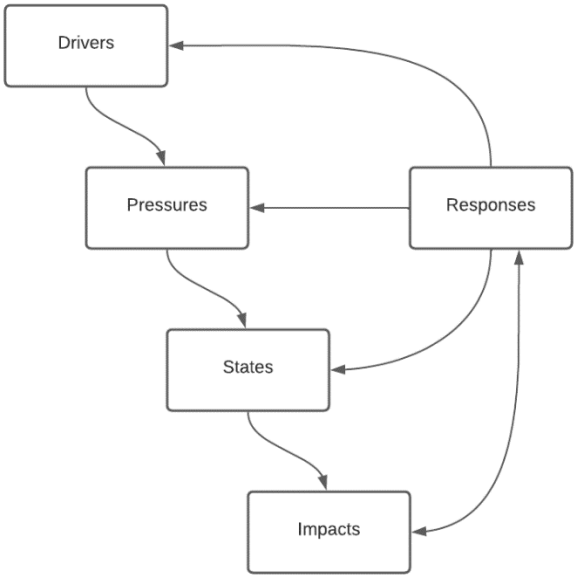
The DPSIR framework is more widely encountered internationally and endorsed by bodies such as the UN's Food and Agriculture Organization. It seeks to capture the links between Driver, Pressures, States and Impacts, and acknowledges that policy responses can influence all four categories of the complex system.

- **Drivers** are socio-economic activities that influence the system (eg, in a transport context, the planning and other influences increasing densification of residential building in urban areas).
- **Pressures** are the source of effects from socio-economic activities such as waste or emissions (or in the urban densification example above, the increased congestion on parts of the network).
- **States** are measures of characteristics and qualities of the environmental assets (in the densification example, capacity of roads and other transport services in the densifying areas).

- **Impacts** are measures of effects of changes in the environment of interest (congestion's adverse effect on outcomes for travel time, travel time reliability, emissions and human health impacts etc).
- **Responses** are interventions and mitigations (seeing reductions in adverse outcomes above).

Figure 4.2 illustrates the general expectation of the relationships in the DPSIR framework.

**Figure 4.2 Flowchart of DPSIR framework**




#### 4.1.2.1 Should a DPSIR framework be applied to BRM in the transport sector?

Fundamentally, the DPSIR framework seeks to monitor the changes in a complex system with causal links. Transport investments, activities and interventions exist in a complex system that includes the economic system, the ecosystem and the society. Furthermore, transport can influence each system directly and indirectly and be influenced by the systems. This means the DPSIR framework can be used to monitor the contribution of the transport investment, activities and interventions to the economic, social and environmental systems. Translating the DPSIR framework into a framework for BRM requires aligning the outcomes and benefit measures to the framework's components.

An initial assessment of how the 12 benefit clusters might align or be matched to the DPSIR framework suggests that the benefit clusters could be assigned to a component of the framework. But it is not clear what added value using the DPSIR framework offers to strengthen BRM or compliance with BRM. The addition of the DPSIR framework could muddy the waters for user simplicity, clarity and cost-effectiveness. Our literature review has not found that PSR or DPSIR frameworks are widely used in transport management, and where they have been applied, the benefit of doing so has proved ambiguous (Laureti et al., 2010).

Another framework from the environmental sciences that could have application to transport BRM is the Ecosystem Services framework, following on from the work of the Millennium Ecosystem Assessment Board (Millennium Ecosystem Assessment, 2005). This views natural environments as performing functions that provide four categories of services to human populations:

- cultural services (the settings for commemoration, recreation and tourism provided by landscapes)
- provisioning services (the production of food, fibre, water and energy from ecosystem processes)

- regulating services (such as shelter from wind and sun, protection against erosion)
- supporting services (basic natural functions like nutrient cycling and pollination on which other services depend).

There is an implicit ascendancy in this framework, as all organic life relies on supporting services, the habitability of places depends on regulating services, the basics of survival are obtained from provisioning services, and higher order sources of satisfaction are derived from cultural services.

A transport system has similarities to a natural ecosystem, as different types of transport infrastructure or mode are like organisms occupying their own niches in the system. In terms of high-level transport system assessment, it is common to divide transport system benefits into three or more broad categories:

- Matters relating to human welfare, such as safety, reliability and inclusiveness resemble cultural services of the transport system.
- Matters relating to the efficient provision of connectivity for prosperity are like provisioning services.
- Matters relating to the natural and physical environment, such as impacts on air and water quality and on climate changing emissions, combine characteristics of both regulating and supporting functions, reducing risks to the security of the transport system and human activities that have evolved around them.

The Ecosystem Services framework may help in categorising the types of benefit obtained from different projects or policies and clarify which benefits are receiving the most attention across a funded programme or portfolio of investments, but like the DPSIR framework it does not appear to have been widely used in that way for transport system assessments.

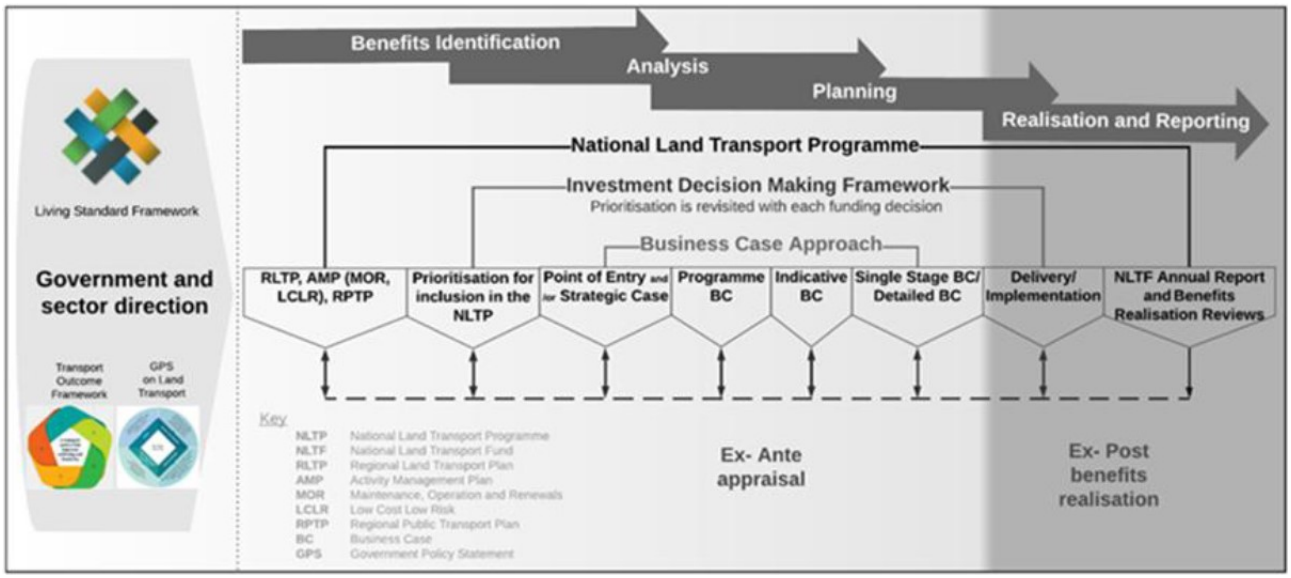
While neither the DPSIR framework nor the Ecosystem Services framework appear to have much formal role for BRM, they may have informal use for side calculations on future risks and resilience. The DPSIR framework in particular could be used for identifying types of risks and their drivers, and hence help in developing resilient responses.

## 4.2 The Waka Kotahi BRM framework

The Waka Kotahi BRM approach sits within the Waka Kotahi Investment Decision-Making Framework – see Figure A.1.

The Waka Kotahi BRM framework is outlined in more detail in Figure 4.3 below (Waka Kotahi, 2021). It is immediately apparent that it goes through many more stages in the preparatory stages of benefits realisation, analysis and planning than it does in the period after approval of a project, where there is a single stage of delivery/implementation followed by a stage for reporting and benefits realisation reviews. Figure 4.3 implies that government and sector direction are guided by the LSF, the Transport Outcomes Framework and the GPS. However, as is apparent from its treatment in the Treasury's CBAx tool for evaluation of policy initiatives across government, the LSF is not yet at a stage where it can give guidance on measurable targets across many of its domains, nor is it informative about the trade-offs involved when comparing gains in different Living Standards domains that may be mutually opposed (eg, between gains in consumption and in various environmental measures that are inversely proportional to waste discharges from consumption).

**Figure 4.3 The Waka Kotahi BRM framework (reprinted from Waka Kotahi, 2021, p. 9)**




Under this Waka Kotahi BRM framework, broad prioritisation in the National Land Transport Programme is guided by strategic direction from regional land transport plans, regional public transport plans, and other Waka Kotahi operational plans. Analyses in the form of strategic and other business cases span benefits identification and planning stages, and monitoring plans and benefits realisation plans carry projects to delivery. Decision gates provide accountability checkpoints throughout this process.

Ex-post analyses of projects once completed have focused on such matters as changes in traffic numbers and average speeds after project completion and also the costs and timeliness of completion. They may also include measures of better journey reliability (reduction in travel times and reduced variance in those times), reductions in through traffic and congestion in urban areas, and improvements in safety (although usually only indicative, as benefits realisation reviews are taken too soon after project completion to overcome the random variability in transport accidents). But such reviews rarely include a full ex-post CBA, so comparing with ex-ante appraisals that informed the funding decisions is tenuous. Benefits realisation reports on the Waka Kotahi website were discontinued in August 2020, but resumption of normal traffic after COVID-19 restrictions removal provides an opportunity to resume ex-post evaluation of more realised benefits and value gained.

To put this in context, we compare the Waka Kotahi BRM framework with examples from the literature, including other countries. All have broad similarities, although none are the same. Table 4.2 shows how the BRM approach has been adapted to suit different countries' priorities.

**Table 4.2 Comparison of BRM frameworks**

| Generic 1 | Generic 2 | Waka Kotahi | ATAP | UK | USA |
|---|---|---|---|---|---|
| Benefits identification | Benefits identification | Issue identification from regional land transport plans, activity management plans (maintenance, operation and records; low-cost, low-risk), regional public transport plans | 1, 2, 3: Policy choices and planning – issues cited and options generated | Gate 1: Business justification – identifying benefits | Critical decision (CD) 1: Approve alternative selection and cost range |
| Benefits planning | Benefits analysis and planning | Prioritisation for inclusion in National Land Transport Programme | 4: Business cases for proposed initiatives | Gate 2: Delivery strategy – value and appraise | CD-2: Approve performance baseline and scope |
| Benefits monitoring | Benefits delivery | Business case approach: Strategic – Programme – Indicative – Final | 5: Prioritisation and programme development | Gate 3: Investment decision – plan to realise | CD-3: Approve start of construction/ execution |
| Benefits management | Benefits transition | Delivery/implementation | 6: Delivery | Gate 4: Readiness for delivery | CD-4: Approve start of operations or project completed |
| Benefits evaluation | Benefits sustainment | Benefits realisation reviews and National Land Transport Fund annual report | 7: Post-completion review | Gate 5: Operation review and benefits realisation | |

## 4.3 Distilling the Waka Kotahi BRM approach

Table 4.3 describes the principles of the Waka Kotahi BRM approach (as defined in Waka Kotahi, 2021).

**Table 4.3 Principles for applying the Waka Kotahi BRM framework**

| Principle | Description |
|---|---|
| Benefits cascade | The common thread of benefits can be traced from organisational strategy to organisational activities and outcomes of funding. |
| Revisiting and refining benefits | Benefits will need to be revisited and refined through the business case stages. It is expected that, as the business case is developed, there will be greater clarity about the impact of the investment and the associated benefits measures, resulting in a potentially larger set of more diverse benefits at the end.<br>Benefits are required to be entered for all activities and programmes in the Waka Kotahi Transport Investment Online system, so there will be a good record of the natural progression of benefits and their measures as programmes are translated into activities, and more detailed business cases are developed. |

| Principle | Description |
|---|---|
| Diversity of benefits | The need to align the benefits in the Waka Kotahi BRM approach with the GPS.<br>BRM may require balancing tension between benefits associated with strategic organisation-level objectives and benefits specific to project- or programme-level objectives. |
| Benefit trade-offs | The range of benefits available in the BRM framework allows for consideration of the broader impact of programmes or investment. This means it is necessary to consider trade-offs across benefits when discussing and selecting them.<br>If one benefit is sought as a positive outcome, discussion should consider if there are any unintended negative impacts on other benefits in the framework. For example, while the installation of new roading infrastructure might improve access, does it negatively impact on greenhouse gas emissions? |
| More is not necessarily better | Having a broader range of benefits available may encourage the selection of a greater number of benefits and measures. However, it is important to note that selecting more benefits will not improve a proposal's assessment prospects for National Land Transport Programme inclusion and/or funding approval.<br>Decision-makers will be looking for evidence (through changes in the benefits measure or measures) of the impact of each selected benefit, rather than the number of benefits that can be associated with the investment.<br>There will need to be a balance between reflecting an appropriate spread of benefits and measures without setting up an unnecessarily large set for ongoing monitoring. |
| Overlapping benefit areas and measurement | There are some natural overlaps across the framework. |
| Monetisation and measurement of benefits | While there is some overlap between benefits, the monetisation methodologies outlined in the *Monetised Benefits and Costs Manual* ensure there is no double-counting between monetised benefits.<br>Monetisation is not the same as measurement for the purposes of the BRM approach. Although related, they serve different purposes.<br>Monetisation relates to forecasting long-term (multiple decades) accrued costs and benefits that take into account broader context, economic considerations and impacts, and translate the forecast impact into a common unit (dollar value) so as to be readily comparable. Monetised benefits and costs form part of the Investment Prioritisation Method and assessment of investment proposals, alongside non-monetised measures.<br>The benefit measures are a way of forecasting and monitoring the actual, short-term on-the-ground impacts. The unit of measurement reflects the actual impact – for example, the number of injuries in numerals, or the time taken to walk to the supermarket in minutes. The timeframes of measurement are set by when the impact will first be felt (up to a decade) rather than accrued over a long period. The benefits measures assist in choosing the best options for investment based on shorter-term impacts and can be monitored in the short to medium term to understand if expected benefits are being realised. |
| Quantitative and qualitative measures | Links to other guidance on quantitative and qualitative measurement of benefits in BRM (eg, https://www.nzta.govt.nz/resources/monetised-benefits-and-costs-manual/). |

### 4.3.1 Review of the benefits cascade principle

The benefits cascade principle is very well aligned to the good practice of organisational consistency in linking to higher objectives or outcomes. We recommend the principle be retained and encouraged.

### 4.3.2 Review of the revisiting and refining benefits principle

This principle is linked to the consistent application of BRM throughout the life of a project, programme or organisational strategy. As such, our view is that there is a high degree of alignment with the intent behind this principle and criteria for good practice at both the framework and indicator level. However, there are some risks with revisiting the measures, such as when the act of revisiting leads to a radical change in what is being measured, as such changes could lead to an inconsistency or discontinuity that could undermine the usefulness and clarity of BRM. Therefore, we recommend that revisiting benefits could involve adding new benefits of interest, not replacing benefits of interest, if continuity over time is required. That way, the performance of the investment/project can be judged against the original core benefits sought, and the value-add of the additional benefits will be easier to interpret. This will be advantageous for assessing the performance of the investment/project as well as a potential source of lessons that can be applied in the future – for example, lessons about what sort of benefits emerge for different kinds of investments or projects.

### 4.3.3 Review of the diversity of benefits principle

The diversity of benefits principle discussion includes two ideas:

1. the need to align the benefits in the Waka Kotahi BRM approach with the GPS
2. the ability to deal with competing tensions.

The alignment with the GPS is highly consistent with the good practice principles because it allows the linking to higher objectives driving the organisation in a potentially consistent manner.

But it is not clear how the ‘diversity of benefits’ maps to good practice, and it is unclear what value it adds to the BRM approach as a principle for the framework. It is probably better described as a challenge for implementation than a principle for application.

While a diversity of benefits enables comprehensive coverage, the principle of diversity of benefits requires balancing opposing tensions in the choice of benefit measures at different levels, and as such, can be inconsistent with the evaluation criteria of consistency and an ability to link project-level benefits to organisational or national-level outcomes. Diversity of principles could lead to tensions in the choice of benefits and is also inconsistent with the benefits cascade principle in the current BRM approach.

However, such tensions emerge in applying BRM to real-life projects due to the existence of competing objectives and the measures related to those competing objectives. For example, lower travel speeds improve safety risk outcomes but are detrimental to travel time as a measure of network productivity. Another example is congestion charges, which are detrimental to the financial costs of transport use, as a sub-measure of network productivity, but may be beneficial for travel reliability and efficiency of transport pricing.

These competing objectives, which frequently occur in complex systems and regulated markets, mean that investments that benefit one objective may cause disbenefits for another objective. The most common way to manage this in investment analysis and CBA is to quantify and monetise the benefits and disbenefits into the common measure of dollars (Treasury, 2017), then estimate the net benefits by subtracting the absolute value of the disbenefits from the absolute value of the benefits. If the net benefit value is positive, the investment is overall a beneficial contribution to the combination of objectives sought. If the net benefit value is negative, then the disbenefits exceed the benefits, and the combined effect is detrimental in the context of the combination of objectives. This is an example of the fundamental link between BRM and CBA. CBA’s balancing of competing objectives is less applicable to non-quantified and non-monetised benefits or disbenefits, where the solution is often a subjective judgement of the relative and combined impact of competing non-quantifiable benefits.

### 4.3.4 Review of the benefit trade-offs principle

As discussed above, trade-offs will emerge due to competing objectives. Good practice in New Zealand and overseas is to have a consistent way to assess the effects of the trade-offs so that it is possible to understand the overall consequences of the trade-off objectively and consistently in the context of the objectives sought. This is where CBA and monetisation into a common unit measure are helpful. While this is an important issue for BRM application, it is not so clear how it relates to the criteria for designing best practice frameworks or indicators.

### 4.3.5 Review of the 'more is not necessarily better' principle

This principle is highly consistent with the criteria for cost-effective BRM. The aim of these criteria is reducing the burden of BRM, encouraging compliance with BRM and improving its value for money (efficiency). This is an area where the number of benefits assessed in the ex-ante CBA and BRM may diverge. The divergence occurs because, in the CBA, there are reasons to be interested in a comprehensive assessment of the benefits. Those reasons include providing decision-makers with an as-comprehensive-as-possible assessment of the benefits relative to the costs for an individual project and ranking the range of possible investment options. However, once the decision has been made to proceed with a project and the focus shifts to BRM, then the need to measure and monitor all the benefits assessed in the CBA may no longer be the optimal choice. In fact, it may be more cost-effective to monitor a narrower set of benefits in BRM with any loss of quality from the BRM. In the case of BRM, the choice of benefits that are monitored should be influenced by the following criteria:

- benefit measures that allow the monitoring between expectations and outcomes
- benefits that are linked to strategic outcomes
- benefits that allow for cross-organisational comparison
- benefits that make the highest contribution to the benefits exceeding the costs in the ex-ante CBA.

### 4.3.6 Review of the overlapping benefit areas and measurement principle

This principle seems to exist for the reassurance of users, but it lacks any guidance on how to deal with whether overlapping benefits could be a problem for double-counting the performance of the investment or project, or whether the monitoring within BRM could be more cost-effective through optimising to avoid overlap. We recommend strengthening the guidance associated with this principle.

### 4.3.7 Review of the monetisation and measurement of benefits principle

The discussion of this principle is highly relevant to dealing with inconsistencies, trade-offs, overlapping benefits and quantification. It could come earlier in the guidance and be incorporated into other subsections.

### 4.3.8 Review of the quantitative and qualitative measures principle

This principle of reviewing the quantitative and qualitative measures available for different benefits is to ensure up-to-date information and techniques are used where available, and to provide guidance on where to find information on how to measure benefits.

## 4.4 Indicators for the Waka Kotahi BRM approach

Benefit indicators or measures are the means of tracking benefits realisation from the initial appraisal through to project completion, commissioning and established use. To illustrate how the indicators work for BRM, Table 4.4 compares the indicators in the Waka Kotahi BRM framework with those used in Victoria (VicRoads, 2016).

The Waka Kotahi BRM framework divides its benefits into 12 benefit clusters of varying size, within which there are 24 benefits and 64 separate benefit measures. Only 13 of the 24 benefits have quantifiable and monetisable measures (30 out of the 64). The clusters that are predominantly non-monetised have coloured text in the table. The 12 benefit clusters are spread across five outcomes from the outcomes framework: healthy and safe people (clusters 1–3), resilience and security (cluster 4), economic prosperity (clusters 5 and 6), environmental sustainability (clusters 7–9) and inclusive access (clusters 10–12). Its cluster names can be a little opaque: the usually large benefit items of savings in travel time and vehicle operating costs come under cluster 5.2 on network productivity and utilisation.

The Waka Kotahi BRM framework has a large number of separate measures and indicators compared to others in use. The Victorian framework in the table has just 16 benefit categories aligned to three strategic outcomes – a thriving place to live and do business (productivity), a place where people and places are well linked (journeys) and a liveable place where people want to be (wellbeing). Its benefit descriptions are differently framed, with less specificity about mental or physical health distinctions but arguably more outcomes focused.

If measurability is a key criterion for BRM indicators, many of the 64 Waka Kotahi benefits are not consistent with BRM. And if a concise, cost-effective set of measures is required, a limited set of indicators based around reducing cost of moving people and freight may be sufficiently informative about benefits for productivity and environmental wellbeing. Measuring inclusive access is more challenging, as many of the commonly suggested measures (eg, the number of kneeling buses for the mobility impaired, or verbal stop announcements on public transport for the visually impaired) are supply-side input or output measures, not demand-side outcome measures (eg, changes in transport use by the disadvantaged or in their satisfaction with transport available).

**Table 4.4 Comparison of BRM indicators**

| Waka Kotahi benefit clusters (non-monetised in coloured text) | | |
|---|---|---|
| 1.1 | Impact on social cost of deaths and injuries | Healthy and safe people |
| 1.2 | Impact on a safe system | |
| 2.1 | Impact on perceptions of safety and security | |
| 3.1 | Impact of mode on physical and mental health | |
| 3.2 | Impact of air emissions on health | |
| 3.3 | Impact of noise and vibration on health | |
| 4.1 | Impact on system vulnerabilities and redundancies | Resilience and security |
| 5.1 | Impact on system reliability | Economic prosperity |
| 5.2 | Impact on network productivity and utilisation (includes savings in time and vehicle operating cost) | |
| 6.1 | Wider economic benefit (productivity) | |
| 6.2 | Wider economic benefit (employment) | |
| 6.3 | Wider economic benefit (imperfect competition) | |
| 6.4 | Wider economic benefit (regional economic development) | |
| 7.1 | Impact on land and biodiversity | Environmental sustainability |
| 7.2 | Impact on water | |
| 8.1 | Impact on greenhouse gas emissions | |
| 9.1 | Impact on resource use efficiency | |
| 10.1 | Impact on user experience of the system | Inclusive access |
| 10.2 | Impact on mode choice | |
| 10.3 | Impact on access to opportunities | |
| 10.4 | Impact on community cohesion | |
| 11.1 | Impact on heritage and cultural values | |
| 11.2 | Impact on landscape | |
| 11.3 | Impact on townscape | |
| 12.1 | Impact on te ao Māori | |

| VicRoads benefit categories | |
|---|---|
| Increased employment opportunities | Productivity |
| Business and industry attractiveness | |
| Reduced exposure to costs | |
| Resource efficiency | |
| Transport network efficiency | |
| Community satisfaction with journeys | Journeys |
| Active and inclusive communities | |
| Dependable and adaptable network | |
| Local amenity and environmental quality | Wellbeing |
| A less carbon-intensive network | |
| Protection of environmental services | |
| Perception of safety | |
| Safety risk | |
| Actual safety | |
| Public safety | |
| Community satisfaction with services | |

As part of the review, we assessed the guidance in the *Land Transport Benefits Framework and Management Approach: Guidelines.* Our assessment reviewed three key aspects:

1. Consistency of the guidance for each benefit in the benefit clusters with the criteria for good practice BRM measures. Are the benefits quantifiable and monetisable?

2. Can the benefits be measured at the project and the strategic or system level in a consistent way?
3. Does the guidance provide users with enough information to complete a BRM assessment for each benefit, or at least provide links to other important sources of guidance on the assessment of benefits, such as the *Monetised Benefits and Costs Manual.*

Overall, this review found that some benefits are consistent with good practice BRM measures. Frequently, where there are good practice measures, they can be measured at the project and strategic level. However, there is clear room for improvement around the guidance and measures for the Environmental Sustainability, Economic Prosperity and Inclusive Access benefit clusters. In a few cases, aggregating the project-level benefits to represent the strategic-level benefits would risk overstating the outcomes at the strategic level.

Table 4.5 contains the detailed assessment of the BRM guidance. A summary of the findings for each benefit cluster follows the table. Overall, the assessment found that the guidance for some clusters is more developed and more helpful than others. There are several examples where adding a cross-reference to existing guidance in other Waka Kotahi manuals would enhance how actionable the guidance is for users.

**Table 4.5 Detailed review of guidance for specific BRM indicators**

| Strategic outcomes | Benefit cluster | Benefit | Existing measures | Measurable | Scalable | Actionable | Suggestions or comments |
|---|---|---|---|---|---|---|---|
| Healthy and safe people | Changes in user safety | Impact on social cost of death and serious injuries | Change in social cost of death and serious injuries | Yes | Yes | Yes | Link to other Waka Kotahi guidance. |
| | Changes in user safety | Impact on safe system | Improvement in the safety rating of infrastructure | Yes | Yes | Yes | Link to other Waka Kotahi guidance. |
| | Changes in perceptions of safety | Impact on perceptions of safety and security | Survey results | Yes | Yes | Not immediately | Surveys require careful design, planning before changes are made, funding and commissioning. So, they are not easy to action, which means this measure is only a partial BRM match in terms of fit for purpose. |
| | Changes in human health | Impact of mode on physical and mental health | Change in the volume or share of trips that are walking or cycling | Yes | Yes | Yes | Requires multimodal traffic counts. |
| | Changes in human health | Impact of air emissions on health | None | Yes | Yes | Not immediately | The guidance is descriptive only in pointing out that quantification and monetisation is possible, but no information is provided on where to find out more about how to quantify the changes. |
| | Changes in human health | Impact of noise and vibration on health | None | Yes | Yes | Not immediately | The guidance is descriptive only in pointing out that quantification and monetisation is possible, but no information is provided on where to find out more about how to quantify the changes. |
| Resilience and security | Changes in impact of unplanned disruptive events on access to social and economic opportunities | Impact on system vulnerabilities and redundancies | No quantifiable measure currently | No | No | No | This benefit needs to be more specifically defined before reliable measures can identified. An index combining road kilometres out of action and duration of such outages may be possible, but needs to be tested in practice. |
| Economic prosperity | Changes in transport costs | Impact on system reliability | Journey time reliability | Yes | Yes | Not immediately | Would require specific before-and-after studies, which are likely to be costly. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Impact on network productivity and utilisation | Impact on network productivity and utilisation | Travel time, fuel costs and vehicle operating costs | Yes | Yes | Yes | Network productivity is measured through changes to travel time and the financial costs of transport use (eg, public transport fares and vehicle operating costs).<br>Productivity and utilisation are relative measures so focus on cost saving per trip or travel time per trip. |
| | Wider economic impact | Productivity due to agglomeration | No measure in the guidance | Yes | Yes | No | Use procedure in the *Monetised Benefits and Costs Manual* pages 92–96. |
| | | Employment impact | Procedures outlined but explanation is light | Yes | Yes | Not immediately | More guidance would be an improvement. |
| | | Imperfect competition | Guidance focuses solely on theory | Yes | No | No | Could potentially use procedure in the *Monetised Benefits and Costs Manual* page 99. However, the procedures are vague and focus on the margin between labour costs and price. |
| | | Regional economic development | Guidance focuses solely on theory | Yes | No | No | The *Monetised Benefits and Costs Manual* suggests estimating the international tourism benefits but excluding the domestic tourism effects. In both cases there is a risk of counting redirected tourism as new tourism spend. |
| Environmental sustainability | Changes in natural environment | Impact on water | Descriptive only | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. Guidance offers only a description of the issue and suggests qualitative evidence is available on water quality without providing any pointers where such information can be obtained. |
| | | Impact on biodiversity | Descriptive only | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. Guidance offers only a description of the issue and suggests qualitative evidence is available on transport-related impacts without providing any pointers where such information can be obtained. |
| | Changes in climate | Impact of greenhouse gases | Links to procedures | Yes | Yes | Yes | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Changes in resource efficiency | Impact on resource efficiency | No measures | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. Description of three forms of resource efficiency –sustainability of inputs/outputs; processes; and disposal. No guidance on quantification or qualitative measures. |
| Inclusive access | Changes in access to social and economic opportunities | Impact on user experience of the land transport system | Suggestions but not specific measures | Yes | Yes | No | The quantification of benefits varies by mode. Quantifiable and monetisable benefits include improvement in the condition or quality of infrastructure or user experience. |
| | | Impact on mode choice | Percentage of trips by mode | Yes | Yes | No | The existing measures are too vague and lack strategic direction or a focus on the incremental impacts of mode choices. |
| | | Impact on access to opportunities | Travel time to destinations | Yes | Yes | Yes | More guidance on comparators would be helpful. In economic appraisal it is the change in travel time that is a measure of benefit or cost. |
| | | Impact on community cohesion | No guidance on measures | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. |
| | Changes in liveability of places | Impact on heritage and cultural values | No guidance on measures | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. |
| | | Impact on landscape | No guidance on measures | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. |
| | | Impact on townscape | No guidance on measures | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. |
| | Changes in te ao Māori values | Impacts on te ao Māori | No guidance on measures | No | No | No | Fails to meet BRM criteria unless quantitative measures can be identified. |

The findings for each benefit cluster were as follows.

*Healthy and safe people*

- Some of these indicators are consistent with BRM, such as the social cost of deaths and serious injuries. These indicators are quantifiable and monetisable at both the project and strategic level.

Other areas such as air pollution, noise and vibration have strong potential to be consistent with good practice BRM. But the guidance could be improved by increasing the specificity about quantifying or valuing the benefit in the guidance. Adding more detail on how to quantify them or adding cross-reference links to guidance in other Waka Kotahi manuals would be a good improvement.

*Resilience and security*

- Existing guidance by Waka Kotahi lacks quantitative measures for this benefit cluster. Therefore, it fails to meet the criteria for BRM where quantifiable measures are a key requirement. The Ministry of Transport uses measures such as the alternative routes available and the number of times a route has been out of service. Some adaptation of Ministry of Transport measures investigated has the potential to generate quantifiable measures.

*Economic prosperity*

- The benefits in this cluster all appear to have the potential to be consistent with BRM criteria, at least at the project level. Better links in the guidance to quantification procedures in other Waka Kotahi manuals would improve the quality of the guidance for BRM. However, the partial equilibrium roots of the procedures for estimating the scale of wider economic benefits at the project level could lead to an overstatement of the benefits if they were simply aggregated up to the strategic level.
- We also think the explanation of imperfect competition benefits and the regional tourism benefits in the *Monetised Benefits and Costs Manual* needs clarification.
- The procedures for the imperfect competition benefit imply that there will always be a transport-induced competition benefit, yet this would not always be the case, as it depends on the market response. Therefore, the project-level estimates of the benefits are not necessarily additive for estimating the strategic-level benefits.
- The procedures for the regional tourism benefits ignore the potential for an increase in tourism for one attraction resulting in less tourism for another attraction, and for inter-regional transfer of benefits. Therefore the procedures for the regional tourism wider economic benefits are not additive, and they are at risk of overstating the strategic- or national-level benefits.

*Environmental sustainability*

- The guidance in this section is incomplete and mostly composed of descriptions of how transport can negatively impact the environment. More guidance on the options for quantification and monetisation or links to other sources of information would be extremely beneficial to users. There may, for instance, be potential to adapt Australian values for such matters as biodiversity loss or air quality impact on health per VKT on a road, if the Australian data can be adjusted for differences in contextual setting in New Zealand.

*Inclusive access*

- The guidance seems incomplete, mostly composed of descriptions of how transport can negatively impact the accessibility setting. More guidance on the options for quantification and monetisation or links to other sources of information would be extremely beneficial to users.
- Indicators that could be added include:
  - the percentage of households within 500 metres of public transport stops

– the percentage of public transport that is accessible – for example, kneeling buses, trains with wheel access, and verbal stop announcements on buses and trains (which benefit people with disabilities and tourists).

## 4.5 From strategic direction to project measures

As discussed above, setting targets at the strategic level may require a different set of measures and indicators of success than those required for evaluating projects and programmes consistent with strategy. The literature suggests one key task in designing a BRM framework that enables those connections between project and strategy to be made is to define at the outset what success would look like.

To illustrate how strategic documents can influence that BRM design, Table 4.6 compares two New Zealand strategy documents with two documents from overseas practice. New Zealand transport strategy is governed by the Ministry of Transport's Transport Outcomes Framework, which has five outcome categories, and by the Strategic Priorities within the GPS, of which there are four. These are compared in the table with Norway's National Transport Plan and the UK's Monitoring and Evaluation reporting.

All these strategic frameworks cover similar ground in seeking improved connectivity for economic prosperity, safer travel and positive contributions to environmental improvements. The New Zealand frameworks split out inclusive access and wider transport options as separate strategic goals, and the Transport Outcomes Framework also includes transport resilience and security (under which some measures are specific to only aviation and maritime security).

The comparison is illuminating between New Zealand's GPS and Norway's National Transport Plan, which are both forward-looking documents setting out intentions for the decade ahead. The two documents' objectives for safety are effectively the same, whereas their environmental objectives are similar but diverging, with the GPS focusing on climate change emissions and adding inclusive accessibility under the objective, whereas the Norwegian plan focuses on climate and environmental goals. Greater divergence, however, appears in the objective of better transport functioning, which the GPS splits between 'improving freight connections' and 'developing better transport options', whereas the Norwegian plan includes this under the single objective of efficiency. Norway also includes three subsidiary goals under this objective: getting better value for money; using efficient new technologies; and making travel easier to help competitiveness and accessibility more generally.

There may be benefit in splitting 'improving freight connections' from 'developing better transport options' in accessing specific expertise, but there is also benefit in elevating efficiency as the overarching aim in both. In New Zealand, new transport options development has been prominent in discussions about urban transport, where a wide range of innovations have emerged in recent years, ranging from micro-mobility options to light rail and trackless trams, with little apparent attention given to efficiency or the conditions needed for it to arise. Hence app-enabled electric hire scooters have been admitted onto footpaths, appropriating public spaces by parking anywhere and ignoring the long-established safety practice of separating traffic of different speeds, with little analysis of what that has achieved in improving transport around urban centres or in reducing safety and security of other footpath users. Whether such developments significantly shorten travel times, remove people from cars and lessen congestion, or reduce greenhouse gas emissions tends to be asserted rather than demonstrated through observation and analysis, in the absence of a clear focus on broadly scoped efficiency of the sort now common in extended CBA.

**Table 4.6 Comparison of BRM frameworks**

| New Zealand – Transport Outcomes Framework | New Zealand – GPS Strategic Priorities | Norway – National Transport Plan | UK – Monitoring and Evaluation Report |
|---|---|---|---|
| **Economic prosperity** | **Improving freight connections**<br>• Improving connections for economic development | **Efficient**<br>• Better value for money<br>• Efficient use of new technologies<br>• Make travel easier for competitiveness | **Improving connectivity for prosperity** |
| **Healthy and safe people** | **Safety**<br>• A transport system with no fatalities or serious injuries | **Safe**<br>• Vision Zero for traffic fatalities and injuries | **Improve user experience – safety, reliability, inclusiveness** |
| **Environmental sustainability** | **Climate change**<br>• Support emission reductions, improve inclusive access | **Environmentally friendly**<br>• Contribute to climate and environmental goals | **Improve air quality and climate changing emissions** |
| **Inclusive access** | **Better transport options**<br>• Develop access to social and economic opportunities | Not addressed | Not addressed |
| **Resilience & security** | No quantified measures available | Not addressed | Not addressed |

New Zealand's GPS proposes a number of indicators to measure progress, which have more practical relevance than the indicators identified in the Transport Outcomes Framework. The GPS eschews ambiguous measures such as the contribution of transport industries to GDP, which is a measure of cost on the economy, not of efficiency improvement. GPS measures focus on measurable outcomes, such as the number of deaths and injuries on the roads, shares of passengers and freight traffic moved by different modes, and tonnes of greenhouse gases per year emitted by transport. Some of these are universal indicators where the value per unit gained is the same everywhere, such as number of transport-related fatalities or tonnes of greenhouse gas emissions. Others, like exposure to air pollution or mode shares, are likely to have a value that varies geographically or temporally and need to be recorded in a disaggregated way.

Two further characteristics of the GPS measures that could be refined are as follows.

- They focus on physical measures, not the economic consequences. Measures should be monetised where it is feasible to do so (eg, for injuries and greenhouse gas emissions, which have values in the Waka Kotahi BRM framework) as this is necessary to build a view of the efficiency of investments to which these observed changes are attributed.
- Measures are mostly cited in totals per year, but as the population grows over time, so too will many of the aggregate measures of transport effects. While targets may be set in aggregate terms, such as zero net carbon by 2050, these measures should also be expressed in per capita terms to identify whether the transport loading on road structures and environment are easing as transport becomes more efficient, which is a prerequisite for meeting the aggregate targets.

### 4.5.1 Measures for linking project benefits to strategic outcomes

The literature reviewed for this report shows that assessing strategic-level outcomes may require a different set of measures and indicators of success than those required for evaluating projects and programmes consistent with that strategy. Projects and programmes often focus on distinctions in local-level impacts that are scarcely discernible from a national strategic level or that may be challenged because their benefits are overstated by activity relocation due to new infrastructure investments, creating transfer effects rather than real expansion of benefits obtained. Strategic outcomes are expressed in high-level terms that are difficult to attribute to individual project investments, but there are exceptions in some measures that are consistent and transportable between the assessment levels.

For example, in the UK, Venables et al. (2014) suggest an academic approach to the overview of strategic outcomes inferred from aggregating across projects the user benefits and associated productivity and investment and employment effects, subject to testing to ensure additionality and to avoid resource displacement effects of the sort addressed in computable general equilibrium analysis (Table 4.7). This approach is narrowly focused on economic matters and does not mention environmental impact indicators. Nor does it cover social objectives, such as inclusiveness and service resilience.

**Table 4.7 High-level measures for assessing strategic outcomes (adapted from Venables et al., 2014, pp. 1–6)**

| User benefits (savings) | Productivity | Investment and employment | Environmental |
|---|---|---|---|
| • Vehicle operating costs<br>• Travel time (average)<br>• Congestion (time variance)<br>• Crash casualties | • Economic density<br>• Economic scale | • New investment/jobs<br>• Subject to:<br>– Additionality<br>– Displacement (general equilibrium) effects across the wider economy | (Not covered in Venables et al., 2014) |

The UK Department for Transport's *Monitoring and Evaluation Report* does include environmental effects (tackling climate change), social impacts (improving user experiences) and economic impacts (improving connectivity), but instead of identifying measured benefits, it simply lists projects and programmes that were primarily oriented to these respective outcome categories. Table 4.8 shows a compressed list of the types of programmes that appear under the different categories, which for 2021 included an eclectic selection of investments, with no environmental matters covered other than climate change emissions, and active travel included under the climate change category (fuel switching) rather than user experience/health and safety.

**Table 4.8 High-level measures for assessing strategic outcomes (adapted from Department for Transport, 2021, pp. 8–9)**

| Improving connectivity | Improving user experience | Tackling climate change |
|---|---|---|
| • Local authority major schemes<br>• High speed rail links<br>• Transformational impacts of transport | • Local roads maintenance and renewal<br>• Inclusive transport and strategy<br>• Rail transformation<br>• Search and rescue callouts | • Zero-emission vehicles<br>• Local authority plans for $NO_2$<br>• Active travel portfolio<br>• E-scooter trials |

A more quantifiable selection of performance criteria is provided by Hyperion (2020) in its report for the Office of Road and Rail into Highways England's processes for evaluating and assessing the benefits realised from its capital investment, and how these processes are being implemented, including its post-opening project evaluation reports. The purpose of the post-opening project evaluation process is to:

- assess whether investments have delivered their expected value for money
- validate the accuracy of schemes' forecast costs, benefits and impacts
- promote transparency for Highways England's stakeholders.

Hyperion's assessment criteria focus on a limited number of measures under the categories of Economy, Safety, Traffic and Environment, and, as shown in Table 4.9, some of the measures are clearly dependent on other measures in the list (eg, environmental emissions based on traffic outturns).

**Table 4.9 High-level measures for assessing strategic outcomes of Highways England (adapted from Hyperion, 2020, p. 15)**

| Economy | Safety | Traffic | Environmental |
|---|---|---|---|
| • Monetised savings in journey time and casualties<br>• Outturn costs compared to predicted costs | • Outturn compared to forecast collision numbers<br>• Outturn compared to forecast collision rates<br>• Outturn compared to forecast collision severity<br>• Transport safety trends 5 years before scheme compared to 5 years after scheme | • Traffic outturn compared to traffic model forecasts<br>• Special survey results on user flow expectations | • Traffic based impacts – air quality<br>• Traffic based impacts – greenhouse gases<br>• Traffic based impacts – noise<br>• Selective site inspections to verify planned mitigations are in place |

This is the most explicit reporting we have found of individual project or programme analysis results being linked to strategic outcomes. It indicates a number of measures can be directly uplifted from investment appraisal and aggregated for strategic purposes, including reductions in the emissions of greenhouse gases attributable to the investments, and reductions in accidents, fatalities and other injury costs (including treatment and productivity losses). Improvements in the density of transport infrastructure or that ease movement across the network (eg, capacity improvements, but also smarter traffic management) could also be combined, as long as due allowance is made for the possibility of induced traffic caused by investments lowering the generalised cost of transport and the level of observed transport activity lifting in response.

## 4.6 Towards a benefits realisation indicator set

Transport is a means of connectivity – people to places, businesses to markets for inputs and outputs. Improved connectivity can raise productivity by lowering transport costs and facilitating beneficial contacts and transactions, but benefits are also tempered by adverse impacts of transport on people (accidents, pollution, community severance, environmental disruption). So, the calculation of transport benefits needs to account for adverse effects on people and the natural environment. CBA can bring these items into account, along with prosperity impacts (wider economic benefits) and provide a critical input to BRM.

In choosing a set of indicators to monitor benefits realisation, a fundamental question is what would success look like for individual projects and the wider strategies they are aligned with? BRM shifts the focus away from the iron triangle of project management, of building to required quality on time and on budget, towards the outcomes that the project or strategy is intended to achieve. Outcomes that can be measured in physical terms can be used in BRM, such as changes in transport-related fatalities or greenhouse gas emissions. Other outcome indicators will need to be compiled from a combination of measures, such as the impacts of

transport-related pollution on health and wellbeing, which is a function of the level of transport-related pollution and the population at risk of exposure to pollution, which will be highest in specific localities.

We have suggested the proposed indicators for the GPS provide a good base on which to build a set of measures applicable to both project- and strategic-level benefits realisation assessment. But measures in different types of physical unit are hard to compare unless converted to a common metric, which is a role CBA-related monetary valuations can play, providing linkage between project- and strategic-level objectives.

Waka Kotahi investments are principally directed at providing transport infrastructure and some means to regulate its use. Waka Kotahi does not control all factors that influence the performance of the transport system or the adverse externalities it may generate. In particular, it has little influence on the generalised cost of transport, which is an important factor in individual choices over transport mode and the level of transport activity. Road networks in New Zealand are generally provided as open access facilities. While fuel duties and road user charges in aggregate cover the annual expenditures on state highway construction, maintenance, and supports to local council road expenditure and some public transport facilities, the charges do not cover all transport externalities or the time- and location-specific costs of congestion. Parts of the road network are therefore likely to be inefficiently under-priced and overused, with new capacity generating new demand.

Such pricing inefficiency will temper the ability of new road building to meet strategic objectives around mode shift and emission reduction, and it complicates the attribution of observed effects to investments made. A set of indicators may help in BRM, but more detailed analysis would be needed to explain observed changes.

Table 4.10 shows a selected set of measures that could be drawn from project or programme monitoring and could be used for BRM at the strategic, system or portfolio level. It is challenging for BRM to identify and attribute observed changes to particular investments, especially at the strategic level, where the distinction needs to be drawn between benefit generation and benefit relocation. Three criteria were used to identify measures or indicators that are consistent with BRM practice – that is, the extent to which an indicator is:

- **Measurable** – it can be quantified
- **Scalable** – it can be consistently measured at the project and strategic or programme level
- **Actionable** – it can be used quickly and relatively easily to assess benefits associated with a project.

The criteria applied for choosing the measures are consistent with the previous discussion, where measurability is critical. The framework was designed to align with the Transport Outcomes Framework and builds on the assessment of the existing Land Transport Benefits Framework (see Table 4.5). The proposed set of measures in Table 4.10 seek to address gaps created by unactionable measures and situations where measures of the incremental impact are not available. Therefore, the measures in Table 4.10 are a mixture of:

- existing measures
- modifications to existing measures to either focus them on incremental impacts or to transform them into relative measures
- new measures to fill gaps in the framework.

The measures are drawn from the literature and the authors' knowledge of what is possible in New Zealand in terms of data availability. A bottom-up assessment of the existing Waka Kotahi guidance is used, firstly, to identify the gaps where additional measures could add value, and secondly, to eliminate benefits that are very onerous to quantify or just not quantifiable, to reduce the burden of benefit measurement, which is vital for widespread application of BRM.

**Table 4.10 Select measures for BRM at the strategic system level**

| Strategic outcomes | Benefit cluster | Benefit | Proposed measures | Existing/new measure | Measurable | Scalable | Actionable |
|---|---|---|---|---|---|---|---|
| Healthy and safe people | Changes in user safety | Impact on social cost of death and serious injuries | Change on social cost of death and serious injuries | Existing | Yes | Yes | Yes |
| | Changes in user safety | Impact on safe system | Improvement in the safety rating of infrastructure | Existing | Yes | Yes | Yes |
| | Changes in perceptions of safety | Impact on perceptions of safety and security | Survey results | Existing | Yes | Yes | Yes with surveys |
| | Changes in human health | Impact of mode on physical and mental health | Change in the volume or share of trips that are walking or cycling | Existing | Yes | Yes | Yes |
| | Changes in human health | Impact of air emissions on health | Exposure to transport-related air pollution | Existing but needs to be adjusted for exposure | Yes | Yes | Yes with GIS mapping of exposure |
| | Changes in human health | Impact of noise and vibration on health | Exposure to transport-related noise | Existing but needs to be adjusted for exposure | Yes | Yes | Yes with GIS mapping of exposure |
| Resilience and security | Resilience to natural disasters | Impact on system vulnerabilities and redundancies | Earthquake ratings for bridges in the land transport network | Existing but the information needs to be centralised | Yes | Yes | Needs a central recording system |
| | Resilience to climate volatility | Network resilience to extreme weather events | Duration of road closures due to floods and land slides | New | Yes | Yes | Needs a central recording system |
| | Network resilience to climate change | Climate change resilience | Proportion of the land transport risk that is exposed to climate change risks such as sea level rise | New | Yes | Yes | Needs a central recording system |
| | Changes in impact of unplanned disruptive events | Security of access to the transport network | Duration of road closure due to unplanned events | New | Yes | Yes | Needs a central recording system |
| Economic | Changes in transport | Impact on system reliability | Journey time reliability | Existing | Yes | Yes | Yes with surveys |

| Strategic outcomes | Benefit cluster | Benefit | Proposed measures | Existing/new measure | Measurable | Scalable | Actionable |
|---|---|---|---|---|---|---|---|
| prosperity | costs | | | | | | |
| | Impact on network productivity and utilisation | Impact on utilisation | Change in VKT | Existing | Yes | Yes | Yes with surveys |
| | | Impact on productivity | Transport cost per VKT* | New | Yes | Yes | Yes with surveys |
| | | Impact on efficiency | Travel time savings† | Existing | Yes | Yes | Yes |
| Environmental sustainability | Changes in natural environment | Reduced greenhouse gases from transport | Change in greenhouse gas emission per VKT | Existing | Yes | Yes | Yes |
| | | Reduction in the emissions of particulate matter into the environment | Change in $PM_{10}$ per VKT (with long-term aim of shifting to $PM_{2.5}$) | Existing | Yes | Yes | Yes |
| Inclusive access | Changes in access to social and economic opportunities | Access to transport | Proportion of households with a public transport node within 500 m | New | Yes | Yes | Yes |
| | | Access to employment opportunities | Proportion of businesses with a public transport node within 500 m | New | Yes | Yes | Needs a central recording system |
| | Accessibility of transport | Accessibility of public transport | Percentage of buses that are capable of kneeling | New | Yes | | Needs a central recording system |

* Reduction in the costs of transport per kilometre, both for passengers ($ per passenger kilometre travelled) and freight ($ per tonne kilometre travelled), is a beneficial outcome at the project or programme level, but at the strategic level may still lead to increase in cost of transport if the level of transport activity increases.

† Identical measure for access to employment in the inclusive access benefit cluster.

Lastly, we identified suggested measures for the GPS strategic priorities at the request of the Ministry of Transport's representative on the project steering group. Those measures are shown in Table 4.11 below. The measures were chosen to align with those in Table 4.10 above to reflect the common foundation – the Transport Outcomes Framework.

**Table 4.11 Selected measures for BRM at the GPS level**

| GPS 2021 priorities | Measure |
|---|---|
| Safety | Social cost of death and serious injuries |
| Better travel options | Proportion of households with a public transport node within 500 m |
| Improved freight connections | Change in heavy VKT |
| Climate change | Change in greenhouse gas emission per VKT |

# 5 Conclusions and recommendations

When considering what measures or indicators Waka Kotahi should use for BRM, the literature we reviewed points to some broad criteria for selecting measures. We discuss these below.

## 5.1 Conclusions

Benefits are outcomes, not inputs or even outputs. In particular, employment and spending on a project are inputs, not outcomes. So, despite local and some national politicians' tendency to focus on the spending and jobs a chosen project or programme brings to a particular locality or region, these elements have no place in the appraisal of project benefits, both because they are miscategorised as benefits and because whatever resources Waka Kotahi and others bring to a project, they could equally invest them elsewhere with similar economic impact on jobs and expenditure. The distinguishing feature between the investments is the societal return from each one, made up of the stream of beneficial outcomes resulting from the project. The implication is that items relating to project cost or employment have no place in an indicator set for BRM.

A second choice point is to decide what type of project is being envisaged. In the BRM literature and the Treasury's (2017) guidelines, new road or rail construction jobs are what are referred to as waterfall projects with a large front-end effort at design and refinement that are rolled out during construction. The Waka Kotahi BRM framework outlined in Figure 4.3 above is appropriate for such projects, as benefits are not realised until the project is complete and open for use, and the commitment in preparation and construction of such projects offers little scope for substantial change of direction once the project construction has commenced.

But not all Waka Kotahi investments are waterfall projects. There may be safety improvement programmes with a progressive sequence of stages in which benefits arise as each stage is completed. In such projects, beneficial outcomes may emerge after early stages, and the assessment of those benefits and whether they meet expectations may be useful for adjusting the continuing rollout of later stages of the programme. Such projects would be amenable to more 'agile' management, allowing adjustment of project outputs along the way. BRM would require a series of intermediate checks on the way to project completion. That would imply some subdivision into the delivery/implementation phase stages in the Waka Kotahi BRM framework in Table 4.3 above.

Another critical choice apparent in the literature is whether BRM is undertaken to improve accountability in decision making, adding another layer of scrutiny to the early stage selection process and implementation, or whether it is used for learning about implementation to improve future practice. The literature suggests the accountability role is more prevalent than the learning role, but that may be missing an opportunity for future improvements in project selection, implementation and management.

A key requirement of BRM is that the benefits should be capable of being measured. Further, they should be capable of being monetised so that net benefits after deducting costs incurred in obtaining them can be estimated. Numerous benefits in the Waka Kotahi BRM framework are not yet at the point of being measurable or monetised, so they fall out of contention as indicators for use in BRM. That is particularly the case in the inclusive access benefit cluster, where further work is required in developing measures of each benefit before they can be included in the BRM framework.

Although there are linkages between BRM and CBA, the scope of each measure is not the same. BRM covers strategic matters, many of them unquantifiable and not informed by CBA. However, to reduce the data burden on BRM, it should draw on measures already estimated in CBA wherever possible. A number of measures in CBA do apply to both project- and programme-level aims and to strategic objectives.

## 5.2 Recommendations

A set of measures for informing BRM requires choosing indicators that encapsulate a variety of information present in both the ex-ante appraisals that set up the expectations around project delivery and ex-post evaluations once they have been completed. Agile projects also need to be readily measurable at intermediate stages through a project's construction or implementation. We suggest a set of possible indicators for strategic BRM in Table 4.10 but offer the following as contenders for benefits attributable to investments at the project and programme level, many of which are already directly included in the Waka Kotahi BRM framework:

- Reduction in the expected cost of accidents and injuries is a beneficial outcome at both the project and the strategic level.
- Reduction in transport's expected greenhouse gas emissions is a beneficial outcome at both the project and the strategic level.
- Reduction in the cost of transport services as a proportion of GDP or merchandise exports is a beneficial outcome at the strategic level.
- Reduction in the costs of transport per kilometre, both for passengers (dollars per passenger kilometre travelled) and freight (dollars per tonne kilometre travelled), is a beneficial outcome at the project or programme level, but at the strategic level may still lead to an increase in cost of transport if the level of transport activity increases.
- Environmental externalities such as emissions affecting air quality or noise are beneficial outcomes at both the project and the strategic level, albeit varying by locality, so individual project estimates cannot be simply extrapolated to national level; they currently lack monetised values, but these could be proxied by adjusting Australian dollar values per passenger kilometre travelled and tonne kilometre travelled.
- Wider economic benefit as a function of estimated savings in generalised costs in project appraisals is a beneficial outcome at the project level but cannot be aggregated to the strategic national level without adjusting for potential double-counting and general equilibrium effects.
- Aggregate measures may be useful in tracking progress towards aggregate targets for transport improvement, but converting these into per capita or per unit indicators will also be useful in identifying trends in efficiency and value for money gained.
- The GPS contains some recommended indicators for safety, transport options, freight connectivity and low-carbon outcomes, which could provide a base on which to build an indicator set for BRM, but further development is required of measures of inclusion.

Such measures would inform progress against the variety of government transport objectives outlined in Table 4.1 above. The GPS includes a number of practical proposed indicators that could form the basis of a set of measures relevant to both project-level and strategic-level assessment, with some minor modifications to reflect per capita impacts and the monetary value of benefit gains, as described in section 4.5 above.

It might also be useful to revisit the grouping of benefits into clusters to align more closely with other countries that have arranged their BRM under three strategic outcome categories: economic prosperity, wellbeing (including health and safety and inclusion) and sustainability (environmental and climate matters). That would allow more ready comparison of investments made and benefits realised against the three categories across countries.

Waka Kotahi also undertakes ex-post analyses of projects once completed. These focus on such matters as traffic numbers and speeds after project completion and also the costs and timeliness of completion. These rarely take the form of an ex-post CBA, so comparing with ex-ante appraisals that informed the funding decisions is tenuous. Measuring indicators based on economic measures, such as those outlined in the

bullet list above, would enable a closer comparison of ex-ante expectations and ex-post results in a common metric. The benefits realisation reports that appear on the Waka Kotahi website were discontinued in August 2020, but the resumption of normal traffic after the relaxation of COVID-19 restrictions provides an opportunity for restarting a new phase of ex-post evaluation that covers more of the realised benefits and value gained.

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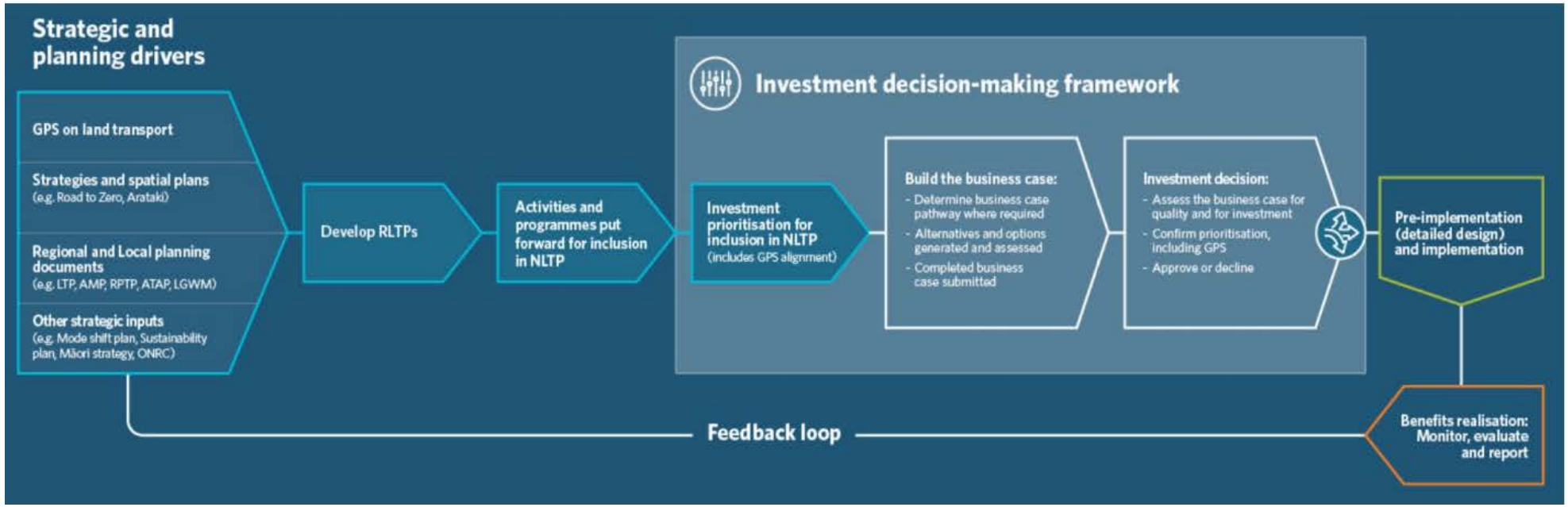
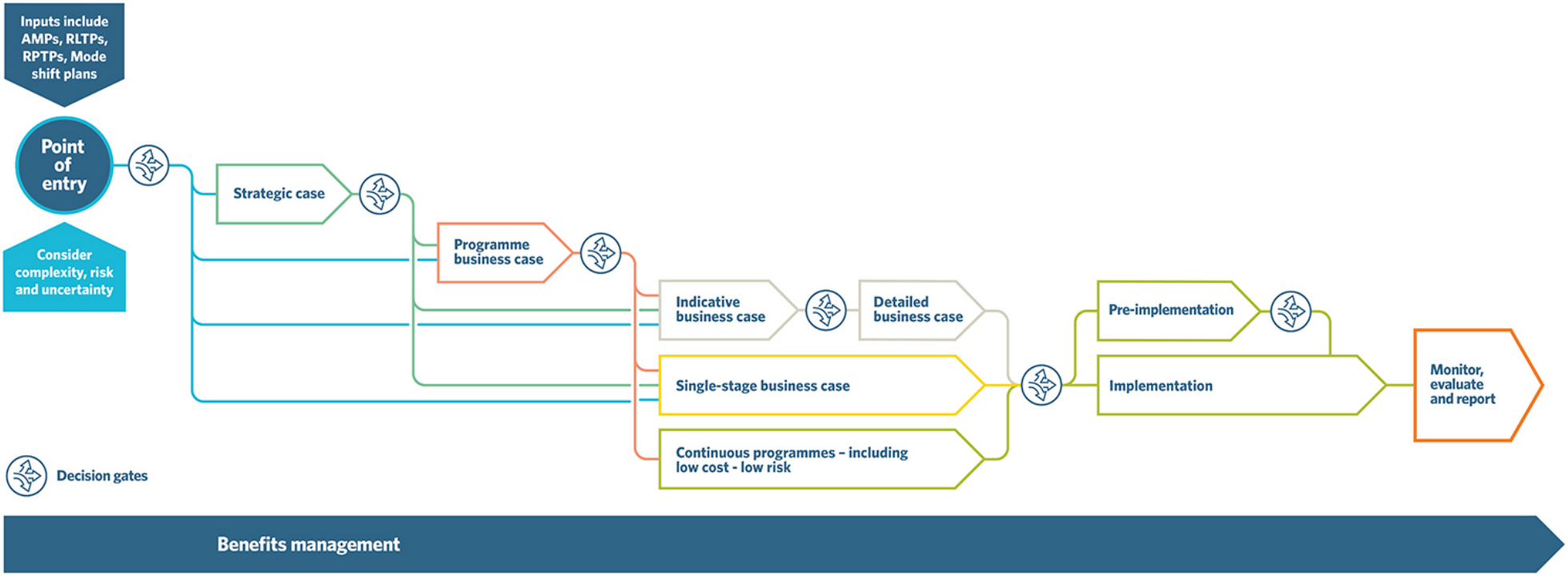
# Appendix A: The Waka Kotahi Investment Decision-Making Framework

**Figure A.1 The Investment Decision-Making Framework and business case decision pathways (reprinted from Waka Kotahi, 2020, p. 4)**






**Notes:**

AMP = activity management plan

ATAP = Auckland Transport Alignment Project

GPS = Government Policy Statement on land transport

LGWM = Let's Get Wellington Moving

LTP = long-term plans

NLTP = National Land Transport Programme

ONRC = One Network Road Classification

RLTPs = regional land transport plans

RPTPs = regional public transport plans