Infrastructure Investment

Supporting Better Decisions

Summary of Report

August 2010
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Introduction

Public infrastructure investment is a key driver of the economy, delivering a wide range of services that underpin the material standard of living of all New Zealanders. Modern society relies on infrastructure for domestic markets to function efficiently, for export goods to be produced and for social interaction to occur. The OECD suggests that investment in infrastructure, particularly in network infrastructure such as transport and communications, seems to boost long-term economic output more than other kinds of physical investment.

Investing in productive infrastructure is one of six policy drivers in the Government’s ‘Jobs and Growth Plan for New Zealand’ intended to help the country recover from the effects of the global financial crisis. Such infrastructure investment is designed to help increase the growth in productivity; maintain high levels of employment; reduce our vulnerability to adverse events; and close the gap with Australia by 2025.

The Resource Management Act (RMA) has for some time been the bête noire of the development community, while decision-making practice has been somewhat under the radar. Refinement of the approvals processes for projects of national significance and other enhancements were enacted with the 2009 amendment to the RMA. More changes are to come under Phase Two of the reforms.

This research for the New Zealand Centre for Advanced Engineering (CAENZ) has developed another agenda for reform which is designed to enhance decision-making on infrastructure investments. It is apparent from the collective wisdom of the interviews with leading decision-makers, a survey of infrastructure businesses, the case studies, literature analysis and experience of the study team members that the quality of decision-making practice on infrastructure investments is quite varied. There are some instances of leadership rising above poor or partial analysis and others where decision-makers have pursued questionable projects against well-founded advice. There are similarly some examples of the use of innovative methods and others of poor analytical practice. Both sides of the process need to be aligned to make good investment decisions efficiently.

The study has identified remedies in approach and method, in use both here and overseas which can address these issues, at least in part. Some aspects of the required reforms can be implemented simply through information and training. Others require some investigation and demonstration. None the methods are so technically demanding to be ultimately beyond competent analysts (although some are currently operating at a modest level). All require the adoption of rigorous and more standardised process by decision-makers and analysts alike.

It is now timely for such reforms. The publication of the National Infrastructure Plan provides a platform that was previously absent. There is now a range of improved analytical tools which can support decision-makers seeking to understand possible wider economic benefits, network effects and opportunities being evident as real options. There are also effective methods for incorporating a range of social, cultural and environmental factors into the assessment which, taken together with the extended economic analysis, can achieve the intent in the National Infrastructure Plan of improving the advice provided to decision-makers. Together these tools will provide a richer evaluation of infrastructure proposals being considered by government and the private sector.

The Study

The new emphasis now being placed on the role of infrastructure investment comes at a time when there has been growing concern that New Zealand was suffering the consequences of under-investment in network infrastructure in the 1980s and 1990s. Some of this is attributed to aspects of the decision-making process including the way advice is provided (other factors include different government priorities, and different perspectives on infrastructure development, like the notion that electricity generation would develop close to load centres, obviating the need to upgrade the National Grid).

The net effect was falling investment in infrastructure as a proportion of GDP in the latter part of the 20th century, Figure 1. Investment in ‘Transport and Storage’ and ‘Electricity, Gas and Water Supply’ declined through the 1970s and 1980s to settle at around 2% in the 1990s and early 2000s after peaking at 6.5% in 1975. Investment in telecommunications rose fitfully through the 1970s and 1980s only to reverse with the privatisation of Telecom and revive (but not grow significantly) with the onset of competition.

These two drivers of increasing significance and the consequences of the decline in investment prior to 2000...
prompted the CAENZ to undertake a study designed to promote discussion on ways to enhance current practice to achieve high quality outcomes when making public infrastructure investment decisions.

The study, led by CAENZ Programme Director John Boshier, was undertaken between December 2009 and June 2010. The work was based on seven main inputs:

1. An assessment of complications and extensions of Cost Benefit Analysis by Dr Arthur Grimes of Motu Economics;
2. An exploration of the possibility of using macro-economic modelling to assess the relative productivity benefits of investment in different forms of infrastructure by Kel Sanderson of BERL Economics;
3. Evaluation of the Baseline through a international literature review of decision-making frameworks and option assessment; and a survey of managers involved in infrastructure investment by Rob Steel of Opus Consultants;
4. Means to assess social outcomes, including social and cultural impact assessment and extensions of CBA by Dr Peter Phillips of Dialogue Consultants;
5. An examination of tools to assess wider economic effects and the analysis of real options by Murray Ellis of Dialogue Consultants;
6. Interviews with eleven decision-making leaders by Tony Nicklin, a Director of CAENZ;
7. Case studies on four major infrastructure projects in the Auckland region.
   - the Britomart Transport Hub project was reviewed by Nik Vorster of ARTA;
   - the New Lynn Transport Project was reviewed by Alan Rodgers-Smith of Waitakere City Council with an invaluable commentary by Mayor Bob Harvey;
   - the Waikato Water project for Auckland was reviewed by Dr Deborah Corneby of Watercare; and
   - the final section of the Albany to Puhoi Realignment of SH1 was reviewed by Ben King of Ernst & Young.

Interviews with Leading Decision-makers

Eleven individuals, including past Cabinet Ministers, local government mayors, chairs and directors of major companies (both SOEs and private sector), were interviewed. Common themes on how the investment decision process could be improved were identified in the interviews including:

- Having a shared, long term vision and a high level infrastructure plan for New Zealand to support that vision;
- Making greater use of systems thinking and considering the network effects of any individual project;
- Developing the ability to be able to prioritise between sectors;

Figure 1: Infrastructure investment as a proportion of GDP. Source: NZCID
• Providing a stable regulatory environment recognising that public policy drives infrastructure development;
• Intuition backed by experience is an important component of the decision-making process;
• Broader societal measures should be considered in the evaluation process;
• The impact on business confidence and perception is not well understood in the evaluation process;
• Separating the governance and management to limit the political interference during the project delivery; and
• Better utilisation of past experience and learning.

There is strong alignment between this agenda and the themes explored in the study with a number addressed directly in the recommended reforms. These include the inclusion of wider economic effects, networks effects and real options; a mechanism for prioritisation between sectors; incorporation of social outcomes; recognition of the distribution of costs and benefits; quality assurance through the Gateway Review process and benefits management planning and benefits realisation testing.

The overall structure of the diagnosis and reform identified by the study is summarised in Figure 2.

Operationalising Strategy

Many of the decision-makers interviewed in the study commented on the need for a strategy for infrastructure development. The National Infrastructure Plan is a substantial improvement over past practice that did not see a role for such a plan. It provides a framework to enable government agencies and the private sector to better coordinate the provision of infrastructure. That said, an overall strategic framework for infrastructure investment is missing and sector-specific legislation and policy statements are relied on to provide guidance for project appraisal.

Invoking strategy and vision is not a laissez passer to avoid analysis, in fact, quite the reverse. The scale of an overarching strategy is such that there needs to be significant interaction between strategic intent and analysis to ensure that strategy is firmly grounded and that there are clear objectives, standards and targets. This is one of the major benefits of Logical Framework Analysis in that there is no room for equivocation in the matrix. Ends, means, and measures are thoroughly integrated.

Some of the concerns about strategy may be addressed by greater transparency in the reporting of analyses and

<table>
<thead>
<tr>
<th>Process</th>
<th>Diagnosis</th>
<th>Reform</th>
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</thead>
<tbody>
<tr>
<td>Vision</td>
<td>No long-term vision for national development as context for infrastructure planning.</td>
<td>Adopt long-term vision for national development as context for infrastructure planning. National Criteria.</td>
</tr>
<tr>
<td>Option Definition</td>
<td>Narrow definition of options, inappropriate scale of project, failure to consider non-build options, network effects, agglomeration effects, etc.</td>
<td>Better exploration of regulatory, governance and ‘better use’ options; ensure scope considers real options; use of Logframes, Investment Logic Maps.</td>
</tr>
<tr>
<td>Analysis</td>
<td>Some poor practice; confusion of economic and financial analyses; narrowness – failing to properly address wider economic, social and environmental effects; lack of transparency; optimism bias.</td>
<td>More standardised approach to CBA and financial analysis including wider economic effects and distribution analysis. Use enhanced MCA for non-monetised social and environmental attributes.</td>
</tr>
<tr>
<td>Decision-making</td>
<td>Intuition and analysis in conflict; ‘pork barrel’; undocumented value judgements; disregard of analysis; inappropriate regulatory environment.</td>
<td>Better presentation of analysis, including risk; more comprehensive analysis; transparency of decisions; regulatory reform for monopoly suppliers.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Limited on-going assessment in implementation; risk of interference in implementation.</td>
<td>Preparation of benefits management plan; regular planned reviews of business case; wider use of Gateway process for quality assurance during project design and implementation.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Inadequate or absent assessment of project outcomes; failure to learn from experience.</td>
<td>Systematic benefits realisation testing. Transparency in reporting of project analyses.</td>
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Figure 2: Enhancing decision-making on infrastructure investment
decisions and by ‘closing the loop’ through benefits management plans and benefits realisation testing. A key element in this is the development of indicators which provide the (sometimes missing) link between vision and analysis, and which are then used to assess outcomes. Other concerns may be addressed by more comprehensive analysis, including wider economic, social and environmental effects that reduce the gap between what decision-makers intuit on the basis of their experience and what is covered by analysis.

Better Project Definition and Quality Assurance

There is often inadequate exploration of options despite the availability of volumes of guidance. The Infrastructure Australia experience highlights the issue thus: “A broad range of options to solve the problems was not considered – many submissions jumped directly to large-scale, expensive capacity enhancements, without any consideration of ‘non-build’ solutions such as changes in regulations, governance arrangements or introducing demand management measures to make better use of existing infrastructure.” The development of investment alternatives should consider a wide range of possible solutions, including non-build opportunities, bundling or integrating projects into a programme, pricing, and the examination of the use of complementary networks.

There are various techniques particularly Investment Logic Mapping that can be used to assist the process of option identification. This can be used in conjunction with the Gateway Review process which provides an effective mechanism for on-going quality assurance. Whether or not the Gateway Review process is adopted, it is appropriate that proponents of all major infrastructure projects develop and implement a Benefit Management Plan against which project outcomes can be progressively evaluated.

Enhanced Cost Benefit Analysis

An overview of the approaches to assessment used by leading government agencies in the UK, Australia and New Zealand confirms a number of similarities in existing assessment practices. Perhaps the most striking is the consistency of use of Cost Benefit Analysis (CBA) as the primary tool to evaluate infrastructure investment. There is also strong consistency of method including the approaches to valuing benefits and adopting assumptions in terms of identifying the source of information, sensitivity analysis and validation.

What has been happening in recent years is the extension of scope of cost-benefit analysis and complementing it with other forms of assessment. This is evident in initiatives like the New Approach To Appraisal (NATA) by the Department for Transport in the United Kingdom, the monetisation of a wider range of social effects by the New Economics Foundation. These enhancements can go a long way towards bridging the gap between the breadth of information sought by some decision-makers and what is provided by some cost benefit analyses. It would be fair to say that in general New Zealand has been slow to adopt extensions to cost benefit analysis to cover a wider range of economic and social effects.

Wider Economic Effects

Wider economic effects derive from improving the efficiency with which markets operate through agglomeration, mitigating existing market failures, and through an increased output in imperfectly competitive markets. A detailed discussion of these effects is provided in a report to NZTA prepared by Steer Davies Gleave.

Improvement in transport links improves efficiency in a number of ways including the facilitation of closer production linkages. In sectors where there are economies of scale, this results in productivity improvements; raising efficiency as well as the volume of production. Reduced barriers also enable businesses to relocate to more central locations to further gain economies of scale while still being able to access the resources (such as labour, materials and components) they need from the hinterland. Such agglomeration benefits are typically the most important of the wider economic effects. They are fully additional to the benefits captured in conventional CBA appraisal.

Wider economic effects can also include other improvements to the efficiency of economic activity through enhanced competition, labour market effects, taxation, trade gains, and technology and knowledge transfer.

A trial application of the method developed for the UK Department for Transport commissioned by the NZTA examined the Waterview motorway extension project. This established the workability of the procedure in New Zealand. The wider economic effects calculated in that study add another $250m, or 23%, to the conventionally captured benefits. While the method in this case is specific to road transport, the same general principles apply in other sectors.
Measuring Productivity Gains to Assist Budget Allocation

The research has identified an approach to the vexed question of selecting the most productive investments after exploring both ‘top-down’ and ‘bottom-up’ approaches. The preferred approach is ‘bottom-up’ by considering the productivity gains offered by individual projects and network-based programmes based on an extended cost benefit analysis which includes consideration of wider economic benefits, Figure 3. The chart, which was developed for assessing transport projects and is used in various forms in several countries, has been augmented by adding the left hand column to clearly identify the components of the benefits of a project that represent productivity gains.

The ‘bottom-up’ approach builds on the benefits of a more standardised approach to analysis recommended by the study by enabling a portfolio of high performing projects to be built up which have been evaluated on a comparable basis. This enables a more nuanced approach to investment decisions than the somewhat blunt instrument of the question as to “which sector (such as electricity, roading, or telecommunications) is the best to invest in?” There are also significant technical and practical issues which militate against such a macro/top-down approach. These include the abstraction of the assumption of perfect markets, the significant portion of infrastructure which is not traded and therefore does not have market prices, and the limitations of available data.

The budget allocation issue can be addressed by using more standardised analysis methods that enable comparisons to be made between sectors by ranking the full range of proposed projects and identifying the incidence of high-performing projects that can’t be funded. There may be a case for switching funds into sectors with more high value projects (especially those which offer high productivity gains) that would otherwise not go ahead through lack of funds.

Such an approach is a pragmatic response to the conclusion of Fozzard that an all-embracing theory was probably a mirage in stating “Perhaps the most important conclusion to be drawn from the present review is that resource allocation decisions in the public sector may be guided by technical analysis but are made through a political process in which technical analysis is but one, and not always the most important, consideration.”

Social Outcomes in Cost Benefit Analysis

Cost benefit analysis has been extended from a focus on the direct measurable costs to include a wider range of factors. Recent experience in Europe in handling socio-economic/indirect effects was analysed as part of the HEATCO project.

One of the approaches to extending the valuation of costs and benefits is the Social Return on Investment (SROI). While developed principally as a tool for non-governmental organizations it has recently been applied to the proposed addition of capacity (Third Runway) at London’s Heathrow Airport.

Key features of SROI include disaggregation of impacts across a range of stakeholders; and a more extensive

![Figure 3: Productivity gains identified by extended cost benefit analysis](image-url)
use than previously of financial proxies to value things that are not traded through subjective assessment, similar traded goods or services; and analysing data on spending patterns.

A distinctive feature of the Heathrow analysis is the valuation of community impacts that are commonly identified in consultation and social impact assessment but rarely quantified in project analyses. These factors include ‘blight’, the loss of value in the fabric of the community and the costs of living with uncertainty prior to a decision, or prior to a scheme coming into operation. Such considerations are not typically quantified; just as in New Zealand the effects on properties not crossed by public infrastructure are not compensable under the Public Works Act 1981.

Scoping Projects: Network Effects and Real Options

The way a project is scoped and the bounds of the effects that are evaluated are central to maximising the productivity of investments. Silo-thinking can inappropriately limit the scope of a project or curtail the assessment of benefits that might occur. The assessment of network effects and the exploration and evaluation of real options can go some way to addressing these issues, but cannot of themselves open people’s eyes to the possibilities.

Network effects are a core issue in project definition in terms of making sure that the scope of the project that is assessed captures the full range of potential effects within a network. The central issue is that the effects of an enhancement to one part of a network can depend not only on the consequences on other parts of the network, but also the enhancements implemented on the other parts. This can mean that individually all enhancements appear uneconomic even when the enhancements would all appear worthwhile when viewed collectively. One important factor, especially to governments is the resilience of infrastructure networks. An evaluation of their ability to withstand the effects of external events and recover from damage should be included in the analysis.

A simple example is a road with four congested sections. In effect, there are four bottlenecks in a row. Upgrading one section (but not the others) offers few benefits since this would just result in aggravated congestion on the others. Hence no investment appears warranted. Nevertheless upgrading all four sections would result in substantial net benefits. With all the bottlenecks removed a substantially increased flow of traffic is possible.

What constitutes the ‘network’ that should be analysed is not always a simple question. It is not always the collection of links in a single mode system like a motorway network. The New Lynn Transit Centre is a good example where the network comprised elements of rail, road, bus services, car and passenger access and commercial building development. Analysing the links on any one of these would have served little purpose. The whole integrated combination of interacting components needed to be analysed and compared with its alternatives. The commercial building component is an example of a real option since they would not happen without the interchange, but the commitment to construction and then delivery of the rail infrastructure provides the platform for commercial construction.

The interest in real options for the analysis of infrastructure investments arises because providing improved infrastructure can create opportunities for further investments. One classification defines five types:

- **Waiting-to-Invest option**: holding the necessary resources available to make an investment, but waiting until the time to do so is propitious;
- **Growth option**: building an asset that can have its capacity expanded at a later date;
- **Flexibility option**: the ability to alter the course of the investment after it is built;
- **Exit option**: the ability to get out of an investment. Virtually all infrastructure can be either run down if it proves to be redundant, or to have its life extended if it has ongoing value beyond its design lives; and
- **Learning option**: making an investment enables the holder to learn about an uncertain quantity, technology, or opportunity.

Cost-benefit analysis has not conventionally included the potential benefits that might come from subsequent projects or development. However, where projects have clearly identifiable consequences in enabling other projects to go ahead, then it is valid to include this value in the project assessment.

There are two quite distinct cases for considering real options in infrastructure investment:

- initial infrastructure investment can be enhanced in some way that facilitates further investments in that infrastructure or its use;
- infrastructure investment creates opportunities for further investment in the industries that use the infrastructure.

The importance of options created by certain infrastructure investments means that a standard needs
analysis may need to be supplemented by an ‘opportunities analysis’. Some caution is needed when the possibility is purely speculative. Rather than attempt a doubtful valuation it may be better to assess the extent to which the project falls short of breaking even without including any option value. The question for decision-makers is then whether they are prepared to believe that the option is worth at least that much.

Social Outcomes

Social impact assessment (SIA) is an evaluation tool designed to facilitate understanding of the distribution of positive and negative effects of particular resource developments, policies, and plans at local, regional and national levels. It includes the identification of strategies to avoid, remedy or mitigate the adverse effects of development, plans and policies, and, increasingly, to enhance the extent of benefit enjoyed by the affected and interested parties and wider communities. There has been a perception that the assessment of social effects has been unduly focused on the negative effects, but this is not inherent in the method.

Social impact assessment is often undertaken as part of the project assessment process but is more importantly a tool for ongoing monitoring and evaluation, working with the affected communities to manage the identified effects. Various jurisdictions have established SIA as a statutory requirement, typically as part of an environmental impact assessment. These are progressively becoming more systematised with the more extensive provision of guidance. The State of Queensland, for instance, is currently consulting on guidelines for preparing a social impact management plan.

There is growing recognition that overall results of cost benefit analyses can obscure distinct sets of ‘winners’ and ‘losers’. This variation in outcomes between groups in society is now being incorporated within or alongside cost benefit analyses typically through income weighting, distributional matrices, and stakeholder analysis.

The revision of the Green Book in 2004 in the UK highlighted the need to consider distributional issues and recommended the adjustment of benefits to reflect the impact of proposals on different income groups. It also notes the need to consider other distributional impacts, such as those associated with gender, marital status and race. Guidance in the NATa requires the core Appraisal Summary Table to be supported by an analysis of ‘distribution and equity’. This can include distributional analysis across dimensions other than income, such as between regions, between rural and urban areas, by gender, by race and so on.

Presenting The Results Of Financial And Economic Analyses

An issue in project analysis is the confusion that sometimes occurs between financial and economic analyses. The economic analysis is to show whether the proposal is in the interests of society in general, while the financial analysis is to show whether or how the agency can afford it (given the existing financial arrangements).

The State of Queensland uses government-owned corporations to carry out much of its infrastructure development. The Department of Infrastructure and Planning in the State has developed a matrix to present the outcomes of financial and economic analyses which gives precedence to the economic analysis in terms of advice on the investment decision. This matrix has been developed further in part as a response to the advocacy by a number of stakeholders at a CAENZ Distinguished Fellows Forum for a project ‘rating’ measure after the manner of Standard and Poors. While performing a similar function the matrix is not sequential between the main classes (it does not run A1, A2, A3, B1, B2...) like a credit rating. In the matrix the highest performing projects would be classed as A1, with 1-3 various levels of BCR above 1 (positive NPV) and 4-6 various levels of BCR below 1 (negative NPVs).

There are a number of instances in class ‘B’ where projects might well proceed despite a negative financial analysis. A simple example is road safety measures where there are clear social benefits, but no revenue implications.

Multi-criteria Analysis

The use of MCA is a response to the challenges of incorporating a range of factors into the assessment of infrastructure and the inherent problems of valuing non-traded services and the ecological, spatial and social effects of a project. The claim for MCA is that it makes it possible to evaluate several alternative projects or variants on various quantitative and qualitative criteria and thereby take into account all the effects arising from a project, policy or programme. MCA is undertaken using a range of rigorous methods including the Analytical Hierarchy Process, ELECTRE, and the PROMETHEE methods in a wide range of jurisdictions.
One of the better techniques developed for practical application to infrastructure decisions is set out in the NATA by the UK Department for Transport. The criteria now cover: environmental impact, safety, economy, accessibility, and integration. These specific items relate to transport, and to some degree to the UK, but the model can readily be translated into other infrastructure sectors and countries.

MCA is a valuable tool to incorporate factors that cannot be monetised into analysis and for reducing long lists of options. It complements rather than substitutes for CBA both in terms of timing when it is undertaken and in terms of coverage. It should not include financial information, i.e. the agency’s own incomes and expenditures for the project in the assessment. Financial aspects of a project relate to the agency’s ability to fund the project and withstand its subsequent costs. This issue must be resolved before the project can go ahead, regardless of its merits on any other grounds. Hence financial matters run in parallel with the MCA without being part of the MCA assessment.

The credibility of MCA can be assisted by more transparent reporting, particularly in terms of scoring and weighting. Where these measures use interval scales and arithmetic to determine rankings, these data should be open to scrutiny and public consultation as with Melbourne Water. Wider involvement in generating weightings gained through stakeholder consultation would also be advantageous.

While MCA allows consideration of a wide range of factors, it should be recognised that the final step in making decisions is in many respects a multi-criteria assessment itself. It is not appropriate for officials/analysts/technicians to seek to simulate what is the responsibility of decision-makers.

The Case for Standardised Methods Used in Sequence

The New Lynn Transit Centre makes a fascinating case for standardisation of analytical methods and the extension of cost benefit analysis to include wider economic and network effects. The project is about $305m of public capital expenditure, with about another $350m in private land development following as a result.

The project involves:
- putting the Auckland western rail line into a one km trench (opened in March 2010);
- building a bus and train station above it (to be opened in October 2010);
- integrating a new road network above it; and
- vigorously encouraging new land development to occur around this new transport infrastructure (the first new commercial development is planned to begin construction in November 2010 for completion in early 2012).

The genesis of the project was a planning charrette held in 1996 that began the process of reviving the whole town centre of New Lynn. From the mid-1990s Waitakere City, led by Mayor Bob Harvey, determined its strategic vision to build and retrofit all of its main town centres.
around the rail lines, and contain most of its growth within existing City limits.

One of the interesting aspects of this project (grounded in the City’s ‘Greenprint’ strategy) was the relationship between strategy and analysis. Mayor Harvey states: “Each of the decision-making bodies – Watercare, NZTA, Waitakere, ARTA, ARC, Kiwirail, Treasury and Cabinet – all had different ways of deciding this thing in its many stages. It was simply not possible to stabilise a common Benefit-Cost ratio or decision-making procedure between all of these entities. But it was only Waitakere that had the decision-making freedom to measure and evaluate all of the costs and benefits of such a major infrastructure intervention as if they were an organic whole. The rest of them had their own clip-boards.”

The adoption of a standard portfolio of methods would not only reduce the frustration faced by innovators like Mayor Harvey but also create a level field in terms of various sectors competing for funds – there would be a more equal process in terms of the identification of benefits at which some agencies presently appear to be better than others. This would alleviate the risk of a sub-optimal allocation of investment resources if, for example, intangible benefits are included in one project but not with another because of different agency practices.

In essence the approach should be to monetise what can be monetised and then deal with social, cultural and environmental aspects that can’t be monetised (like the concept of ‘mauri’) by appropriate means. One of the more interesting frameworks for systematic and sequential analysis is that used by Melbourne Water with its Triple Bottom Line (TBL) assessment. What differentiates a TBL Assessment from a purely financial assessment is the extent to which it takes into account the broader effects on the environment and society. An important feature of the Melbourne Water approach is that the weighting used in the multi criteria analysis is based on widespread consultation based on the understanding that “the weight given to factors and the identification of relevant distinguishing factors is subjective and cannot be decided by ‘experts’ in isolation.” Sensitivity analysis, changing the discount rate, and modelling probability distributions for uncertain effects are then used to incorporate risk and uncertainty in the decision-making.

Wider Economic Benefits and Institutional Change

As the CAENZ study went ahead the emphasis progressively shifted from diagnosis of the issues to potential remedies. The importance of securing wider...
economic benefit from infrastructure investment has also become increasingly apparent to ensure that the full value of larger, more complex projects is properly assessed. This in turn led to consideration of some institutional issues in relation to the monopoly SOEs that were not anticipated at the outset of the project.

Frameworks currently applied to monopoly suppliers (specifically the Grid Investment Test) are too narrow and need to incorporate a wider range of considerations and use a greater range of analytical tools. The regulation of monopoly infrastructure providers should be revised in such a way that the wider benefits of new investment may be partly captured by the provider or recognised by dedicated funding. In this way, there is increased incentive and capability to provide additions to the network for the benefit of the community.

Cautionary Tales from Overseas

The study has included an extensive canvas of overseas practice in decision-making frameworks and assessment. Two aspects of this overseas experience are particularly salutary. The first relates to projects in North America, Europe and Asia. It suggests that enthusiasm for incorporating a wider range of benefits needs to be tempered by an appreciation of how the existing, more limited analysis has been used and abused.

Bent Flyvbjerg\textsuperscript{18} analysed 258 transportation infrastructure projects in many jurisdictions over a 30 year period covering a total investment of €90 billion. Flyvbjerg found that costs had been underestimated in 90% of projects they examined. This is not, unfortunately, an isolated case. A study by Hugo Priemus of 210 transport infrastructure projects representing an investment of US$62 billion (2006 prices), for instance, looked at the forecast demand with actual traffic during the first year of operation of these projects and found that over 50% of projects overestimated demand\textsuperscript{19}.

The second cautionary tale relates to the experience of Infrastructure Australia from 2008 when it issued a call for proposals for funding for nationally significant infrastructure\textsuperscript{20}. Issues arising in the proposals beyond poor project definition included:

- Some initiatives did not support Infrastructure Australia’s strategic priorities or make a significant impact on national productivity;
- There was little attempt to define or quantify the problem that the initiative would solve, so that the case for action was not clear. As a result, it was often not clear why the initiatives submitted had been prioritised above other potential candidates;
- A broad range of options to solve the problems was not considered – many submissions jumped directly
to large-scale, expensive capacity enhancements, without any consideration of 'non-build' solutions such as changes in regulations, governance arrangements or introducing demand management measures to make better use of existing infrastructure; and

- Many initiatives, including those seeking immediate funding, were presented with limited or no supporting economic analysis, with flawed analysis, or with analysis which showed that projects were likely to be economically unviable.

The Infrastructure Australia experience is somewhat daunting given the efforts made to promote good proposals reflected in: a clearly articulated strategy; detailed guidelines; and competition for funds which might have been expected to encourage proponents to do a decent job. Even with all these conditions of a good RFP met, many applications were apparently flawed at the most fundamental level.

This analysis has echoes in other inputs to this report, including the interviews with leading decision-makers. None of this, however, is a rejection of analysis per se, far from it, but rather:

- a cautionary note against boosterism in claiming benefits; and
- an agenda for change in the manner in which analysis is conducted and reported.

### An Agenda for Reform

The study makes 13 recommendations to support better decisions on infrastructure investment:

1. Augment the Government’s long term vision and strategy for infrastructure investment with quantified performance indicators and national criteria for project selection, and include these in the National Infrastructure Plan.

2. Operationalise the relationship between strategy, project planning, and evaluation through the use of Logical Framework Analysis which clearly defines the links between ends, means, measures, assumptions and resourcing.

3. Promote the use of Investment Logic Mapping and the inclusion of the governance viewpoint at project inception to add rigour to problem identification, to ensure wide coverage in options definition, and to capture opportunities.

4. Prepare and foster the adoption of a standard portfolio of analytical tools and indicators to ensure comparability of investment proposals that would capture:

   - directly monetised user benefits (as in Treasury’s The Primer);
   - wider economic effects;
   - productivity gains;
   - network effects;
   - life cycle costing;
   - social effects that can be monetised;
   - distribution of effects between stakeholders/communities;
   - effects that cannot be monetised (principally social and environmental).

5. Undertake investigations to show how the value of ‘real options’ might be incorporated into analyses of infrastructure investments.

6. Develop a process using the standardised project assessments to present the economic benefits and productivity gains of projects and programmes in different sectors to inform the discussion of budget allocation between sectors and develop a portfolio of high-performing investments.

7. Extend the use of the State Services Commission’s Gateway Review Process across the public sector including agencies and local government.

8. Require a Benefit Management Plan for every major infrastructure project.

9. Revise investment tests for monopoly infrastructure (such as the National Grid and the permanent way for rail) to take into account wider economic effects.

10. Undertake a study of benefits realisation testing on a range of past investments to determine lessons that can be learned and identify exemplars for the promotion of good practice to be used with the portfolio of methods.

11. Undertake a pilot benchmarking project across a range of central and local government agencies on the quality of analytical methods and tools used for infrastructure investment.

12. Establish an on-going programme of publication of analyses of investment proposals to provide increased transparency on infrastructure investment advice and decision-making.

13. Undertake an upgrade of the statistics on infrastructure to facilitate better planning, monitoring and evaluation.

### Endnotes


3. This was developed for the US Agency for International Development (USAID) in the 1960s. It has since been extended by GTZ - German Technical Cooperation where it is known as the ZOPP method.


8. Fozzard, A (2001), The Basic Budgeting Problem Approaches to Resource Allocation in the Public Sector and their Implications for Pro-Poor Budgeting, Overseas development Institute, Centre for Aid and Public Expenditure.

9. A range of factors continue to be excluded from the analyses, for instance, the value of unpaid labour outside of the market (child-rearing, charitable unpaid work etc.) which is a major contributor to society.


