

Cost Benefit Approaches to Valuing Nature: Case Studies in New Zealand

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Summary

Section 32 of the Resource Management Act requires councils to evaluate the alternative options. Pure, fully monetised cost benefit analysis (“CBA”) is in theory the ideal preferred approach for evaluations, but it is at one extreme of a whole spectrum of related approaches based on the level of detail and quantification or monetisation.

In practice, few if any s32 analyses are fully monetised, and in fact many if not most are either purely qualitative (descriptions or matrices) or a mix of qualitative and quantitative (numerical or scoring). However, there are other examples across the entire spectrum.

Keywords: evaluation, monetised, council, cost benefit analysis, RMA section 32

Scope

This paper is a review of existing New Zealand case studies and literature outlining council approaches on current best practice Cost Benefit Analysis (“CBA”) methodology as applied to section 32 and other environmental policy initiatives. This paper addresses the section 32 RMA requirement to evaluate proposed policies and methods, and in particular the potential for greater detail and monetisation or quantification. The intention is to inform the quality of council policy and spending proposals, by providing guidance on the issues that should be considered, and how proposals could be assessed, particularly when evaluating environmental effects and natural values

The paper is structured as follows:

The paper begins with an introduction of the importance of sound decision-making and the main legislative requirements on councils regarding their decision processes. This is followed by the methodology, comprising an overview of the theory of cost benefit analysis, including principles of valuation and comparison, plus a discussion of what level of quantification or monetisation is expected in practice in New Zealand. Next, the paper looks at case studies in New Zealand categorised by their level of monetisation. Finally, the paper ends with some concluding remarks.

1. Introduction

Councils have limited resources, and the efficient use of those resources has a major impact on the welfare and living standards of citizens. Councils need to maintain and enhance the benefits provided by the natural environment, but also to minimise the financial and economic costs to the community. Conversely, councils need to ensure that the benefits of growth and economic development can be achieved with minimal environmental costs.

Section 32 (“s32”) of the Resource Management Act (“RMA”)¹ requires councils to evaluate any proposed regional or district plan, plan change or variation. They must assess whether the proposed policies and methods are the most appropriate way in which to achieve the objectives, in terms of their efficiency and effectiveness.

The Local Government Act 2002 (“LGA”), sections 76 to 79, requires a similar evaluation process regarding council decision-making, namely to identify all reasonably practicable options, and assess their impacts. Impacts include financial, economic, social, cultural and environmental costs and benefits to both current and future generations. The LGA requirements cover not only district plan proposals, but also Council decisions that are not directly related to the RMA, such as bye-laws, capital expenditure and the provision of services and infrastructure to meet social and economic objectives.

In order to manage the trade-offs between the various environmental and non-environmental costs and benefits of their decisions, councils need some way to evaluate the alternative options. Pure, fully monetised cost benefit analysis (“CBA”) is in theory the ideal preferred approach for evaluations, but it is at one extreme of a whole spectrum of related approaches based on the level of detail and quantification or monetisation.

However, the LGA s79 requires a council to exercise judgement regarding the level of detail and quantification or monetisation in evaluations supporting its decisions. The more significant the decision, the more detail is required. Also, the less costly it is to obtain detailed information, the more detail is required.

2. Methodology

2.1 Overview of Cost Benefit Analysis (“CBA”) in Theory

Cost Benefit Analysis (“CBA”) is a decision tool that strives to capture all significant impacts of an option, both negative (costs) and positive (benefits), and express them as either a single net total value or a single ratio. Costs and benefits include not just financial impacts such as council expenditures, but also non-financial impacts such as environmental, economic and social ones. All effects are considered, including unintended ones.

¹ See Appendix Two for the full text of RMA s32

CBA is done from the viewpoint of society as a whole, but as the sum of all the individual impacts on all the individual “winners” (experiencing the benefits) and “losers” (experiencing the costs) in the society. The impacts are assessed from the standpoint of the “winners” and “losers” themselves, in line with their own perceptions, preferences and values.²

In order to compare different kinds of impact and generate a single value, a common metric is required within impacts, and a common weighting system between impacts. The common unit of measure is money, so no further weighting is required.

Impacts are monetised based on the individuals’ estimated willingness to pay (“WTP”) to receive a benefit or avoid a cost, or their willingness to accept (“WTA”) compensation for losing a benefit or incurring a cost.³

Environmental values for CBA can include “non-use values” as well as “use values”. Non-use values include non-human existence values, either of individual animals or of whole ecosystems or properties such as “bio-diversity”. Provided human stakeholders value it and are willing to pay towards it (or trade it off against some other benefit), it can legitimately be included in a CBA evaluation.

2.2 Principles for Valuation and Describing Costs and Benefits

Pure, fully monetised CBA is, in theory, the ideal preferred approach for evaluations, but it is at one extreme of a whole spectrum of related approaches based on the level of detail and quantification or monetisation. The spectrum can be divided into three broad categories as follows:

- *Qualitative (non-numerical)* descriptions of costs and benefits. For example: “costs include fencing of numerous streams, which will be a significant cost”
- *Quantitative (numerical)* measures of costs and benefits, but without monetisation. For example: “costs include fencing of five kilometres of streams, which will be a significant cost”
- *Monetised* measures of cost. For example: “costs include fencing of five kilometres of streams, which will total \$50,000, comprising five kilometres of fencing at \$10,000 per kilometre”⁴

2.3 Legal Requirements and Expectations in Practice

Section 79 of the LGA requires a council to exercise judgement regarding the level of detail and quantification or monetisation in evaluations supporting its decisions. The more significant the decision, the more detail is required. However, the more costly it is to obtain detailed information, the less detail is required.

In the specific instance of planners undertaking or commissioning s32 analyses, an important authoritative source of guidance from central government is the MfE-

² Centre For European Evaluation Expertise (Eureval-C3E), 2006, page 8

³ For further discussion of problems and solutions in monetisation, see the other papers in this suite, “Cost Benefit Approaches: Valuing Nature” (Auckland Council, 2011) and “Is Benefit Transfer a Reliable and Useful Policy Tool?” (Auckland Council, 2010)

⁴ Enfocus Limited, 2008

sponsored “Quality Planning” guidance note.⁵ The Quality Planning guidance note encourages a pragmatic graduated approach to implementation of the RMA (“the depth of analysis should be commensurate with the scale of the proposal”), with full monetisation required only in extreme cases.

“It is theoretically possible to determine a monetary value for difficult-to-measure costs and benefits (using a variety of valuation techniques); but in practical terms such an approach is likely to be feasible for only a small number of interventions and/or a limited number of costs and benefits.”⁶

The document does include a warning that more significant decisions about policies and methods will still require more detailed analyses, with higher levels of monetisation that are more akin to a full cost-benefit analysis:

“As a general rule, potentially high economic and social costs will require in-depth analysis of the method's impact, possibly using a detailed, and more highly monetised cost-benefit analysis. When the costs are likely to be high, the community will also expect a clear explanation - and quantification - of the method's environmental benefits.”⁷

Costs or magnitudes are not the only determinant of detail required, as explained in the following quote:

“The depth of analysis required will also be influenced by the issue's importance, complexity, and degree of 'newness'.”⁸

The following section looks at case studies in New Zealand, categorised based on their level of detail and monetisation.

3. Application in New Zealand – Case Studies

Few if any s32 analyses are fully monetised, and in fact many if not most are either purely qualitative (descriptive) or a mix of qualitative and quantitative.

The MfE Quality Planning website⁹ cites several case studies as best practice for various aspects of s32 evaluation. They include varying degrees of quantification and partial monetisation, but none of them are fully monetised.

⁵ Ministry for Environment, 2008

⁶ Ministry for Environment, 2008

⁷ Ministry for Environment, 2008

⁸ Ministry for Environment, 2008

⁹ Ministry for Environment, 2008. The website is based on a guidance note, whose development is described as follows:

“This guidance note has been prepared by Sarah Dawson, Carey Barnett and Andrew Purves from Boffa Miskell. It is based on guidance published in July 2000 by the Ministry for the Environment.

“The note was subsequently updated by Tania Richmond from Richmond Planning Limited (2004) and by Incite (2005) to reflect the Resource Management Amendment Act 2005.

“The note has been further updated by Bianca Hurrell and Richard Peterson of Harrison Grierson Consultants Ltd in July 2008. It was finalised by Gerard Willis of Enfocus Ltd, Gina Sweetman of Sweetman Planning Services Ltd and Matt Hickman from the Ministry for the Environment in December 2008”

The full spectrum of detail and monetisation can be divided into the following categories, which are described below along with relevant case studies:

3.1 Purely Qualitative Descriptions

The most basic form of assessment is a purely qualitative description of the costs and benefits for each option. The options can then be compared by comparing the descriptions. If there is only one option (the proposal) plus the status quo, then the descriptions of the costs and benefits of the proposal can be compared to the status quo.

3.1.1 Waipa Bilimag Rezoning:

Waipa District Council's decision on proposed private plan change 53 to the Waipa District Plan¹⁰, involving commercial re-zoning at the behest of private property development group Bilimag, is a good example of a purely qualitative assessment using only non-numerical descriptions of a single option relative to the status quo. It documents how the council is meeting its obligations under s32 (2) to undertake a further evaluation before making its decision on a plan change. The decision sets out the decision-maker's consideration of how the proposed objectives, policies and methods will support the purpose of the RMA. The decision also provides a comprehensive assessment of how the proposed policies and methods (in this case zoning) would efficiently and effectively achieve the objectives by providing a tiered activity status for specific zoning rules.

Like many s32 reports, in considering the appropriateness of the proposed policy and methods, the assessment utilises a matrix that includes columns related to effectiveness, efficiency, benefits, costs and uncertainty.

The analysis is entirely qualitative and descriptive, with a strong focus on intervention logic rather than numbers, which is reasonable in the circumstances. Waipa is a small district with limited resources and should not fully re-litigate what has become fairly common practice for commercial re-zoning.

3.1.2 Manukau Wairoa Maritime Village:

The s32 report for proposed plan change 13 to the Manukau Operative District Plan¹¹, to re-zone Wairoa River Maritime Village, illustrates current industry good practice when using a purely qualitative descriptive approach to evaluating multiple alternative planning methods to achieve the proposed outcome. The report provides a summary discussion of the three broad alternative methods considered (i.e., doing nothing, implementing an existing residential zone and creating a new specialised zone). It then proceeds to consider these methods in terms of their benefits and costs in relation to environmental and social outcomes.

The report subsequently includes an evaluation of the appropriateness of each of the proposed objectives, policies and methods. The report includes an assessment of each

¹⁰ Waipa District Council, 2007

¹¹ Manukau City Council, 2005

objective and its appropriateness; it also sets out how each policy has been considered in terms of the benefits and costs in relation to the relevant objectives while having regard to their overall efficiency and effectiveness.

The objectives and policies have been broken into various subsections as they relate to the broad resource management issues. These are:

- social, economic and cultural wellbeing, health and safety
- maintenance and enhancement of amenity values
- managing adverse effects.

In using this approach the analysis provides a reasonable level of detail and complexity in a simple and understandable manner. The report clearly sets out how the approach is considered the most appropriate and links this to how the plan change will be appropriate in achieving the purpose of the RMA. Given the circumstances and the nature of the decision, there seems no reason to believe that further detail (i.e. quantification) would improve the decision in this instance.

3.2 Qualitative Description Matrix

When there are multiple options embodying various combinations of common or similar impacts, it is often convenient to list those impacts in a table or matrix, and then for each option, describe how the option will affect that impact.

3.2.1 Wellington Infill:

The s32 report for proposed plan change 56 to the Wellington City District Plan¹² (managing infill housing development), provides a good example of how to present the resource management issue within broader planning and policy issues in order to determine the necessity for the proposed provisions.

While presenting this broader context, the report has successfully summarised the s32 process undertaken by the council by purposefully focusing on the pivotal changes to resolve the issue being addressed. This approach, particularly the evaluation matrix which clearly outlines the preferred option, means that the effects of the proposed plan change are easily linked to the wider issue, enabling the public to be aware of the issues as well as the potential costs and benefits.

The analysis is purely qualitative (non-numerical), which is perhaps appropriate in the circumstances, given that it relates largely to the amenity impacts of changing site coverage and lot size. The impacts are diverse, complex and a matter of individual preferences, which would make them difficult to quantify robustly.

3.2.2 Dunedin Airport:

The s32 report for Proposed District Plan Change 3 to the Dunedin City District Plan¹³, (regarding Dunedin Airport), provides an example of how the costs and

¹² Wellington City Council, 2007

¹³ Dunedin City Council, 2007

benefits of the proposed policies and methods should be assessed together with the risk of acting or not acting if there is uncertain or insufficient information.

The report includes a matrix table¹⁴ that sets out an assessment of the rules as a package and then also provides a more detailed examination of specific rules. Both the process and analysis are easy to understand and effective, as a clear link is provided between the costs and benefits and the social, environmental and economic risks associated with each provision or package of provisions. The matrix includes specific columns that summarise the considerations of the risk of acting or not acting.

This approach means that the s32 report can easily be interpreted by the public, while effectively conveying the necessity of the proposed new provisions including the risks of acting or not acting.

However, ease of interpretation comes at a cost, in terms of detail. This analysis is entirely qualitative and descriptive. The overall option of creating a special zone is described and compared to several other options and shown to be clearly preferable. However, the detailed implementation elements are only qualitatively compared to “do nothing”, and would benefit from further detail or quantification. For example:

“Manage the location and scale of retail activities

Cost: Increase cost of land at airport

Benefit: Effects upon airport resource and activity areas are avoided”

Although highly plausible, and in common practice in other cities (as they show in an appendix comparing other cities), it is not necessarily clear that the benefits of this option outweigh the costs, without further quantification of some kind.

3.3 Numerical Quantification (Non-Monetary)

In some cases, the amount of particular impacts can be estimated in raw numeric terms, such as *instances of enforcement per activity* (say dairy shed discharges). If there are only a small number of impacts, it can be useful to compare the raw numbers directly. In more complex cases, however, there are often two major shortcomings:

- It can be difficult or costly to assign a unit of measure (and to perform the measurement forecast) to some of the impacts (e.g. benefits to the community from building height restrictions)
- It can be difficult for the reader to assess trade-offs of one type of benefit for another if they are in different units of measure

In practice, although some examples include numerical descriptions, they tend to combine them with qualitative (non-numerical) descriptions, rather than quantifying all impacts. And where all impacts are quantified, they tend also to be either scored or partially or fully monetised (see below).

3.4 Ranking or Scoring (Unweighted)

¹⁴ A copy of the matrix is included as Appendix Three

There are a range of non-monetary techniques for assessing costs and benefits, ranging from simple ranking through to complex scoring and weighting.

One way to measure a cost or benefit in non-monetary terms is to apply value in accordance with a simple rating scale such as, for example, -5 to +5. Consultation with resource users and the community may aid in determining the 'score' given to different costs and benefits.

Alternatively, the highly subjective nature of many of the costs and benefits can be acknowledged by simply rating them on a narrative 'low, medium, high and very high' spectrum.¹⁵

3.4.1 Canterbury Lakes:

The s32 report for Variation 1 to Environment Canterbury's Proposed Natural Resources Regional Plan Chapter 6, Beds and Margins of Lakes and Rivers¹⁶, is recommended by MfE as a best practice example of how to evaluate whether the objectives are the most appropriate to achieve the purpose of the RMA at a regional level.

The report includes two matrices used to assist in evaluating the appropriateness of both proposed policy options and the methods to implement the policies. The first matrix provides a summary of the matters considered in the Council's s32 assessment. The second uses a ranking approach of low, moderate or high to subsequently evaluate the related appropriateness of each option. This means that the appropriateness of options can be easily ascertained in terms of where there are high levels of effectiveness, efficiency and benefits versus the costs and uncertainty relative to the other options considered.

The analysis is quantitative, but only in terms of subjective rankings of impact intensities. In this instance, the ranking happens to result in options that are clearly superior due to being "dominant". (An option "dominates" another if it is better in at least one aspect, and no worse in all other aspects.) So there are no trade-offs to be made between being better in one respect and worse in another, which would otherwise have required more detailed analysis to resolve.

The policy options are clearly shown to be the most efficient and effective way to achieve the objectives; however, the objectives themselves might benefit from more detailed analysis. For example, they assert that although one of the objectives "may result in some limitations on the use of land by the owners of the margins, the individual costs are considered to be outweighed by the benefits to them and to the wider community."

This may well be true, but compliance costs do not appear to have been thoroughly analysed in detail in this example, which appears to be fairly typical of generally accepted best practice.

3.5 Weighted Score or Index (E.g. Multi Criteria Analysis "MCA")

¹⁵ Ministry for Environment, 2008

¹⁶ Environment Canterbury, 2004

Evaluation balance sheets can be developed to provide a quantified value for each cost and benefit. This approach involves:

- Defining an indicator for each type of cost and benefit. For example, an indicator for administrative cost might be instances of enforcement per activity (say dairy shed discharges).
- Developing a rating scale (usually 0 to 10) to enable the extent to which the indicator is met to be quantified. For example, more than 50 enforcements per 100 operating dairy sheds might be rated 10 (i.e. highest cost); between 50 and 40, rated 9, between 35 and 40 rated 8 etc).
- Developing and applying a weighting factor such that some benefits and costs are accorded more importance. This is usually achieved by allocating a percentage of the total cost to each type of cost (for example administration cost might be allocated 10% of the total cost, compliance costs on resource users 25% etc).
- Summing figures and subtracting cost from benefit.

While such approaches ensure costs and benefits are quantified and therefore have an appearance of greater rigour, they are obviously open to manipulation and need to be carefully designed to ensure they are justifiable.¹⁷

3.5.1 Infrastructure Auckland MCA:

The weighted score or index method corresponds to the “Multi Criteria Analysis” that was used extensively by Infrastructure Auckland and required by them to be used by the councils they funded. The method as applied had its supporters, but was found by others to be cumbersome and sensitive to subjective values and interpretations.

In fact, rating or scoring scales that sum different factors are mathematically identical to fully monetised approaches, if one of those factors is money (i.e. financial impacts such as construction costs and fuel expenditure savings). The units of the scoring system constitute a common “currency” used to value each factor. And if money is one of those factors, then the number of dollars per scoring unit enables the scoring for each factor to be converted into a dollar equivalent.

3.6 Partial Monetisation

According to MfE “Having some costs and benefits monetised and some not is an acceptable approach. In such cases, the monetised values should provide a benchmark for the qualitative and subjective assessments also included. Such an evaluation needs to disclose how it would rate the monetised values, which then needs to be used to 'calibrate ' the subjective assessment.”¹⁸

In fact, if the calibration were done comprehensively and fully quantified, then this would be comparable to a weighted score or index (or MCA) that could be converted

¹⁷ Enfocus Limited, 2008

¹⁸ Ministry for Environment, 2008

to a fully monetised analysis. In practice, the calibration tends to be less comprehensive and quantitative, as can be seen in the following example.

3.6.1 Canterbury Air Quality:

The s32 report for the Air Quality Chapter of the Proposed Canterbury Natural Resources Regional Plan¹⁹ includes a good example of a partially monetised cost-benefit analysis for a controversial issue (how to reduce emissions, particularly from domestic wood burners). The economic costs and benefits to the community could be quantified for some of the alternative methods. For example, the report states that there is a net economic benefit, in the long term, in banning open fires because of their poor heat output for the amount of fuel used. However, it also identifies that there is an overall net economic cost to the community in upgrading old wood burners and banning new wood burners in new houses. The environmental costs and benefits are qualitative descriptions, due to the difficulty in quantifying health and amenity benefits and costs generally. (But see example 7(d) below “Air Quality National Environmental Standard”, regarding quantifying health impacts.)

The s32 analysis combines the qualitative and quantitative parts of the cost-benefit analysis to give an overall qualitative efficiency rating (low, moderate, high). The cost and benefits are easily identified in a table, with the more feasible methods being highlighted.

The environmental purposes are largely taken as a given, albeit with substantial analyses of causality to health impacts. The desirability of achieving them (versus do nothing) is not subject to a fully monetised cost benefit analysis.

3.7 Full Monetisation

As the name suggests, full monetisation involves converting every impact to a monetary equivalent. The analysis should cover environmental, social and cultural impacts as well as financial and economic impacts; it should include the long term effects; and it should take account of future as well as present affected parties.

The “Environmental economics” field has generated an extensive range of tools to monetise environmental and social impacts, which are the subject of the other papers in this suite.

None of MfE’s Quality Planning case studies included full monetisation. In fact, I am not aware of ANY s32 evaluation that had full monetisation. However, full monetisation has been undertaken for other important council decisions, and central government ones, as discussed below.

3.7.1 Transfund/NZTA Transport Projects (Standard Values for CBAs):

Outside of the RMA process, most large transport projects have been subjected to a form of full monetisation CBAs, formerly based on Transfund/NZTA’s Project Evaluation Manual (“PEM”) and now based on the revised version known as

¹⁹ Environment Canterbury, 2002

NZTA's Economic Evaluation Manual ("EEM"). The PEM/EEM has standard values for many social and economic factors such as waiting time and deaths avoided.

The NZTA's Economic evaluation manual - volume 1 (EEM1) is the industry's standard for the economic evaluation of transport activities and is used by approved organisations for economic evaluation and the preparation of funding applications to the NZTA. The EEM1 sets out procedures and values to be used for the calculation of benefits such as savings in travel time, increased trip reliability, changes in vehicle operating costs, reduced accident costs, as well as benefits from increased transport user comfort, reduced driver frustration and impacts on the environment and non-transport users.²⁰

The EEM now includes a new methodology option specifying how to calculate and monetise wider economic impacts such as employment generation and productivity improvements. However, other than the emissions reduction benefits, the PEM/EEM does not explicitly monetise most environmental impacts, such as habitat loss and water quality. Instead, analysts are advised that:

"There are various techniques that allow economic values to be assigned to benefits, e.g. willingness to pay, avoidance or mitigation costs. Where benefits that do not have monetary values in this manual are considered likely to be significant, it may be desirable to undertake such an analysis.

"Where no monetary value is available, the benefits should be described and where possible quantified, and also reported as an input into the NZTA's funding assessment"²¹

In practice, many project sponsors tend instead to physically mitigate or remedy negative environmental impacts, as part of the construction compliance cost.

3.7.2 Waitakere Council Building Relocation (Estimations-Based CBA):

Various other council project evaluations have been undertaken that include supposed full monetisation CBA's, although again the environmental component is often problematic or not a major issue. One example is Waitakere City Council's "Civic Future" relocation project²².

The council had outgrown their original building, and were spread across several sites, which was affecting operational efficiency and ongoing costs. The solution was to consolidate in one large building. They had to decide whether to enlarge their original building, or sell it and construct a new larger building at a more central location (or do nothing and remain dispersed).

Enlarging the original building was the cheapest solution. However, constructing a new building in the heart of Henderson was found to be preferable, because it would stimulate the economy in the town centre and generate more employment. The

²⁰ NZTA, 2010

²¹ NZTA, 2010

²² Waitakere City Council, 2002

difference in environmental impacts was expected to be minor, so the project evaluation focussed instead on travel costs, employment generation and operational efficiency (and construction costs).

3.7.3 Auckland Coastal Ecosystems (Discrete Choice Model Partial CBA):

An attempt was made in 2010 by Auckland Regional Council (“ARC”) consultants to monetise the environmental benefits to Auckland of stormwater improvements to the Waitemata Harbour²³. Advanced and highly sophisticated Discrete Choice Modelling survey techniques were used to calculate individuals’ levels of willingness to pay for various types of improvements to the environment (or willingness to accept compensation for various reductions in environmental quality).

Discrete Choice Modelling surveys a sample of residents and asks them to make a series of choices between two or three options. The options embody various combinations of discrete levels of the various environmental features, plus a monetary element paid or received. Respondents’ preferences indicate their willingness to trade one feature for another and for money.

These were then aggregated to generate seemingly robust estimates of the total monetised value of improvements to the coastal and marine environment. However, the results have yet to be incorporated into any specific s32 analysis of an individual project or policy measure.

3.7.4 Air Quality National Environmental Standard (Benefit Transfer CBA):

On behalf of Ministry for Environment, the consultancy NZIER has undertaken a fully monetised CBA of the National Environmental Standard (“NES”) for air quality²⁴.

Two options were analysed, namely compliance by 2013 or by 2020. The analysis was quite comprehensive, including quantitative estimates of all of the significant benefits and costs and their monetary values.

The benefits were valued primarily using “benefits transfer”, namely applying benefit values already established in other studies. The main benefits were actually reductions in costs of three health impacts:

- Premature deaths (at \$3.4 million/death – Value of Statistical Life²⁵)
- Hospitalisations (at \$8,400/hospitalisation – financial costs only)
- Reduced Activity Days (“RADs”) (at \$46/RAD – loss of work time only)

A variety of benchmarks were used to value the health impacts, including in particular the NZTA transport Economic Evaluation Manual but also other relevant studies. The authors consider that their estimates are conservative, in that some

²³ ARC, 2010

²⁴ NZIER, 009

²⁵ Value of Statistical Life (“VoSL”) is an average value based on the amount people are willing to pay to reduce the risk of death

benefits were omitted, notably loss of life quality per hospitalisation (estimated at \$335,000) and per RAD (not quantified).

The main costs were found to be compliance costs of replacing wood-burners for home heating. Census and other survey data were used to calculate the number of households affected (potentially 290,000); the proportion affected per year is based on the asset replacement life (15 years or 6.7%) or an accelerated schedule; compliance cost was estimated elsewhere as \$260 per scheduled replacement and \$3,000 per premature replacement of wood-burners.

The authors acknowledge that their calculations are subject to substantial error margins, but they consider that the calculated benefit cost ratio is high enough (3.9:1 for 2013 and 3.2:1 for 2020) for the conclusions to be robust under reasonable sensitivity analyses.

4. Concluding Remarks

In the New Zealand context of section 32 (“s32”) of the Resource Management Act (“RMA”), few if any s32 analyses are fully monetised, and in fact many if not most are either purely qualitative (descriptions or matrices) or a mix of qualitative and quantitative (numerical or scoring). However, there are other examples across the entire spectrum.

For pure compliance purposes, full monetisation is generally not seen as legally required, except possibly in extreme circumstances (such as major transport projects). However, new techniques, resources and databases are increasingly more readily available, offering increasing opportunities to improve decision-making by applying more monetised approaches. More detailed review of those approaches, and their applicability in New Zealand, are the subject of the other two papers in this suite, namely “Cost Benefit Approaches: Valuing Nature”²⁶ and “Is Benefit Transfer a Reliable and Useful Policy Tool?”²⁷

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APPENDIX ONE: GLOSSARY OF ACRONYMS

ARC – Auckland Regional Council

BCR – Benefit Cost Ratio

C3E - Centre for European Evaluation Expertise

CBA - Cost Benefit Analysis

CEA- Cost Effectiveness Analysis

CER - Cost-Effectiveness Ratio

CUA – Cost Utility Analysis

DEA – Data Envelopment Analysis

EC – European Community

EEM - Economic Evaluation Manual (NZTA) – see also PEM

Eureval – see C3E

ICER - Incremental Cost-Effectiveness Ratio

LGA - Local Government Act 2002

MCA/MCE – Multi Criteria Analysis/Evaluation

MfE - Ministry for the Environment

n/a – not applicable

NES – National Environmental Standard

NPV – Net Present Value

NZIER – New Zealand Institute for Economic Research

NZTA - New Zealand Transport Authority

PEM Project Evaluation Manual (Transfund/NZTA) - now called EEM

PV – Present Value

QALYs - Quality-Adjusted Life Years (years of human life saved or lost, weighted by quality of life in terms of pain, health and disability (0 = dead, 1 = perfect health))

RMA - Resource Management Act 1991 (as amended by Resource Management Amendment Act 2005)

S32 – Section 32 of the RMA

VoSL – Value of Statistical Life (based on the amount people are willing to pay to reduce the risk of death)

APPENDIX TWO: RESOURCE MANAGEMENT ACT SECTION 32

Resource Management Act 1991 No 69 (as at 16 December 2010),

http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html?search=ts_act_resource+management+act_rese&p=1&sr=1

32 Consideration of alternatives, benefits, and costs

(1) In achieving the purpose of this Act, before a proposed plan, proposed policy statement, change, or variation is publicly notified, a national policy statement or New Zealand coastal policy statement is notified under [section 48](#), or a regulation is made, an evaluation must be carried out by—

- (a) the Minister, for a national environmental standard or a national policy statement; or
- (b) the Minister of Conservation, for the New Zealand coastal policy statement; or
- (c) the local authority, for a policy statement or a plan (except for plan changes that have been requested and the request accepted under [clause 25\(2\)\(b\)](#) of Schedule 1); or
- (d) the person who made the request, for plan changes that have been requested and the request accepted under [clause 25\(2\)\(b\)](#) of Schedule 1.

(2) A further evaluation must also be made by—

- (a) a local authority before making a decision under [clause 10](#) or [clause 29\(4\)](#) of Schedule 1; and
- (b) the relevant Minister before issuing a national policy statement or New Zealand coastal policy statement.

(3) An evaluation must examine—

- (a) the extent to which each objective is the most appropriate way to achieve the purpose of this Act; and
- (b) whether, having regard to their efficiency and effectiveness, the policies, rules, or other methods are the most appropriate for achieving the objectives.

(3A) This subsection applies to a rule that imposes a greater prohibition or restriction on an activity to which a national environmental standard applies than any prohibition or restriction in the standard. The evaluation of such a rule must examine whether the prohibition or restriction it imposes is justified in the circumstances of the region or district.

(4) For the purposes of the examinations referred to in subsections (3) and (3A), an evaluation must take into account—

- (a) the benefits and costs of policies, rules, or other methods; and
- (b) the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the policies, rules, or other methods.

(5) The person required to carry out an evaluation under subsection (1) must prepare a report summarising the evaluation and giving reasons for that evaluation.

(6) The report must be available for public inspection at the same time as the document to which the report relates is publicly notified or the regulation is made.

APPENDIX THREE: DUNEDIN AIRPORT EVALUATION MATRIX

	OPTION 1 Status Quo	OPTION 2 Expand the designation purpose	OPTION 3 Provide for airport related activities in the Rural Zone	OPTION 4 Establish a new airport zone	OPTION 5 No controls
Benefits	<p>Environmental Benefits</p> <ul style="list-style-type: none"> • consideration of activities and effects on case-by-case basis • rural amenity remains priority • Existing sewage and water infrastructure able to cater for activities <p>Social Benefits</p> <ul style="list-style-type: none"> • enables participation of community in consent process <p>Economic Benefits</p> <ul style="list-style-type: none"> • low additional implementation cost as using existing 	<p>Environmental Benefits</p> <ul style="list-style-type: none"> • Continues to protect the airport physical resource • Existing sewage and water infrastructure able to cater for activities <p>Social Benefits</p> <ul style="list-style-type: none"> • Airport operations continue to be provided <p>Economic Benefits</p> <ul style="list-style-type: none"> • Minimal implementation costs for DIAL and for Council • Initial cost of notice of requirement • certainty for DIAL 	<p>Environmental Benefits</p> <ul style="list-style-type: none"> • rural amenity retains importance • Existing sewage and water infrastructure able to cater for activities <p>Social Benefits</p> <ul style="list-style-type: none"> • provides choice for travellers and other users of airport <p>Economic Benefits</p> <ul style="list-style-type: none"> • plan change can readily adapt existing provisions • range of sites throughout 	<p>Environmental Benefits</p> <ul style="list-style-type: none"> • enables integrated management of the airport resource and its effects, and rationalise the existing zones • clear policy intent designed to meet issues • Existing sewage and water infrastructure able to cater for activities <p>Social Benefits</p> <ul style="list-style-type: none"> • provides choice for travellers and other users of airport <p>Economic Benefits</p> <ul style="list-style-type: none"> • certainty of activities for adjoining landowners <p>Economic Benefits</p> <ul style="list-style-type: none"> • airport can continue to develop 	<p>Environmental Benefits</p> <ul style="list-style-type: none"> • none identified <p>Social Benefits</p> <ul style="list-style-type: none"> • choice and variety provided for airport users <p>Economic Benefits</p> <ul style="list-style-type: none"> • airport can continue to develop

	provisions		the Rural Zone provides choice	• effects upon activity centres can be managed	
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Costs	<p>Environmental Costs</p> <ul style="list-style-type: none"> • ad hoc development assessed on case by case basis may result in inefficient use of resource and loss of rural amenity • Existing zones do not relate well across boundaries • Case by case activity assessment results in inefficient use of infrastructure & difficult to plan for future demand <p>Social Costs</p> <ul style="list-style-type: none"> • Need for adjoining landowners to be aware of activities and resource consent 	<p>Environmental Costs</p> <ul style="list-style-type: none"> • DIAL may not accept conditions being applied on designation to mitigate potential effects • Effects may not be adequately managed • Infrastructure may require upgrading with increased demand <p>Social Costs</p> <ul style="list-style-type: none"> • adjoining landowners only involved at notice of requirement stage <p>Economic Costs</p>	<p>Environmental Costs</p> <ul style="list-style-type: none"> • airport activities may not be concentrated but spread throughout the rural zone • potential conflict with other activities in rural zone • Infrastructure may require upgrading with increased demand <p>Social Costs</p> <ul style="list-style-type: none"> • potential conflict with adjoining sites <p>Economic Costs</p> <ul style="list-style-type: none"> • cost of 	<p>Environmental Costs</p> <ul style="list-style-type: none"> • Reduction in the area of Rural, industry and residential zoned land • Without controls on size and location other activity areas in city at risk • Existing infrastructure unable to cope with wide range of activities and requires upgrade <p>Social Costs</p> <ul style="list-style-type: none"> • Reverse sensitivity or other effects from activities established on site <p>Economic Costs</p> <ul style="list-style-type: none"> • cost of 	<p>Environmental Costs</p> <ul style="list-style-type: none"> • Loss of rural amenity • Airport physical resource at risk from competing uses and other inappropriate activities located in close proximity • Commercial areas of the city at risk <p>Social Costs</p> <ul style="list-style-type: none"> • Increased potential for conflict with surrounding landowners <p>Economic Costs</p> <ul style="list-style-type: none"> • Costs of compliance
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	<p>process</p> <p>Economic Costs</p> <ul style="list-style-type: none"> • costs of resource consent to applicants • monitoring and enforcement costs to Council 	<ul style="list-style-type: none"> • if appropriate conditions not imposed on designation potentially significant impacts on activity centres, such as Mosgiel. 	plan change process	plan change, compliance costs	and legal action <ul style="list-style-type: none"> • Cost of plan change to remove current controls
Effectiveness and Efficiency	Existing situation is ineffective in addressing issues including integrated management of resource.	Does not address all the issues adequately, particularly effects on surrounding environment and commercial centres.	Does not address all issues. Potentially ineffective if airport activities are not limited in location.	Effectively deals with issues managing effects while enabling the airport to develop. Provides certainty for DIAL, Council and surrounding landowners.	No certainty that issues can be addressed. Inefficient with high costs to the environment and community.