
under: the Resource Management Act 1991

In the matter of: Hearings on Submissions on the Proposed One Plan

between: Fonterra Co-operative Group Limited

Submitter

and: Horizons Regional Council

Respondent

Statement of evidence of Thomas Brent Layton on behalf
of Fonterra Co-operative Group Limited

Dated: 17 June 2008

Date of Hearing: 2 July 2008

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STATEMENT OF EVIDENCE OF THOMAS BRENT LAYTON

INTRODUCTION

- 1 My full name is Thomas Brent Layton. I appear on behalf of Fonterra Co-operative Group Limited (*Fonterra*).
- 2 I am the Chief Executive of the New Zealand Institute of Economic Research Inc. (*NZIER*). As the Chief Executive I am the Chief Economist of NZIER and *ex officio* a member of its Board.
- 3 I graduated from Victoria University of Wellington with a Bachelor of Commerce and Administration degree in Economics, a Bachelor of Arts with First Class Honours in Economic History and Econometrics and a Ph.D. degree in Economic History.
- 4 I have over thirty years experience in the application of economics in various spheres, including as an academic and in the operation of a wide range of businesses. In the 1990s I was a Director and later Deputy Chairman of HortResearch, the government's horticultural-based research organisation, when its headquarters were in Palmerston North. I was Chairman of AgResearch from 1999 to 2002. I was made an Officer of the New Zealand Order of Merit in 1997 for services to business management and was elected a Fellow of the Institute of Directors in New Zealand in 2003.
- 5 In my economic consultancy activities I have engaged in a wide range of work, but I specialise in regulatory economics. My work in this area has included consideration of the efficiency implications of various rules and regulations relating to the use and transfer of property rights.
- 6 Work of particular relevance to the Proposed One Plan includes not only a number of projects involving environmental economics but also a wide range of work in the regulatory area, including:

- 6.1 Chair of the Rules Committee of the New Zealand Electricity Market during the time the rules for the wholesale electricity market were designed;
 - 6.2 Chair of the Transport Working Group of the Electricity Governance Establishment Committee which established the initial rules for the regulation of electricity transmission;
 - 6.3 Advisor to the Commerce Commission on the development of the settlement agreement to regulate Transpower New Zealand Limited;
 - 6.4 Author of a report on regulatory objectives for the Commerce Commission;
 - 6.5 Author of a report on the regulatory role of the Electricity Commission; and
 - 6.6 Member of the Advisory Committee which reviewed the regulatory control provisions in Parts 4, 4A and 5 of the Commerce Act 1986.
- 7 I am familiar with the Proposed Horizons One Plan (*Proposed One Plan*) to which these proceedings relate.
- 8 I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court. Except where I state that I am relying upon the specified evidence of another person, my evidence in this statement is within my area of expertise.
- 9 I have endeavoured to be accurate and to cover all relevant matters relating to the topic on which I am giving evidence. I am not aware of any matters which might alter or detract from my conclusions which I have not included.
- 10 The assumptions on which my evidence is based are not, in my view, unlikely or unreasonable.

SCOPE OF EVIDENCE

- 11 My evidence will address:
 - 11.1 Whether the Section 32 Report prepared in support of the Proposed One Plan (the *s32 Report*) is consistent with good regulatory practice;
 - 11.2 Illustrate the consequences of some of the inadequacies of the analysis underlying the s32 Report by considering the likelihood some specific proposed policies will result in economically inefficient outcomes;
 - 11.3 Discuss other likely consequences of an inadequate s32 Report; and
 - 11.4 Suggest a potential way forward to avoid the unintended poor consequences likely to arise if the Proposed One Plan is implemented in substantially its current form.

SUMMARY

- 12 The s32 analysis leading up to the Proposed One Plan appears to fall well short of fulfilling adequately a number of the principles of good regulatory practice – efficiency, transparency, clarity, and equity.
- 13 The inadequacies of the s32 analysis have led to failures to identify inefficiencies in proposed rules and policies, including:
 - 13.1 Failures to identify the most efficient means to address agricultural operations, including the most appropriate way to reduce nitrogen leaching into waterways;
 - 13.2 Inappropriate preference for water takes for hydro-electric power generation when such takes may not correspond to the most efficient use of water resources; and
 - 13.3 Inclusion of potentially unachievable water quality standards.

- 14 The inadequacy of the s32 analysis may also undermine the public acceptability of the Proposed One Plan with the following consequences:
- 14.1 Increase the likelihood of appeals against decisions under the One Plan;
 - 14.2 Lower voluntary compliance and raise enforcement costs;
 - 14.3 Lower the credibility and standing of Horizons Regional Council (*Horizons*) as the community leader on recognising and addressing resource management issues; and
 - 14.4 Lead to on-going requests for changes and revisions of the One Plan.
- 15 In my opinion, the best option appears to be to proceed as currently planned for some issues, specifically those that are unlikely to be contentious, but go back and re-evaluate the approach to the more contentious issues to conform to the standards of good regulatory practice.

REGULATORY PRACTICE

- 16 In 1997 the predecessor to the Ministry of Economic Development (*MED*) published a *Code of Good Regulatory Practice*.¹ I have been involved in the development of a number of regulatory programmes, and I consider the *Code of Good Regulatory Practice* to codify sound regulatory decision-making principles.
- 17 In the context of the development of regulations the Government now requires:

¹ *Code of Good Regulatory Practice*, November 1997,
http://www.med.govt.nz/templates/MultipageDocumentTOC_22149.aspx
 (attached as **Appendix A** to this statement of evidence).

*Government agencies with the power to create or enforce regulatory frameworks ... to confirm that the principles of the Code of Good Regulatory Practice have been complied with....*²

- 18 I consider that compliance with the *Code of Good Regulatory Practice* is appropriate in the development of regional plans under the Resource Management Act 1991 (*RMA*). I hold this view for the following reasons:

18.1 As a matter of first principles, it is appropriate to develop regional plans in a manner that represents good practice. I realise that the *RMA* has particular processes under which plans are developed, but I am not aware of anything under the *RMA* that contemplates deviation from good regulatory practice.³

18.2 I consider that the principles in the *Code of Good Regulatory Practice* accord with the purpose of Section 32 of the *RMA*. As my colleague Mr Baker will explain, Section 32 requires local authorities to evaluate objectives to ensure they are the most appropriate way to achieve sustainable management and to examine whether policies, rules, and other methods are the most appropriate way to achieve the objectives.⁴ As I understand it, Section 32

² Cabinet Office Circular, Regulatory Impact Analysis Requirements: Update Guidance [CO (07) 3] at para 2.1 (attached as **Appendix B**).

³ I realise that one could argue that the *RMA* does not require equity per se, as it requires that certain matters (eg relationship of Maori with their ancestral lands) be provided for, see *RMA*, s6(e). Nevertheless, as a general principle, I consider that all other things being equal, the *RMA* should strive to achieve equity among regulated parties. As I explain below, the Proposed One Plan does not appear to treat people in like situations in a similar manner.

⁴ See Statement of Evidence of Nathan Neill Baker, Section 32 Requirements.

requires an analysis to ensure that proposed plans represent good regulatory practice.

18.3 Rules under regional plans "have the force and effect of a regulation."⁵ Therefore, like other regulations, regional plan rules should be developed in accordance with the *Code of Good Regulatory Practice*.

19 I therefore consider that the *Code of Good Regulatory Practice* provides a sound basis by which to evaluate the s32 Report prepared by Horizons in the development of the Proposed One Plan.⁶

20 The Code is short. It has only five principles and each principle is fleshed out by a small number of guidelines.

Principles

21 The principles are:

21.1 Efficiency: adopt and maintain only regulations for which the costs on society are justified by the benefits to society, and that achieve objectives at lowest cost, taking into account alternative approaches to regulation;

21.2 Effectiveness: regulation should be designed to achieve the desired policy outcome;

⁵ RMA, s68(2).

⁶ An Australian publication with a similar purpose is the Council of Australian Governments' guide to *Best Practice Regulation*. This was published in October 2007. The principles it contains are worded differently but are very similar in purpose and overall intent to those in the New Zealand *Code of Good Regulatory Practice*. If I used the Australian document as the basis of my evaluation of the adequacy of the s32 Report then I would reach the same conclusions as I have below.

- 21.3 Transparency: the regulation making process should be transparent to both the decision-makers and those affected by regulation;
 - 21.4 Clarity: regulatory processes and requirements should be as understandable and accessible as practicable; and
 - 21.5 Equity: regulation should be fair and treat those affected equitably.
- 22 As explained below, I am of the opinion that the s32 Report prepared by Horizons falls well short of fulfilling adequately a number of these principles and their accompanying guidelines.

Efficiency

- 23 The s32 Report contains too little by way of a discussion or attempted quantification of benefits and costs to society of most of the proposed approaches for a submitter to be confident that the benefits outweigh the costs for the chosen approaches and that they are the lowest cost option to achieve the objectives.
- 24 The environmental and community benefits and costs are listed in words and then ranked as to where they fall on a scale between low (L) and high (H). The same horizontal scale is used for each benefit and each cost and every option in every policy so how benefits should be assessed against costs is not obvious. Nor is it obvious how the benefits or costs of one option are to be assessed against the benefits or costs of another. If a benefit and a cost of an option are both rated high do they cancel one another out? If the benefits of two options are both rated low, for example, are they identical in dollar terms, if quantifiable?
- 25 For example, it is impossible to determine the relative costs and benefits of competing options to achieve water quality using the framework provided in the s32 Report. All options are combined in a single table using the horizontal scale for each option, with some options assessed as having higher costs and others as

lower. In conclusion of the water quality section, the s32 Report states that:

Taking into account the costs and benefits associated with the options identified, it is considered that options 1, 2, 3, 5, 6, 7, 8 and 9 are the most appropriate for achieving the objective. These options, used to varying degrees throughout the Region, are considered to be effective in managing water quality efficiently and effectively. The mix of regulation and non-regulatory methods is considered appropriate as it ensures that, where careful control is required the tools are available, and where there is a need for general education and changes in community approaches, softer methods are available.⁷

- 26 It is not apparent that Horizons has evaluated, for example, whether the regulatory approach proposed in Rule 13-1 is more efficient and will lead to better outcomes compared to a collaborative approach of working with farmers. In my opinion, such a perfunctory cost benefit analysis will not lead to efficient outcomes in which the benefits exceed the costs and costs are minimised, taking into account the alternative approaches to regulation.
- 27 Ms Marr, in the Officer's Report on the Overall Plan, concedes that the s32 analysis is not based on a consideration of costs and benefits. She states:

If there is merit in assessing the economic benefits and costs of particular policies then this will be done. ... We intend to do this with key parts of the [Proposed One Plan] and present this information in the topic hearings so it can be seen in its context.⁸

4 s32 Report at page 84.

8 Planning Evidence and Recommendations Report at page 57 (emphasis added).

- 28 Thus, the policies, rules and other methods have been chosen and publicly notified in advance of the evaluation of their benefits relative to their costs and the costs of alternatives; in other words, in advance of consideration of their efficiency. In my opinion, it is not consistent with good regulatory practice principles to decide on which approaches to propose without carrying out, so far as possible, an evaluation of costs and benefits first.
- 29 Nor does evaluation after notification appear to be in accordance with good decision-making or with the requirements of Section 32 of the Act. Good decision-making practice requires an assessment of competing options before a course of action is proposed. It is far better to start off in the right direction, than to try to change course mid-way through the journey. It is possible to fine-tune the approaches as you progress, but it is better not to have to reverse course.
- 30 Section 32 recognises the need to evaluate options before notification. Section 32(1) requires an evaluation to be carried out before public notification of the proposal. My colleague Mr Baker will discuss the requirements of Section 32(1), but for purposes of my analysis, I note that the evaluation “must take into account the benefits and costs of policies, rules, or other methods; ...”⁹
- 31 In New Zealand, quantification of costs and benefits, where possible, is considered to be an important element of good regulatory practice. In the Court of Appeal’s decision in the AMPS-A case in 1992 Richardson J said that it was the:

... responsibility of a regulatory body to attempt, so far as possible, to quantify detriments and benefits rather than

⁹ RMA, s32(4)(a).

rely on a purely intuitive judgment to justify a conclusion that detriments in fact exceed quantified benefits.¹⁰

I can see no reason that a similar level of analysis should not be required under Section 32. Quantification, where possible, is important for ensuring proposed rules and regulations are efficient in the sense that the costs do not exceed the benefits and the costs are minimised. It is also important for achieving other elements of good regulatory practice - transparency, clarity and equity.

- 32 Mr Maassen and Mr Percy in their Section 42A Reports appear to discount the usefulness of an economic analysis. For example, Mr Maassen states that:

It is not necessary for a s.32 analysis to provide an all embracing economic analysis of costs and benefits. That is because there are matters that do not lend themselves to economic evaluation.¹¹

- 33 Similarly, Mr Percy states that:

It is not a requirement of s32 to complete the evaluation using economic analysis.¹²

- 34 With respect, Mr Maassen and Mr Percy appear to miss the point. It is not simply a comparison of the costs and benefits of the effectiveness of a particular approach in which the costs may be quantifiable but the benefits (eg improved water quality) may be difficult to quantify. Rather, it is the comparison of the relative costs and benefits of competing approaches where the analysis pays its greatest dividends. For example, if two approaches

¹⁰ *Telecom Corp of NZ Ltd v Commerce Commission* [1992] 3 NZLR 429 at 447.

¹¹ Section 42A Report of John Maassen at para 34.

¹² Section 42A Report of Phillip Percy at para 30.

achieve the same end (eg better water quality) but one costs a fraction of the other, then the less expensive approach would be more efficient. However, absent a cost benefit analysis of competing options, it is impossible to know if one can achieve the same result at lower cost. In my view, the failure to assess the relative costs and benefits of competing approaches is a serious shortcoming of the s32 analysis.

Transparency

- 35 The Proposed One Plan, and its implications and likely effects, are far from transparent to those affected. What are the likely costs to various types of agriculture of the proposed Rule 13-1 relating to nitrogen leaching? How do these compare to the costs to agricultural operations operating under non-regulatory whole-farm business plans? What are the practical consequences for the future availability of water for agricultural irrigation of the exemption in Policy 6-16 of takes for hydro electricity generation from the calculation of minimum flows and core allocations? Why are takes for animal and food hygiene reasons not classed as essential takes in Policy 6-19? What would be the practical consequences and effects on water availability if they were?
- 36 In his section 42A Report, Mr Percy argues at some length that a s32 Report is required to be a summary report only. He concludes:

I believe that the s32 report prepared for the Proposed One Plan meets the requirements of s32 of the Act. It provides a summary of the evaluative process that Horizons undertook to develop the Proposed One Plan and provides a summary of the key documents, consultation and investigations that had informed the One Plan up until the date it was publicly notified.¹³

¹³ Section 42A Report of Phillip Percy at para 62.

In my view, the approach outlined by Mr Percy is a long way short of providing the transparency consistent with good regulatory practice principles.

- 37 Mr Percy appears to have overlooked an important point. Section 32(5) reads: "The person required to carry out an evaluation under subsection (1) must prepare a report summarising the evaluation and giving reasons for that evaluation." Thus, while the report should summarise the evaluation, for the reasons for the evaluation there is no qualifier, and a mere summary of the reasons is not sufficient.
- 38 I will leave the parsing of the phrases to the lawyers, but I note as an economist with considerable experience in establishing regulatory frameworks, it is essential to explain to the public what is proposed and why, if they are to contribute in a constructive and meaningful way to policy development and improvement. In my view, the s32 Report lacks sufficient transparency to ensure the public is adequately informed of the reasons why the various elements of the Proposed One Plan have been chosen over alternatives, or indeed what those alternatives might be.
- 39 A further matter highlights my reasons for concern about transparency. I note from Mr Percy's evidence that there has been a study relating to the proposed provisions for the management of nutrients from non-point sources.¹⁴ However, I understand that the results of this study were not available when the Proposed One Plan was formulated and notified. He indicates that the Proposed One Plan requirements are based on an *"initial evaluation, which was informed by input from a range*

¹⁴ Section 42A Report of Phillip Percy at para 72.

of professionals and agricultural experts, indicated that the cost to benefit ration [ratio?] was likely to be favourable.”¹⁵

- 40 The information provided about the “initial evaluation” upon which the policies are based is so sparse that the reasons for the evaluation are very far from transparent. The policies proposed could have extremely far reaching consequences for potential submitters. How are those reading the Proposed One Plan meant to decide whether they have something to be very worried about and worth making submissions on, or that the costs of the policies will be minimal?
- 41 To require each potential submitter to undertake their own research and their own cost benefit analysis and reach their own conclusions is inefficient and poor regulatory practice. However, this appears to be precisely what Mr Percy is proposing in his s42A Report when he states that “*submitters ... will need to provide evidence to support their position rather than simply attacking the evaluation already undertaken by the Council.*”¹⁶ Since the Council has not provided its evidence, submitters cannot judge its quality and robustness. Thus they do not have this to criticise and to inform them whether they need to seek their own evidence.

Clarity

- 42 I believe the points I have already made make it clear that the s32 Report lacks clarity. I reiterate that the horizontal scale used to assess the relative costs and benefits is far from clear. Furthermore, the overall assessment with respect to water quality appears to combine the majority of the options without clear elucidation of which options are most appropriate in which situations.

¹⁵ Ibid.

¹⁶ Section 42A Report of Phillip Percy at para 70.

Equity

- 43 In terms of equity, one aspect that the *Code of Good Regulatory Practice* identifies as important is horizontal equity: that people in like situations should be treated in a similar manner. One of the likely consequences of the Proposed One Plan is that different farmers will face very different costs of compliance.
- 44 For example, the costs of compliance are likely to be significantly different under the regulatory approach for some farming operations proposed under Rule 13-1 compared to the voluntary approach for other types of farming operations under Policies 5-1 and 5-2. In addition, the cost of abatement of nitrogen leaching per unit reduction is likely to differ widely for different farming operations under Rule 13-1.
- 45 In my view, as the likely wide disparity between farmers of the cost burden of the Proposed One Plan becomes more apparent, the equity of the approach advocated by Horizons will be seriously questioned by the community.

EFFICIENCY CONSEQUENCES

- 46 In my opinion, the failure to adopt good regulatory practices in developing and analysing the One Plan has contributed to some less than optimal policy proposals. I will illustrate this with three instances I have already briefly referred to.

Comparative Costs to Different Types of Farming Operations

- 47 One of the requirements of efficient resource allocation is to equate the marginal (social) costs of producing an outcome across the various parties contributing to produce it. If this is not the case, then a given outcome can be achieved at lower overall costs in terms of resources by reducing the contribution made by those with high marginal costs and increasing the contribution from those with low marginal costs. Only if the marginal costs are equalised is the overall cost at a minimum.

- 48 In more concrete terms, the efficient or lowest cost way to reduce nitrogen leaching into a particular waterway will be an arrangement in which the marginal costs of each unit of abatement in the waterway will be equal. In my view, it is extremely unlikely that Rule 13-1 will be of this kind; in other words, I doubt that Rule 13-1 would result in an efficient outcome. It is even more unlikely in my opinion that the application of a non-regulatory approach to the higher country and a regulatory approach to more intensive agricultural areas will result in the optimal allocation of abatement activity between different types of farming operations.

Hydro-generation Preference

- 49 Policy 6-16 appears to give preference in the allocation of water takes to hydro electricity generation. It does this by providing that the minimum flows and core allocations set out in Schedule B shall be assessed after any takes for hydro electricity generation have been taken. For this preferential ranking to be an appropriate policy under the RMA, which emphasises efficient resource use, it needs to be incontrovertible that the value of water in hydro-generation is always greater than its value in all other potential uses by the community.
- 50 The use of water for hydro electricity generation is in many instances very important for the community and New Zealand, especially given the climate change obligations the country has and is likely to have in the future, and our difficulties of reducing greenhouse gas emissions. Hydro as a renewable energy source has a minimal impact on carbon emissions even when emissions during construction are taken into account¹⁷ and to the extent

¹⁷ The carbon footprint of hydro-generation depends on the size of the dam constructed but according to a United Kingdom Parliamentary report it ranges between 5 and 30 tonnes of CO₂-equivalent per MWh of electricity. For a standard coal-fired station the same source estimates the carbon output is over 1,000 tonnes of CO₂-equivalent per MWh. For a gas-fired power station the carbon output ranges between 500 tonnes of CO₂-equivalent per MWh, see

hydro-generation replaces fossil fuel and geothermal generation it will reduce New Zealand's emissions.

51 However, this does not mean that it is always more efficient (and thus more appropriate) to use a unit of water for hydro rather than for other uses. NZIER undertook a study of the value of water in various uses in Canterbury. The report is provided as **Appendix C.**

52 The base case in the report estimates the average value of water for various uses as follows:

52.1 \$7.50 per cubic metre of water for industrial uses;

52.2 \$1.62 per cubic metre of water for horticulture;

52.3 \$0.10 per cubic metre of water for dairy irrigation;¹⁸

52.4 \$0.04 to \$0.16 per cubic metre of water for hydro electric generation;¹⁹

52.5 \$0.02 per cubic metre of water for sheep/beef farming;
and

52.6 \$0.02 per cubic metre of water for arable crops.

Carbon Footprint of Electricity Generation, October 2006,
<http://www.parliament.uk/documents/upload/postpn268.pdf>

¹⁸ The value of water for dairy irrigation is based on a price of \$4/kgMS, well below the payout for the past season.

¹⁹ The value of running water all the way down the five Tekapo and Ohau stations on the Waitaki River is \$0.04 per cubic metre at a price of \$50 per MWh of electricity and \$0.16 per cubic metre at a price of \$200 per MWh. By way of comparison, the costs of generating a unit of power by a new wind farm are approximately \$75 per MWh.

- 53 In short, this analysis shows that the value of water used in industry and for irrigation of horticultural and dairy farms can be considerably higher than its value for hydro electricity generation.
- 54 From an economic efficiency perspective, the assumption underlying proposed Policy 6-16 about the superior value of using water for hydro-generation is not correct, and the outcome if the policy is adopted is very likely to be an inefficient use of resources.
- 55 Again, in my opinion, the failure to attempt to quantify the costs and benefits of the proposed policy is likely to have been a factor in the failure to identify and question the assumption of superior efficiency of using water for hydro-generation.

Water Quality Standards

- 56 Schedule D of the Proposed One Plan provides a list of values, management objectives, and water quality standards for water management in the Horizons Region. Through various objectives and policies in Chapter 6, the Proposed One Plan requires water quality to be managed to achieve the standards provided in Schedule D. Of primary importance are:

56.1 Policy 6-3 requires that, in cases where water quality standards are presently being achieved, activities are to be managed to continue to meet such standards;²⁰ and

56.2 Policy 6-4 requires that, in cases where water quality standards are not being achieved, activities are to be managed "*in a manner which enhances water quality in order to meet the water quality standard*".²¹

²⁰ Proposed One Plan, Policy 6-3.

²¹ Proposed One Plan, Policy 6-4.

- 57 I have already discussed the lack of transparency around the study supporting the nutrient standards. Policy 6-3 and Policy 6-4 and Schedule D go beyond nutrient standards, however, and cover other aspects of water quality (see Table D17).
- 58 There appears not to have been a thorough analysis with respect to the achievability of the proposed water quality standards in Schedule D. To require compliance with water quality standards, absent a study of the technical and economic feasibility of achieving the standards, is unlikely to lead to efficient outcomes. Unless there is some idea of the costs of a policy against which to measure the benefits, it is unlikely the costs will be appropriately matched to the value of the benefits.

OTHER CONSEQUENCES

- 59 In my opinion, the absence of a reasonable attempt to assess the costs and benefits of the policy options and failure to set out fully the reasons for the decisions reached will undermine the public acceptability of the Proposed One Plan.
- 60 This will likely have a number of consequences:
- 60.1 Increase the likelihood of appeals against decisions under the One Plan;
 - 60.2 Lower voluntary compliance and raise enforcement costs;
 - 60.3 Lower the credibility and standing of Horizons as the community leader on recognising and addressing resource management issues; and
 - 60.4 Lead to on-going requests for changes and revisions of the One Plan.
- 61 Horizons is charged with a very demanding role. It has to lead (and push) the community to accept changes, some of which have a negative impact on some people and the value of their property. The Council has to do this without the ability to offer

compensation to the injured. Its chances of success depend on its ability to carry most of the community with it and to not sow the seeds of lasting resentment among the affected. Adherence to the principles of good regulatory practice - efficiency, effectiveness, transparency, clarity and equity – is important.

WAY FORWARD?

- 62 There appears to be three options open:
 - 62.1 Carry on as currently proposed and introduce more assessments of economic benefits and costs of particular policies when individual topics are discussed;
 - 62.2 Go back and re-do the s32 analysis to ensure that it conforms with best regulatory practice and contains transparent and clear evaluations of the costs and benefits of the various options and a full discussion of the reasons for the evaluation; or
 - 62.3 For some issues, specifically those that are unlikely to be contentious, proceed as currently planned and for the other more contentious issues go back and re-do the s32 analysis to conform to the standards of good regulatory practice.
- 63 The advantage of the first option is lower costs in the short-term. The disadvantage is, that in the long-term it could prove very costly in terms of appeal costs, enforcement costs, loss of credibility and leadership for the Council, and a shortened life for the regulations and rules.
- 64 The advantage of the second option is lower costs in the long-term, the disadvantage is higher costs in the short-term. Some of these short-term costs may be largely unnecessary if the analyses would be of minimal value to the quality of the outcome.

- 65 The third option seems likely to be optimal given the situation Horizons faces, provided the contentious and the uncontentious can be reasonably easily identified and separated from one another. Water quality and water quantity are the primary issues of concern to Fonterra.
- 66 It may be possible to arrive at an appropriate outcome through the hearings and appeals processes. But I am strongly of the view that everyone's interests (but primarily Horizons') would be served if we quickly got to the right path. It would be inefficient to try to find the most appropriate path through post-hoc analysis of competing options. In my view, a far more appropriate approach would be to assess the competing options to address the contentious issues now, and not wait to try to arrive at them through appeals.

Brent Layton

17 June 2008

APPENDIX A: CODE OF GOOD REGULATORY PRACTICE

Code of Good Regulatory Practice

[Originally Published 15 November 1997]

Short Description The Code of Good Regulatory Practice discusses efficiency, effectiveness, transparency, clarity and equality in regards to Regulation.

Author Quality of Regulation Team, Competition and Enterprise Branch

Efficiency

Adopt and maintain only regulations for which the costs on society are justified by the benefits to society, and that achieve objectives at lowest cost, taking into account alternative approaches to regulation.

Efficiency Guidelines

- *Consideration of alternatives to regulation:* regulatory design should include an identification and assessment of the most feasible regulatory and non-regulatory alternative(s) to addressing the problem.
- *Minimum necessary regulation:* when government intervention is desirable, regulatory measures should be the minimum required, and least distorting, in achieving desired outcomes.
- *Regulatory benefits outweigh costs:* in general, proposals with the greatest net benefit to society should be selected and implemented.
- *Reasonable compliance cost:* the compliance burden imposed on society by regulation should be reasonable and fair compared to the expected regulatory benefit.
- *Minimal fiscal impact:* regulators should develop regulatory measures in a way that minimises the financial impact of administration and enforcement.
- *Minimal adverse impact on competition:* regulation should be designed to have a minimal negative impact on competition.
- *International compatibility:* where appropriate, regulatory measures or standards should be compatible with relevant international or internationally accepted standards or practices, in order to maximise the benefits of trade.

Effectiveness

Regulation should be designed to achieve the desired policy outcome.

Effectiveness Guidelines

- *Reasonable compliance rate:* A regulation is neither efficient nor effective if it is not complied with or cannot be effectively enforced. Regulatory measures should contain compliance strategies which ensure the greatest degree of compliance at the lowest possible cost to all parties. Incentive effects should be made explicit in any regulatory proposal.
- *Compatibility with the general body of law,* including the statute which it amends, statutes which apply to it, and the general body of the law of statutory interpretation.
- *Compliance with basic principles* of our legal and constitutional system, including the Treaty of Waitangi, and with New Zealand's international obligations.
- *Flexibility of regulation and standards:* regulatory measures should be capable of revision to enable them to be adjusted and updated as circumstances change.
- *Performance-based requirements that specify outcomes* rather than inputs should be used, unless prescriptive requirements are unavoidable. This will help ensure predictability of regulatory outcomes and facilitate innovation.
- *Review regulations systematically* to ensure they continue to meet their intended objectives efficiently and effectively.

Transparency

The regulation making process should be transparent to both the decision-makers and those affected by regulation.

Transparency Guidelines

- *Problem adequately defined*: identifying the nature and extent of the problem is a key step in the process of evaluating the need for government action. Properly done, problem definition will itself suggest potential solutions and eliminate others clearly not suitable.
- *Clear identification of the objective of regulation*: the policy goal should be clearly specified against the problem and have a clear link to government policy.
- *Cost benefit analysis*: regulatory proposals should be subject to a systematic review of the costs and benefit. Resources invested in cost benefit estimation should increase as the potential impact of the regulation increases.
- *Risk assessment*: regulatory proposals should be subject to a risk assessment which should be as detailed as is appropriate in the circumstances.
- *Public consultation* should occur as widely as possible, given the circumstances, in the policy development process. A well-designed and implemented consultation programme can contribute to better quality regulations, identification of the more effective alternatives, lower costs to business and administration, ensure better compliance, and promote faster regulatory responses to changing conditions.
- *Direct approaches to problem*: In general, adopting a direct approach aimed at the root cause of an identified problem will ensure that a more effective and efficient outcome is achieved, compared to an indirect response.

Clarity

Regulatory processes and requirements should be as understandable and accessible as practicable.

Clarity Guidelines

- *make things as simple as possible, but not simpler, in achieving the regulatory objective.*
- *Plain language drafting*: where possible, regulatory instruments should be drafted in plain language to improve clarity and simplicity, reduce uncertainty, and to enable those affected to better understand the implications of regulatory measures.
- *Discretion should be kept to a minimum*, but be consistent with the need for the system to be fair. Good regulation should attempt to both minimise and standardise the exercise of bureaucratic discretion, in order to reduce discrepancies between government regulators, reduce uncertainty, and lower compliance costs.
- *Educating the public* as to their regulatory obligations is fundamental in ensuring compliance.

Equity

Regulation should be fair and treat those affected equitably.

Equity Guidelines

- *Obligations, standards, and sanctions* should be designed in such a way that they can be imposed impartially and consistently.
- *Regulation should be consistent with the principles* of the New Zealand Bill of Rights Act 1990, and the Human Rights Act 1993, and the expectations of those affected by regulation, as to their legal rights, should be met.
- *People in like situations should be treated in a similar manner*, similarly, people in disparate positions may be treated differently.
- *Reliance should be able to be placed on processes and procedures of the regulatory system*: a regulatory system is regarded as fair or equitable when individuals agree on the rules of that system, and any outcome of the system is considered just.

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APPENDIX B: REGULATORY IMPACT ANALYSIS REQUIREMENTS

Cabinet Office

Cabinet Office Circulars

CO (07) 3

3 April 2007

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Regulatory Impact Analysis Requirements: Update of Guidance

Introduction

1. This circular updates and replaces previous guidance on the Cabinet requirements for regulatory impact statements (RIS) and business compliance cost statements. It reflects Cabinet's decisions in 2006 and 2007 to strengthen the regulatory impact analysis requirements.¹
2. The new regulatory impact analysis requirements apply from 1 April 2007. The main changes

are:

- 2.1 government agencies with the power to create or enforce regulatory frameworks are required to confirm that the principles of the Code of Good Regulatory Practice have been complied with and that regulatory impact analysis has been undertaken in accordance with the new requirements;²
 - 2.2 changes to the format and requirements for RISs, including new sections on the adequacy of the RIS and on implementation and review;
 - 2.3 a new Regulatory Impact Analysis section is to be included in Cabinet papers (replacing the Regulatory Impact and Business Compliance Cost Statement section);
 - 2.4 discussion documents for proposals that require a RIS must include questions and/or discussion of each of the substantive RIS sections, or a draft RIS;
 - 2.5 all RISs are to be published;
 - 2.6 the Ministry of Economic Development's (MED) Regulatory Impact Analysis Unit (RIAU) is to focus on proposals likely to have a significant impact on economic growth.
3. Ministers' offices and chief executives should ensure that:
 - 3.1 all staff involved in the preparation of submissions for Cabinet and Cabinet committees are familiar with the advice in this circular;
 - 3.2 the material in this circular is conveyed to all Crown entities or other State agencies for which their Minister is responsible, which have an involvement in the preparation of proposals that require a RIS.

Summary of regulatory impact analysis requirements

4. The regulatory impact analysis requirements are designed to improve the quality of regulation making and to ensure that regulatory proposals are cost-effective and justified.
5. In summary, the requirements for regulatory impact analysis are:
 - 5.1 all policy proposals submitted to Cabinet that result in government bills (or Members' bills that the government is planning to support or adopt) or statutory regulations must be accompanied by a RIS (unless an exemption applies);
 - 5.2 discussion documents relating to proposals that require a RIS must include questions and/or discussion of each of the substantive RIS sections, or a draft RIS;
 - 5.3 RISs should be included with Cabinet papers circulated for departmental consultation;
 - 5.4 Cabinet papers should include a Regulatory Impact Analysis section;
 - 5.5 departments must confirm that the principles of the Code of Good Regulatory Practice and the RIA requirements have been complied with when submitting Cabinet papers with a RIS;

5.6 all RISs should be published.

6. Departments and other government agencies preparing Cabinet papers are responsible for meeting the regulatory impact analysis requirements.

Regulatory impact statement (RIS) requirements

7. All policy proposals submitted to Cabinet that result in government bills, statutory regulations, or that propose that the government support or adopt a Members' bill must be accompanied by a RIS, unless an exemption applies. Exemptions are set out in paragraph 14.
8. 'Statutory regulations' has the same meaning as 'regulations' in the Regulations (Disallowance) Act 1989. This means that a RIS is required for any proposals for deemed regulations submitted to Cabinet for consideration. This includes when statutory regulations are to be made by individual Ministers under an enabling power in an Act and the Minister's decision is referred to Cabinet for noting.
9. A RIS is required at the time 'in principle' or final decisions are sought from Cabinet and before the preparation of drafting instructions on the bill or regulations. It does not need to be resubmitted with the actual bill or regulations. A RIS is not required for Cabinet submissions seeking intermediate decisions, but it may be prudent to provide a draft RIS at this stage.
10. Departments are required to include the RIS when circulating Cabinet papers for departmental consultation. When circulating the RIS with the Cabinet paper, departments should ask other departments to comment on the RIS as well as on the Cabinet paper.
11. The RIS must contain the following information³:

- **Executive summary**

One paragraph of no more than 150 words summarising the problem, the preferred option, and the main impacts.

- **Adequacy statement**

A statement about who has reviewed the RIS (RIAU or name of department that has reviewed the RIS) and whether the RIS is adequate according to the criteria agreed by Cabinet (see paragraph 29).

- **Status quo and Problem**

- A brief, high-level summary of relevant key features of the current situation – not just features of the current regulation.
- A summary of why government action is needed, including why the current arrangements are insufficient to address the problem. This should contain an appropriate level of detail on the costs and benefits of the status quo (including compliance costs, risks and opportunities).

- **Objectives**

The objectives that options are measured against.

- **Alternative options**

For each option that is neither the status quo nor the preferred option:

- a brief, high-level summary of key features of the option;
- why it is not the preferred option, including an appropriate level of detail on the benefits and costs (including compliance costs, risks and opportunities).
- **Preferred option**
 - A brief, high-level summary of key features of the preferred option.
 - Why it is preferred and a statement of all of the proposal's impacts, including an appropriate level of detail on the benefits and costs (including compliance costs).
 - A risk assessment with a description of how risks will be/are being mitigated.
 - Steps that have been taken to minimise compliance costs, if any.
 - A paragraph that briefly describes how the preferred option would impact on the stock of regulation, including whether the proposal overlaps and interacts with existing rules, whether the proposal makes any existing rules redundant, and whether these rules are being removed or altered as part of the proposal.

- **Implementation and review**

(note: this section does not need to be completed for tax policy proposals)

- How the proposal will be given effect, including timetables where available.
- Plans for notifying affected parties of what they need to do to comply with any new requirements, if any.
- The enforcement strategy that is to be implemented to ensure that the preferred option achieves the public policy objective, if any.
- Plans for monitoring and evaluating the preferred option, including key dates, if any.

- **Consultation**

Who was consulted? What was the form of consultation? Key feedback from stakeholders and government departments on each of the options considered, with particular emphasis on any significant concerns that were raised about the preferred option, how the department authoring the RIS altered the proposal to address these concerns, and, if they did not alter the proposal, why not.

12. The RIS should provide a summary of the required information and should focus on the analysis of the options, including why the preferred option is best. Background elaboration should be kept to a minimum. The RIS needs to be able to stand alone. Departments should clearly specify the assumptions they have made about the drivers of the problem or issue and how the proposed solutions will influence these drivers. The length of the RIS will depend largely on the complexity of the problem under consideration, the number of options considered, and the extent of the analysis conducted on the proposal and the alternatives, which should be appropriate given the magnitude of the proposal.

13. When providing a discussion of impacts of options, the RIS should not be limited to economic concerns, and should examine the full range of outcomes including social, cultural, health, and environmental outcomes.

Exemptions from RIS requirements

14. The RIS requirements do **not** apply where the proposal:
 - 14.1 is of a minor or machinery nature and does not substantially alter existing arrangements;
 - 14.2 deals with administrative procedures within or between departments, and does not impact on business, consumers, or the public;
 - 14.3 is necessary to implement an international treaty for which an extended National Interest Analysis (NIA) has been prepared and submitted to Cabinet. This means that each time a RIS is required, an extended NIA could be prepared in substitute for the RIS;
 - 14.4 is to give effect under urgency, in terms first announced in the Budget, to a specific Budget decision, where the decision is to:
 - 14.4.1 repeal, impose, or adjust a tax, fee or charge; or
 - 14.4.2 confer, revoke, or alter an entitlement; or
 - 14.4.3 impose, revoke, or alter an obligation;
 - 14.5 is an Order in Council that provides solely for the commencement of enabling legislation or any provision of enabling legislation.
15. In the case of a Cabinet paper proposing that New Zealand take treaty action, a NIA can be prepared instead of a RIS, provided it complies with all RIS requirements (an 'extended NIA'). In these circumstances all of the procedures that are set out in this circular apply to the extended NIA. The department leading the policy work should liaise with both the Treaty Officer in the Legal Division of the Ministry of Foreign Affairs and Trade and the RIAU about the respective requirements.
16. For proposals involving supplementary order papers (SOPs), the submission to Cabinet on the proposal should identify whether the SOP alters the content of the RIS that was the basis of Cabinet's decision on the original policy/legislation, and if so, in what way. A new RIS is not required and other requirements for regulatory analysis do not apply.

Regulatory Impact Analysis section in Cabinet papers

17. Cabinet has agreed to change the Regulatory Impact and Business Compliance Cost section in Cabinet papers. Cabinet and committee papers that contain policy proposals that will result in government bills or statutory regulations are required to contain a section entitled **Regulatory Impact Analysis**. The requirement for a section in the Cabinet paper is additional to the RIS itself. The Cabinet paper is to indicate:

- 17.1 whether the department confirms that the principles of the Code of Good Regulatory Practice and the regulatory impact analysis requirements, including the consultation RIS requirements, have been complied with;
 - 17.2 whether a RIS has been prepared and whether the RIAU considers the RIS is adequate (or, if the RIS is not reviewed by the RIAU, whether the department considers it is adequate) or, if a RIS has not been prepared, why not;
 - 17.3 whether the final RIS was circulated with the Cabinet paper for departmental consultation.
18. For proposals that are likely to have a significant impact on economic growth, the RIAU will provide a comment on whether the analysis and the RIS are adequate. Consultation with the RIAU should be noted on the CAB 100 consultation form, in addition to any other consultation that has taken place with MED on the paper.

Requirements for discussion documents

19. Cabinet has also agreed to strengthen the requirements by requiring regulatory analysis in discussion documents. Departments must include questions and/or discussion of the substantive elements required for a RIS (problem, objectives, options, impacts of those options, and, where relevant, implementation and review strategies) or a draft RIS for all discussion documents that include proposals that would require a RIS. Further guidance on these requirements is set out in the MED's Regulatory Impact Analysis Guidelines.
20. The regulatory impact analysis section in Cabinet papers seeking agreement to release discussion documents should state whether the substantive RIS elements (or a draft RIS) have been included in the discussion document at a level that is reasonable given the stage of the policy development process and whether the approach in the discussion document complies with the Code of Good Regulatory Practice.
21. Where there are discussion documents that are expected to result in proposals likely to have a significant impact on economic growth, the discussion document should be submitted to the RIAU to comment on whether the design of the discussion document is likely to result in an adequate final RIS.

Publication of RISs

22. Since 2001 there has been a requirement for RISs with business compliance cost statements to be published so that the regulatory analysis process is open and transparent. Cabinet has now agreed that all RISs should be published.
23. All RISs are required to be:
 - 23.1 attached to the press statement announcing any new policy for which a RIS is required;
 - 23.2 lodged on the responsible department's website, and the dedicated pages of the Ministry of Economic Development's website: <http://www.med.govt.nz>⁴;

23.3 included in the explanatory note to bills that are introduced into the House.

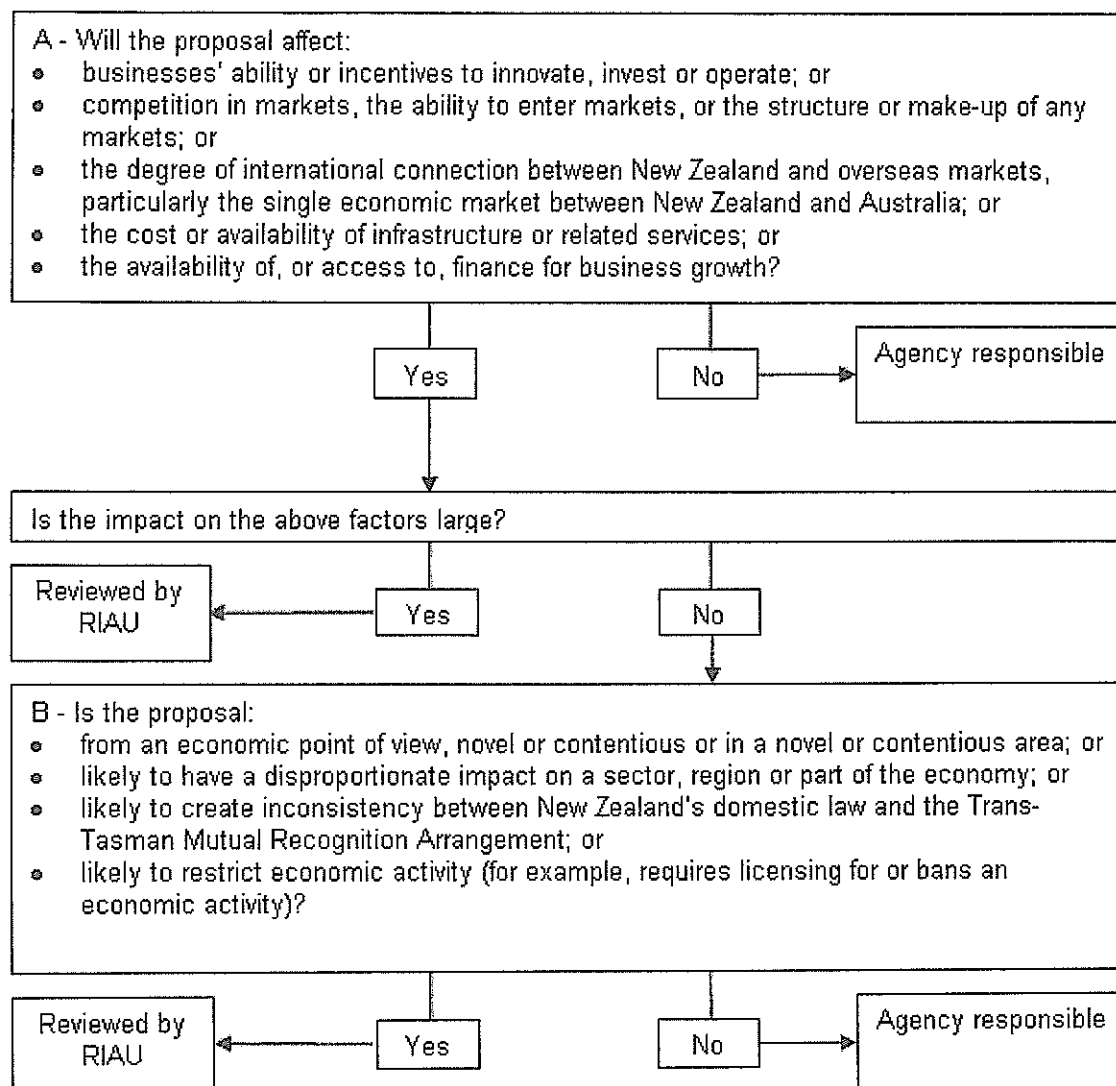
24. There may, however, be some instances where it is not appropriate to publish the RIS or sections of the RIS. The provisions of the Official Information Act 1982 should guide decisions about whether a RIS, or part of a RIS, should be published.
25. The decision on the precise timing of publication of RISs is left to the responsible Minister and/or Cabinet. Ministers may wish to review and amend the RIS to ensure that it fully reflects the government's position and is of a high standard.

Format Requirements

26. Departments should ensure that a suitable electronic version of the RIS (in ASCII or Microsoft Word format) is supplied to the Parliamentary Counsel Office (PCO) in sufficient time to enable it to be included in the copies of the draft Bill that are printed for submission to the Cabinet Legislation Committee (LEG).
27. RISs for incorporation in explanatory notes must, so far as possible, follow the standard format specified by the PCO, as the typesetting process for the printing of Bills imposes limitations on the format for explanatory notes to Bills. Departures from this format, or requests for the inclusion of non-text material such as tables or graphs, may not be able to be accommodated, or may result in delays in the production of LEG copies of the Bill.
28. Enquiries about the PCO's requirements for including a RIS in the explanatory note to bills should be directed to the PCO team leader responsible for the department's legislation.

Role of the Regulatory Impact Analysis Unit

29. Cabinet has agreed that the MED RIAU should focus on those proposals with "significant potential impact on economic growth", and to allow the RIAU to deem a RIS inadequate if it:
 - 29.1 fails to explain why the existing framework would not suffice to deal with the problem being addressed;
 - 29.2 fails to include an appropriate cost-benefit analysis, risk assessment and statement of compliance costs; or
 - 29.3 has been subject to manifestly inadequate consultation.
30. The RIAU will not review proposals that are not likely to have a significant impact on economic growth. Departments will need to take responsibility for their own RIA and ensure they meet the above criteria.
31. To determine whether proposals should be reviewed by the RIAU, departments, in consultation with the RIAU, must apply the following tests:



32. When a proposal meets the test of having a significant impact on economic growth, the RIAU has advised that it requires, if possible:

32.1 5-10 working days to comment on discussion documents;

32.2 departments to begin discussing the regulatory impact analysis with the RIAU at least 20 working days before finalising the paper;

32.3 10 working days to review an RIS.

33. The RIAU has advised that the regulatory impact analysis and RIS can be reviewed simultaneously and that the analysis should be submitted to the RIAU as soon as it is completed.

Further information

34. MED has developed detailed guidance on undertaking regulatory impact analysis and preparing RISs in its Regulatory Impact Analysis Guidelines, which are available from its website: <http://www.med.govt.nz>.

35. Enquiries about PCO's requirements for including a RIS in the explanatory note to bills should be directed to the PCO team leader responsible for the department's legislation.
36. This circular is also available on the Cabinet Office website at www.cabinetoffice.govt.nz. The contents will also be included in the *Step by Step Guide: Cabinet and Cabinet Committee Processes*.

Secretary of the Cabinet

1. This guidance takes account of changes agreed by Cabinet in 2006 and 2007 [CAB Min 40/4C, POL Min (06) 9/13 and CBC Min (07) 3/7]. It replaces Cabinet Office Circular CO (04) 4 and relevant sections in chapter 3 of the Cabinet Office *Step by Step Guide: Cabinet and Cabinet Committee Processes*.
2. The Code of Good Regulatory Practice is available in the Regulatory Impact Analysis Guidelines, which are available on the MED website: <http://www.med.govt.nz> .
3. A Word template setting out these headings is attached to the RIA Guidelines, which are available on the MED website: <http://www.med.govt.nz>
4. When the responsible Minister and/or Cabinet determines the RIS is ready for publication, departments must send the departmental website link for each RIS to MED at ria@med.govt.nz. The RIS on departmental websites must comply with the e-government web guidelines.

APPENDIX C: VALUING WATER

Valuing water

Investigating the relative value of water in the Canterbury region

Report to Fonterra

February 2006

Preface

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established *Quarterly Survey of Business Opinion* and *Quarterly Predictions*.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

NZIER was established in 1958.

Authorship

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1. Introduction

NZIER has been commissioned by Fonterra to carry out an investigation into the relative average value of water in the Canterbury region across competing uses. The competing uses of interest are dairy farming, sheep/beef farming, arable cropping, horticulture, hydro generation and industrial/commercial use.

This report outlines: the method adopted in undertaking the analysis, the resulting relative values, sensitivity analysis of the relative values to changes in key assumptions, and some further points for consideration and recommendations as to where the analysis could be progressed and what value might be obtained from doing so.

The provision of dairy data by Fonterra has meant that specific farm level data has been able to be used to estimate the value of water for dairy farming in the Canterbury region. For this reason, the method and results for dairying and for competing uses are discussed in separate sections in this report.

2. Value of water calculations for dairying in Canterbury

This initial investigation utilises individual farm data (supplied by Fonterra) in conjunction with other information about the costs and volumes of water associated with irrigation to attempt to identify the value of water for irrigation in dairy farming in Canterbury.

The farm data supplied by Fonterra features information on a small number of non-irrigated farms, and a relatively large number of irrigated farms. The dataset includes information on farm size (Ha), herd size (number of cows), the volume of production (kg of milk solids (MS)) as well as an identifier as to whether the irrigation is border dyke or spray (if irrigated).

2.1 Methodology

2.1.1 Comparing output from irrigated and non-irrigated farms

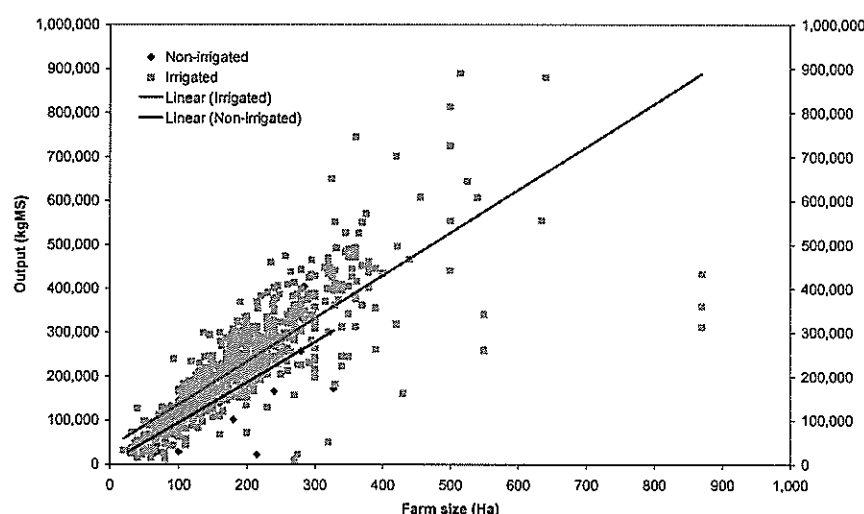
The availability of relevant farm level data comparing output from irrigated and non-irrigated farms in Canterbury means that we are not restricted to using generally accepted or estimated values for gross margins resulting from irrigation in dairy farming. This provides a degree of robustness in terms of adding a regional context to the less specific cost and water use information publicly available.

Initially we compared average output figures for irrigated farms against non-irrigated farms. This was done by calculating a measure of output for both farm types – kg of milk solids per hectare (kg MS/Ha). The comparison showed a number of things:

- There was a clear difference in average output (kg MS/Ha) between the irrigated and non-irrigated farms. The irrigated farms produced output on average nearly 30% higher than that of the non-irrigated farms.
- Statistical tests of significance confirm that there is strong evidence of the average level of productivity being different between irrigated and non-irrigated farms. We can be confident¹ that the difference observed between the average output per hectare of irrigated and non-irrigated farms is material and genuine, rather than being a result of a random sample.

Figure 1 The pattern of output by farm size – irrigated vs. non irrigated farms

kg MS, Ha – Canterbury region.



Source: Fonterra, NZIER

This is reinforced by the trends shown in the chart above. The level difference between the two lines indicates that there is a difference between the level of output between irrigated and non-irrigated farms i.e. the intercept is different.

The similarity in the slopes/gradients of the two lines indicates that the effect on output from increasing farm size does not appear to be significantly larger (or smaller) for irrigated farms than for non-irrigated farms.

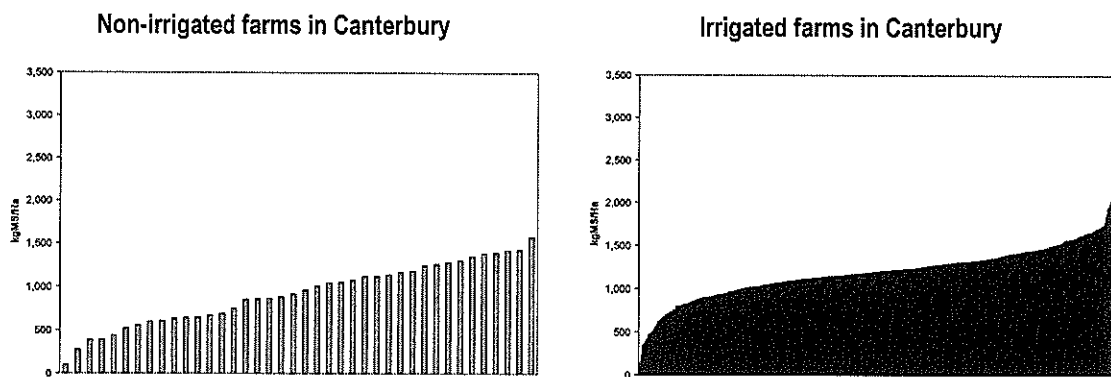
¹ At a 95% level of significance

2.1.2 Differences in productivity

The charts below shows the information on productivity (kg MS/Ha) in an alternative manner, by showing the distributions for irrigated and non-irrigated farms side by side. While there are only a few non-irrigated farms in the sample, it is useful to compare the general shapes of the distributions.

The main discernable difference is the more pronounced bulge in the distribution of lower productivity irrigated farms compared to non-irrigated farms. The shape of the distribution becomes steep quite quickly (few farms have very low productivity) compared to the distribution for non-irrigated farms which is more graduated in shape. This could imply that lower productivity non-irrigated farms may gain more from the shift to irrigation than do higher productivity non-irrigated farms. Around 53% of non-irrigated farms have output of less than 1,000 kg MS/Ha, whereas only around 22% of irrigated farms have output of less than 1,000 kg MS/Ha.²

Figure 2 Distribution of productivity – irrigated vs. non irrigated farms
kg MS per hectare. Canterbury region.



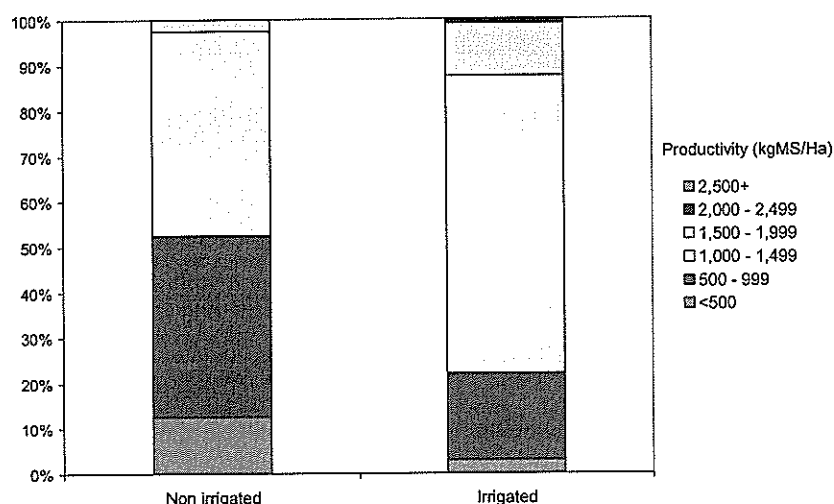
Source: Fonterra

Figure 3 shows the distribution of productivity for both irrigated and non-irrigated farms in terms of bands of productivity. By comparing the distributions it is easy to see how the overall effect is a higher output per hectare for irrigated farms.

² These results should be interpreted with caution, taking into account the relatively small number of non-irrigated farms that were present in the data.

Figure 3 Distribution of productivity – irrigated vs. non irrigated farms

kg MS per hectare. Canterbury region.



Source: Fonterra

2.1.3 Calculating the average value

Taking these initial output/productivity figures (kg MS/Ha) for both types of farms, we then used a payout figure (\$/kg MS) across all units of output to produce a value of output per hectare. The base case assumes a value of \$4.00 per kg MS. The difference in value of production per hectare figures for irrigated and non-irrigated farms is consistent with other published figures. The figures used here though have the benefit of being from actual farm data, whereas many cost benefit analyses use assumed standard levels.

For irrigated farms, the costs associated with irrigation are then removed from the value of output figures. This provides net value of output figures. The data on the type of irrigation (i.e. border dyke or spray) meant we could calculate a weighted average irrigation costs for irrigated farms. Capital costs, transition costs and operating costs were all included in the cost of irrigation.

We then used figures on assumed water use to calculate the average value of water in \$ per cubic metre for an annual period. These were taken from actual water use figures for the Canterbury region.

The table below shows the costs and water use values assumed for each type of irrigation.

Table 1 Irrigation costs assumed in base case calculations

Irrigation - Border Dyke	Water use	7,700	Cubic metres per year
	Capital cost + transition costs	\$4,100	\$/Ha
	Amortised cost	\$390.26	\$/Ha/year
	Operating costs	\$100	\$/Ha
	Total costs	\$490	\$/Ha/year

Irrigation - Spray	Water use	4,000	Cubic metres per year
	Capital cost + transition costs	\$4,000	\$/Ha
	Amortised cost	\$380.74	\$/Ha/year
	Operating costs	\$190	\$/Ha
	Total costs	\$571	\$/Ha/year

Source: See sources section

The calculations produced a average value of water estimate of around **\$0.10 per cubic metre³**. This value is not significantly different from similar values produced by SKM in the cost benefit analysis on the Waitaki region of around \$0.11 to \$0.14 per cubic metre of water.

The calculations are backed up from the testing of significance of difference in mean/average output per hectare (productivity). The difference between the two means is the key driver of the average value of a unit of water for irrigation. The value of the output and irrigation costs are important, but the effect on the average output from a unit of land will be the most important factor. Given that we are confident of the statistical significance of the difference in average output, we can be confident that the average value of water for irrigation produced in the final calculations is based on real differences in productivity.

2.2 Sensitivity of base case result to variation in key drivers of value

We can also gain confidence by checking the sensitivity of the value to changes in key assumptions. The table shows the likely variation in the value of water given variation in the key input variables.

³ This is based on calculations for a one year period.

The table shows that it takes relatively large variations (in the order of +/- 50%) in the key input variables from the levels assumed in the base case, to make material changes in the value of water. The resulting values range from \$0.05 to \$0.21 at the most extreme.

Table 2 Sensitivity testing on average value of water

Factor varied	Variation used	Average value of water (\$ per cubic metre)	% change from base case average value
Value of output (\$/kg MS)	\$4.50	\$0.13	26%
	\$4.25	\$0.12	13%
	Same as base case (\$4.00)	\$0.10	n/a
	\$3.75	\$0.09	-13%
	\$3.50	\$0.08	-26%
Irrigation costs (\$/Ha)	- 50%	\$0.16	54%
	- 25%	\$0.13	27%
	- 10%	\$0.11	11%
	Same as base case	\$0.10	n/a
	+ 10%	\$0.09	-11%
	+ 25%	\$0.08	-27%
	+ 50%	\$0.05	-54%
Water use (cubic metres per year)	- 50%	\$0.21	124%
	- 25%	\$0.14	50%
	- 10%	\$0.11	25%
	Same as base case	\$0.09	0%
	+ 10%	\$0.09	2%
	+ 25%	\$0.08	-10%
	+ 50%	\$0.07	-25%

Note: It is important to consider the variation in each variable in isolation. The values represent what would happen to the average value of water if the values we assume in our base case were higher or lower than assumed, rather than being a dynamic model of scenarios.

Source: NZIER, Fonterra

2.3 Testing the average value for sub-groups of the sample

To further test the likely average value of water for irrigation we produced the same calculations but for sub-groups of the total sample of farms. We

first looked at different groups of farm by size to see if the average value would be any different.

Given that there were a relatively small number of farms in each of the sub-groups, the main problem was producing estimates which were still statistically significant. The only sub-groups which produced statistically significant results were the 50 – 100 hectare and 200 – 250 hectare groups. These groups produced average water values of \$0.12 and \$0.31 per cubic metre respectively. These results should only be regarded as very indicative, as the lack of significance across groups (as a result of the limited sub-sample size) limits the comparability of these sub-group farm size values. Another caveat for these sub-group values is that the cost structures across different farm sizes will be considerably different, which is not factored into the analysis.

We also considered how different the average values would be when looking at the different types of irrigation in the sample separately i.e. comparing border dyke irrigated farms against non-irrigated farms, and spray irrigated farms against non-irrigated farms. While the costs associated with the two types of irrigation (as assumed) are not significantly different (on a \$/Ha per year basis) the amount of water use associated with each is quite different.

The calculations produce a value for border dyke irrigation of \$0.07 per cubic metre of water, with a value for spray irrigation of \$0.12 per cubic metre of water.

3. Value of water calculations in alternative uses in Canterbury

While the initial investigation discussed above focussed solely on the average value of water in dairy farming in the Canterbury region, it is useful to know how this value compares with the relative values for competing uses of water. This section outlines the methodology behind the calculations of the average value of water for sheep/beef farming, arable cropping, horticulture, hydro generation and for industrial/commercial use in the Canterbury region, as well as the estimated values for the base case.

3.1 Methodology

3.1.1 Sheep/beef farming, arable crops and horticulture⁴

Farm level data for sheep/beef farming, arable crops and horticulture was not available as it was for dairy farming. This meant we relied on publicly available information about the gross margins, costs and quantities involved in irrigation across these various competing uses.

The key variables used to estimate the average value were similar to those in the dairying calculations i.e. the estimate required an assessment of:

- The effective value of irrigation or gross margin⁵ in \$/hectare (i.e. the relative outputs in \$/hectare for an irrigated vs. a non-irrigated farm).
- The costs associated with the irrigation – this included capital costs, transition costs and operating costs (\$/hectare). The capital costs and transition costs were amortised to an annual figure.
- The estimated water use involved in the irrigation.

The irrigation costs were taken away from the effective gross margins to produce a net increment (in \$/hectare) from irrigation for that particular use. This figure was then spread across the estimated water use to produce an estimate of the average value of water for that use in \$/cubic metre.

For sheep/beef farming, arable crops and horticulture, there were three main sources of information which provided the estimates for the key variable outlined above. These sources are listed in section 6.⁶

The high gross margins for horticulture that result from irrigation are the determining factor in the relativities of the average values for these three

⁴ Note that in the analysis Horticulture excludes Viticulture.

⁵ Gross in that it has not had the costs associated with irrigation removed.

⁶ Where more than one estimate was available from the sources, the relevant figures were averaged.

competing uses. While the margins for sheep/beef farming are close in magnitude (in the order of \$500/hectare), the margin for horticulture is in excess of \$12,000/hectare, reflecting the relatively dense nature of production. While the costs associated with irrigation for horticulture are also relatively high, neither they, nor the relatively higher level of water use negate the impact of the high gross margin associated with irrigation in horticulture.

This is reflected in the base case estimates of the average value of water:

- sheep/beef farming: **\$0.02 per cubic metre**
- arable crops: **\$0.02 per cubic metre**
- horticulture: **\$1.62 per cubic metre**

3.1.2 Hydro

While there is a vast amount of information in the public arena relating, in particular, to issues surrounding the impact of water allocation on hydro generation in the Waitaki area, there is an equally large amount of variability in the estimated value of water to electricity generation.

One useful way of considering the value of water to hydro generation is by estimating the foregone value of electricity resulting from the removal of a certain volume of water from use in generation. Previous analysis by NZIER⁷, used in investigating the impact of the Waitaki catchment plan, has estimated that the loss of 3 cumecs (cubic metres of water per second) through the Tekapo and Ohau Stations is approximately equivalent to 75 GWh of potential generation annually. We use this figure to estimate the potential loss in generation from withdrawing one cubic metre of water per second, over an annual period. The value lost is the accumulated loss from not having that one cumec available to generate at Tekapo A and B, and Ohau A, B and C power stations.

We apply a per unit price (\$/MWh) to the electricity foregone as a result of reducing the availability of water and deduce a value per cubic metre of water. Two variations in price are allowed for in the calculations, to represent the potential variation in the value of water to a hydro generator, depending on the conditions at the time the water was taken. Using the average spot electricity price⁸ over the period 1996 to 2006 (approximately \$50/Mwh) the average value of water to a hydro generator is estimated at around **\$0.04 per cubic metre**. This represents the average value, essentially over a long-run period of 'baseload' hydro generation.

⁷ "A review of the draft Waitaki Catchment plan – Report to Major Electricity Users' Group", April 2005. http://www.nzier.org.nz/SITE_Default/SITE_Publications/reports/2005_Reports.asp

⁸ At the Benmore node.

If we consider an alternative situation where one unit of water was removed and an alternative means of generating electricity is required in the short run, the result is quite different. If we assume that peaking plant is required to generate in the absence of the water removed, the value of the electricity rises considerably. In this instance we assume an electricity price of around \$200/MWh which represents the trigger price whereby the Whirinaki reserve station enters the market to generate. This results in a average value of water of **\$0.16 per cubic metre**. This valuation would be more relevant in times of constraint, or over the winter for example. At these times flexibility in hydro generation can be very valuable.

The actual cost a generator would be prepared to pay is likely to lie somewhere between these two values, depending on their judgement of the value of the electricity that they would be able to generate (based on the likelihood of constraints over the period for which the water would be available).

3.1.3 Commercial/industrial use

There is little information available about the value of water for use in commercial and industrial processes. While it is a competing source of demand for water, the quantities associated with commercial and industrial processes are likely to be relatively minor compared to levels of usage in dairy farming, horticulture and hydro generation, for example. Despite this, information about the relative values of water indicates that, *ceteris paribus*, in general the value to commercial manufacturing is likely to far exceed that of hydro generation and irrigation for farming purposes on a per cubic metre basis.⁹ In general, water is likely to make up a relatively small proportion of commercial and industrial total costs for firms in the Canterbury region¹⁰ and hence even a small increase in the amount of water used could relate to significant volume (and value) changes in the production of the commercial/industrial firms' final products. This would flow through to a high average value of water.

One estimate denoted as being “the ‘extreme’ lower bound estimate, rates the average value of water for manufacturing to be in the order of **\$7.50 per cubic metre**”¹¹. Regardless of the exact value though, it is likely to be well in excess of that for competing uses in agriculture and hydro generation.

⁹ “National Cost Benefit Analysis of Proposal to Take Water from the Waitaki River”, Sinclair Knight Mertz, 17th November 2004, Appendix G, p.195.

¹⁰ For some heavy metal industries (such as steel and aluminium) water may form a larger proportion of total costs, however the level of operation of such industries in the Canterbury region is minimal, if not non-existent. Primary processing (e.g. Clandeboyne) is likely to be the most water intensive industry in the Canterbury region.

¹¹ *ibid*

4. Summary of comparative values

This section provides a comparison of the estimated average values of water across the competing uses identified in previous sections of the report.

4.1 Base case

The table below presents the relative values of water to competing uses, showing the gross margins, total irrigation costs, net income increment and water demand for each use (where relevant) along with the final estimated value of water in \$ per cubic metre. The final line in each table also shows the present value of an entitlement to a cubic metre of water over a 30 year period. The table represents the base case scenario i.e. the values which are considered to be best mid-point estimates¹².

Table 3 Estimated values of water – base case¹³

\$ per cubic metre of water

	Dairy	Sheep/beef	Arable crops	Horticulture	Industry	Hydro
Gross margins (\$/Ha)	\$1,061	\$519	\$500	\$12,184	-	n/a
Total irrigation costs (\$/Ha)	\$550	\$406	\$449	\$3,285	-	n/a
Net income increment (\$/Ha) per year	\$511	\$113	\$50	\$8,899	-	n/a
Water demand (cubic metres/year)	4,941	7,000	3,250	5,500	-	n/a
Estimated value of water/cubic metre	\$0.10	\$0.02	\$0.02	\$1.62	\$7.50	\$0.04 / \$0.16
Present value of entitlement (30 years)	\$1.09	\$0.17	\$0.16	\$17.00	\$78.79	\$0.42 / \$1.67

Notes: (1) Total irrigation costs includes estimates of capital costs, transition costs and operating costs.

(2) Entitlement relates to one cubic metre of water over a 30 year period, using a discount rate of 9%.

Sources: NZIER, also see section 6

As noted in section 3.1.1, the table reinforces that the relatively high gross margins associated with water use in horticulture feed through to a high value of water per cubic metre when compared with other farm types (dairy, sheep/beef, arable cropping). The horticulture value also exceeds that for use in hydro electricity generation – even when considering the ‘peak’ example whereby replacement generation is required from expensive diesel powered generation. The value to industry/commercial processes is considerably higher than all the farming types and the value for hydro

¹² Section 4.2 presents the results for scenarios other than the base case, whereby key input variables are ‘shocked’ to see the effect on the estimated average value of water.

¹³ It is also useful to reinforce here the nature of values estimated. For dairy, sheep/beef, arable crops and horticulture they represent the comparison between dryland and irrigated farms, rather than being an incremental gain associated with moving from medium intensity to high intensity irrigation for example. Such incremental measures would likely produce higher average values.

generation. Again, the volumes are likely to be minor in comparison, but water use will form a smaller proportion of total inputs and costs for industrial and commercial firms.

4.2 Sensitivity of base case results to variation in key drivers of value

Now that we have established estimates of the relative average value of water for various competing uses, it is useful to examine how sensitive these relative values are to changes in the assumed levels of key variables in the calculations. Tables 4 – 6 show the likely variation from the calculated base case (shown in Table 3) given variation in the key input variables which produce the base case.

The variations will affect the dairy, sheep/beef, arable crops and horticulture uses, as these contain key drivers of the average values which we can ‘shock’. As the industrial/commercial value is a static number no variation in its value is calculated. Also, the two values for hydro generation are shown, and the sensitivity testing will not produce alterations in these values.

The first table below depicts the effects on the relative average values which result from a 20% increase in the gross margin associated with irrigation for dairy, sheep/beef, arable crops and horticulture. While the estimates for industrial/commercial and hydro generation uses remain the largest, the dairy value climbs to just below that of the peaking value for hydro generation. The relative values for sheep/beef and arable crops have also changed, with arable crops providing a higher average value. On average, the 20% increase in gross margin produced an increase of 90% in the average value of water across the four farming types compared to the base case.

Table 4 Estimated values of water – alternative scenario 1 (increase gross margin by 20% above base case)

\$ per cubic metre of water

	Dairy	Sheep/beef	Arable crops	Horticulture	Industry	Hydro
Gross margins (\$/Ha)	\$1,273	\$622	\$600	\$14,620	-	n/a
Total irrigation costs (\$/Ha)	\$550	\$406	\$449	\$3,285	-	n/a
Net income increment (\$/Ha) per year	\$723	\$216	\$150	\$11,336	-	n/a
Water demand (cubic metres/year)	4,941	7,000	3,250	5,500	-	n/a
Estimated value of water/cubic metre	\$0.15	\$0.03	\$0.05	\$2.06	\$7.50	\$0.04 / \$0.16
Present value of entitlement (30 years)	\$1.54	\$0.32	\$0.49	\$21.65	\$78.79	\$0.42 / \$1.67

- Notes: (1) Total irrigation costs includes estimates of capital costs, transition costs and operating costs.
(2) Entitlement relates to one cubic metre of water over a 30 year period, using a discount rate of 9%.
(3) Note that for dairy, the variation in gross margin differs from the variations used in section 2.2 where the payout figure was adjusted.

Sources: NZIER, also see section 6

The following table looks at the effect of variation in another key component – total irrigation costs. Again the variation only effects the four types of farming. Here we consider the effect of a 10% reduction in the total costs of irrigation for each of the farm types.

The changes in average value across the four farm types are quite small, with no significant change in any of the relative values. Even with a larger reduction in irrigation costs, the gross margin is still a more influential factor in determining the average values across different uses than are irrigation costs.

Table 5 Estimated values of water – alternative scenario 2 (reduce irrigation costs by 10% below base case)

\$ per cubic metre of water

	Dairy	Sheep/beef	Arable crops	Horticulture	Industry	Hydro
Gross margins (\$/Ha)	\$1,061	\$519	\$500	\$12,184	-	n/a
Total irrigation costs (\$/Ha)	\$495	\$365	\$404	\$2,956	-	n/a
Net income increment (\$/Ha) per year	\$566	\$153	\$95	\$9,227	-	n/a
Water demand (cubic metres/year)	4,941	7,000	3,250	5,500	-	n/a
Estimated value of water/cubic metre	\$0.11	\$0.02	\$0.03	\$1.68	\$7.50	\$0.04 / \$0.16
Present value of entitlement (30 years)	\$1.20	\$0.23	\$0.31	\$17.63	\$78.79	\$0.42 / \$1.67

Notes: (1) Total irrigation costs includes estimates of capital costs, transition costs and operating costs.

(2) Entitlement relates to one cubic metre of water over a 30 year period, using a discount rate of 9%.

Sources: NZIER, also see section 6

We can also show the effects of variation in the amount of water used across the four farming types. For dairy, sheep/beef farming and arable crops, the volume of water used in relation to the net income increment means that it would take large changes in water demand to cause a significant change in the value of water. For horticulture, because the income increment is so much larger, changes in water use create larger impacts on the average water value. The table shows the effect of a 20% increase in water use for the four farming types above the base case uses.

Table 6 Estimated values of water – alternative scenario 3 (increase water use 20% above base case use)

\$ per cubic metre of water

	Dairy	Sheep/beef	Arable crops	Horticulture	Industry	Hydro
Gross margins (\$/Ha)	\$1,061	\$519	\$500	\$12,184	-	n/a
Total irrigation costs (\$/Ha)	\$550	\$406	\$449	\$3,285	-	n/a
Net income increment (\$/Ha) per year	\$511	\$113	\$50	\$8,899	-	n/a
Water demand (cubic metres/year)	5,929	8,400	3,900	6,600	-	n/a
Estimated value of water/cubic metre	\$0.09	\$0.01	\$0.01	\$1.35	\$7.50	\$0.04 / \$0.16
Present value of entitlement (30 years)	\$0.90	\$0.14	\$0.14	\$14.17	\$78.79	\$0.42 / \$1.67

Notes: (1) Total irrigation costs includes estimates of capital costs, transition costs and operating costs.

(2) Entitlement relates to one cubic metre of water over a 30 year period, using a discount rate of 9%.

Sources: NZIER, also see section 6

As we would expect, the average values for the four farming types reduced, with the largest impact being on value for horticulture. It did not however, result in a change in its position behind industrial/commercial use as the highest value use.

Overall, the low-volume high-value effect inherent in water use for commercial and industrial use means that even with large variations in the key drivers of the average value of water, its value per cubic metre is still higher than those for competing uses. Some reasonable variations in the gross margin associated with irrigation may impact on the value of water to dairy in relation to hydro generation's upper bound value. From our estimates it appears that under reasonable scenarios, the average value of water for use in sheep/beef farming and for arable crops is low relative to other uses in Canterbury.

5. Next steps/recommendations

The analysis above provides useful information on the comparative value of water for different uses. While the absolute values are important in terms of determining the cost of not having an allocation of water for example, the values for a particular use in relation to other competing uses is of primary importance.

Although the commercial and industrial average value is materially larger than those for other uses, there are a number of other non-price factors which are important. For example, the volumes required and the location of the demand are important considerations in determining the real willingness of a user to pay for water. At some low volume of water the commercial and industrial value will likely be zero. This means that they are likely to be allocated first, and that they are unlikely to compete directly with farmers for water in many areas.

These kinds of issues will limit the usefulness of the analysis in terms of determining who will pay the most for water under a given regime. The real values are likely to be quite business specific – more so than is allowed for here, with other non-price factors contributing to an overall decision about willingness to pay.

For this reason, additional information about the mix and relative importance of key drivers of demand for water would be valuable. This information would need to be at a fairly low level to capture important differences in drivers even within a sector.

In general, more farm level information and data would provide an increased level of detail and intra-sector variation which is not possible through the limited information that is readily available.

There is likely to be limited value in looking at what the value added to different sectors (competing uses) might be from increased water use. At the moment, the average value estimates as calculated are an economic surplus, or rental, earned from the use of the water rather than providing a macro-economic context of the flow-on effects. There is a reasonable amount of information already available about the relative value added effects for different farming types and hydro generation, but probably not for commercial/industrial use.

The value from extending this analysis to other regions will be determined by the amount of consistent regional data that is available. For it to be of any value, the information would need to be comparable across regions. It may be possible for larger regions, but sub-regional analysis is unlikely to be feasible. Even so, regional figures are likely to be high level estimates,

and the major benefits would still be gained through gaining a better understanding of key drivers of demand.

6. Sources

“A review of the draft Waitaki Catchment plan – Report to Major Electricity Users’ Group”, NZIER, April 2005.

“Benchmark data technical paper 00/08”, MAF, 2000.

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