

Review-

Essential Freshwater Package: Benefits Analysis

COMPLETED FOR THE MINISTRY OF THE ENVIRONMENT

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1. Scope of work

This document provides a review of the report titled: Essential Freshwater Package: Benefits Analysis the Essential Freshwater Regulations- Industry Impact Analysis. The scope of work provided by the Ministry for the Environment was a review in regards to the following questions:

- Are the assumptions clearly documented, technically sound and defensible? Is uncertainty addressed sufficiently?
- Are there any significant gaps in the analysis or areas where further analysis is required to confirm the results?
- Have any large costs or benefits been missed and have the reasons been clearly documented?
- Have any sectors and stakeholders not been considered and have the reasons been clearly documented?
- Are the conclusions reasonable and consistent with the analysis undertaken?

To review these questions this document has been grouped into three sections.

1. Review of method applied to analysis.
2. Review of methods in relation to benefits and water quality changes
3. Derived conclusions from results.

2. Review of Method Applied to Analysis

The benefits analysis provides a well set out method. Initially describing the links between the problem or pressures, state and impacts, which therefore highlights the community benefits for achieving water quality improvements. The regulatory policy of the Essential Freshwater Package is then described as a regulatory policy to be implemented by landholders. The benefits of the policy and those subsequently to be assessed are stated as “the full set of values obtained from improvements of freshwater. i.e everything that can change people’s wellbeing.”

The authors have then set out the different components to achieve the total economic value, the assumptions of adoption and implementation, and the discount rate. In order to assess the non-market values, the authors have then provided a review of past Choice modeling (CM) studies, which capture participants’ willingness to pay (WTP) through presenting them with a number of trade-offs for attributes that are outcomes of achieving water quality and an example of a choice set is presented. The values generated from these three studies are then used in a benefit transfer. The assumptions employed by the authors are clearly documented.

Benefit transfer is a method that applies values generated from choice modelling studies or other non-market valuation experiments into the new context by adjusting them to represent the attributes which is, in this case, water quality outcomes achieved through regulatory policy. The use of both choice modelling and benefit transfer are common in environmental assessments, particularly in capturing the community utility or improved welfare from increased community amenity.

However, this benefits report is limited to the fact that there are only three case studies with values that are draw on. This presents some issues in completing the benefit transfer due to the limitation of data. Subsequently there are a range of issues with the scope, framing, scale, population and measurements used in the report. The authors then continue with the commercial and reputation values along with the costs of delays and lags in the biophysical system. The commercial values capture values from past recreational fishing studies and Gross Domestic Values which are then described however, not then included in the overall monetary valuation. The travel cost analysis values that are specified for recreational fishing values could also be used in the monetary assessment through benefit tranfer.

Currently, the lack of data makes it difficult to assess the benefits of the regulatory policy and subsequent water quality outcomes comprehensively. The analysis would be much stronger if a broader literature review and meta-analysis for water quality outcomes, was first conducted, and the data then used for a benefit transfer. This would allow more capacity to extrapolate out the results in a more defensible manner. This is considered to be a large gap in the study.

The methods applied in the analysis consist of a number of steps that the authors have clearly stepped through. The report is well written and clearly structured. The following comments relate to specific components of the larger method.

1. Speed of Implementation

The linear nature of adoption may be ambitious in past water quality programs that have found it usually follows a more polynomial regression where adoption might occur quickly at the start and then slow over time. I don’t believe; however this impacts the overall outcome of the analysis significantly, however, some sensitivity testing would be useful. The assumption that the two programs together will have cumulative impacts may also be ambitious and some form of sensitivity testing would be useful.

II. Timeframes

The analysis timeframe is clear that it is 30 years, which subsequently is 2050. It might be useful to check the time range for the benefit transfer to ensure that all time frames are correctly aligned.

III. Discounting

The discount rate has been clearly defined and justified. Presenting all the different options and rates that other policies have used. For completing the overall Cost Benefit Analysis the Ministry must be aware the costs at the industry level in the previous report used 7%, and the benefits in this report have been assessed at 3%. This is fine as it ensures that benefits are reflecting the next generation of public benefit and the costs are then weighted more heavily at the start than at the end of the analysis. Making the public policy decision more robust.

IV. Non-Market Valuation

Although the study did not complete a revealed preference study it reviewed choice modelling studies and travel cost studies completed previously. After reviewing this literature, the author then uses a benefit transfer approach to extrapolate to the broader population. The methodology is relevant to determining the community welfare for water quality improvements.

There are three aspects of the benefit transfer that are difficult to follow exactly how the authors have accounted for them in the study. Particularly in the framing that was presented to the participants in the initial choice modelling studies and how this was adjusted when the benefit transfer occurred.

1. Adjustment for scope factors. I am currently unsure how the Canterbury study which uses the attribute of suitable for swimming, was then aligned to the Infections or number of people who get sick for the Auckland and Bay of Plenty Study. The Phillips study used one single river catchment to assess community values. The characteristics of these different swimming sites in the catchment need further attention and adjustments to values to extrapolate to all catchments and swimming sites across the country.
2. Variations in the management policy. It is unclear what the policy mechanism is that has been framed for the different studies, in a couple it is noted that it is based off achieving the catchment target for water quality outcomes. However in the fencing off of animals on streams is less clear what the policy mechanism is to achieve these outcomes. This needs to be clarified to ensure that the adjustment aligns to the regulation proposed.
3. Treatment of risk and uncertainty. Currently, it is not clear if the choice models presented any attribute to the participants in terms of risk of achieving the outcomes. Even if there is 100% adoption of the management practices was the risk of not achieving the ecological outcomes framed as a potential risk to participants. In one respect the study tries to account for this in section 5.2 noting that there are lags in the system to achieve actual targets- was this type of information presented to the participants to consider in their Willingness To Pay estimate?

There are further comments on the attributes in the next section.

V. Representative population

The three different studies that have been reviewed to complete the benefit transfer may have a different participant demographics to the overall population of New Zealand. A simple table comparing demographics of the studies to the overall NZ population would be useful to understand if these three studies are generally representative of the overall community. Therefore if representative the participants WTP values when transferred are also representative.

VI. Quantification of Quality Improvements

This section pulls the benefit transfer data together. I think that human health is well captured, using swimming as the proxy makes sense for this. However, I think water clarity is not an independent attribute as it is also embedded in safety and human health or it is embedded in ecosystem health. A part of the benefit that people value in water clarity is the capacity for aquatic plants to grow and with this brings fish and more general ecosystem health outcomes. Along with the capacity to swim it. The authors may have considered this and have thought through this further however this is not explained, and I think needs further analysis.

There are no clear adjustments for the scope, risk and uncertainty and policy framing issues that I have highlighted in section IV. The authors however have robustly captured the marginal change in compliance for implementing some of the regulations so as to ensure double-counting does not occur.

The authors report in the text and refer to table 19 that the higher range could be \$500 million however in the table the range of the 3% is reported at \$451 million. The results and the reporting need to be doubled checked.

Some of the results derived here are also not reported correctly in the conclusions, and further changes would be required if the comments in this document are accepted.

VII. Commercial and reputational values

The process of capturing the commercial and reputational values seem incongruent to the prior section and in the opening sentence it notes water clarity however the contamination and algal bloom are then described as been linked to nitrates, and nutrients.

The contaminated drinking water of high nitrate concentrations in groundwater appears very site-specific (Canterbury and Waikato) but are then extrapolated across the whole NZ population without any links or reasoning. It also would appear that the majority of the actions described earlier are linked to poor water quality run-off and that is why there is end of catchment targets. Because of this these values don't align with the costs or policy approaches highlighted in the previous report. Although I don't deny it is an issue, I also don't think this section is an outcome directly linked to the regulatory policy mechanism looking to be put in place.

The values of the recreational finishing have been reviewed as a travel cost approach which is essentially a non-market valuation approach, and then there is an assessment of the GDP contribution of recreational fishing. I suspect there would be further travel cost or choice modelling studies which could be considered for benefit transfer too and this would be a useful contribution to the amenity value of improved water quality. At a minimum, this section could be moved into the non-market valuation section and the commercial value still included as a comparison.

The authors suggest that the damage to New Zealand's brand and reputation is related to the dairy industry however they then go on to justify this statement with a study based on sheep meat. There is also a large tourism industry built on this image too, however, this is not considered. I think this section of the report does not robustly contribute to the report and therefore I would recommend either taking it out or looking more broadly at the industries that rely on water quality reputational attributes.

VIII. Avoided costs of delay

This section highlights the risks and lag effects of achieving outcomes. These are essentially the types of risks that are important in the framing and completing the benefit transfer- which are highlighted

in the non-market valuation section of comments. These are relevant and impact on the community WTP for different attributes and outcomes linked to the policy that is to be implemented.

Currently, the author highlights the lags and risk as an issue and something to be considered but does not capture the impact of them and they are not considered in the adjustment of the WTP estimates.

3. Review of community benefits in relation to water quality changes

This section of the review is specific detail pertaining to the attributes of water quality outcomes and the benefits that are received by the community.

The non-market valuation studies reviewed presents a number of attributes which represent the outcomes of the policy on the community. Examples of the attributes that the studies captured are suitability for swimming, fishing, abundance and range of *mahinga kai* available.

Given that there is a broad list of actions to achieve the water quality targets I do wonder if a focus group was run the community benefits might be broader than what was explored in the case studies reviewed. For example the fencing off of stream from animals also had the added component of revegetation in the cost report and if this revegetation was successful it would potentially offer increased biodiversity which therefore may contribute more recreational value such as bird watching.

Interestingly, I think the reason for the large values obtained by the Māori population in Millers study indicates that environment and the cultural attribute were not independent. Meaning that the improvements in water quality outcomes have large positive impacts for culture. I would recommend that the authors explored this further. This is also a stakeholder group who have larger values for the water quality outcomes and are large proportion of the population. One potential way is using Millers study to do this through benefit transfer adjustments.

The extrapolation of the values that were selected to the whole population may be higher than reported. This is based on the fact that families would use these waterways recreationally too so assessing those only above 18 may be an underestimate of the total value. This might be something to consider based on the reviewed literature, but again the alignment to the broader population demographics would have to be checked.

If the intention is that the benefit will be aligned to the costs and assessed as a CBA then further studies need to be reviewed and considerations such as Māori values captured in the monetary values. Currently, the travel cost data for recreation fishing could also be explored further and captured as a monetary benefit. If the intention is to highlight the economic benefits, however, not compare or assess a strategy for how the regulation will be implemented, then the descriptive nature of the values would be adequate.

4. Derived conclusions from results

The authors present a table at the end which captures the different categories of benefits, describes the values and then if a monetary value has been recorded, this is then reported. The authors report the values that they have derived from the completion of their benefit transfer over the 30 years and at a 3% discount rate. The ecosystem health value appears to be reported incorrectly as the results in the section 3.4.3 Ecosystem health is stated to be \$451 million not \$4,569 million. Also the range provided from water clarity does not match what the result is that is calculated on Table 19 of \$451 million.

I would recommend that a range is reported for all of these benefits and they are adjusted based on the earlier comments in my review.