

Jobs for Nature - Mahi mō te Taiao

Understanding economic impacts of the programme
Final Report

17 October 2023
Commercial in Confidence

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Preface

This report has been prepared for The Jobs for Nature Secretariat by Jason Webber, Chelsea Steen-Jones and Memory Rugube from MartinJenkins (Martin, Jenkins & Associates Ltd).

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Executive summary

About Jobs for Nature (J4N)

Jobs for Nature (J4N) is a $1.19 billion four-year programme established to support a green recovery for New Zealand from the disruption of COVID-19. It aims to create 11,000 additional employment opportunities, provide enduring benefits for freshwater ecosystems and water quality, biodiversity, climate change and cultural values, and support sustainable land use and implementation of new regulatory requirements, including for freshwater, biodiversity, and climate change.

As at 30 June 2023, there have been 12,508 employment starts and $638 million provided to 501 projects (plus five programme oversight projects) across a range of work to benefit the environment, people, and regions across New Zealand. It formed part of the government's COVID-19 Response and Recovery Fund (CRRF).

The context and scope of our review

To enable programme planning and benefit management, the Jobs for Nature Secretariat are wanting to:

- assess the likely economic returns from the environmental outputs, and
- understand the economic implications for projects once funding ceases.

J4N will directly contribute $1.19 billion from project spending and oversight, but it is not yet clear how much financial return that creates to New Zealand through new skills, environmental conservation, and a more coordinated sector for sustainable land use, or to what extent the programme's benefits will continue once funding ceases.

Across the natural resource sector – and indeed, across most public sector reporting, there is limited information and data that exists about environmental performance. From J4N there is a large body of reporting on outputs from the programme, creating an opportunity to start filling information gaps. However, the outputs that have been measured do not neatly align to the outcomes that Ministers and the public are presumably seeking in investing in nature-based programmes, such as immediate outcomes for the environment or longer-term outcomes for the climate.

To support more direct performance reporting, we were asked to:

- identify a suite of performance measures that could be used to assess the benefits associated with the investment in the programmes
- develop a summary of the costs and benefits, and
- assess the economic impact of investment in the regions.

CBAx results demonstrate that the investment has a positive NPV and return, although over a slightly longer timeframe than some other investments

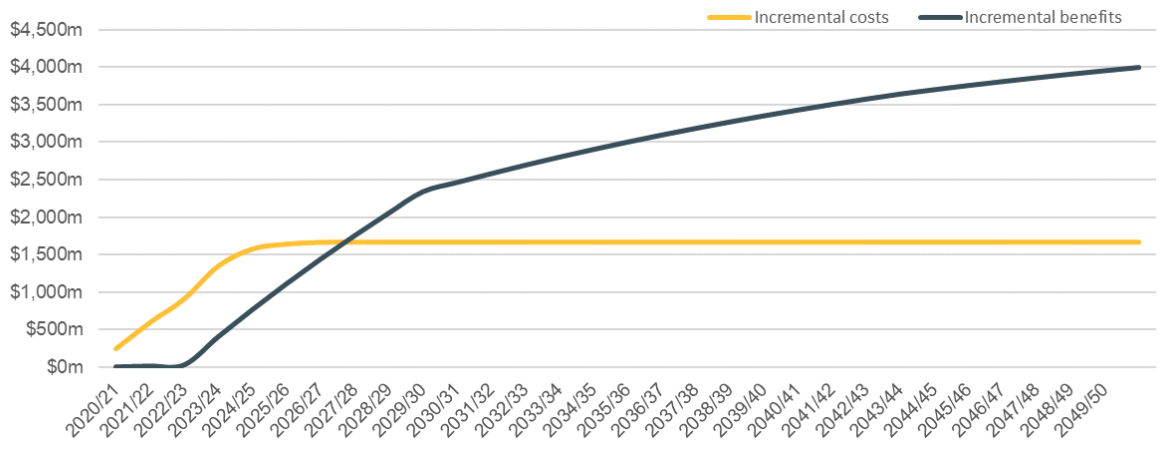
The net present value (NPV) of the investments made in J4N programmes, under a 5 percent social discount rate, is estimated as $2.147b, over a thirty-year period. The benefit to cost ratio is 2.46, however, due to the long-term achievement profile of environmental outcomes and impacts, the payback period is considerably long – 7 years.

A summary of the NPV is included in the table and diagram below.

Summary of incremental costs and benefits ($000s)

High-level summary	Total present value
Costs	$1,473,688
Benefits	$3,620,910
Net present value (NPV) at 5%	$2,147,222
Benefit Cost Ratio (BCR)	2.46
Payback period	7.004 years

Incremental costs and benefits over time (real 2020/21 dollars)



The chart above highlights the significant up-front investment costs made by both the Crown and other parties, and a delay in the achievement of benefits, due to the long lead time for investments in nature-based projects to deliver environmental benefits. There are some small, but immediate, employment benefits included in this assessment.

The economic impact assessment (EIA) also shows that investment in the regions contributed positively to GDP

The programme also directly spent $786.308m[1] in the regions, and this was estimated to create $994.5m in economic benefit, for a BCR of 1.20 overall.

The total estimated FTEs to have been supported with this expenditure is between 10,774 FTEs and 13,555 FTEs.

The table below summarises the results overall from the EIA, with the following table showing the results on a region-by-region basis.

Total economic impact assessment ($000s)

National	Direct	Indirect	Induced	Direct + Indirect	Direct + Indirect + Induced
GDP ($000s)	$557,502	$466,882	$411,498	$1,024,385	$1,435,883
Employment (FTEs)	6,516	4,258	2,781	10,774	13,555

Economic impact assessment by region ($000s)

Region	Programme expenditure	GDP benefits (Direct + Indirect + Induced)	Estimated FTEs
Auckland	$36,799	$44,203	417
Bay of Plenty	$109,483	$131,509	1,241
Canterbury	$141,270	$169,691	1,602
Gisborne/Tairāwhiti	$45,284	$54,394	513
Hawkes Bay	$40,328	$48,441	457
Manawatū-Whanganui	$61,916	$74,373	702
Marlborough	$31,521	$37,863	357
Tasman-Nelson	$34,314	$41,217	389
Northland	$56,624	$68,015	642

[1] Nationwide investment is reported separately in the analysis as it includes projects that cross regions (such as the Kaipara Moana Remediation Programme), investment on delivering systems and tools for freshwater management and regulations, and administrative costs associated with the scheme.

Otago	$62,945	$75,608	714
Southland	$34,987	$42,025	397
Taranaki	$21,354	$25,651	242
Waikato	$48,196	$57,892	547
Wellington	$29,367	$35,275	333
West Coast	$26,916	$32,331	305
Chatham Islands	$5,006	$6,013	57
Regional total	**$786,308**	**$944,500**	**8,916**
Nationwide	$409,082	$491,383	4,639
Total	**$1,195,391**	**$1,435,883**	**13,555**

We also developed a reusable suite of impact measures that can be used to assess environmental investment's impact and performance on an ongoing basis

To quantify the performance of the Jobs for Nature programme and future environmental investments, we leveraged existing literature and programme reporting data to craft intervention logic maps. The intervention focus areas were identified as:

- restoring terrestrial ecosystems
- restoring freshwater ecosystems
- eliminating pests and threats to biodiversity
- access and connection with nature, and
- upskilling the workforce.

A summary of the intervention logic map is included in the figure, below.

INTERVENTIONS	Restoring terrestrial ecosystems	Restoring freshwater ecosystems	Eliminating pests and threats to biodiversity	Access and connection with nature	Upskilling the workforce
INPUTS	• Biodiversity plantings • Planting native trees	• Protecting areas • Planting • Restoring waterways	• Plant clearing • Pest trapping and poisoning	• Asset maintenance	• Training to staff/formal qualifications • Employment opportunities
OUTPUTS	• Ecosystem restoration areas • Plants planted in terrestrial areas	• Fences constructed • Riparian planting areas • Riparian planting coverage • Freshwater restoration areas • Fish passages remediated	• Wilding conifers controlled • Other plant pest controlled • Wallabies controlled • Other animal pests controlled	• Tracks maintained • Assets maintained	• Staff trained in health and safety, project management, conservation, science, mātauranga Māori, and administration • Staff experienced in conservation and environmental work
OUTCOMES	• Improved biodiversity • Improved resilience of ecosystems • Preserved/improved natural resources	• Improved biodiversity • Improved resilience of ecosystems • Preserved/improved natural resources	• Reduced threats to biodiversity • Preserved/improved indigenous biodiversity	• Preserve culturally significant lands and waters • Maintain access and connection with nature • Restore access and connection with nature	• Increased environmental awareness • Upskilled workforce • Increased employability
FIRST-ORDER IMPACT	• Avoided extinction of species • Carbon sequestration • Air pollution removal • Avoided run-off • Energy savings	• Avoided extinction of species • Avoided wetland loss • Increased water quality • Avoided soil loss • Carbon sequestration • Increased ecological quality	• Avoided extinction of species • Avoided production losses • Avoided loss in biodiversity value	• Recreational benefits • Tourism benefits	• Avoided unemployment • Avoided income loss • Increased productivity • Increased opportunities for youth offenders
SECOND-ORDER IMPACT	• Reduced climate effects • Reduced environmental degradation	• Reduced climate effects • Reduced environmental degradation • Reduced health risks • Recreational benefits • Cultural benefits	• Reduced climate effects • Aesthetic benefits • Recreational benefits • Cultural benefits • Tourism benefits • Social cohesion • Economic wellbeing of communities	• Social and cultural wellbeing of communities • Health impacts • Economic wellbeing of communities • Healthy and productive ecosystems	• Decreased recidivism • Reduced poverty • Improved health and wellbeing for employees

Recommendations on filling data gaps

We have also developed some recommendations on how to improve data quality and collection, to both better supplement existing project data, and to support better reporting on environmental and economic outcomes in the future. We describe these potential additions and changes further, below.

Understanding and collecting ongoing costs

Financial data about maintenance budget and costs show the level of investment needed to maintain the benefits from the programme.

Understanding the additional investment that would be required to maintain the gains delivered by the programme will be important to guide any potential investments in the future. Obtaining this information will require collaboration among the agencies.

Collecting baseline data on place, including land and freshwater quality before work begins

Information on the state of land or land use before restoration efforts, including information on the type of land use (for example, monoculture or agriculture), soil quality, biodiversity, and ecosystem health would help to better target and understand investments made in particular regions.

Right now, there is limited baseline data that exists in an analysable form, meaning that both the identification of potential areas for restoration and the impacts of this restoration are conducted on a generalised, rather than place-based basis. Engagement and collaboration with agencies such as LINZ and Landcare Research may assist in closing this gap.

Collecting additional demographic information about the nature of employment and jobs created

Current reporting is missing data on the nature of employment and training provided as well demographic data on individuals employed through the project, including age, gender, ethnicity, and educational background.

This information would help to understand the types of employment opportunities and skills created and who is impacted by them.

Collecting more evidence on the impact that restoration activities have on boosting Māori cultural values

Finally, there is limited information reported on the impact that restoration activities have on Māori cultural values and or how work contributes to honouring Te Tiriti o Waitangi. Although this data often exists on an ad-hoc basis, collecting this information in a more analysable form may make it easier to identify and measure the impact that restoration activities have.

The analysis could benefit from drawing on some of the MfE work on wellbeing and the Māori compass, and it may be necessary to engage with the relevant people working on this. A survey on the cultural use of terrestrial and freshwater ecosystems as well as leaning on other agencies' work could also aid with reducing the knowledge gap in this area.

Introduction

Purpose and scope of this review

About Jobs for Nature

Jobs for Nature (J4N) is a $1.19 billion four-year programme established to support a green recovery for New Zealand from the disruption of COVID-19. It aims to create 11,000 additional employment opportunities, provide enduring benefits for freshwater ecosystems and water quality, biodiversity, climate change, cultural values, and support sustainable land use and implementation of new regulatory requirements, including for freshwater, biodiversity, and climate change.

As at 30 June 2023, there have been 12,508 employment starts and $638 million provided to 501 projects (plus five programme oversight projects) across a range of work.

Table 1: Jobs for Nature employment starts and project funding by primary project type

Types of projects	Employment starts (as at Q4 2023)	J4N funding paid (as at Q4 2023)	Project funding (J4N only)
Total	**12,508**	**$637,895,549**	**$1,195,390,636**
Pest / weed control and fauna protection	3,817	$194,569,882	$301,996,011
Catchment management and protection	911	$63,821,624	$250,448,865
Freshwater management and protection	1,420	$66,487,040	$163,022,322
Forest protection and other planting	2,017	$100,297,013	$143,263,600
Wilding conifer and pine management	2,130	$91,132,282	$103,355,600
Riparian planting	1,166	$46,541,576	$65,348,338
Programme oversight	-	$24,210,106	$56,614,202
Access to nature and training	710	$23,057,216	$56,299,110
Other iwi-led outcomes	337	$27,778,810	$55,042,589

Source: Ministry for the Environment

The programme was initially planned to end on 30 June 2024, however, over half of the projects have end dates beyond this. The end date for the programme is now June 2025. For the purposes of this report, we have modelled four hypothetical scenarios for how the programme could be managed:

1. Work ceases 30 June 2024 with all programme funding used (base case)
2. Work ceases 30 June 2024 with any underspends returned to the Crown
3. Funding is used in accordance with current timeframes to allow projects to finish, with any project-level overspends managed within the programme (status quo)
4. Funding is extended to allow projects to finish, with additional funding allocated to cover overspends on individual projects.

Context for this review

To enable programme planning and benefit management, the Jobs for Nature Secretariat are wanting to:

- assess the likely economic returns from the environmental outputs, and
- understand the economic implications for projects once funding ceases.

J4N will directly contribute $1.19 billion from project spending and oversight, but it is not yet clear how much financial return that creates to New Zealand through new skills, environmental conservation, and a more coordinated sector for sustainable land use, or to what extent the programme's benefits will continue once funding ceases.

Across the natural resource sector – and indeed, across most public sector reporting, there is limited information and data about environmental performance. From J4N, there is a large body of reporting on outputs from the programme, creating an opportunity to start filling information gaps. However, the outputs that have been measured do not neatly align to the outcomes that Ministers and the public are seeking in investing in nature-based programmes, such as immediate outcomes for the environment or longer-term outcomes for the climate.

As there is limited information about environmental performance reporting, J4N is an opportunity to set measures and combine reported outputs with research to develop an approach for assessing the return on nature-based investment and inform future funding decisions. This review is also an opportunity to identify key data gaps that would need to be filled to complete this picture.

Purpose of this report

This report identifies immediate outcomes of the programme that could be considered in the final review and used to inform future funding decisions. It describes a way to measure the economic, environmental, and wellbeing impacts associated with different types of interventions.

By using data from other research and relevant literature, and recognising existing limitations, our review assesses the benefits of J4N investment using a social cost-benefit analysis, and conducting an economic



impact assessment on programme spending that was conducted in the regions, as a way to demonstrate the economic impacts of these interventions.

This report and the associated analysis set out a suite of reusable impact measures that can be both added to Treasury's CBAx toolkit and used by future programmes to assess performance of investments.



CBAx Results

Frameworks and tools utilised

We used both a social cost-benefit analysis (CBAx) and an economic impact assessment (EIA) approach to assess the value and outcomes delivered by the programme

We recognise that there are a variety of approaches to measure the value of nature-based investment, many of which are still in their early stages of development and maturity in New Zealand. Alternative valuation and assessment approaches which have not been used in our analysis include:

- **Total Economic Value (TEV),** which is a framework that seeks to quantify the total economic value of land-based ecosystems and their services. This involves measuring use values, non-use values (for example, the continued existence of endangered species), and option values (the option to use a resource in the future). A limited set of non-market valuation estimates of non-use and option values have been consolidated across the public sector and included in the Treasurys CBAx spreadsheet model.

  On freshwater quality and environmental amenity, the CBAx model references non-market valuations, based on data from a set of two discrete choice experiments (DCE) or willingness to pay surveys.[2] A notable feature of the two DCE surveys is they rely on respondent perceptions of the risk of loss of environmental amenities or freshwater quality.[3]

  Where this information is included in the Treasury's CBAx model, we integrated these valuations and findings into this report, but have not taken an overall TEV approach, because there is not an agreed, consistent approach on how to measure TEV across the public sector in New Zealand.

- **The System of Environmental-Economic Accounting – Ecosystem Accounting (SEEA) framework,** is a statistical framework that integrates economic and environmental data to measure the natural capital and ecosystem services of a country. It was adopted by the UN Statistical Commissions in March 2021.

  It aims to provide a more comprehensive and multi-purpose view of the interactions between the environment and the economy. Statistics New Zealand has published *Environmental accounts 2019*

[2] See *Non-market valuation of improvements in freshwater quality for New Zealand residents, from changes in stock exclusion policy MPI Technical Paper No: 2017/08*, Prepared for the Ministry for Primary Industries and *Non-market economic valuation of myrtle rust management benefits for New Zealand residents MPI Technical Paper 2017/59*. Prepared for the Ministry for Primary Industries
[3] Both reports include chapters on perceptions and experiences but do not report the provision of data to respondents on actual environmental outcomes and trends.

(data to 2017). This adopts the UN SEEA framework and has a particular emphasis on greenhouse gas emissions and the role of land use in carbon sequestration.

Because this information and data is primarily focussed on greenhouse gas emissions currently in New Zealand, and the Environmental Accounts published by Statistics New Zealand do not appear to contain information at a significant granularity to assess the impact of investments made in Jobs for Nature projects, this approach has not been taken in this report.

The analysis presented in this report uses two main economic value assessment approaches:

- A social cost-benefit analysis, based on the New Zealand Treasury's CBAx framework, and
- An economic impact assessment (EIA), which measures the economic impact of expenditure across an economy, and in particular regions in that economy.

We utilised these two frameworks for two reasons: First, the social cost-benefit analysis approach is the standard and recommended method for assessing and requesting funding from the Crown for investments. The approach is well understood across the New Zealand public sector and is re-usable and comparable across both nature-based and non-nature-based investments.

This approach allows for better comparability between the marginal value of investments in nature-based activities compared to those not in the natural resource sector – that is, it is the standard and agreed approach for measuring the relative values of investments at the time that Crown funding decisions are made as part of the Budget process.

We used the economic impact assessment (EIA) approach to quantify the value of jobs and economic activity that was created and preserved through the investments made in J4N in the regions. This approach has been commonly utilised when reporting on the impact of investments made through the Provincial Growth Fund (PGF), when the focus of investments has primarily been on creating jobs and stimulating economic activity, particularly in certain regions in New Zealand.

The results of the EIA are presented following the results of the social cost-benefit analysis.

Summary of the cost-benefit analysis (CBAx)

This section sets out the results of the cost-benefit analysis. Identified costs and benefits, and the approach, inputs and assumptions to this analysis, are included in Appendix 1.

Table 2 below provides a high-level summary of the incremental costs and benefits of the investment made to date in Jobs for Nature projects, in present-value terms as at FY 20/21,[4] relative to the counterfactual, which would have been that this investment did not occur, and would have been funded from existing agency baselines, or not at all.

[4] The CBA is presented in present value (PV) terms at FY 20/21 as this was the first year that investment was made.



The forecast period of these benefits is for ten years for economic benefits (to FY 30/31), and thirty years for non-economic benefits (to FY 50/51).

We selected a shorter period for the assessment of the economic benefits because, in most instances, investing for economic benefits (such as growth in jobs or an improvement in employability) generally demands a shorter return period than social, environmental, or well-being benefits.

Summary of the CBAx

Table 2: Summary of incremental costs and benefits ($000s)

High-level summary	Total present value
Costs	$1,473,688
Benefits	$3,620,910
Net present value (NPV) at 5%	$2,147,222
Benefit Cost Ratio (BCR)	2.46
Payback period	7.004 years

The net present value (NPV) of the investments made in J4N programmes, under a 5 percent social discount rate, is estimated as $2.147 billion over a thirty-year period. The benefit to cost ratio is 2.46, however, due to the long-term achievement profile of environmental outcomes and impacts, the payback period is considerably long – 7 years.

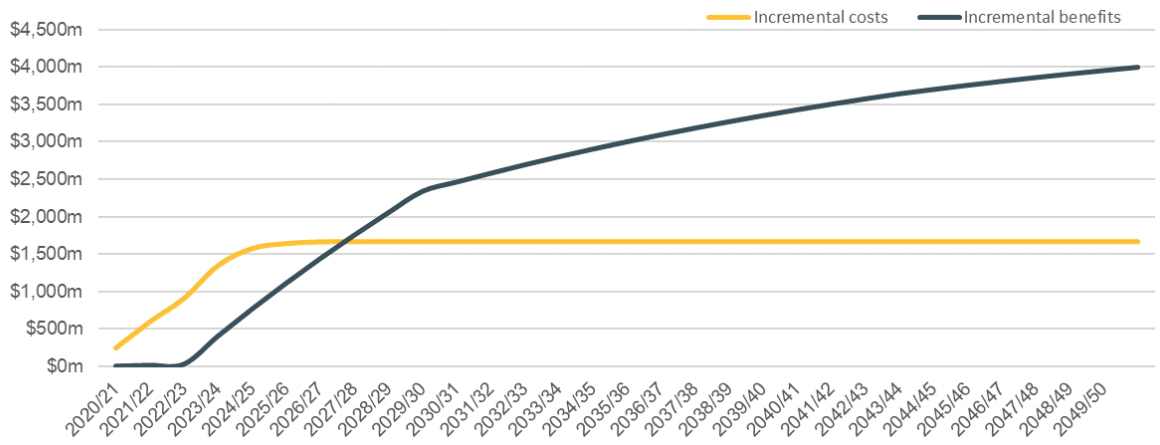
This is consistent with initiatives that invest for environmental outcomes – and the payback period for the investment in J4N projects is arguably shorter compared to other environmental investments, due to the dual objective nature of the fund (that is, supporting both jobs and economic growth as well as environmental outcomes), and the programme delivering a range of achieved economic benefits.

Further details on other scenarios showing the impact of different assumptions and social discount rates are provided in the sensitivity analysis section below.

The profile of the incremental costs and benefits is provided in the chart below.



Figure 1: Incremental costs and benefits over time (real 2020/21 dollars)[5]



The chart highlights the significant up-front investment costs made by both the Crown and other parties, and a delay in the achievement of benefits, due to the long lead time for investments in nature-based projects to deliver environmental benefits.

However, once projects are funded, benefits are estimated to significantly exceed costs for the investments made from FY 27/28 onwards.

Sensitivity analysis

Because we recognise that many of the impact measures and assessments are uncertain, both due to the uncertainty of particularly interventions and the long-term nature of the assessment period, we also conducted a sensitivity analysis on the benefits, including changing the assessment period and reducing benefits by up to 50%. A summary of the sensitivity analysis is included in Table 3, below.

Table 3: Sensitivity analysis of the incremental costs and benefits

Present value - $000s	**Costs**	**Benefits**	**NPV**	**BCR**
Core analysis	**$1,473,688**	**$3,620,910**	**$2,147,222**	**2.46**
Variable change				
Discount rate - 4%	$1,516,680	$4,002,467	$2,485,787	2.64
Discount rate - 6%	$1,432,500	$3,301,947	$1,869,446	2.31
Assessment period of ten years, not thirty	$1,473,684	$2,119,212	$645,528	1.44

[5] Although there were some marginal incremental employment benefits achieved between 2020/21 and 2022/23, these are not visible on the chart due to chart scaling.

Benefit variable changes				
Benefits reduced by 50%	$1,473,688	$1,810,455	$336,767	1.23

In each instance, the results demonstrate that the assessed benefits still outweigh the costs of the investment made to date.

The major sensitivity in the model is therefore the extent to which benefits are both achieved and valued in out-years, and the extent to which these long-term benefits are valued compared to short-term costs and outcomes, as the BCR drops significantly when reducing the benefits and assessing the investment over only a ten-year time horizon.

This result is consistent with evidence which indicates that investments in environmental outcomes require longer time horizons when compared to other types of investments, and the fact that many of the environmental investments also contain qualitative benefits which are difficult to quantify.

It should be noted that, on its own, the investment in jobs and spending specifically in regions demonstrates a strong quantitative economic return. We discuss this in the economic impact assessment (EIA) later in this report.

Programme funding scenario analysis

As part of sensitivity analysis, we have also set out different funding scenarios for how the programme may proceed.

We have modelled four hypothetical scenarios for how the programme could be managed:

1. Work ceases 30 June 2024 with all programme funding used (base case)
2. Work ceases 30 June 2024 with any underspends returned to the Crown
3. Funding is used in accordance with current timeframes to allow projects to finish, with any project-level overspends managed within the programme
4. Funding is extended to allow projects to finish, with additional funding allocated to cover overspends on individual projects.

These are scenarios are used to explore how benefit profiles would differ based on future programme spend. **These are not considered as options**.

Scenario 1 – Work ceases 30 June 2024 with all programme funding used

This scenario represents the Base Case and details what benefits would look like based on the original design of the programme. Under this scenario, there is fixed term funding over four years for projects that provide skills and employment opportunities while delivering environmental outcomes.

Having this scenario as the base case allows us to assess the impact of the programme based on its original design and intent. The CBA results for Scenario 1 are shown in the tables throughout the report.

Benefits of the Base Case

- This scenario honours the commitments of the project – injecting the committed funding into communities and the environment over four years.
- Relationships with stakeholders that have been built through the programme could be maintained through other work with the Crown, particularly in the environmental space.

Costs/disbenefits

- The programme is tracking behind all funding being used by the initial end date of 30 June 2024.
- This scenario would require considerable effort to redistribute and manage funding to ensure it is fully committed by the planned end of the programme. This additional oversight has an opportunity cost for the time of programme managers and the J4N Secretariat.

Scenario 2 – Work ceases 30 June 2024, underspends returned to the Crown

This scenario assumes the programme keeps to its planned timeframe, but tests what the impact is if not all of the committed funding is distributed, noting projects continue on past the initial end date of 30 June 2024.

Benefits of Scenario 2

- This scenario aligns with the spirit of the COVID Response Recovery Funding used for the project - time limited, focused on economic stability, an opportunity to invest in the environment. This approach would result in higher fiscal restraint, albeit at the cost of delivery of environmental outcomes.

Costs / disbenefits

With funding not distributed to projects returned to the Crown, this is anticipated to:

- Impact quantified benefits - estimated as at least 20% lower than other scenarios, primarily driven from incomplete project work
  - It creates a sunk cost on the projects that will not be able to be completed that had work planned but disrupted due to more time needed up front for planning, time needed to build relationships for work to be confirmed and commence, and natural events that impacted critical timeframes for projects, like weather disrupting planting seasons.
  - 20% is our conservative estimate of the benefits lost from truncated work, given the investment in projects to date has been in both outputs, and improved efficiency in getting outputs over time (from relationships and plans in place, and lessons learned).
  - There would be significant costs / lost benefits from not completing work, particularly for pest management – for example, the return of the wallaby.
- Impact qualitatively considered benefits

- It creates a significant relationship cost by stopping work and clawing back funding. There would be a significant loss of trust and confidence from existing and new relationships that had been built up with communities, organisations, iwi, hapu, and marae.
- In addition to the impact on relationships, stopping funding may result in a breach of contracts which may create significant legal and financial consequences.

The quantified impacts for this scenario are shown in the table below. It is expected to result in the lowest level of benefits overall and lowest BCR.

Table 4: Scenario 2 – Work ceases 30 June 2024, underspends returned, 80% of benefits realised ($000s)

High-level summary	Scenario 1 / base case	Total present value
Costs	$1,473,688	$1,280,412
Benefits	$3,620,910	$2,896,728
Net present value (NPV) at 5%	$2,147,222	$1,616,316
Benefit Cost Ratio (BCR)	2.46	2.26
Payback period	7.004 years	7.067 years

Scenario 3 – Extended timeframes, overspends managed

While Scenario 1 is used as the base case for analysis to test the impact of the project in line with the original design, this scenario is what is likely to happen going forward (the status quo).

Benefits of Scenario 3

- Relationships are maintained, and with extended timeframes there is more of an opportunity to share and leverage connections more widely within and beyond the environmental sector (for example, health, employment, and other government areas).
- More time to collect data and refine information on environmental impacts for a clearer picture to inform future investment decisions.

Costs / disbenefits

- Some additional oversight is needed to reallocate budgets and manage overspends to date. This additional oversight has an opportunity cost for the time of programme managers and the J4N Secretariat.

The quantified impacts for this scenario are shown in the table below. The main difference from Scenario 1 is in the timing of costs and benefits. Amounts are more spread out, and subject to additional discounting in outer years.

Table 5: Scenario 3 – Work continues until projects end, overspends managed ($000s)

High-level summary	Scenario 1 / base case	Total present value
Costs	$1,473,688	$1,456,279
Benefits	$3,620,910	$3,620,910
Net present value (NPV) at 5%	$2,147,222	$2,164,631
Benefit Cost Ratio (BCR)	2.46	2.49
Payback period	7.004 years	7.001 years

Scenario 4 – Extended timeframes, additional funding provided

This scenario shows what further investment into the outcomes the programme set out to achieve would return. This would allow any overspends from projects to date to be covered, with other planned work able to continue.

Benefits of Scenario 4

- Relationships are maintained, and with extended timeframes there is more of an opportunity to share and leverage connections more widely within and beyond the environmental sector (for example, health, employment, and other government areas).
- More data overall on the impacts of environmental initiatives from the full suite of projects for a clearer picture to inform future investment decisions.

Costs / disbenefits

- No further costs beyond the additional funding required, which is qualitatively considered in the table.

The quantified impacts for this scenario are shown in the table below. There are significant qualitative benefits in this scenario that are not reflected in the BCR, particularly the opportunity to generate more data and useful information, while preserving relationships.

Table 6: Scenario 4 – Work continues until projects end, additional funding provided ($000s)

High-level summary	Scenario 1 / base case	Total present value
Costs	$1,473,688	$1,508,139
Benefits	$3,620,910	$3,620,910
Net present value (NPV) at 5%	$2,147,222	$2,112,771

Benefit Cost Ratio (BCR)	2.46	2.40
Payback period	7.004 years	7.031 years

Incremental costs

Table 7 summarises the present value of the estimated total costs of the investment in J4N programme, over the period from FY 20/21 to when programme funding completes for individual projects. Further details on these costs are provided in Appendix 1.

Table 7: Incremental costs

Costs	Total present value $000s	% of total costs
Total J4N project costs	$1,035,281	70%
Total non-J4N project costs	$252,056	17%
Deadweight cost of taxation related to use of Crown funds	$186,351	13%
Total incremental costs	**$1,473,688**	**100%**

The bulk of the incremental cost is direct expenditure associated with the J4N programme from the Crown (70%). This cost also includes the costs contributed to all projects by non-Crown sources – including private funding, and local and regional government funding.

Finally, in line with the Treasury's guidance on cost-benefit analysis, a deadweight cost associated with the Crown expenditure is also included, to represent the economic cost of taxation.

We utilise 18%, which is lower than the Treasury's recommended rate of 20%.

As discussed in the Distributional impacts section below, some investments appear to generate higher quantitative marginal benefits compared to others – we discuss this in further detail below, but it is also important to note that many of the investments have strong qualitative components which are not able to be easily modelled and should also be considered in future investment decision-making.

Incremental benefits

The incremental benefits were estimated using a range of impact measures from the Treasury's CBAx toolkit and a literature review which was conducted to support the analysis presented in this report.[6] We discuss the suite of impact measures later in this report.

The major incremental benefit categories are summarised in Table 8 below.

Table 8: Incremental benefits

Incremental benefits	Total present value $000s	% of total benefits
Economic benefits	$1,175,611	32%
Environmental benefits	$2,012,584	56%
Wellbeing benefits	$432,715	12%
Total incremental benefits	**$3,620,910**	**100%**

The largest portion of incremental benefits are environmental benefits. These benefits reflect the value of improving the quality of freshwater and water catchments, protecting and improving biodiversity, reducing fire risks, increasing carbon sequestration and reducing water treatment costs as a result of improving natural wetlands.

The economic benefits include improved productivity on farms due to better pest control, avoided irrigation and hydro losses due to better freshwater management, reduced youth unemployment, and improvements in earning outcomes for individuals who were provided a job through the scheme.

The wellbeing benefits relate to the improved recreational value and aesthetic appeal of conservation spaces, reduced human health risks as a result of an improvement (or further degradation) of freshwater, improvements in cultural values, and an increase in recreational amenity for freshwater activities, such as fishing.

Further details on each of the impact measures is included in Appendix 1.

Use of the impact measures to quantify benefits

As noted earlier, we developed a suite of impact measures to quantitatively assess the impacts of the investment made across the programme.

These impact measures have been developed from a variety of sources, including:

[6] MartinJenkins, *Impact assessment desktop review – draft report.* Provided 30 June 2023.

- existing measures in the Treasury's CBAx toolkit, such as those measuring amenity or cultural value, reductions in youth unemployment, improvements in freshwater quality, and the value of carbon sequestration, and
- an additional suite of impact measures and assessments on the value of these interventions based on a literature review, which included reviewing both domestic and international data sources that attempted to identify and quantify the value of various environmental outcomes.

The impact measures have been included in a selectable database in the same format as the Treasury's CBAx toolkit so they can be used for future natural resource sector proposals and investment decisions.

Distributional impacts and investments, and considering qualitative investments

Decision makers are often concerned about the distributional impacts of projects and policies – that is, if particular policies are likely to benefit (or harm) particular segments of society. Distributional analysis is an important supplementary step to a CBA, which can demonstrate how costs and benefits are distributed across different cohorts of a population.[7] In the section below, we identify areas of the results where benefits are expected to accrue.

Investments that directly support the agriculture sector's productivity and performance have the highest quantifiable benefits

Not surprisingly, investments that directly supported reducing pests on or near agricultural land, and investments that improved water quality and led to reductions in irrigation losses, generated the highest quantitative benefits in the modelling. This implies that investments in the following activities have the strongest marginal impact on benefits:

- Pest control adjacent or near to agricultural land
- Investments in water catchment improvement that reduced runoff or loss, and
- Investments in water catchment improvements which improved water quality.

Investments that support reductions in the need to invest in 'grey' infrastructure also demonstrate a strong return

Given the large planned expenditure in resilience and response activities following the Auckland Anniversary Weekend floods and Cyclone Gabrielle, investments in wetland protection, improvement, and other freshwater protection activities act as a strong 'green' investment in flood mitigation and prevention compared to the alternatives, which are often referred to as 'grey' infrastructure.

The costs that are avoided – in either response costs or avoiding the need to construct significant man-made 'grey' infrastructure (such as additional stormwater pipes or water treatment plants), is significant, and

[7] See Distributional analysis guidance note, Office of Best Practice Regulation, Commonwealth of Australia, 2021. https://obpr.pmc.gov.au/resources/guidance-assessing-impacts/distributional-analysis

is the single greatest contributor to the environmental benefits included in this assessment. These avoided costs represent some 67% of the total environmental benefits that are quantified in the environmental benefits assessment in the CBAx.

This analysis – and results – demonstrate that a strong case remains for investing in riparian and freshwater management activities to improve resilience and could form part of a future response to climate change adaptation activities.

Economic Impact Assessment (EIA) of the regional investment and job creation

Summary of the economic impact assessment (EIA) approach

Another way of assessing the value of investments in job-creation is to conduct an economic impact assessment, compared to the CBAx approach that was discussed earlier in this report.

Economic impact assessment derives the jobs and GDP delivered in a defined geographic area from the expenditure associated with an activity or event. In this case, the J4N programme invested in all regions throughout New Zealand, and a significant portion of the programme's funding was focussed on generating nature-based jobs in regions throughout New Zealand.

We have used Input-Output (I-O) multiplier analysis to assess the economic impacts of the investment made in these regions, which is an internationally accepted method widely used in New Zealand to analyse the impact that organisations, industries, spending, and events can have on regional jobs and GDP.

Regional I-O table and multipliers are derived from Statistics New Zealand's national I-O table, building on the unique regional industry activity. The tables allow us to identify the employment and value added in a study area based on expenditure in a particular region (or group of regions).

The I-O tables used in the analysis were provided by Butcher Partners Ltd, who are a recognised producer of regional I-O tables. These tables have been used in many regional economic impact studies in New Zealand.

This particular method involved identifying the particular expenditure from the programme that occurred in regional locations, which was regularly reported on by the programme, categorising the expenditure in the I-O model, and then running this information through the model to generate an estimate of the employment (jobs) and value added (GDP).

Because the programme also reported on the number of employment starts, we did a 'track-back' check on the model output compared to the actual number of employment starts – this helped to validate that the information produced by the model was a reasonable representation of what was expected to occur in the regions due to funding provided by the J4n programme.[8]

[8] Note that we would anticipate that the number of employment starts should be higher than the number of FTEs and jobs estimated to be created, as an employment start does not necessarily correlate to one FTE. Put another way, multiple employment starts could add up to one FTE.

Expenditure included

For the purposes of the economic impact assessment, we included only the expenditure that was directly invested in the regions throughout New Zealand. This equated to a total of $786.308m of the total programme expenditure of $1.195b. Nationwide investment is reported separately in the analysis as it includes projects that cross regions (such as the Kaipara Moana Remediation Programme), investment on delivering systems and tools for freshwater management and regulations, and administrative costs associated with the scheme.

A summary table of the breakdown of expenditure – by region – is included in the table below. The output can be further broken down by the year it occurred or was planned to occur but is summarised here for presentation purposes.

Table 9: Project expenditure by region

Region	Expenditure $000s
Auckland	$36,799
Bay of Plenty	$109,483
Canterbury	$141,269
Gisborne/Tairāwhiti	$45,284
Hawkes Bay	$40,328
Manawatū-Whanganui	$61,916
Marlborough	$31,521
Tasman-Nelson	$34,314
Northland	$56,624
Otago	$62,945
Southland	$34,987
Taranaki	$21,354
Waikato	$48,196
Wellington	$29,367
West Coast	$26,916
Chatham Islands	$5,006
Total	**$786,308**

Measures of benefit – employment and GDP added

The two benefits that are identified through an economic impact assessment are employment and GDP creation (value-added).

Employment is the jobs that are estimated to have been created by the expenditure. Jobs are expressed as full-time equivalents (FTEs). Because the programme has also reported on employment outcomes and employment starts, we can compare the employment result to the programme's reports to see if the model is presenting a plausible result.

Value-added or GDP, is the additional value that is captured in the particular region within the local area. Value added is generally the sum of salaries, wages, and profits, including depreciation and indirect taxes.

Direct, indirect and induced impacts

As well as the direct impacts from the expenditure, I-O multiplier analysis is used to estimate the indirect and induced impacts of investment in particular regions resulting from the initial (direct) activity. The three types of impacts are discussed below:

- **Direct impacts:** The J4N projects in the regions receive the direct Crown funding from the J4N programme and use this to hire and maintain staff on projects.
- **Indirect impacts:** The J4N projects make further purchases (such as additional trapping equipment, or riparian plants) from their suppliers and so on, some of which occurs in the study area.
- **Induced impacts:** Employees of both the J4N projects and supplier firms are paid a wage, and some of these wages are spent on consumption in the study area.

Economic impacts – estimated jobs created or supported and regional value add (GDP)

A summary of the results is shown in the following two tables.

Impacts are considered in two ways – they are summarised at the national level (that is, it summarises all of the estimated regional impacts), and also on a region-by-region basis.

Table 10: Total economic impact assessment at a national level

National	Direct	Indirect	Induced	Direct + Indirect	Direct + Indirect + Induced
GDP ($000s)	$557,502	$466,882	$411,498	$1,024,385	$1,435,883
Employment (FTEs)	6,516	4,258	2,781	10,774	13,555

As the results show, the total programme expenditure of $786.3m in the region was estimated to create $994.5m in economic benefit, a BCR of 1.20 overall.

The total estimated FTEs to have been supported with this expenditure is between 10,774 FTEs and 13,555 FTEs, which is around the 12,508 of employment starts reported by the programme. As noted earlier, because multiple employment starts may equate to a single FTE, the estimated number of jobs supported and created with the expenditure appears consistent with the figures that the programme has reported.

Table 11: Economic impact assessment by region

Region	Project expenditure $000s	GDP benefits (Direct + Indirect + Induced) $000s	Estimated Jobs
Auckland	$36,799	$44,203	417
Bay of Plenty	$109,483	$131,509	1,241
Canterbury	$141,270	$169,691	1,602
Gisborne/Tairāwhiti	$45,284	$54,394	513
Hawkes Bay	$40,328	$48,441	457
Manawatū-Whanganui	$61,916	$74,373	702
Marlborough	$31,521	$37,863	357

Region	Project expenditure $000s	GDP benefits (Direct + Indirect + Induced) $000s	Estimated Jobs
Tasman-Nelson	$34,314	$41,217	389
Northland	$56,624	$68,015	642
Otago	$62,945	$75,608	714
Southland	$34,987	$42,025	397
Taranaki	$21,354	$25,651	242
Waikato	$48,196	$57,892	547
Wellington	$29,367	$35,275	333
West Coast	$26,916	$32,331	305
Chatham Islands	$5,006	$6,013	57
Regional total	**$786,308**	**$944,500**	**8,916**
Nationwide and multi-region	$409,082	$491,383	4,639
Total	**$1,195,391**	**$1,435,883**	**13,555**

It is not surprising that the spend in the Canterbury region results in the highest value of GDP impact given that the region accounted for 12% of the total programme expenditure.

However, it must be noted that close to 90% of the nationwide expenditure includes spending on significant multi-regional projects such as the Kaipara Moana Remediation Programme, Predator Free 2050 and the Wai Connection project, among others. Therefore, project expenditure and in turn impact may be understated for some of the regions.

Developing a suite of impact measures

As part of our approach to develop measures for assessing and quantifying the performance of the J4N programme , we identified five key intervention focus areas. The intervention focus areas were:

- restoring terrestrial ecosystems
- restoring freshwater ecosystems
- eliminating pests and threats to biodiversity
- access and connection with nature
- upskilling the workforce.

The intervention logic maps for each of these five areas are summarised in

Figure 2 and map the inputs, outputs and outcomes of the projects undertaken through the programme to a set of impacts. Due to time and data limitations we have focussed on a subset of measurable impacts and grouped them into three categories namely, environmental, wellbeing and economic as shown in Table 12 below.

Table 12: Measurable impacts

Economic impacts	Environmental impacts	Wellbeing impacts
• Avoided flood damage • Reduced stock loss in waterways • Improved productivity for farmers due to reduced competition for grazing • Reduced costs to the agricultural sector and government associated with pest control • Avoided irrigation losses • Avoided hydro losses • Improved agricultural productivity • Reduced pasture damage from possums • Reduced youth unemployment • Positive impact on GDP • Improvements in employment and earnings outcomes for trainees	• Increased carbon sequestration • Improved water quality • Improved biodiversity • Improved ecological quality • Improved water clarity • Soil retention • Reduced water treatment costs • Reduced fire risks • Avoided costs associated with managing biofouling	• Improved recreational value • Aesthetic appeal • Reduced human health risks • Improved cultural values • Increase in fish catch • Increased educational opportunities



Figure 2: Intervention logic map for the J4N programme intervention areas

INTERVENTIONS	Restoring terrestrial ecosystems	Restoring freshwater ecosystems	Eliminating pests and threats to biodiversity	Access and connection with nature	Upskilling the workforce
INPUTS	• Biodiversity plantings • Planting native trees	• Protecting areas • Planting • Restoring waterways	• Plant clearing • Pest trapping and poisoning	• Asset maintenance	• Training to staff/formal qualifications • Employment opportunities
OUTPUTS	• Ecosystem restoration areas • Plants planted in terrestrial areas	• Fences constructed • Riparian planting areas • Riparian planting coverage • Freshwater restoration areas • Fish passages remediated	• Wilding conifers controlled • Other plant pest controlled • Wallabies controlled • Other animal pests controlled	• Tracks maintained • Assets maintained	• Staff trained in health and safety, project management, conservation, science, mātauranga Māori, and administration • Staff experienced in conservation and environmental work
OUTCOMES	• Improved biodiversity • Improved resilience of ecosystems • Preserved/improved natural resources	• Improved biodiversity • Improved resilience of ecosystems • Preserved/improved natural resources	• Reduced threats to biodiversity • Preserved/improved indigenous biodiversity	• Preserve culturally significant lands and waters • Maintain access and connection with nature • Restore access and connection with nature	• Increased environmental awareness • Upskilled workforce • Increased employability
FIRST-ORDER IMPACT	• Avoided extinction of species • Carbon sequestration • Air pollution removal • Avoided run-off • Energy savings	• Avoided extinction of species • Avoided wetland loss • Increased water quality • Avoided soil loss • Carbon sequestration • Increased ecological quality	• Avoided extinction of species • Avoided production losses • Avoided loss in biodiversity value	• Recreational benefits • Tourism benefits	• Avoided unemployment • Avoided income loss • Increased productivity • Increased opportunities for youth offenders
SECOND-ORDER IMPACT	• Reduced climate effects • Reduced environmental degradation	• Reduced climate effects • Reduced environmental degradation • Reduced health risks • Recreational benefits • Cultural benefits	• Reduced climate effects • Aesthetic benefits • Recreational benefits • Cultural benefits • Tourism benefits • Social cohesion • Economic wellbeing of communities	• Social and cultural wellbeing of communities • Health impacts • Economic wellbeing of communities • Healthy and productive ecosystems	• Decreased recidivism • Reduced poverty • Improved health and wellbeing for employees

Source: MartinJenkins

Quantitatively considered impacts and assumptions underpinning the analysis

For ease of reference, the identified impacts were modelled across three categories: economic, environmental and wellbeing impacts.

Economic impacts

For the purposes of our analysis, economic impacts refer to the consequences of an intervention on the financial aspects of an economy. These take the form of improved employment and income outcomes, improved agricultural productivity and impact on gross domestic product (GDP). The impacts result mainly from the following interventions: ecosystem and freshwater restoration, pest control and upskilling of the workforce. It is important to note that restoring and maintaining assets in the natural environment results in economic impact in the form of tourism which has not been quantified in this analysis. Table 13 provides a summary of the quantified economic impacts of the programme's interventions.

Table 13: Summary of quantified economic impacts

Impact measure	Description	Source of data
Avoided flood damage	Avoided harm to people and damage to property, infrastructure and the environment from floodplain restoration	Based on the Nature Conservancy's estimates of the benefits and costs of reducing future flood damages
Reduced stock loss in waterways	Avoided cost of stock loss	Based on USDA report on stock losses and Inland Revenue value of stock
Improved productivity for farmers due to reduced competition for grazing	Agricultural land value maintained through pest management	Based on MPI report on economic costs of pests
Reduced costs to the agricultural sector and government associated with pest control	Avoided cost during and after the programme to control animal pest levels	Based on MPI report on economic costs of pests
Avoided irrigation losses	Avoided impact on water yield / water irrigation impacts from managing wilding conifers	Based on Otago Regional Council's Regional Pest Management Plan CBA
Avoided hydro losses	Avoided hydro losses from managing wilding conifers in hydro catchments	Based on Otago Regional Council's Regional Pest Management Plan CBA
Improved agricultural productivity	Agricultural land value maintained through invasive plant management	Based on MPI report on economic costs of pests

Impact measure	Description	Source of data
Reduced pasture damage from possums	Agricultural land value maintained through pest management - Possums only	Based on MPI report on economic costs of pests
Reduced youth unemployment	Measures the employment gains from youth participation	Based on CBAx model impacts database
Positive impact on GDP	Measures the improvement in GDP as a result of government investment	Calculated by utilising an economic impact analysis (EIA)
Improvements in employment and earnings outcomes for trainees	Measures the income gains after qualification completion	Based on CBAx model impacts database

Environmental impacts

Environmental impacts pertain to the effects of an intervention on the natural world and its ecosystems. The impacts result mainly from ecosystem and freshwater restoration and pest control interventions. They are measured in the form of avoided costs and stated preference willingness to pay based on existing literature. Other impacts identified but not measured were, reduction in nitrogen leaching and reduced sedimentation in water bodies; it is assumed that these are captured in the improvements in water clarity and quality measures. A summary of the quantified environmental impacts of the programme's interventions is shown in Table 14 below.

Table 14: Summary of quantified environmental impacts

Impact measure	Description	Source of data
Increased carbon sequestration	The value of increased carbon sequestration generated by planting new native forestry	Based on MPI's tables on carbon sequestration rates per ha of planted forest
Improved water quality	Measure of willingness to pay for a 1% improvement in water quality, per person	Based on CBAx model impacts database
Improved biodiversity	Measure of willingness to pay for the extinction of up to 10 susceptible species	Based on CBAx model impacts database
Improved ecological quality	Measure of willingness to pay for a 1% improvement in water quality, per person	Based on CBAx model impacts database
Improved water clarity	Measure of willingness to pay for a 1% improvement in water clarity, per person	Based on CBAx model impacts database



Impact measure	Description	Source of data
Soil retention	Measures the avoided loss of topsoil	Based on riparian planting CBA reports
Reduced water treatment costs	The avoided costs of replacing wetland ecosystems with physical infrastructure - per hectare	Based on CBAx model impacts database
Reduced fire risks	Avoided costs of suppressing fires and associated damages from wilding conifer control	Based on MPI's wilding conifer control CBA
Avoided costs associated with managing biofouling	Avoided impact of biofouling resulting from invasive pest species	Based on a UNESCO report on Best Practices in Biofouling Management

Wellbeing impacts

Wellbeing impacts refer to effects of an intervention on the overall quality of life, health, and happiness of individuals or communities. The impacts result mainly from enhancing and restoring places of historical, cultural, and recreational significance. Freshwater ecosystems also serve as outdoor laboratories and offer opportunities for knowledge sharing and educational experiences. However, the educational impact of restoring freshwater ecosystems has not been quantified. A summary of the quantified wellbeing impacts of the programme's interventions is shown in Table 15 below.

Table 15: Summary of quantified wellbeing impacts

Impact measure	Description	Source of data
Improved recreational value	Measure of increased user enjoyment from improved areas for recreational activities including tracks, camping grounds and huts	Based on a research study on the non-market value of parks
Aesthetic appeal	Measure of increased aesthetic benefit derived from restoring the ecosystem	Based on a research study on the costs and benefits of afforestation
Reduced human health risks	Measure of reduced risk of E.coli infection from fencing out of stock	Based on estimates from the Essential Freshwater Package Benefit Analysis
Improved cultural values	Measure of enhanced welfare from being able to protect and promote Māori culture and practice	Based on a study of the costs and benefits of proposed reforms to the resource management system
Increase in fish catch	The value of additional fish caught on a recreational fishing trip	Based on studies of the recreational value of fishing in New Zealand

Other assumptions

Valuation techniques

A combination of techniques and tools have been used to quantify the impacts of the programme. These include:

- market prices based on available market data
- generic prices found in the CBAx model
- stated preference willingness to pay based on research, and
- estimates of central reference values and ranges based on available data.

Success rate

The model assumes that the likelihood of the impacts occurring varies from 3%-100% for different impacts.

Timeframes

Time lag

The model assumes that the economic impacts will begin a year after the projects are delivered, while the environmental and wellbeing impacts begin to accrue three years following the investments.

Time period

The model assumes that economic benefits are accrued over a 10-year period, while the environmental and wellbeing benefits are accrued over a 30-year period.

Qualitatively considered impacts

We identified a number of impacts that are likely to be realised but have not been estimated due to difficulty in monetising them, particularly for assessments that span more than ten years.

The qualitative impacts are summarised below.

- **Impact on tourism** – it is expected that pest control and enhanced biodiversity will increase popularity of a region and result in an increase in international and domestic visitors and therefore tourism value added.
- **Health impacts associated with nature-based employment** – nature-based employment fosters a stronger connection to the natural world. This connection has been linked to reduced stress and improved mental health.
- **Wellbeing impacts associated with access and connection to nature** – spending time in natural environments offers opportunities for enhanced well-being, increased happiness, and a sense of purpose.

- **Commercial fishing impacts associated with restoring waterways** – effective waterway restoration efforts can lead to increased fish abundance and diversity which can benefit commercial fishing by providing larger and more sustainable fish stocks.
- **Research and educational benefits associated with freshwater ecosystems** - freshwater ecosystems provide a rich and diverse learning environment that contributes to scientific research, environmental awareness, and educational opportunities.
- **Improved relationships with iwi, hapū, and private landowners.**
- **Trust and confidence in government.**

Table 16 below indicates the potential magnitude of these qualitatively impacts as either low, medium, or high.

Table 16: Potential magnitude of unquantified impacts

Unquantified impacts	Magnitude
International tourism	Moderate
Health impacts associated with nature-based employment	Moderate
Health impacts associated with access and connection to nature	Moderate
Commercial fishing impacts	Low
Increased educational opportunities	Low
Improved relationships with iwi, hapū, and private landowners	High
Trust and confidence in government	Moderate

Gaps in the data

We have also developed some recommendations on how to improve data quality and collection, to both better supplement existing project data, and to support better reporting on environmental and economic outcomes in the future. We describe these potential additions and changes further, below.

Understanding and collecting ongoing costs

Financial data about maintenance budget and costs show the level of investment needed to maintain the benefits from the programme.

Understanding the additional investment that would be required to maintain the gains delivered by the programme will be important to guide any potential investments in the future. Obtaining this information will require collaboration among the agencies.

Collecting baseline data on place, including land and freshwater quality before work begins

Information on the state of land or land use before restoration efforts, including information on the type of land use (for example, monoculture or agriculture), soil quality, biodiversity, and ecosystem health would help to better target and understand investments made in particular regions.

Right now, there is limited baseline data that exists in an analysable form, meaning that both the identification of potential areas for restoration and the impacts of this restoration are conducted on a generalised, rather than place-based nature. Engagement and collaboration with agencies such as LINZ and Landcare Research may assist in closing this gap.

Collecting additional demographic information about the nature of employment and jobs created

Current reporting is missing data on the nature of employment and training provided as well demographic data on individuals employed through the project, including age, gender, ethnicity, and educational background.

This information would help to understand the types of employment opportunities and skills created and who is impacted by them, and would better inform a distributional analysis on employment opportunities created by the programme.

Collecting more evidence on the impact that restoration activities have on boosting Māori cultural values

Finally, there is limited information reported on the impact that restoration activities have on Māori cultural values and or how work contributes to honouring Te Tiriti o Waitangi. Although this data often exists on an ad-hoc basis, collecting this information in a more analysable form may make it easier to identify and measure the impact that restoration activities have.

The analysis could benefit from drawing on some of the MfE work on wellbeing and the Māori compass, and it may be necessary to engage with the relevant people working on this. A survey on the cultural use of terrestrial and freshwater ecosystems could also aid with reducing the knowledge gap in this area.

Glossary of terms

Term	Definition
Benefit	The measurable improvement resulting from a project or programme (change) that is perceived as positive by one or more stakeholders and contributes to programme objectives.
Benefit-cost ratio (BCR)	The BCR is the ratio of total discounted benefits to the total discounted costs. A BCR greater than 1.0 indicates that the benefits exceed the costs.
Cost-benefit analysis	A systematic approach used to evaluate the financial and economic desirability of a project or policy by comparing its costs and benefits over a specified period.
Direct impacts	Impacts generated by the initial expenditure associated with the programme.
Economic benefit	Measurable improvement to the financial aspects of an economy resulting from a project or programme.
Economic impact assessment (EIA)	Analysis that quantifies the contribution that an activity makes to a geographical area in terms of output, GDP and employment.
Employment starts	Number of new people employed over a given period
Environmental benefit	Measurable improvement to the natural world and its ecosystems resulting from a project or programme.
Full-time equivalent (FTE)	Unit of measurement of the number of full-time hours worked by all employees in a business. They provide a measure of total labour demand associated with expenditure.
Indirect impacts	Impacts that occur when businesses or people directly involved in the programme purchase materials, goods and services from suppliers, who in turn make further purchases from their suppliers, and so on.
Induced impacts	Impacts that occur when employees in those businesses providing the materials, goods and services are paid wages and the enterprises generate profits that are spent on consumption within the region.
Input-output table	A representation of national or regional economic accounting that records the way industries both trade with one another and produce for consumption and investments.
Intervention logic	Depiction of the logic that underpins an investment.
Net present value (NPV)	A financial metric that represents the difference between the present value of benefits and the present value of costs. A positive NPV indicates that the benefits outweigh the costs.
Payback period	The amount of time it takes to recover the cost of an investment.
Present value (PV)	The discounted value of future cash flows.

Term	Definition
Social discount rate	Rate used to represent society's preferences for the timing of costs and benefits. It reflects the idea that a dollar received or spent in the future is worth less than a dollar received or spent today.
Value added	The additional value that is captured in the particular region within the local area. It is generally the sum of salaries, wages, and profits, including depreciation and indirect taxes.
Wellbeing benefit	Measurable improvement to the overall quality of life, health, and happiness of individuals or communities resulting from a project or programme.

Appendix 1: Cost and benefit details

Costs

Costs have been derived from the programme costs and have been separated into the following categories:

- Total J4N project costs refer to the J4N Crown investment administered by the Department of Conservation (DOC), Ministry for the Environment (MfE), Ministry of Primary Industries (MPI), Land Information New Zealand (LINZ) and Ministry for Business, Innovation and Employment (MBIE).
- Total non-J4N project costs include the value of cash and in-kind funding provided by charities and private businesses as well as other government agencies not involved in administering J4N funds.
- Deadweight cost of taxation related to use of Crown funds, estimated at 18% of J4N Crown funding.

Benefits

Benefits have been estimated based on existing literature modelled across three categories:

- Economic benefits refer to benefits to financial aspects of an economy resulting from the programme
- Environmental benefits refer to positive effects of the programme on the natural world and its ecosystems
- Wellbeing benefits refer to the positive effects of the programme on the overall quality of life, health, and happiness of individuals or communities.

Table 17: Detailed incremental benefits

Benefits	Total present value $000s	% of total benefits
Economic Benefits	**1,175,611**	**32%**
Avoided flood damage	5,125	<1%
Reduced stock loss in waterways	1,575	<1%
Improved productivity for farmers due to reduced competition for grazing	170,615	5%
Reduced costs to the agricultural sector and government associated with pest control	203,909	6%
Avoided irrigation losses	215,665	6%

Benefits	Total present value $000s	% of total benefits
Avoided hydro losses	268,451	7%
Improved agricultural productivity	140,234	4%
Reduced pasture damage from possums	1,218	<1%%
Reduced youth unemployment	168,818	5%
Environmental Benefits	**2,012,584**	**56%**
Increased carbon sequestration	36,177	1%
Improved water quality	43,784	1%
Improved biodiversity	324,728	9%
Improved water clarity	43,784	1%
Soil retention	5,212	<1%
Reduced water treatment costs	1,355,994	37%
Reduced fire risks	156,871	4%
Avoided costs associated with managing biofouling	46,035	1%
Wellbeing Benefits	**432,715**	**12%**
Improved recreational value	937	<1%
Aesthetic appeal	8,391	<1%
Reduced human health risks	161,963	4%
Improved cultural values	184,429	5%
Increase in fish catch (as a food source)	76,995	2%
Increased educational opportunities	No data	
Total incremental benefits	**3,620,910**	**100%**

Approach to cost-benefit analysis modelling

We have prepared the social cost-benefit analysis based on the New Zealand Treasury's CBAx framework. To identify costs, we used the programme's quarterly reporting data. To identify benefits, we used intervention logic maps developed for each of the J4N programme's intervention areas (see Figure 2).

A cost-benefit model was built in Excel to complete the assessment. Within the model:

- A summary of CBA outputs is provided noting all incremental costs and benefits
- A sensitivity analysis is provided which captures variations to the cost benefit model
- All costs and benefits are presented in 2020/21 real dollars
- Core inputs and assumptions have been identified and applied consistently across all sheets, these include a 5% discount rate as per Treasury guidance and a deadweight cost of taxation of 18%
- A separate input and calculation sheet for project costs has been developed to capture all Crown and non-Crown costs of the project
- Separate input and calculation sheets for economic, environmental and wellbeing benefits have also been developed
- Additional sheets that provide context to workings in the model have also been included.



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